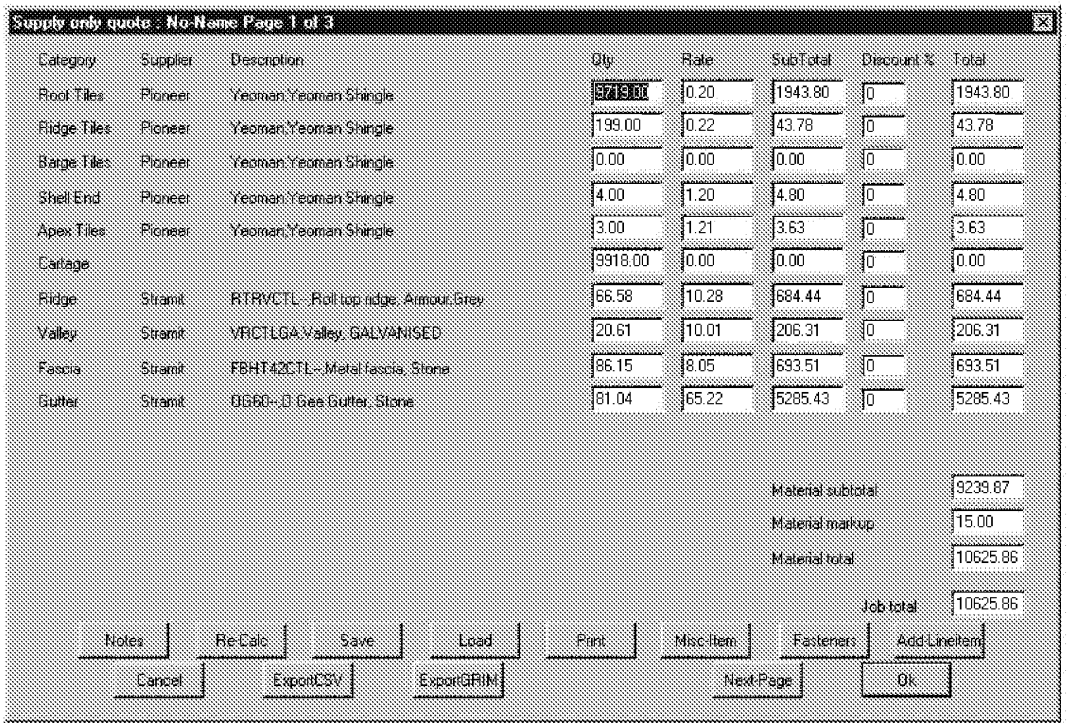
Supply-Only

When you select **Supply-Only**, all the materials are tallied, sorted and displayed on the Supply-Only dialog box.



The title on the dialog box describes the name of the current quote as well as what page is displayed.

Along the top you can see columns called Category, Supplier, Description, Qty, Rate, Subtotal, Discount and Total. Each row represents a single material item ranging from the roof cover material to gutter brackets.

Category this value is simply a shorthand description of the type of item described in the following table.

Category Name	Type of material	Unit
Straight	Straight metal roof material	M2
Curved	Curved metal roof material	M2
Ridge	A ridge flashing	M
Valley	A valley flashing	M
Fascia	A fascia flashing	M
Gutter	A gutter	M
Apron	An apron flashing	
Barge	A barge (rake) flashing	
Step	A step flashing	M
Batten	A batten material	M
Flat Sheet	Flat sheet metal for custom flashings	Each
Fabrication	The total fabrication cost of the custom flashing	Each
Fasten	A fastener type	Boxes
Clip	A type of clip for standing seem panels	Boxes
Accessory	A flashing accessory item.	Each
Membrane	A membrane material	Roll

Roof tiles	Roof tiles	Each
Ridge tiles	Ridge tiles	Each
Hip starters	Hip starter piece	Each
Apex tiles	Apex piece	Each
Roof shingles	Roof shingles	Each
Ridge shingles	Ridge shingles	Each
Apex shingles	Apex shingles	Each
Roof shakes	Roof shakes	Each
Ridge shakes	Ridge shakes	Each
Apex shakes	Apex shakes	Each
Starter course	Starter course material for shingle and shake roofs	Each
D Pipe	A downpipe	Each
D Access	A downpipe accessory which could be a pop, offset, shoe or elbow.	Each
Extra	An extra item read in from *extras.dat*	Each
Insulation	An insulation material	Rolls (large or small)
Ccharge	The curving charge	One off
Cflash	A curved flashing	Each
User Length	A user length value (eg vermin proofing)	M
User	A user defined item	Each
Misc	A user defined item from Misc-Item	Each
Cartage	The number of items to deliver	Each

Supplier This is the name of the supplier of the item

Description This is the description which combines the description of the item and finish

Qty This is the quantity of each item derived from the estimate process. The unit for the quantity is described in he above table.

Rate This is the rate per item

Subtotal This is the sum of the quantity and rate

Discount This is the discount percentage you want to apply for that line item. The default value is the discount associated with the selected customer.

Total This is the total taking the discount into account

Below the Total column is the Job total field which is the total for the job, not just for the page you are looking at.

The buttons at the bottom of the page are

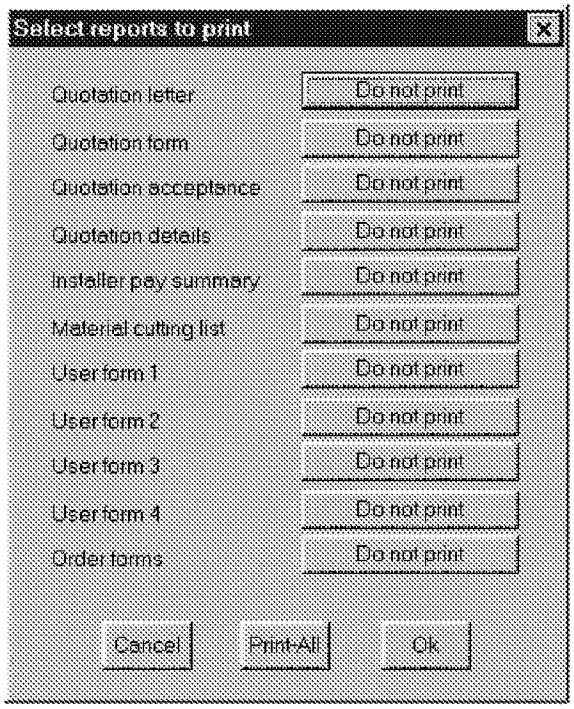
Notes When you click **Notes**, you then click the form report name you wish to attach a note to. For each of the forms, if it has a **###**QQnote key-text-string, then the relevant note will appear on that form. When the note is formatted on the report, line breaks you typed in are ignored since the notes will span the “text width” value of the **###**Qqnote text entity. If you want to force a line break, you must use the ^ (carot) character.

Re-Calc If you make a change to any of the numeric fields on the dialog, you should click **Re-Calc** to see that change

Save You can save this quote by clicking **Save**, then entering a name for this quote. Then you can redo another quote if you wish.

Load You can load a quote you have previously saved for this job.

Print Here you can print up to 11 predefined reports. You can select the reports you want to print on the Select reports to print dialog box.



After you click **Ok**, each report is prepared and then sent to your printer. Like the other reports, the order forms are first preprocessed, generating one or more individual orders for each supplier. The order number on the job details dialog box is used to uniquely identify each order form.

Misc-Item This lists items in *misc.dat* from which you can select one or more. Each selected item is added to the quote. You would use this to add miscellaneous hardware items such as vents, tools and other fasteners. If you add a misc item, it is accumulated with other misc items in the list. Refer to the appendix to see the format of *misc.dat*

Fasteners This lists the fasteners in *fasten.dat* so you can add more fasteners to the quote if you want to.

Add-LineItem This adds a new field to the end of the list allowing you to enter any information into the Category, Supplier and Description fields. This has replaced the User fields in previous versions.

Cancel You can cancel any changes you have made and close this dialog box

ExportCSV This allows you to write the table of information on this dialog box to a comma separated value file, ready to import into other computer systems

ExportGRIM This allows you to write the current job as a GRIM file. If you have given this job a quote number, then the name of the grim file is *<Quote Number>.GRO*. If you have not, the name of the grim file is *GrimFileOut.GRO*. You also get separate grim files defining the materials required from each supplier. These are named *Order-<Job Number>-<Index>.GRO*. Refer to the appendix to see the format of a GRIM file.

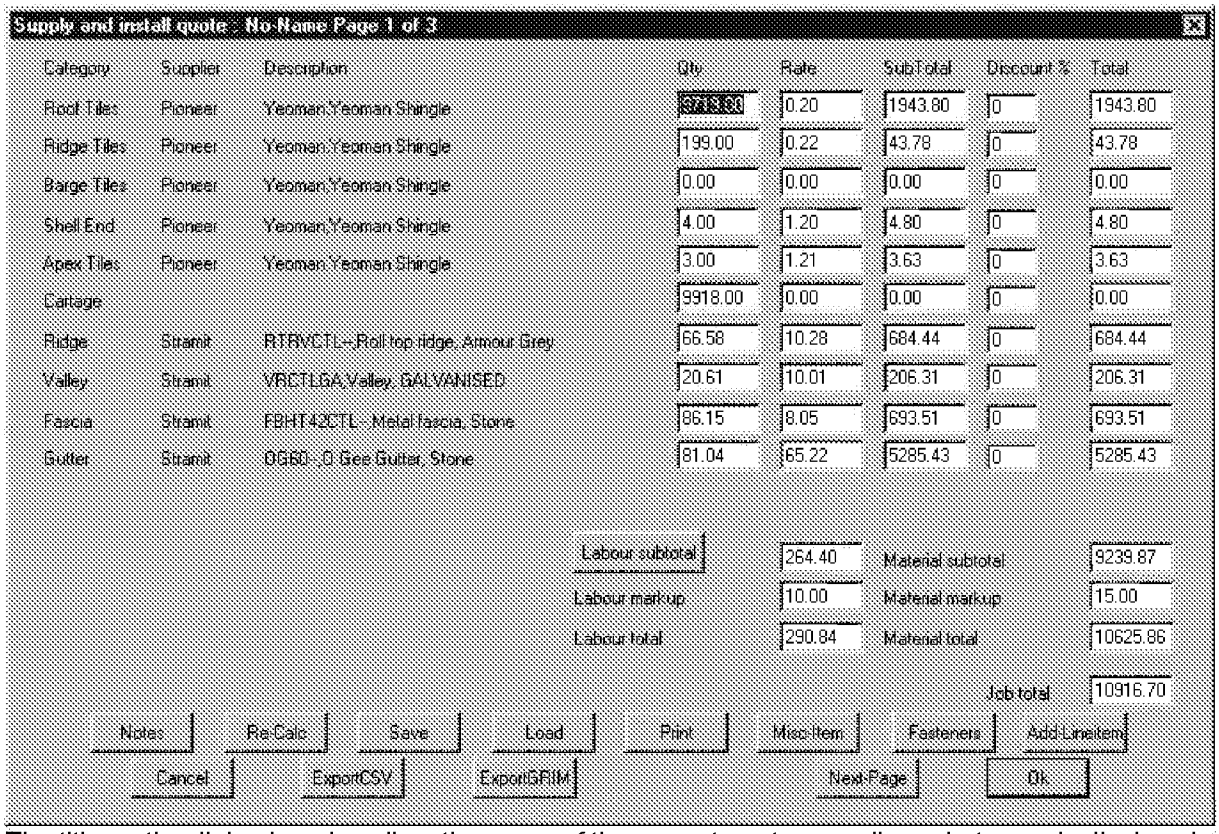
Next-page This will display the next page, if there is one.

Prev-page This will display the previous page if there is one.

Ok This lets you close the dialog box

Supply+Install

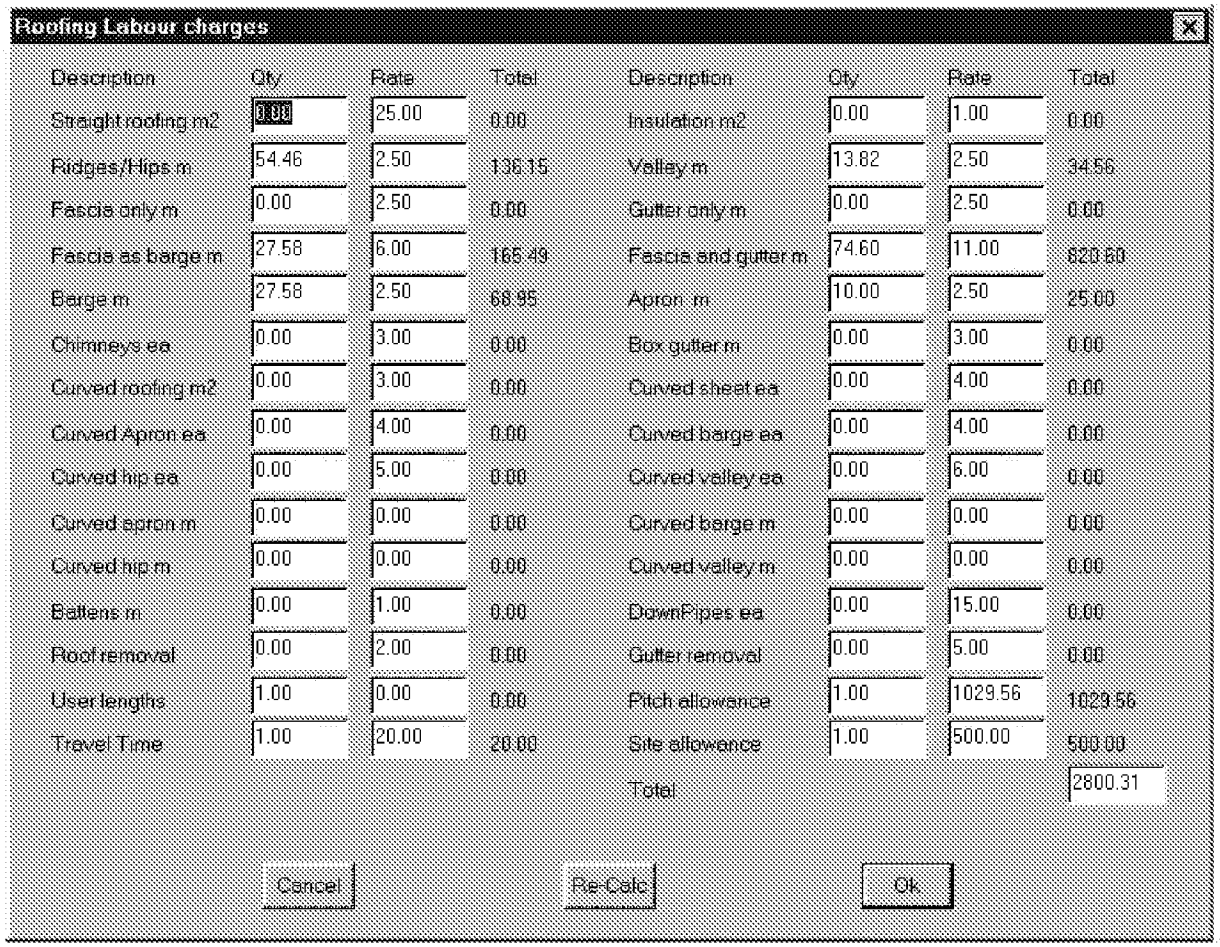
When you click Supply+Install, all the materials are tallied, sorted and displayed on the Supply-Only dialog box as well as the installation charge.



The title on the dialog box describes the name of the current quote as well as what page is displayed.

This dialog is similar to that for Supply-Only, except you can alter the labor charges as well as assign markup percentages to the labor and material charges. Only the differences between the two dialog boxes are discussed here.

Labor subtotal Clicking **Labor Subtotal** displays the Roofing labor charges dialog box for this job.



For each item, there is a quantity, a rate and the total. The labor total is then the sum of the individual totals. Most of the items and rates are derived directly from the Costing Labor-rates dialog box as well as *extras.dat*.

The value labeled **User lengths**, is derived from the **Cover User-Lengths** command.

Th value labeled **Pitch Allowance** is derived from the pitch range settings you set under **Costing Labor-rates**. The final pitch allowance value is derived from adding up the individual roof plane areas coupled with the particular allowance set for that pitch.

In the Roofing labor charges dialog box you can alter the quantities and rates. Those changes you make will only effect the current job.

> Note : the roofing quantities used are nett values not gross values. That is, they are the geometric areas and lengths of the roof and not the amount of material which is ordered.

Labor markup this is the labor markup percentage

Labor total This is the labor total amount including the labor markup percentage.

Material subtotal This is the sum of the material costs

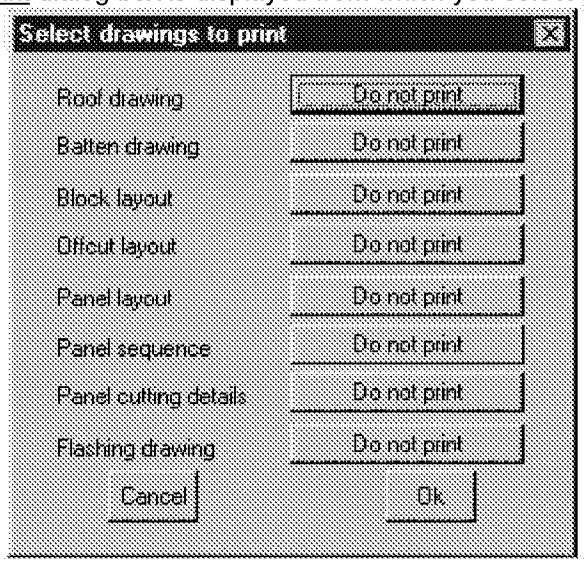
Material markup This is the material markup percentage

Material total This is the material total amount including the material markup pecentage.

Job total This is the total cost for the job including material and labor.

Drawings

When you click **Drawings**, you can now print up to 8 different drawings.
The Select drawings to print dialog box is displayed from which you select the drawings you want.



Drawing name	Template name	Intended Use
Roof drawing	Drawing-Roof	Shows the roof
Batten drawing	Drawing-Batten	Shows the battens on the roof
Block layout	Drawing-block	Shows the blocks on the roof as created by Auto-Block
Offcut layout	Drawing-offcut	Shows the cuts and offcuts created by Gen-OffCuts
Panel layout	Drawing-sheet	Shows the sheets on the roof as created by Gen-Sheets
Panel sequence	Drawing-Sheet-Sequence	Shows the sequencing of panel cutting derived from Linear nesting
Panel cutting details	Drawing-Sheet-Cutting	Shows the detailed dimensioned panels
Flashing drawing	Drawing-flashing	Shows the roof and dimensions for each roof line as detailed by Dimension-Roof Lengths

Once you click **Ok**, the particular drawings you want to print are first prepared for printing, and then sent to your printer.

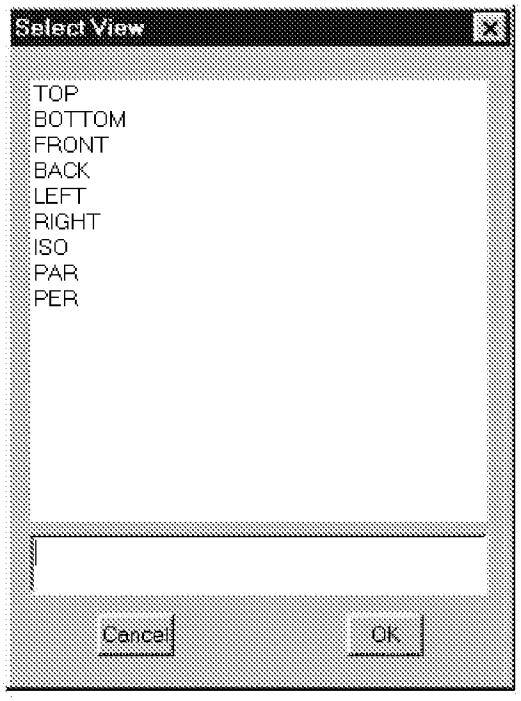
View

This command displays a sub-menu allowing you to change the way you are looking at the model. Normally, you are looking at the model in Top view (ie a plan view orientation). Here you can alter the view to look at the roof from the front, right hand side or even isometric.

> You can see the name of the current view in the status line at the bottom of the graphics area.

Select

Here you can select the new view. When you select the command, the Select view list box is displayed.



After clicking the view name and clicking **Ok**, the orientation of the model on-screen changes to suit. You may need to select **Zoom Fit** to fit the model onto the screen.
The name of this view then appears in the status line at the bottom of the screen.

Spin

You can dynamically spin the model with this command. You should have already selected Iso view with **View Select iso**.

After selecting **Spin**, you are then prompted to locate a point to rotate about, followed by an incremental angle. The smaller the angle, the slower the rotation will be.
Then, the model is rotated about the selected point. To stop the rotation, click the right mouse button or the space bar on the keyboard.

Plot-Scale

This command changes the plot scale on screen.

After entering a new plot scale, you may see some changes. The roof model itself is not changed on screen, but other objects like dimensions, text and plane hatching are.

If you enter a larger plot scale, then text and dimensions appear larger. If you enter a smaller plot scale, then text and dimensions appear smaller. At all times however, the relative size between the text and the roof model will be th same on screen as it would when printed.

> To get a quick A4 plot, select Plot Vertical and you can see an A4 paper border being dragged on your cursor. This will show you if the roof model fits on the A4 page or not.

Split

The **View Split** command displays a sub-menu that allows the selection of single or multiple views to be concurrently displayed within the graphics area of the screen.
The options are one view, two views (in either horizontal or vertical positions) and four views.

The relative size of each multiple view can be automatically or manually determined.

One
Allows the display of only one view within the graphics area of the screen.
The view displayed is the view that displays in the top left hand section of the graphics area when four views are selected.

Ver
Allows the display of two views split with a vertical borderline within the graphics area.
The borderline is positioned by selecting a point location within the graphics area of the screen, hence determining the window extents for each view.

The view displayed in the left section is the view that displays when only one view is selected.

Hor
Allows the display of two views split with a horizontal borderline within the graphics area.

The borderline is positioned by selecting a point location within the graphics area of the screen, hence determining the window extents for each view.

The view displayed in the top section is the view that displays when only one view is selected.

Four
Allows the display of four views split with vertical and horizontal borderlines within the graphics area.

The borderlines are positioned by selecting a point location (defining the intersection point of the borderlines), within the graphics area of the screen, hence determining the window extents for each view.

The view displayed in the top left section is the view that displays when only one view is selected.

Ver-Cen
Allows the display of two views split with a centrally positioned vertical borderline within the graphics area.

The borderline cannot be repositioned using this command.

The view displayed in the left section is the view that displays when only one view is selected.

Hor-Cen
Allows the display of two views split with a centrally positioned horizontal borderline, within the graphics area.

The borderline cannot be repositioned using this command.

The view displayed in the top section is the view that displays when only one view is selected.

Four-Cen
Allows the display of four views split with centrally positioned vertical and horizontal borderlines within the graphics area.

The borderlines cannot be repositioned using this command.

The view displayed in the top left section is the view that displays when only one view is selected.

Zoom

The Zoom commands allow you to zoom the roof model in and out and scroll it from side to side. the alteration of the magnification and position of the display of the current model, within the displayed extents of the view.

You will notice that the current zoom scale is reported in the status line at the bottom of the graphics area.

> If there are multiple views displayed on screen, you must first select the view you want to alter

Window

The **Zoom Window** command allows the alteration of the magnification and position of the display of the current model, within the displayed extents of the view, by defining the required rectangular zoom window with the selection of two point locations.

The extents of the window are defined by selecting any two diagonally opposite corner point locations. The zoom window is fitted, such that its defined extents appear within the displayed extents of the view.

Scale

The **Zoom Scale** command allows the alteration of the magnification and position of the display of the current model, within the displayed extents of the view, by specifying the new zoom scale and selecting the new centre of the zoom window.

The new zoom scale is specified, followed by the selection of a point location to define the new centre of the resultant zoom window. The zoom window is then fitted such that its extents appear within the displayed extents of the view.

A zoom scale specified greater than the current value will enable more of the model to appear within the displayed extents of the view (i.e. a zoom out). A zoom scale specified less than the current value will enable less of the model to appear within the displayed extents of the view (i.e. a zoom in).

In

The **Zoom In** command allows the alteration of the magnification and position of the display of the current model, within the displayed extents of the view, by applying a specified division factor to the current zoom scale and selecting the new centre of the zoom window.

The division factor (Zoom In factor) is specified, followed by the selection of a point location to define the new centre of the resultant zoom window. The zoom window is then fitted such that its extents appear within the displayed extents of the view.

A Zoom In factor greater than 1 increases the magnification (i.e. the current zoom scale is divided) of the display of the model (i.e. a zoom in). However, if the Zoom In factor is less than 1, the current zoom scale is effectively multiplied and the magnification of the display of the model will decrease (i.e. a zoom out).

Out

The **Zoom Out** command allows the alteration of the magnification and position of the display of the current model, within the displayed extents of the view, by applying a specified multiplication factor to the current zoom scale and selecting the new centre of the zoom window.

The multiplication factor (Zoom Out factor) is specified, followed by the selection of a point location to define the new centre of the resultant zoom window. The zoom window is then fitted such that its extents appear within the displayed extents of the view.

A zoom out factor greater than 1 decreases the magnification (i.e. the current zoom scale is multiplied) of the display of the model (i.e. a zoom out).

However, if the zoom out factor is less than 1, the current zoom scale is effectively divided and the magnification of the display of the model will increase (i.e. a zoom in).

Scroll

The **Zoom Scroll** command allows the zoom window, within the displayed extents of the view, to be scrolled across the model with no change in the zoom scale.

The scroll is performed by selecting two point locations which define the old and new positions of the zoom window respectively (i.e. the zoom window is translated).

Fit

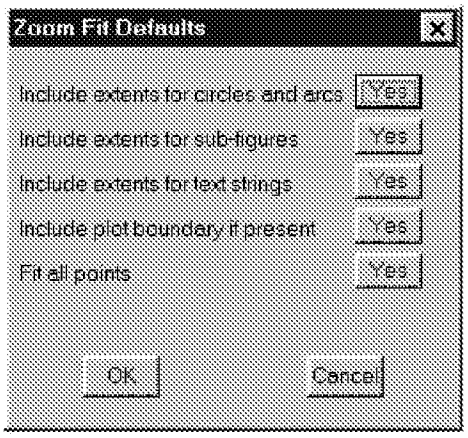
The **Zoom Fit** command allows the zoom scale to be automatically calculated so as to fit all points in the model within the displayed extents of the view.

Only the points in the model determine its fit in the zoom window. If the points are associated to an entity which extends beyond them (e.g. circles), that portion of the model will not appear within the zoom window. If this occurs, use the Zoom Out command to increase the zoom scale.

Fit-Defau

The **Zoom Fit-Defau** command allows the defaults of the Zoom Fit command to be specified and include whether or not the points for the extents of circles, arcs, sub-figures, and text strings are used.

Previous



The **Zoom Previous** command allows View and Zoom commands to be undone, restoring the previous view or screen.

All **View Select, View Split** and **Zoom** commands save the current view or screen split parameters before the operation takes place.

Dyn-Scroll

The **Zoom Dyn-Scroll** command allows the screens to be scrolled dynamically. No change occurs in the Zoom Scale.

This command is similar to **Zoom Scroll** except that the command is repeated until stopped by keyboard or mouse input.

Two points are selected indicating the direction to scroll the view, then the view is scrolled continuously in that direction until a keyboard or mouse input is received. The distance between the two points selected controls the speed of the scrolling.
The further apart the two points, the faster the scroll.

Dyn-Out

The **Zoom Dyn-Out** command allows the screens to be dynamically zoomed out.
This command is similar to **Zoom Out** except that the command is repeated until stopped by keyboard or mouse input.

The factor to zoom out is entered and the new centre of the screen is located.

The view is then zoomed out continuously until a keyboard or mouse input is received.

Dyn-In

The **Zoom Dyn-In** command allows the screens to be dynamically zoomed in.
This command is similar to **Zoom In** except that the command is repeated until stopped by a keyboard or mouse input.
The amount to zoom in is entered and the new centre of the screen is located.
The view is then zoomed in continuously until keyboard or mouse input is received.

Render

This command displays a submenu that allows you to display the roof model as a hidden-line image, or as a shaded image. These displays, allow you to visualize the roof model as it would be in 3D space.

Lines

This command displays the model as a hidden-line image. To get the best picture, select iso view, using **View Select Iso** and then **Zoom-Fit**.

Shade

This command displays the model as a solid shaded image. To get the best picture, select isometric view, using **View Select Iso** and then **Zoom-Fit**. You could also reorient the model with **View Spin**, to get even better orientations.

Repaint

This command simply redraws the screen.

Grid

This command draws a snapping grid in the graphics area of the screen. A snapping grid can be useful if your are doing concept work rather than need to use exact dimensions. Now when you locate a point on screen, the system will actually use the closest grid point.

After you select **Grid**, you are prompted to enter a grid spacing. This is a real world spacing such as 500 for 500mm.

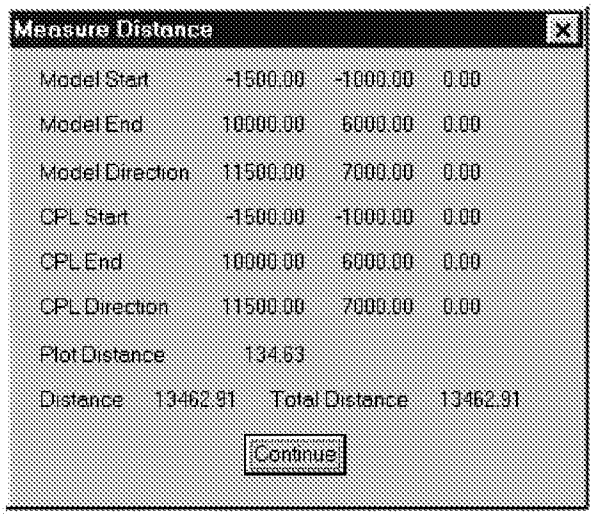
After you click **Ok**, a grid is drawn as a network of white dots. If the Zoom Scale was 1 : 1, then the screen is automatically zoomed to 1 : 500.

If a grid was already on when you selected **Grid**, the grid is turned off. You will notice the state of the grid in the status line at the top of the screen. The grid status will be either On or Off, and the Snapping status will be either On or Off.

Measure

The measure commands allow you to measure a variety of geometric properties in the model.

Distance
This command reports the distance between 2 points you locate.



You are also told the coordinates of the 2 points.

Length
This command reports the length of a line or arc you select.

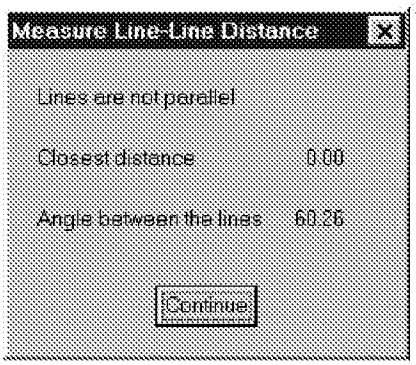
Len-Ents
This command reports the length of a group of lines and arcs you select.

Area
This command reports the area of a plane (roof plane) you select.

Area-Perim
This command reports the area of a closed boundary you select. You must select a successive list of connected lines. (ie instead of selecting a plane, you can select the lines that form the plane boundary)

Area-Points
This command reports the area of a shape you have digitized. In this case, you digitize a series of points which define the corners of the shape.

Lin-Lin
This command reports the distance and angle between two lines.

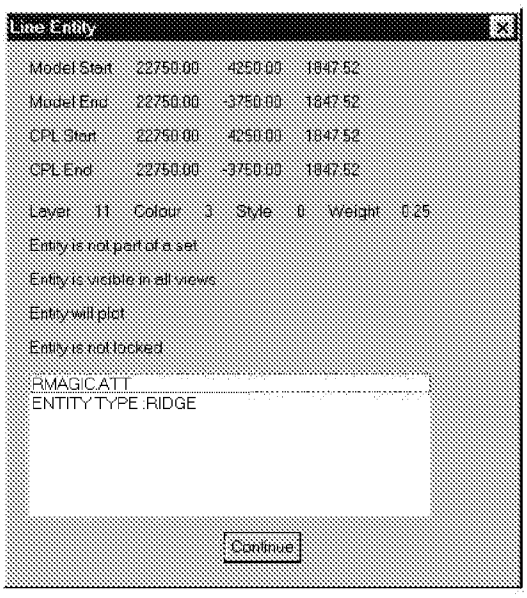


Angle
This command lets you measure the angle given 3 points.

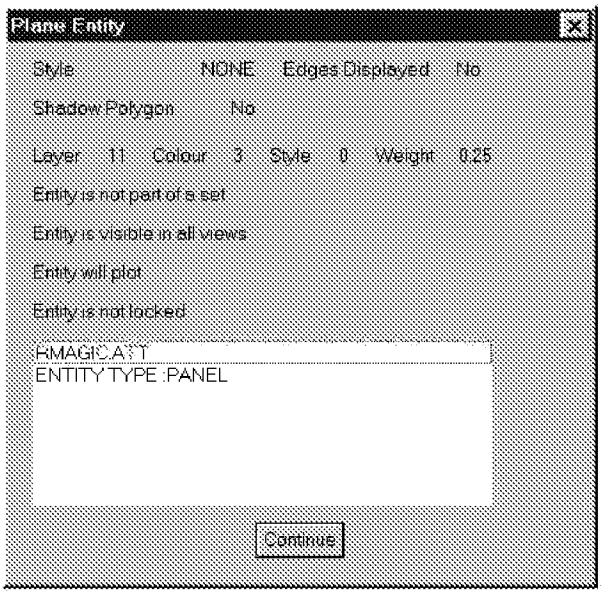
Bearing
This command lets you measure the bearing given 2 points.

Verify
This command reports information about an entity you select.

The reported information differs depending on the type of entity you have selected.



Verify Command 1 Verifying a line



Verify Command 2 Verifying a plane

In the above examples, you will see the tag written on the line making it a RIDGE, and the tag on the plane entity which makes it a PLANE.

Delete
This command lets you select one or more entities to delete. Only free entities may be deleted. A free entity is one which is not associated to another entity.

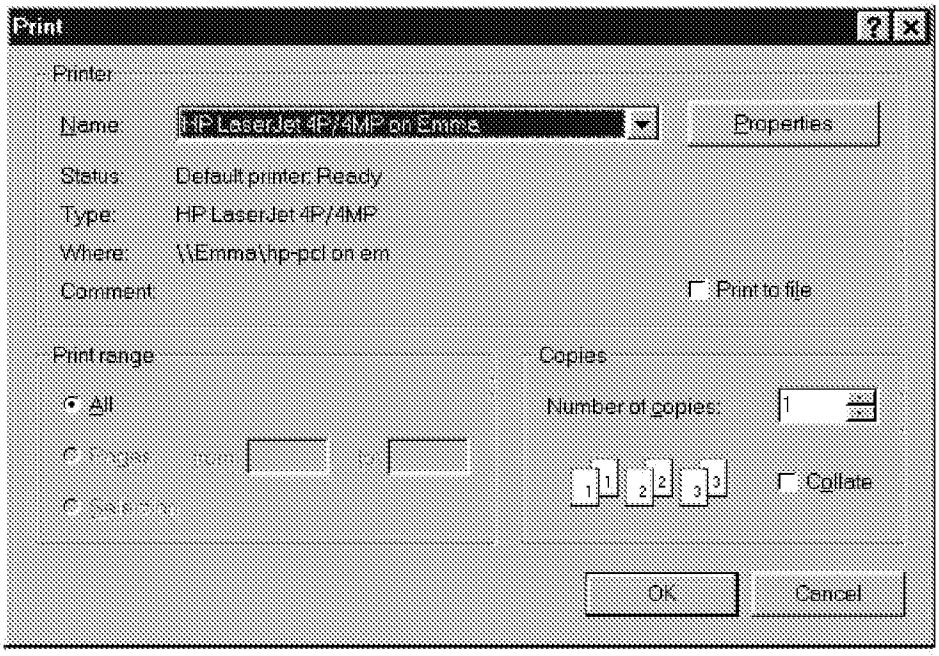
> You cannot delete lines which form the boundary of a plane (roof plane) without deleting the roof plane first.

Plot
This command allows you to quickly create a plot as A4 Vertical or A4 Horizontal and send it to your Windows printer.

Vertical, Horizontal

This command lets you plot an A4 vertical or horizontal size plot from the screen.

After you click **Vertical** or **Horizontal**, the Windows Print dialog box is displayed.



After you click **Ok**, an image of the A4 vertical or horizontal page is dragged on your cursor. You can then see the relative extent of your model and the page.

After locating the bottom left hand corner of the page by clicking the left mouse button, the plot is sent to your printer.

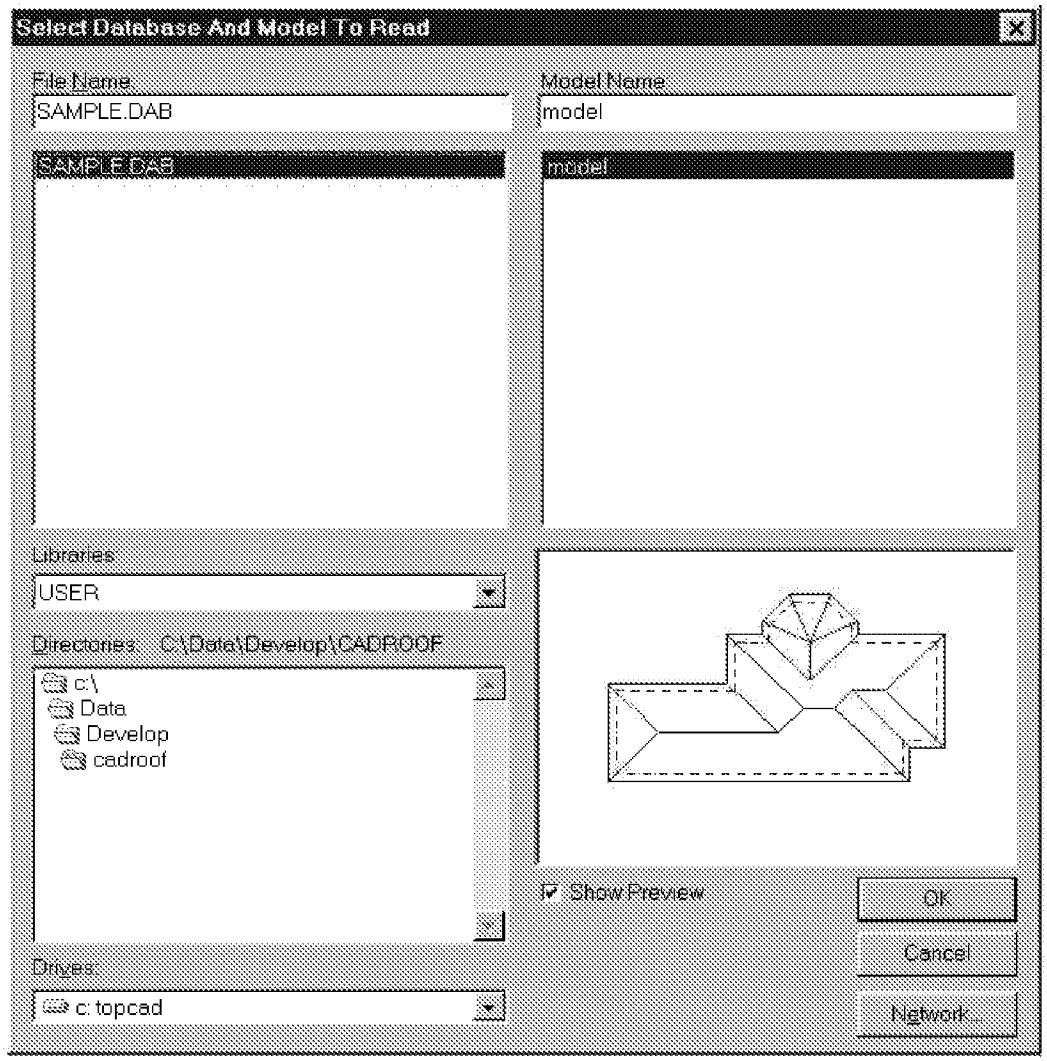
> You may need to adjust your screen display with the **Zoom** commands and/or the **View Plot-Scale** command so you can see the dragged page on screen, as well as fitting your model to the page.
>
> You will find automated printing from the **Cost-Summary** dialog box as well as the **Reports** command. You can perform advanced printing using the **Drawing Plot Screen Scaled**, or the **Drawing Plot Compose** commands.

Open

This command lets you open an existing job.

When you select **Open** the Select database and model to read dialog box is displayed.

On the left hand side, is the list of database files (.DAB) in the current directory. When you click on a DAB file, the list of models in that DAB is displayed in the right hand list box.



When you click on one of the model names, you may get a preview of what that model looks like in the bottom right hand side.

> You can imagine that the database file is the single job you are working on, and the model is the subfile which contains the roof model for this job. In Windows Explorer, you will see the database file but not have access to any of the models within it.
>
> A database file can contain any number of models, but you are advised to only have one job per database file. Other models are automatically created for each job such as report models and drawing models which in turn will increase the overall size of the database file.

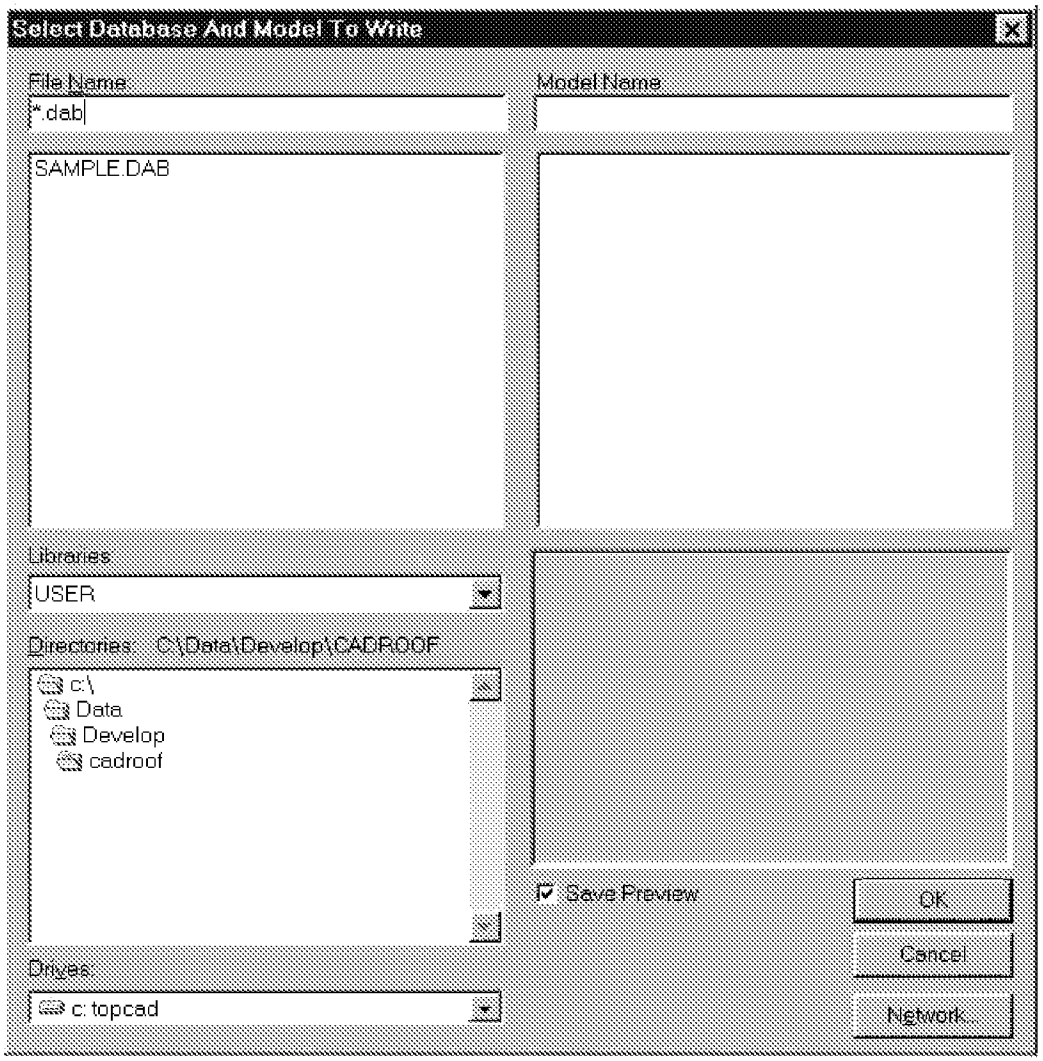
After you click **Ok**, the model you have selected opens into the graphics area of the screen and available for you to edit.

> The database file name and the model name is noted in the status line at the top of the screen.

Save

This command automatically saves the current model you are working on. If you have not yet saved the model, you will see the Select database and model to write dialog box.

Here, you enter the database file name or select one from the list.



You then need to enter a model name to uniquely identify this job in the database file.

You can imagine that the database file is the single job you are working on, and the model is the subfile which contains the roof model for this job. In Windows Explorer, you will see the database file but not have access to any of the models within it.

A database file can contain any number of models, but you are advised to only have one job per database file. Other models are automatically created for each job such as report models and drawing models which inturn will increase the overall size of the database file.

If you want a preview image to be saved, then check the Save preview check box.

The database name and model name are noted in the status line at the top of the graphics screen. If they are noted as None, then you have not yet saved the model.

Save-As

This command is the same as **Save** except it will always allow you to select a new database file and model to save the job in.

Clear

This command clears the current model, leaving the screen as when you first started Roof Wizard. For security, you are first prompted to clear the current model if you have edited it since you last saved it.

> You will notice that the database file name and model name are reported as None in the status line at the top of the screen.

CAD

This command is the entry point to the main Caddsman CAD engine on which **Roof Wizard** is constructed. The command set provided is not covered here, but can be found in the Manuals directory on the Roof Wizard CD.

Quit

This command Quits the Roof Wizard window.

Appendix

The Datafiles

This section describes all the data files, what they are used for and how to set them up. You can use an editor such as Wordpad.exe to edit them.

Compinfo.Dat

This is the datafile containing your company specific details. You can use Wordpad.exe to edit it, or use **Job-Info Company** to change it on-line. *Compinfo.dat* is printed below

```
Company name
Company address 1
Company address 2
Company phone
Company fax
Company note 1
Company note 2
```

Sheeting.Dat

This file contains all the sheeting data for all suppliers. It contains both straight profiles and curved profiles. A sample appears below

```
; Sheet definition file for Roof Wizard

Supplier, Corrugated, SS001, Color, F1265HT17, 6, 280, 0.48, 1, 10.00,
10.00,0, 0
Supplier, Curve Quality, CQ60ZA, Zincalume, FP1265HT17, 6, 762, 0.60, 1,
18.29, 18.29, 0, 0

END
```

Format

Field 1	name of the supplier
Field 2	Profile of the material. It can be anything, except if equals “Curve Quality” then it will be listed as a curve quality sheet.
Field 3	Your internal code for this product for reporting purposes
Field 4	The finish of this sheet. It is one of Color, Zincalume or Galvanized. If it is Color, then you will assign the actual color during run-time.
Field 5	Fastener code. This is the code of the default fastener. It must match a fastener code in *fasten.dat* which contains more information about this fastener.
Field 6	The default number of fasteners per square meter.
Field 7	The effective coverage of the sheet in mm
Field 8	The base metal thickness. This has no direct impact.
Field 9	The pricing method. This is 1 if the following price is per square meter, or 2 if the following price is per linear meter
Field 10	Cost per unit based on the previous field
Field 11	Currently not used
Field 12	The minimum length to order of this sheet
Field 13	The maximum length for this sheet

If you set the maximum length of sheet to 0, then there is no maximum length.

Flashing.Dat

This file contains all the flashing data. It also contains information abaout user defined lengths such as vermin proofing.

```
; Flashing definition file for Roof Wizard
```

```
Supplier, R, Roll top ridge, RTRV60--, Color, ST12x50, 3, 8000, 1,61.68,2
Supplier, V, Valley, VR60ZA, Zincalume, ST12x50, 3, 6000, 1, 60.06
Supplier, B, Barge, CBV24ZA, Zincalume, ST12x50, 3,0000, 1, 15.14
Supplier, A, Apron Std, StdAp24--, Color, ST12x50, 3, 2400, 1, 32.43
Supplier, X, Box gutter, BG1, Galvanized, ST12x50, 3,10000, 1, 32.43
END
```

Format for flashings

Field 1	The name of the supplier
Field 2	The type of flashing based on a code - see below.
Field 3	A description of the flashing
Field 4	Your internal product code
Field 5	The finish of this flashing. It is one of Color, Zincalume or Galvanized. If it is Color, then you will assign the actual color during run-time.
Field 6	Fastener code. This is the code of the default fastener. It must match a fastener code in *fasten.dat* which contains more information about this fastener.
Field 7	The default number of fasteners per meter.
Field 8	The maximum length of this flashing
Field 9	The costing method for this flashing 1 - per length, 2 - per meter
Field 10	the cost per unit
Field 11	the estimation method 0, 1 or 2 - see below

Flashing codes

R	Ridge
V	Valley
A	Apron
X	Box gutter
F	Fascia
G	Gutter
B	Barge
T	Batten
U	A user defined length (eg vermin proofing)

Format for user defined lengths

User defined lengths still use the same format of the flashing record as described above, but some fields have a different meaning. A sample appears below.

```
Supplier, U,Bird wire,,  ,  ,  ,0.60,,0.10,
Supplier, U,Infill strip,  ,  ,  ,  ,0.70,,0.20,
Supplier, U,Leaf guard,  ,  ,  ,  ,0.80,,0.30,
```

Field 1	The name of the supplier
Field 2	Must be 'U' for User defined.
Field 3	A description of the length (eg Bird wire, leaf guard)
Field 4	Not used
Field 5	Not used
Field 6	Not used
Field 7	Not used
Field 8	Cost per meter for the material
Field 9	Not used
Field 10	Cost per meter to install (labor charge)
Field 11	Not used

Flashing estimation methods

Method 0	Each run is split into equal length pieces up to the maximum length
Method 1	Each run is split into a number of maximum length pieces
Method 2	All runs are added and then split into a number of maximum length pieces
Method 3	Each run is split into a number of stock length pieces
Method 4	All runs are added and are split into stock length pieces

You will recall the flashing lengths are affected by the values you have set in the Estimate Allowances dialog box.

Fasten.Dat

This file contains all the fastener data

```
; Fastener definition file for Roof Wizard

;Supplier, Size, Description, Code, Items per unit cost, Suitability, Plain
cost, Color cost
; Suitability is one of 0 - Timber, 1-Steel.

Supplier, 12x65, Hex Head type 17, F1265HT17, 1000, 0, 166.98, 192.46
END
```

Format

Field 1	The name of the supplier
Field 2	The size of the fastener
Field 3	A description
Field 4	A unique code
Field 5	Number of fasteners per box
Field 6	Dummy - not used
Field 7	Cost per box for plain fasteners (zinc or galv)
Field 8	Cost per box for coloured fasteners

Remember that the fastener code is the primary key to sheeting and flashing to fin the correct fastener information

AccessDat

This file contains all the flashing accessory data for barges, fascias and gutters.

```
; Accessory definition file for Roof Wizard. Handles fascia and gutter
accessories.
; The correct accessory list is derived by keying on the manufacturer name
and the ; product description.

; Man, Description,Accessory ID, Code, number per box, Zinc Cost, Galv
cost, Col cost

;If you do not have the cost of the zinc, galv and color items, you must
still set them to something

Supplier, Metal fascia, Fascia_Bracket, FBHTRVB,1, 0.92, 0.92, 0.92
Supplier, Metal fascia, Splice_Plate, FBHTSPZA, 1, 2.23, 2.23, 2.23
Supplier, Metal fascia, Ext_Corner_90, FBHTEC, 1, 2.61,2.61,3.04
Supplier, Metal fascia, Int_Corner_90, FBHTIC, 1, 1.89, 1.89, 2.17
Supplier, Metal fascia, BKT_NAILS_TIMBER, S625BTG,1000,15.42,115.42, 115.42
Supplier,Metal fascia, BKT_NAILS_STEEL, S1016HNN, 1000, 88.17,88.17,88.17

END
```

Format

Field 1	The name of the supplier
Field 2	The description of the flashing
Field 3	The accessory type - see below
Field 4	Accessory code
Field 5	The number of fasteners per box
Field 6	Cost per unit for a Zincalume finish
Field 7	Cost per unit for a Galvanized finish
Field 8	Cost per unit for a coloured finish

The finish adopted by the accessory is that of the flashing to which it is attached.

Flashing Accessory Codes and Estimation Method

Fascia Accessories

Description	Code	Estimation method
Fascia bracket	FASCIA_BKT	Add all lengths of fascia and divide by the rafter spacing. Add on one more for each run.
Splice plate / Joiner	SPLICE_PLATE	Add up all the joins required.
External 90 Corner	EXT_CORNER_90	Add up all external 90 corners
Internal 90 Corner	INT_CORNER_90	Add up all internal 90 corners
External 135 Corner	EXT_CORNER_135	Add up all external 135 corners
Internal 135 Corner	INT__CORNER_135	Add up all internal 135 corners
Bracket nails for steel frames	BKT_NAILS_STEEL	Add up all brackets and multiple by 5. Ie 5 nails per bracket. The framing is derived from the job details. The number reported is the number of boxes
Bracket nails for timber frame	BKT_NAILS_TIMBER	Add up all brackets and multiple by 5. Ie 5 nails per bracket. The framing is derived from the job details. The number reported is the number of boxes

Gutter accessories

Description	Code	Estimation method
Concealed bracket	CONCEALED_BRACKET	Add all lengths of gutter and divide by the rafter spacing. Add on one more for each run.
Color tab	COLOUR_TAB	Add one for each bracket
Bracket nail	BRACKET_NAILS	Add 5 for each bracket
External bracket	EXTERNAL_BRACKET	Add up all external corners irrespective of angle
Stiffener bracket	STIFFENER_BKT	Add all lengths of gutter and divide by the rafter spacing. Add on one more for each run.
Snap clip	SNAP_CLIP	Add one for each bracket
Internal 90 corner	INT_CORNER_ANGLE_90	Add up all internal 90 corners
Internal 135 corner	INT_CORNER_ANGLE_135	Add up all internal 135 corners
External 90 corner	EXT_CORNER_ANGLE_90	Add up all external 90 corners
External 135 corner	EXT_CORNER_ANGLE_135	Add up all external 135 corners
Stop end left	STOP_END_LEFT	Add up all left hand stop ends
Stop end right	STOP_END_RIGHT	Add up all right hand stop ends
Gutter clip	GUTTER_CLIP	Add one for each bracket
Manufactured internal angle	MAN_ANG_INT	Not automatically tallied
Manufactured external angle	MAN_ANG_EXT	Not automatically tallied
Manufactured left hand stop end	MAN_STOP_LEFT	Not automatically tallied
Manufactured right hand stop end	MAN_STOP_RIGHT	Not automatically tallied
Manufactured left hand full return stop end	MAN_FULLRETURN_STOP_LEFT	Not automatically tallied
Manufactured right hand full return stop end	MAN_FULLRETURN_STOP_RIGHT	Not automatically tallied
Bracket nails for steel frames	BKT_NAILS_STEEL	Add up all brackets and multiple by 5. Ie 5 nails per bracket. The framing is derived from the job details. The number reported is the number of boxes
Bracket nails for timber frame	BKT_NAILS_TIMBER	Add up all brackets and multiple by 5. Ie 5 nails per bracket. The framing is derived from the job details. The number reported is the number of boxes

Barge accessories

Description	Code	Estimation method
Barge bracket	BARGE_BRACKET	Add all lengths of barge and divide by the rafter spacing. Add on one more for each run.
Barge end left	BARGE_CNR_LEFT	Add up all left hand stop ends
Barge end right	BARGE_CNR_RIGHT	Add up all right hand stop ends
Barge apex cover	BARGE_APEX_COVER	Add up all barge apex covers

You can assign any or all of these to each flashing if you wish, but in reality, you would only assign those which a supplier actually provides.

Areas.Dat

This file contains all the delivery area data as used by the **Job-Info Job-Details** command.

```
;names of delivery areas for roof wizard
;you can have up to 10 of them;
Metro
Outer 1
Outer 2
Outer 3
Outer 4
Country
North
South
East
West
```

You can edit these names as you wish.

Colour.Dat

This file contains all the sheet color names.

```
; List of colours for sheet metal in Roof Wizard

Heritage Red
Homestead
Caulfield Green
Ironbark
Thredbo White
Smooth Cream
Rivergum
Offwhite
Merino
Slate Grey
Wheat
Mist Green
Saltbush
Beige
Birchgrey
Federation Red
Black
TBA
END
```

These are the list of colours displayed when you want to set the color for the roof sheeting or flashings. You can have any number of them.

Curving.Dat

This file contains all the sheet curving charges.

```
; Sheet curving charges definition file for Roof Wizard
; Supplier, Profile, Product code,FromLength,ToLength,Cost per curve
```

```
Supplier, Curve Quality,CURV0035,0,3.5,10.34
Supplier, Curve Quality,CURV03570,3.51,7.0,17.23
Supplier, Curve Quality,CURV07010,7.01,10.0,21.24
Supplier, Curve Quality,CURV1013,10.01,13,42.74
END
```

The curving calculation is based on the length of the sheet which needs to be curved.

Format

Field 1	The name of the supplier
Field 2	The key string “Curve Quality”
Field 3	Your internal code
Field 4	The “from” length
Field 5	The “to” length
Field 6	The cost to curve this length sheet

The Calculation Method

The cost to curve a sheet is based on the length of the sheet falling in a length range.

For example, the cost to curve sheets which are from 3.5 meters long to 7.0 meters long may be a fixed value. So, a sheet 4.0 long would cost the same to curve as one 6.7 meters long.

When Roof Wizard calculates the total curving change (which you’ll see on the Costing Supply dialog box if a bullnose verandah is present), it measures the overall length of the sheet, finds the relevant supplier name, finds the correct length range record and then adds the particular cost’.

If you don’t want to apply these charges, set the cost to 0.

Downpipe.Dat

This file contains all the downpipe data.

```
; Downpipe definition file for Roof Wizard
;
;Pipes
Supplier, R,100x50,  0.40,DP1810050--,Colour,1800,2400,17.24

;Straps
Supplier,RS,100x50,0,AST10050,0,1.43,1.43,1.64

; Pops
Supplier,RP,100x50,0,NOZ10050,0,1.78,1.78,1.78

;Offsets
Sample supplier,RO,100x50,0.40,OS10050,0,25.67,25.67,37.53

; Shoes
Supplier,RH,100x50,0,SHOE10050,0,14.10,14.10,14.10

; Elbows
Supplier,RE,100x50,0,ELB10050GA,Galvanised,0,14.10

END
```

Format

Field 1	The name of the supplier
Field 2	The type of downpipe item - see below
Field 3	The size of the item as a rectangle or diameter
Field 4	base material thickness
Field 5	Product code

Field 6	The finish, one of Zincalume, Galvanized or Colorbond
Field 7	The long pipe length
Field 8	The shorter pipe length
Field 9	The cost of this item

Downpipe accessory types

R	A rectangular pipe
O	A round pipe
RS	a rectangular strap
RP	A rectangular pop
RO	A rectangular offset
RH	A rectangular shoe
RE	A rectangular elbow
OS	a round strap
OP	A round pop
OO	A round offset
OH	A round shoe
OE	A round elbow

A downpipe will build up its accessory list, by first looking for rectangular or round accessories. Then it will match the relevant size of each of the accessories to match that of the main pipe.

Extras.Dat

This file contains all the costing extras data. These values are added to the material costs, or the labor costs when you perform the costing. You will see them added to the line items under **Costing Supply-Only** and **Costing Supply+Install**.

```
; Standard extras data file for Roof Wizard.
Material delivery charge,1,10,1
Travel Time,1,20,0
Site allowance,1,500,0
Chimneys,2,10,1
Second storey,1,100,1
END
```

Format

Field 1	The name of the extra item
Field 2	The default quantity
Field 3	The default cost
Field 4	determines if it is a material item (0) or a labor item (1).

Insul.Dat

This file contains all the insulation and sarking data used by the **Cover Insulation** command.

```
;Insulation data file for Roof Wizard

;Supplier Product Description Code LargeSize SmallSize LargeCost SmallCost
; Sizes are in square meters

Supplier, Alum Foil, Light grade anti-glare FR,LGAGFR,72,24,188.00,67.67
Insulco, Alum Foil,439/203 Light Grade Anti-Glare,ICFLAG,72,24,230.15,78.61
DummyCo, Dummy Foil, Dummy Description, DUMMCODE,50,10,100,20

END
```

Format

Field 1	The name of the supplier
Field 2	A description
Field 3	The area of insulation in a large roll in square meters
Field 4	The area of insulation in a smaller roll size in square meters.
Field 5	The cost of a large roll
Field 6	The cost of a small roll

If you don't have a small roll, then make the small roll size 0.

Misc.Dat

This file contains all the miscellaneous hardware items which can be added to a quote by clicking **Add-User** on the **Cost-Summary** dialog.

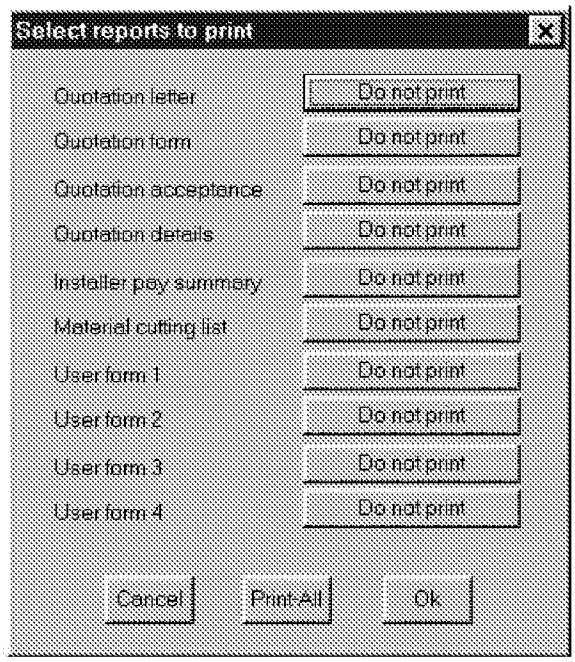
```
; Man, Description, qty, cost
Sample supplier,Tube of silicon,1,5.05
Sample supplier,Claw hammer,2,6.07
END
```

Format

Field 1	The name of the supplier
Field 2	A description
Field 3	default number of units
Field 4	default cost per unit

Report and Drawing Templates

When you click the **Print** button on the **Costing Supply** and **Costing Supply+Install** dialog boxes, a set of predefined templates are used to form the final reports.



The following table describes each of the reports on the Select reports to print dialog box as well as which template is used.

Report name	Template name	Intended Use
Quotation letter	QuotationLetter	A quotation to send to your customer detailing the information as a letter
Quotation form	QuotationForm	A quotation to send to your customer detailing the information in a tabular fashion.
Quotation acceptance	QuotationAcceptance	Same as above with the addition of a place for the customer to accept the quote with a signature
Quotation details	QuotationDetails	This report tabulates the materials and costs for the job
Installer pay summary	PaySummary	This report tabulates the labor costs for you to perhaps give to the installer
Material cutting list	MaterialCuttingList	This report tabulates the sheet and flashing cutting lists
User form 1	UserForm1	An extra form for you to define
User form 2	UserForm2	An extra form for you to define
User form 3	UserForm3	An extra form for you to define
User form 4	UserForm4	An extra form for you to define

When you look at one of the template, you will notice that it comprises of line work, labels, text strings with a prefix of **###** and possibly a diagonal line.

The labels and linework will be printed as you see them on the template. If you want certain text to be written on a report all the time, then you can. If you want specific linework to be on the template, then you can.

The text with a prefix of **###** are what are called “Key text Strings”. These text strings are swapped

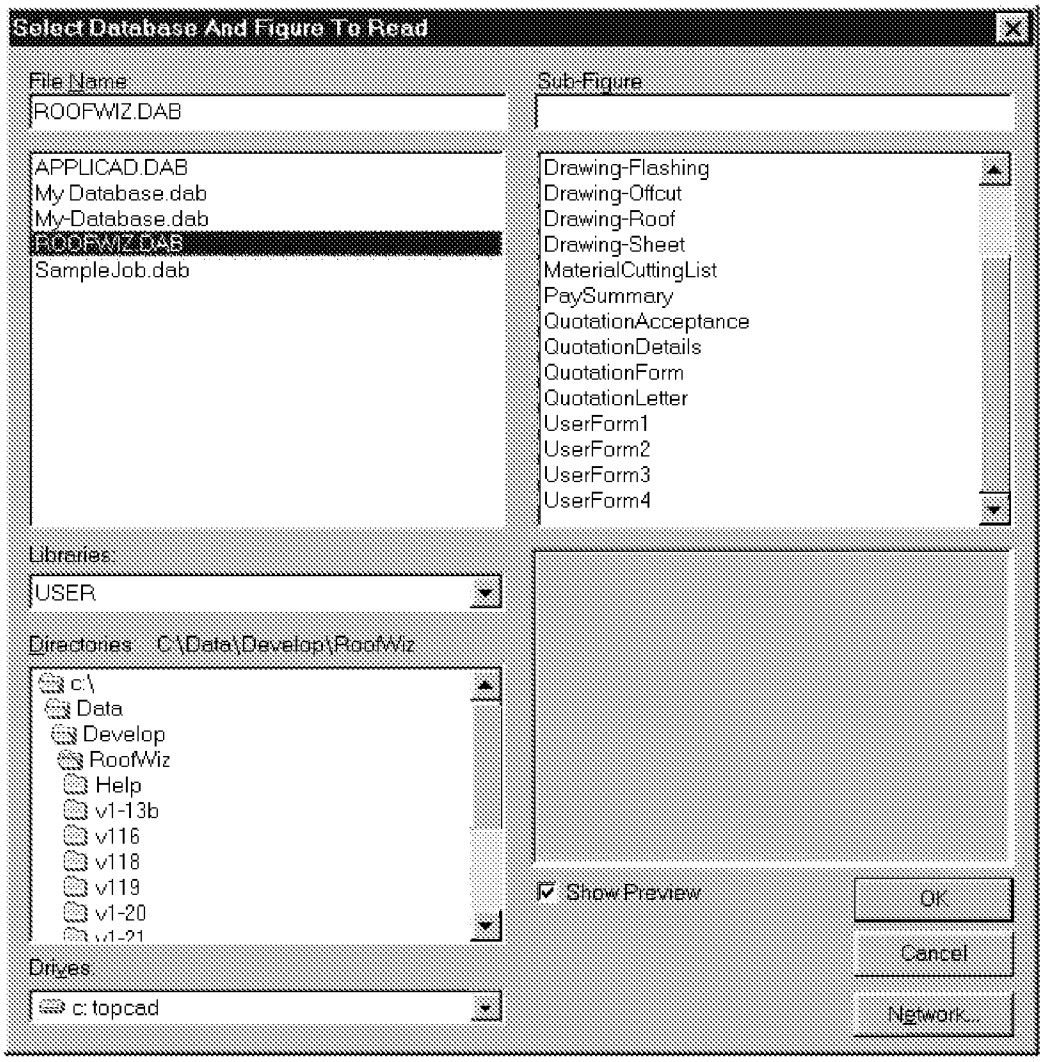
with actual values when you print the report. For example, the key text string ###CustName, will be replaced with the name of the customer for the current job.

The actual value will also adopt, the font, size and location of its particular key text string. Some key text strings describe single values, such as the customer name, and others describe a table of information, such as the flashing cutting list. You will find the complete list of key text in a following section.

A diagonal line represents the extent of the roof plan on this report. The system recognises this line as the roof plan extents because it is on layer 999. You can redraw this line if you wish in another position. As long as it goes onto layer 999, then a roof plan will be exchanged in its place. To change the layer of a line, select **Drawing Line Change**, and on the dialog box, select layer.

Also refer to the later section in the Caddsman getting started manual.

You access these templates using **Drawing File Rd-Sfig** and select **RoofWiz.dab** as the database file. In other words, the templates are stored as subfigures in RoofWiz.dab.



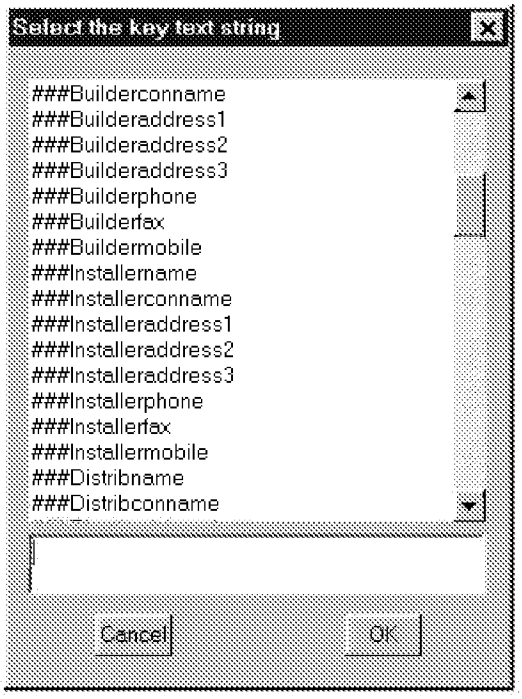
If you cannot find RoofWiz.Dab in the user directory, it may be in the System directory. So change the Library from User to System

After you select RoofWiz.dab, you will see all the subfigures listed in the right hand list box. These are the report templates and the drawing templates.

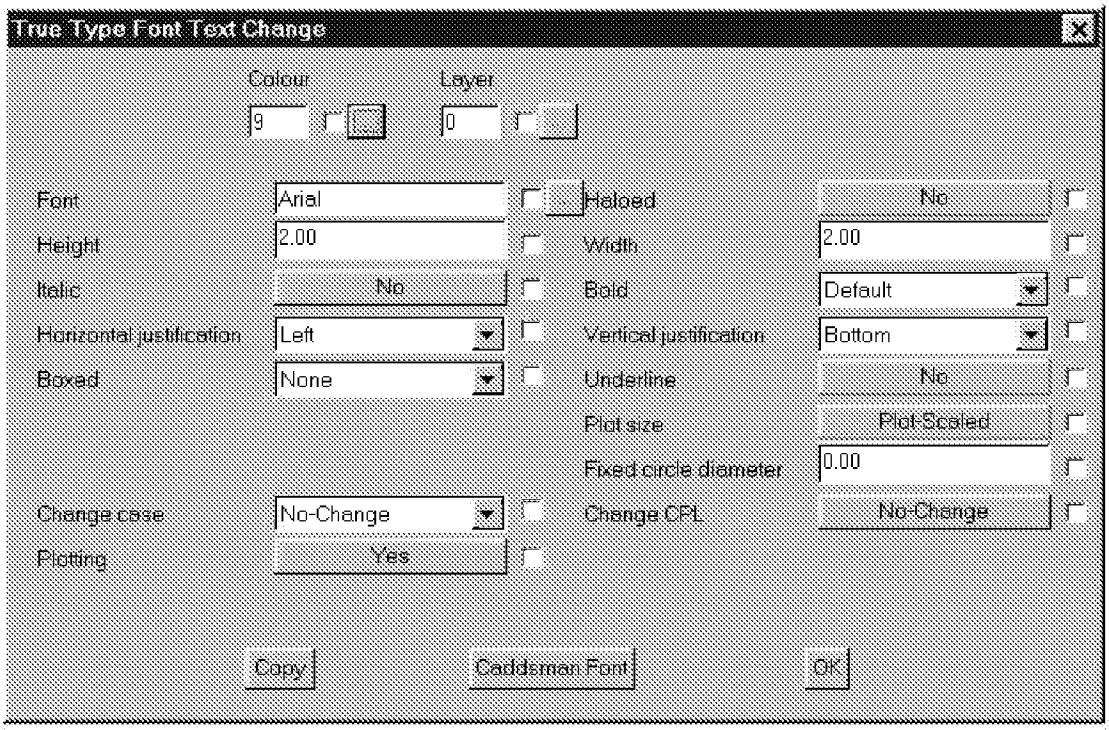
To open a template, click on one of the subfigure names, and click **Ok**.

The **Utilities** command has a variety of options to allow you to :

Ins-Key-text Allows you to insert a key text string from a list of strings



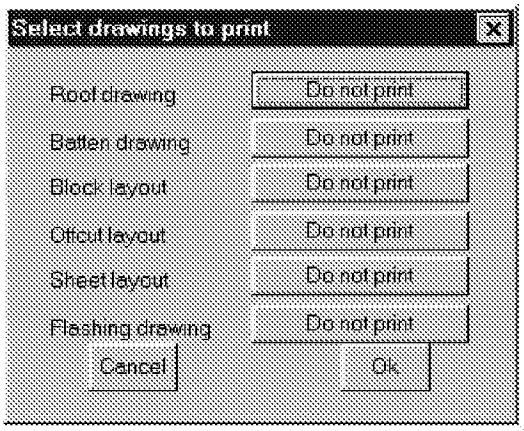
Ins-text Allows you to insert free form text (or a key text string)
Change To change an existing piece of text by way of height, font etc.



Move Allows you to move text from one position to another
Copy Allows you to copy text from one position to another
Edit Allows you to edit text
Delete Allows you to delete text.

To draw lines on the report, you can use the **Mod-Roof Advanced Ins-Line** commands, or the **Drawing Line Insert** commands.

When you click **Reports**, you can now print up to 6 different drawings. The Select drawings to print dialog box is displayed from which you select the drawings you want.



The following table describes the drawing name, template name and its intended use.

Drawing name	Template name	Intended Use
Roof drawing	Drawing-Roof	Shows the roof
Batten drawing	Drawing-Batten	Shows the battens on the roof
Block layout	Drawing-block	Shows the blocks on the roof as created by Auto-Block
Offcut layout	Drawing-offcut	Shows the cuts and offcuts created by Gen-OffCuts
Sheet layout	Drawing-sheet	Shows the sheets on the roof as created by Gen-Sheets
Flashing drawing	Drawing-flashing	Shows the roof and dimensions for each roof line as detailed by Dimension-Roof Lengths

You can operate on the drawing templates in the same way you operate on the reports

The only difference between the reports and drawings, is that the reports are oriented vertically and the drawings are oriented horizontally.

> The key to preparing a good report and drawing is to know exactly what information you want to show on the report, and where you want it to go.

Key text strings can be also recognised even if they are embedded in another text string. For example,, you may enter the following as a text entity.

Dear ###CustName,
The prices for your job is $###JobTotal. Thank you for the opportunity to bid.

This saves the problem of having to space the hard coded text that you want and the key text string.

Key Text Strings

The following key text strings are available for use on reports and drawings you create.

Company key text string

###Compname	Company name
###Compadd1	Company address line 1
###Compadd2	Company address line 2
###Compfax	Company fax
###Compnotes	Company notes
###Compphone	Company phone
###Compacn	Company acn

Job key text string

###Jobnumber	Job number
###Joborder	Order number
###Jobdelarea	Job delivery area
###Jobpickupdate	Job pick up date
###Jobquote	Quote number
###Jobadd1	Job address line 1
###Jobadd2	Job address line 2
###Jobadd3	Job address line 3
###Jobinstaldate	Job installation date
###Jobdeldate	Job delivery date
###MapRef	The job map reference.

People key text strings

###Custname	Customer name
###Custaddress1	Customer address line 1
###Custaddress2	Customer address line 2
###Custaddress3	Customer address line 3
###Custfax	Customer fax
###Custconname	Customer contact name
###Custphone	Customer phone
###Custmobile	Customer mobile
###Buildername	Builder name
###Builderaddress1	Builder address line 1
###Builderaddress2	Builder address line 2
###Builderaddress3	Builder address line 3
###Builderfax	Builder fax
###Builderconname	Builder contact name
###Builderphone	Builder phone
###Buildermobile	Builder mobile
###Installername	Installer name
###Installeraddress1	Installer address line 1
###Installeraddress2	Installer address line 2
###Installeraddress3	Installer address line 3
###Installerfax	Installer fax
###Installerconname	Installer contact name

###Installerphone	Installer phone
###Installermobile	Installer mobile
###Distribname	Distrib name
###Distribaddress1	Distrib address line 1
###Distribaddress2	Distrib address line 2
###Distribaddress3	Distrib address line 3
###Distribfax	Distrib fax
###Distribconname	Distrib contact name
###Distribphone	Distrib phone
###Distribmobile	Distrib mobile
###Salesname	Sales name
###Salesaddress1	Sales address line 1
###Salesaddress2	Sales address line 2
###Salesaddress3	Sales address line 3
###Salesfax	Sales fax
###Salesconname	Sales contact name
###Salesphone	Sales phone
###Salesmobile	Sales mobile

Roof geometry key text strings

The following strings define the combined geometric values for the roof or roofs in the current job.

###RoofArea	The total roof area
###RidgeLen	The total ridge length
###HipLen	The total hip length
###ValleyLen	The total valley length
###FasciaLen	The total fascia length
###GutterLen	The total gutter length
###BargeLen	The total barge length
###FaciaBargeLen	The total fascia as barge length
###ApronLen	The total apron length
###BoxGutterLen	The total box gutter length
###ShellEnds	The number of shell ends
###Apexes	The number of apexes

General Key Text Strings

Key text string	Description
###Supply	If you selected Costing Supply-Only, then this string is exchanged for “For the supply only of” If you selected Costing Supply-Install, then this string is exchanged for “For the supply and installation of” It is assumed that the material breakdown follows on the form.
###Pitch	The pitch of the roof. If there are multiple pitches, then they are appended to this string.
###EaveOffset	The eave offset
###EaveHeight	The eave height
###RafterSpace	The rafter spacing
###Battensz	The batten size
###QQnote	This is the note specific to each form. To allow the note to format properly, you set the width field of the text entity to the physical width you want the text to run to. The note will then wrap to that width, letting you enter as much as you like without worrying about formatting. To force a

	carriage return use the ^ character
###Today	Todays date
###DatabaseName	This will write the Roof Wizard database file and model name for this particular job. For example, if your database file name is called “My Database Name” and the model name is “My model name” then ###DatabaseName will be exchanged for “Sorcerer database File : My Database Name Model My Model name”
###DatabaseFileName	The name of the database file
###DatabaseModelname	The name of the model

Metal Roofing key text strings

###RoofMat	The straight metal roofing material you selected for this job
###CRoofMat	The curved roof material you selected for this job
###MSRoofQty	The area of straight metal roofing
###MCRoofQty	The area of curved metal roofing

Metal Flashing key text strings

###ValleyMat	The valley material you selected for this job
###RidgeMat	The ridge material you selected for this job
###FasciaMat	The fascia material you selected for this job
###GutterMat	The gutter material you selected for this job
###BargeMat	The barge material you selected for this job
###BatMat	The batten material you selected for this job
###ApronMat	The apron material you selected for this job
###StepMat	The step flashing you selected for this job.
###DPMat	The downpipe material you selected for this job
###MRidgeQty	The length of ridge flashing
###MValleyQty	The length of valley flashing
###MGutterQty	The length of gutter
###MFasciaQty	The length of fascia flashing
###MBargeQty	The length of barge flashing
###MApronQty	The length of apron flashing
###MDPipeQty	The number of downpipes
###MDPipeSize	The size of the downpipes
###MBattenQty	The length of battens

Tile roof key text strings

###TileMan	The tile manufacturer
###TileColour	The tile colour
###TileProfile	The tile profile
###TileType	The name of the tile
###TileMaterial	The tile material
###TileCov	The tile coverage
###TileMaxLen	The maximum length of the tile
###TileMinLen	The minimum length of the tile
###TileWidth	The width of the tile
###TileRidgeLen	The length of the ridge tile
###TileRoofCost	The cost of a roof tile
###TileHipCost	The cost of a hip tile
###TileRidgeCost	The cost of a ridge tile
###TileShellcost	The cost of a shell end
###TileApexCost	The cost of an apex tile
###TileBargeCost	The cost of a barge ridge tile
###TileCartage	The cost to deliver 100 tiles

###HipType	The hip type on the tile roof
###RidgeType	The ridge type on the tile roof
###ValleyType	The valley type on the tile roof
###GableType	The gable type on the tile roof
###FlexPointing	If flexible pointing is present

Fastener key text strings

###FastQty	The quantity of fasteners
###FastSize	The fastener size

Insulation key text strings

###InsulQty	The quantity of insulation
###InsulMat	The insulation material you selected for this job

Miscellaneous key text strings

###CartageQty	The quantity of cartage

Tile rates key text strings

The following strings define the tile rate values as found on the **Costing Tile-Rates** dialog box.

String	Description
###DefHipTileLen	The default hip tile length
###DefRidgeTileLen	The default ridge tile length
###DefSarkingSize	The default size of a roll of sarking
###DefBattenLength	The length of batten per m2
###DefCartage	The default cartage rate
###DefSarkingCost	The cost of a roll of sarking
###DefSarkingQuote	The quote rate for sarking
###DefFallCost	The cost of fall protection
###DefFallQuote	The quote rate for fall protection
###DefUnits	The default number of units (roofs)
###DefTwoStoreyExcess	The two storey excess labour rate
###DefBat5025Quote	The quote rate for 50x25 batten
###DefBat5038Quote	The quote rate for 50x38 batten
###DefBat5050Quote	The quote rate for 50x50 batten
###DefBat7550Quote	The quote rate for 75x50 batten
###DefBatUserQuote	The quote rate for User batten
###DefBat5025Cost	The cost of 50x25 batten
###DefBat5038Cost	The cost of 50x38 batten
###DefBat5050Cost	The cost of 50x50 batten
###DefBat7550Cost	The cost of 75x50 batten
###DefBatUserCost	The cost of User batten

Tiler pay values

These values are calculated on the Costing1 dialog box in Roof Magician

###Tilerroof1	Installers roof pay storey 1
###Tilerhips1	Installers hip pay storey 1
###Tilervalleys1	Installers valley pay storey 1
###Tilerridges1	Installers ridge pay storey 1

###Tilergables1	Installers gable pay storey 1
###Tilersarking1	Installers sarking pay storey 1
###Tilerroof2	Installers roof pay storey 2
###Tilerhips2	Installers hip pay storey 2
###Tilervalleys2	Installers valley pay storey 2
###Tilerridges2	Installers ridge pay storey 2
###Tilergables2	Installers gable pay storey 2
###Tilersarking2	Installers sarking pay storey 2
###TilersExtras	Installers extra pay
###TilersPay	The tilers pay not including extras
###TilersPayTotal	The tiles pay including extras.

Tile Quotation values and quantities

The following strings refer to the **Costing** command.

###TileItems	The number of tiles
###TileJCrate	The tile cost
###TileJobCost	Total cost of roof tiles
###HipItems	The number of hip tiles
###HipJCrate	The hip tile cost
###HipJobCost	Total cost of hip tiles
###ValleyItems	The number of valley items
###ValleyJCrate	The valley item cost
###ValleyJobCost	Total cost of valley items
###RidgeItems	The number of ridge tiles
###RidgeJCrate	The ridge tile cost
###RidgeJobCost	Total cost of ridge tiles
###HipItems	The number of hip tiles
###HipJCrate	The hip tile cost
###HipJobCost	Total cost of hip tiles
###GableItems	The number of barge tiles
###GableJCrate	The barge tile cost
###GableJobCost	Total cost of barge tiles
###SarkingItems	The number of rolls of sarking
###SarkingJCrate	The sarking cost
###SarkingJobCost	Total cost of sarking
###BattenItems	The length of battens
###BattenQuoterate	The batten quote rate
###BattenJobCost	Total cost of battens
###CartageItems	The number of cartage items
###CartageJCrate	The cartage cost
###CartageJobCost	Total cost of cartage
###ShellEndsItems	The number of shell end items
###ShellEndsJCrate	The shell end cost
###ShellEndsJobCost	Total cost of shell ends
###ApexItems	The number of apex items

###ApexJCrate	The apex cost
###ApexJobCost	Total cost of apexes
###WasteTiles	The number of waste tiles

Table and list key text strings

###CostingDetailsTable	The costing details table is drawn with its top left corner at the origin of this text. Note that the width of the table is a fixed size.
###CuttingListTable	The cutting list table is drawn with its top left corner at the origin of this text. Note that the width of the table is a fixed size.
###PaySummaryTable	The pay summary table is drawn with its top left corner at the origin of this text. Note that the width of the table is a fixed size.
###SheetList	Produces a Sheetlist, together with a label of supplier, profile and finish. It automatically formats the sheetlist with 5 entries per line.
###FlashingList	Produces a flashing cutting list, together with a label of supplier, profile and finish. It automatically formats the list with 5 entries per line.
###RidgeList	Simply lists the ridge material and its cutting list. It is an abridged version of the ###FlashingList
###ValleyList	Simply lists the valley material and its cutting list. It is an abridged version of the ###FlashingList
###FasciaList	Simply lists the fascia material and its cutting list. It is an abridged version of the ###FlashingList
###GutterList	Simply lists the gutter material and its cutting list. It is an abridged version of the ###FlashingList
###BargeList	Simply lists the barge material and its cutting list. It is an abridged version of the ###FlashingList
###ApronList	Simply lists the apron material and its cutting list. It is an abridged version of the ###FlashingList
###BattenList	Simply lists the batten material and its cutting list. It is an abridged version of the ###FlashingList
###BoxGutterList	Simply lists the box gutter material and its cutting list. It is an abridged version of the ###FlashingList
###BattenSpacingTable	Inserts a table which describes the batten spacings you have set.
###FixtureList	The list of fixture names in the job

Quote specific key text strings

###QuoteName	The name of this quote
###LabMargin	The labor margin percentage
###JobTotal	The Job total (quotation amount)
###CRoofMat	The total of the curved roof material
###InsulMat	The total of the insulation material
###DPMat	The total of the downpipe material
###TotalMat	The total cost of the materials
###RoofMatLab	The sum of roof material cost and roof labor cost
###CRoofMatLab	The sum of curved roof material cost and curved roof labor cost
###FlashMatLab	The sum of flashing material cost and flashing labor cost
###InsulMatLab	The sum of insulation material cost and insulation labor cost
###BatMatLab	The sum of batten material cost and batten labor cost
###DPMatLab	The sum of downpipe material cost and downpipe labor cost
###AccMatLab	The sum of accessories material cost and accessories labor cost
###MatMargin	The material margin percentage
###SubTotal	The total of the materials and labor
###RoofMat	The total of the roof material
###FlashMat	The total of the flashing material
###BatMat	The total of the batten material
###AccMat	The total of the accessories material

Labor key text strings

###RateRoof	The labor rate for roofing
###RateRidge	The labor rate for ridges
###RateFascia	The labor rate for fascia
###RateBarge	The labor rate for barges
###RateChimney	The labor rate for chimneys
###RateCRoof	The labor rate for curved roofing
###RateCApron	The labor rate per curved apron
###RateCHip	The labor rate per curved hip
###RateBat	The labor rate for battens
###RoofLab	The cost of the roof labor
###RidgeLab	The cost of the ridge labor
###FasciaLab	The cost of the fascia labor
###BargeLab	The cost of the barge labor
###BatLab	The cost of the batten labor
###BoxGutterLab	The cost of the box gutter labor
###CSheetLab	The cost of the curved sheet labor
###CBargeLab	The cost of the curved barge labor
###CValleyLab	The cost of the curved valley labor
###RateInsul	The labor rate for insulation
###RateValley	The labor rate for valleys
###RateGutter	The labor rate for guttering
###RateApron	The labor rate for apron flashing
###RateBoxGutter	The labor rate for box guttering
###RateCSheet'	The labor rate per curved sheet
###RateCBarge	The labor rate per curved barge
###RateCValley	The labor rate per curved valley
###RateDP	The labor rate for downpipes
###CRoofLab	The total of the curved roof labor
###InsulLab	The total of the insulation labor
###DPLab	The total of the downpipe labor
###TotalLab	The total cost of labor
###InsulLab	The cost of the insulation labor
###ValleyLab	The cost of the valley labor
###GutterLab	The cost of the gutter labor
###ApronLab	The cost of the apron labor
###ChimneyLab	The cost of the chimney labor
###CRoofLab	The cost of the curved roof labor
###CApronLab	The cost of the curved apron labor
###CHipLab	The cost of the curved hip labor
###DPLab	The cost of the downpipe labor
###RoofLab	The total of the roof labor
###FlashLab	The total of the flashing labor
###BatLab	The total of the batten labor
###AccLab	The total of the accessory labor

Piece Coordinate File Format

A piece coordinate file (PCF) is written as part of the Linear-Nesting process. The name of the file is *<databasename>.PCF* and is written to the user directory.

Piece Co-ordinate File	Header line of the file
SHEET	Keyword defining a new sheet
<Length> <Width> <n Pieces>	Length, and width of the sheet and the number of pieces on this sheet
PIECE	Keyword defining a new piece
<identifier> <n verticies>	The unique identifier of this piece followed by the number of verticies
x1 y1	x y coordinate pair repeated n times
x2 y2	
…	
…	
…	
xn yn	
ENDPIECE	Keyword defining end of piece
ENDSHEET	Keyword defining end of sheet
EOF	Keyword defining end of file

Coordinate (0,0) is always at the bottom left hand corner of the sheet.
Coordinates are absolute with respect to the sheet origin.
Coordinates track the piece in an anti-clockwise direction

GRIM File Format

A Generic Roof Interface Method (GRIM) file is designed to facilitate the transfer of roof geometry and roof material data between computer systems.

A GRIM file is an ASCII file, with a GRIM header line followed by none or more lines containing a key text string and a value. A key text string is one of those defined above. A key text string starts in column 1 and is a maximum of 20 characters. The value for this key text string starts in column 21. The last line in the file is END.

A sample appears below

```
GRIM file header
###TODAY             16 July 1999
###JOBDELAREA        Area 1
###JOBINSTALDATE     16 July 1999
###JOBPICKUPDATE     16 July 1999
###JOBDELDATE        16 July 1999
###MAPREF
###COMPNAME          Applicad
###COMPADD1          37 Railway Road
###COMPADD2          Blackburn Vic 3130
###COMPPHONE         Ph 03 9877 7177
###COMPFAX           Fx 03 9877 0177
###COMPACN
###COMPNOTES
###COMPNOTE1
###COMPNOTE2
###SCALE             1 : 1
###PAGE              Page 1 of 1
###PITCH             26.6
###EAVEOFFSET        610
###EAVEHEIGHT        2700
###RAFTERSPACE       610
###BATTENSZ          90x38
###HIPTYPE           0
###RIDGETYPE         0
###VALLEYTYPE        0
###GABLETYPE         0
###FLEXPOINTING      0
###WASTETILES        0
###WASTESHINGLES     0
###WASTESHAKES       0
###TILEMAN
###TILECOLOUR
###TILEPROFILE
###TILETYPE
###TILEMATERIAL
###TILECOV           10.50
###TILEMAXLEN        0.00
###TILEMINLEN        0.00
###TILEWIDTH         0.00
###TILERIDGELEN      0.00
###TILEROOFCOST      0.00
###TILEHIPCOST       0.00
###TILERIDGECOST     0.00
###TILESHELLCOST     0.00
###TILEAPEXCOST      0.00
###TILECARTAGE       0.00
###TILEAPEXCOST      0.00
###TILEBARGECOST     0.00
###ROOFMAT           Not included
###RIDGEMAT          Roll top ridge, Merino
###FASCIAMAT         Metal fascia, Mountain Blue
###GUTTERMAT         Not included
###BATMAT            Not included
###VALLEYMAT         Not included
###BARGEMAT          Not included
###INSULMAT          Not included
###CROOFMAT          Not included
###DPMAT             Not included
###DATABASENAME      Sorcerer File : aasample.dab    Model : model
###DATABASEFILENAME aasample
###DATABASEMODELNAMEmodel
###ROOFAREA          314.48
###RIDGELEN          15.50
###HIPLEN            47.49
###VALLEYLEN         13.83
###FASCIALEN         75.88
###GUTTERLEN         75.88
```

```
###BARGELEN          0.00
###FASCIABARGELEN    0.00
###APRONLEN          0.00
###BOXGUTTERLEN      0.00
###SHELLENDS         6
###APEXES            4
END
```

Refer to the list of key text strings earlier.

There are also repeated structures which handle material line items reported in the job as well as cutting list. For each material line item present in the job there is the following set of key text strings

###LINEITEM	the name of the line item
###LINEITEM_SUP	the supplier of this item
###LINEITEM_CODE	the product code of this item
###LINEITEM_PRO	the profile of this item (user defined)
###LINEITEM_FIN	the finish of this item (user defined)
###LINEITEM_QTY	the quantity of this item
###LINEITEM_RATE	the cost per unit of this item

If the line item defines straight metal roofing or flashings, a cutting list may follow. The cutting list is of the repeated form

###CUTLIST_SIZES	the number of cutting list sizes to follow
###CUTLIST_QTY	the no off of the following length
###CUTLIST_LENGTH	the length required

The following file segment shows this format

```
###LINEITEM          Ridge
###LINEITEM_SUP      Stramit
###LINEITEM_CODE     RTRVCTL--
###LINEITEM_PRO      Roll top ridge
###LINEITEM_FIN      Merino
###LINEITEM_QTY      2.000000
###LINEITEM_RATE     10.280000
###CUTLIST_SIZES     6
###CUTLIST_QTY       1
###CUTLIST_LENGTH    3200
###CUTLIST_QTY       4
###CUTLIST_LENGTH    2950
###CUTLIST_QTY       6
###CUTLIST_LENGTH    2840
###CUTLIST_QTY       4
###CUTLIST_LENGTH    2800
###CUTLIST_QTY       6
###CUTLIST_LENGTH    2720
###CUTLIST_QTY       2
###CUTLIST_LENGTH    2300
```

A cutting list is written if the name of the line item is one of ‘Straight roofing’, ‘Ridge’, ‘Valley’, ‘Fascia’, ‘Gutter’, ‘Barge’, ’Apron’, or ‘Batten’.

E N D O F D O C U M E N T

http://www.xactware.com/solutions/claims-estimating/ Go JAN FEB MAY 12 2009 2010 2011
32 captures



- Overview
- Features
- Pricing Data
- System Requirements
- Training
- Certification
- Testimonials
- Order



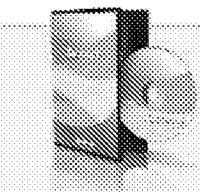
Xactimate Multiple Version Install Webinar

Claims Estimating with Xactimate® 25

Xactimate 25 is the latest version of the number-one claims estimating solution from Xactware. Faster and smarter than ever, Xactimate 25 is designed to be the easiest-to-use and most intuitive Xactimate yet.

All your important estimating and communication tasks are available through one, central dashboard. That includes communications such as sending and receiving estimates and price lists, easier access to files in process, and improved reporting features.

Xactimate Xcert **Experience the power of Xactimate today with a free demo**



Demo, Subscribe, or Renew Xactimate Today

What can you do in a single click?

The simple and smart approach of Xactimate 25 has led to a number of features that are new to the industry and only a click away.

- Estimate in English, Spanish, and French.
- Print reports in English, Spanish, and French.
- Run an insulation wizard that automatically enters estimate line items for wall, ceiling, and floor insulation with appropriate pricing and quantities.
- Run an HVAC wizard that automatically enters estimate line items for the heating / cooling unit, ductwork, thermostat(s), and vents.
- Run a plumbing wizard for a bathroom, laundry, or kitchen and get all appropriate plumbing line items for those room types.

Xactimate 25 is streamlined and packed with features that can improve your estimates and save you valuable time.

Xactimate® Key Features

Here are some of the exciting features available in Xactimate 25:

- **Sketch Wizards**

  Additional estimation wizards for plumbing, HVAC, insulation, and decks have been added to automate common estimating workflows and improve accuracy. These wizards automatically add the line items to the appropriate rooms in a single click.

- **Annotation Layer**

This new annotation feature allows users to include notes on floor plans and digital images. These notes may be toggled on or off to better explain your estimate by adding notes, identifying the loss with circles, arrows, and other drawing tools.

- **Assignment Workflow**

  Send and receive assignments seamlessly through Xactimate. This streamlined assignment process reduces estimating time while improving accuracy.

- **Language Packs**

  New language packs available for Xactimate-Spanish and French (CA), allowing the user to write their estimate in English while printing reports in Spanish or French, as an example.

- **New and Updated Flood Forms**

  Existing flood forms have been updated to match the latest NFIP reports. New flood forms have also been added including the ICC Adjuster Report, Mobile Home Worksheet, and Preliminary Damage Assessment

- **Xactimate Dashboard**

  Upon login, the Control Center will show the last 10 projects opened as well as any new assignments that have been downloaded. Users can quickly connect to download assignments and other data when first entering Xactimate.

- **Claim Manager Enhancements**

  XactCentral is integrated into the Admin Info module, allowing users to create estimates, claim reports, and coverage types and limits from the same screen.

- **Microsoft Word Template Integration**

  The Word token functionality has been integrated directly into Xactimate, making it easier to create and use custom documents by dragging and dropping tokens in the preferred location.

Xactimate Third Party Compatibility

Xactimate can share information with a broad range of leading software packages. This includes products that provide project management, job costing, and data management.

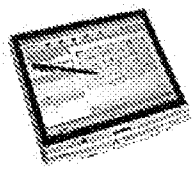
View the Third Party Compatibility chart

Supported Tablet PCs

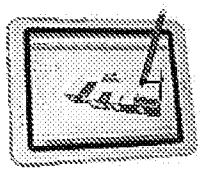
Xactware has always been, and continues to be committed to developing software specifically targeted toward cutting-edge technology. In 1991, we were the first company in the insurance industry to develop property estimation software for the tablet PC. This platform was used to settle over half-a-million property losses.

That tradition continues with Xactimate 24 / 25 and XactRemodel, designed to be fully compatible with virtually all the recently available Tablet PCs running Windows XP Tablet PC Edition 2005. In fact, one of Xactware's largest customers is currently running Xactimate company-wide on almost 2,000 Toshiba Tablet PCs.

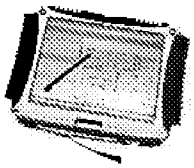
As a normal course of Xactware's QA and product release testing, several Tablet PC models have been verified to be fully Xactimate version 24 and 25 compliant, including the following:



- **Convertible Tablet PCs**
  Convertible tablets, such as the Lenovo ThinkPad X41, are equipped with keyboards. They resemble conventional laptop PCs but have the ability to rotate the touch-sensitive display and lay it flat over the key-board for a more comfortable, pen-based interface when desired. These devices are very versatile, allowing for fast keyboard entry when possible but can be somewhat more fragile than other options.



- **Slate Tablet PCs**
  Tablets such as the Toshiba R10-S804TD are thin, very lightweight, and are not equipped with keyboards. Some models do come with removable, portable keyboards. Virtually all modules have docking stations available that provide for attachment to a full-size monitor, keyboard, and mouse.



- **Ruggedized Tablet PCs**
  These devices are built for environments where hardware may be easily damaged. They are typically equipped with tough casings and shock-absorbing hard drives. These tablets are intended for a work-force in outdoor, dirty, and less than ideal conditions. They are ultra-durable, but are often more expensive than other comparable models and typically lag behind in overall computing power and features.

Xactimate Integration with DISTO™ and Bluetooth®

Xactimate communicates with Bluetooth devices such as the Leica DISTO laser measuring device and wireless headsets. With a wireless headset and DISTO, estimators can set their laptop nearby and enter dimensions for rooms in a loss without touching a keyboard or a mouse.



Leica DISTO Laser Measuring Devices

Save 15% on DISTO laser measuring devices. Xactware customers can receive a 15% discount by entering "Xactware" in the Coupon Code field at checkout.

Xactimate 24.12 and later supports the DISTO Plus and A6 versions.

Bluetooth Wireless Headset

Visit one of our merchant partners to purchase a Bluetooth wireless headset to use in conjunction with your laser measuring device:

Best Buy
Dell

Pricing Data Services

Xactware generates 467 regional pricing databases containing current pricing information to power our estimation and valuation software. Covering regions throughout the United States and Canada, our comprehensive databases provide some of the most trusted pricing in the industry.

The Xactware Pricing Team

Xactware's pricing team has more than 400 years' combined experience in the residential and commercial construction fields, and consists of multiple individuals who are licensed General Contractors, as well as those highly skilled in the trades themselves. In addition, Xactware's pricing team holds multiple first level and journeyman certifications (IICRC) in Water, Smoke Fire, Upholstery, Odor and Carpet cleaning and restoration. Our team of construction and restoration professionals has been producing building cost data for the insurance industry since 1989.

How often are price lists updated?

Price lists are updated and published by the 15th of each month. These price lists are available 24/7 for download via XactAnalysis and your Internet connection.

How may we assist you?

Fax: 1-800-329-9228

Contact us online

Submit pricing feedback

Xactimate® System Requirements

Note: Xactimate 25.1 is supported and has been tested on Microsoft's Vista Business 64 bit Operating System. Xactware invests a great deal to emulate and test hundreds of combinations of hardware and software scenarios. We focus on the scenarios predominant in the market that will return the best results for our customers. Although we have not tested Xactimate on other iterations of Vista 64 bit versions, it is likely to work and we plan on certifying future iterations as customer need is reported.

Multi-Version Install: Because prior versions of Xactimate are not supported in a 64 bit environment, multi-version install installations that include Xactimate 25.1 must be used with a 32 bit operating system.

Xactimate 25 Stand-Alone

Before installing Xactimate 25 on your computer, it is critical that your computer meets the minimum system requirements for Xactimate 25.

Windows XP Service Pack 2 (Service Pack 3 starting with Xactimate 25.2.)

- **Windows XP Media Center 2005 Edition** - supported starting with Xactimate 25.2.
- **Processor Speed** - Xactimate 25 requires at least a 1 GHz processor (1.5 GHz or better is recommended).
- **RAM** - Xactimate 25 requires that your machine have at least 512 MB of RAM (1 GB or better is recommended).
- **Hard Drive Space** - Xactimate 25 requires that your computer have at least 1.5 Gig of free hard drive space available.
- **Monitor Resolution** - Xactimate 25 requires that your monitor resolution be set to 1024x768 or higher.
- **DVD-ROM Drive** - a DVD-ROM drive is required to install Xactimate.

- **Internet Access Required.**

Windows Vista

- **Windows Vista Ultimate** - supported starting with Xactimate 25.2.
- **Processor Speed** - Xactimate 25 requires at least a 1 GHz processor (1.5 GHz or better is recommended)
- **RAM** - Xactimate 25 requires that your machine have at least 1 GB of RAM.
- **Hard Drive Space** - Xactimate 25 requires that your computer have at least 1.5 Gig of free hard drive space available.
- **Monitor Resolution** - Xactimate 25 requires that your monitor resolution be set to 1024x768 or higher.
- **DVD-ROM Drive** - a DVD-ROM drive is required to install Xactimate.
- **Internet Access Required.**

Xactimate 25 can also be used on any Tablet PC that supports these system requirements.

The Xactimate 25 system requirements changed only slightly from Xactimate 24. Additional requirements have been added to support Windows Vista. Other changes include Windows 2000, which will no longer be supported, and the RAM requirement, which has increased from 256MB to 512MB for computers using Windows XP.

Xactimate 25 Network

Like all networked software applications, Xactimate 25 must be installed on a workstation connected to a network which has been properly set up and attached (i.e., mapped) to a shared drive. SQL Server or SQL Express must be installed on your server. An install of SQL Express is available on your Xactimate 25 CD and will allow up to ten users to access your network without a drop in network performance. For networks with more than ten users we recommend that a full version of SQL Server be installed on your sever machine. To install Xactimate 25 you will need to know the name of your server machine, as well as the user name and password for an administrator user on your database (SQL Express or SQL Server). We highly recommend that you have a certified network technician set up and administer your network for you.

Xactimate 25 supports SQL Server 2000, SQL Server 2005, and SQL Express.

Xactimate 25 supports a peer-to-peer network configuration and installation.

Before installing Xactimate 25 on your network, it is critical that both your server and each of your workstation computers meet all of the minimum system requirements for Xactimate 25.

For Servers:

- **Server** - Your server must be at least a 2 GHz processor with at least 1 Gig of RAM (2 Gig or more is recommended) and at least 2 Gig of available hard drive space.
- **Network Hardware** - Your network hardware must be at least 100Base-T with Category 5 Unshielded Twisted-Pair (UTP) cable throughout all network connections.
- **Internet Access** - At least one of the computers on your network must have access to the Internet.

For Workstations:

Windows XP Service Pack 2 (Service Pack 3 starting with Xactimate 25.2.)

- **Processor Speed** - Xactimate 25 requires at least a 1 GHz processor (1.5 GHz or better is recommended).
- **RAM - Xactimate** 25 requires that your machine have a least 512 MB of RAM (1 GB or better is recommended).
- **Hard Drive Space** - Xactimate 25 requires that your computer have at least 1.5 Gig of free hard drive space available.
- **Monitor Resolution** - Xactimate 25 requires that your monitor resolution be set to 1024x768 or higher.

Windows Vista

- **Processor Speed** - Xactimate 25 requires at least a 1 GHz processor (1.5 GHz or better is recommended).
- **RAM** - Xactimate 25 requires that your machine have a least 1 GB of RAM.
- **Hard Drive Space** - Xactimate 25 requires that your computer have at least 1.5 Gig of free hard drive space available.
- **Monitor Resolution** - Xactimate 25 requires that your monitor resolution be set to 1024x768 or higher.

Important! Required network software for non peer-to-peer networks includes Novell 5.0(r) (5.1 recommended) and Windows Server 2003. It is crucial that you use only one type of client driver (i.e., never mix client drivers). Choose either Novell Client 32 (version 3.3 or higher) or Microsoft's built-in clients. Never use Microsoft's Novell clients because Novell networks require Novell client software. Use the same driver on every workstation.

Xactimate® Training

Train at Your Office

Xactware's certified training professionals come to your facility at your convenience and train your people. We can tailor our two- to three-day course to fit your specific needs.

Learn more about onsite training.

Xactimate Classroom Training

Attend a three-day training or two-day advanced training throughout the USA and Canada. Learn the five steps of estimating, how to create an estimate from start to finish, improve estimating speed and efficiency, and more.

Learn more about Xactimate classroom training.

Xactimate Virtual Classroom Training

Experience the benefits of an Xactimate 25 training seminar without ever leaving your office with this powerful real-time training. Experience individualized instruction and review of work in real-time as you spend 3 hours a day for 5 days on in-depth training of Xactimate Administration, Basic and Intermediate Sketch, Estimate Items/Summary, and more.

Learn more about Xactimate virtual classroom training.

Two-Hour Courses

Xactware offers a variety of Two-Hour Virtual Classroom training courses that focus on a specific product or topic. These courses are conducted by a Certified Xactware trainer, providing live instructor interaction and the convenience of online training. Courses include:

- Xactimate Project Management
- Xactimate Report Editor
- Xactimate Sketch Roofing

Xactimate Scenario Training

Xactimate Scenario Training teaches how to estimate the types of losses typically seen in the field. You will estimate repairs to homes damaged by fire and flood. Available online or on disc and includes Xactimate estimates and workbook exercises.

Learn more about Xactimate scenario training.

Xactimate® Certification

The Xactware Certification program is one of the best ways to determine whether a user has the experience and knowledge to get the job done right. Xactware's Certification program has rigorous training and testing requirements for each certification type. You can trust that those certified by Xactware are the best in the business.

Whether your goal is to become certified as a user or a trainer, completing the Xactware Certification program includes you in an elite group of Xactware professionals.

Xactimate User Certification

The User Certification program provides a controlled exam at three different levels to independently verify the user's product knowledge and proficiency. Users can certify at three different levels: Level 1, Level 2, and Level 3. Each level increases in difficulty and is considered a prerequisite for the next level.

Learn more about Xactimate User Certification.

Xactimate Certified Trainer

The Xactimate Trainer Certification (XCT) program is for organizations that teach students how to use Xactimate and want to have an edge on their competition.

Xactware Certified Trainers can provide the same level of training one would receive at Xactware's headquarters. Certified Trainers have direct access to the entire Xactware University of online training and the extensive Resource Library of training material as well as other resources. This path is recommended for organizations that generate revenue from Xactimate training courses.

This rigorous and comprehensive certification program is designed for trainers who would like to train others on Xactimate. Those who complete the requirements are granted the elite status of Xactware Certified Trainer.

Once certified, Xactware Certified Trainers (XCT) will have the privilege of providing authorized Xactimate training while being certified and promoted by Xactware. XCT status ensures that Xactimate users are trained in accordance with Xactware's high standards. Being trained by an XCT is equivalent to being trained at Xactware's campus. This high caliber of training assures employers and those seeking to be trained on Xactimate that they will be properly trained. Students who are trained by an Xactware Certified Trainer are

prepared to get the job done right.

The Xactware Certified Trainer Program includes the following steps:

- Register for the Certified Trainer program.
  To register for the Xactware Certified Trainer program, call our training department at (800) 232-9228 Ext.723.
- Sign and return Xactware's Training Services Agreement.
- Pass the Xactimate 25 Level 3 Certification Exam.
- Complete the three-day Train-the-Trainer course.

  Students can choose from the dates below:

  January 19-21, 2010
  April 6-8, 2010
  July 6-7, 2010
  October 5-7, 2010

- Pass the Xactware Trainer Exam.
- Conduct Xactimate Training while being observed by Xactware personnel.
- Pass the Xactimate Training Evaluation.

Passing students will receive a certificate and have the opportunity to be listed in our Trainer Certification Directory.

Xactimate® Testimonials

"The Spanish language pack in Xactimate 25 is extremely useful to us here in Arizona. We encounter a high percentage of customers who either speak Spanish as their primary language or prefer to speak Spanish. Being able to provide an estimate to them in Spanish goes a long way in ensuring more effective communication. Providing an estimate in Spanish to those who desire it, fits well with our goal of providing personalized customer service and gives us one more advantage. It is one more reason we make Xactimate 25 our estimating software."

James Kowalski
Kowalski Construction

"Xactimate 25 is a big leap ahead in terms of the user interface. Many features that had been implemented over the years have now come together in more a centralized, refined way, resulting in greater productivity. As a seasoned Xactimate user, I can also say without hesitation that Xactware has been doing a great job at listening to the feedback provided by its enormous user base-from both the contractors and the insurance reps. Every new release is a step forward. Other estimating products have been on the market from time to time, but Xactimate continues to offer the most complete package of tools for creating professional property loss estimates. There simply is no better way to ensure that your restoration contracting or remodeling firm is providing its clients with the best estimates in the industry than by using Xactimate. Thank you, Xactware!"

Brent Forder
Okanagan Restoration Services, Ltd.

"The Sketch features you added and enhancements such as plumbing, HVAC, and framing will actually make writing an estimate fun. My estimators will enjoy what they do even more, thanks to Xactimate 25."

Jerry Pennock
Complete Restoration

"The new Xactimate 25 is loaded with fresh ideas designed to help restoration contractors save time and prepare superior estimates. Without question, it is the finest estimating software available."

Eugene Peterson
Advise and Consult, Inc.

"I think you all have done a great job in the new version. The added features are too many to list and they are great improvements. It is so good to work with a company who listens to what our needs as adjusters are and respond so quickly."

Charles Norton
Independent Adjuster

"Once again, it is nice to see the Xactimate crew update the program with features that have usefulness throughout the industry; I really appreciate all of the support from you and your team. I'm always pleased that you take the suggestions given to you from people like myself while testing and using the program and turn those into upgrades that help us more efficiently use your program to complete our job. Once again the 24/7 chat, the real time training, the professional knowledge, and technical support that your team shares with us greatly enhances our ability to help the adjusters that are out working in the field. Keep up the good

work."

Ray Hickok
Wardlaw Claims

"As a general adjuster with over thirty years in the industry, I've used most of the property damage estimating platforms. I've used Xactimate since it was DOS-based. Just when I think it can't get any better, Xactware comes out with a new feature that saves time, money, and headaches. There's a good reason it's the standard of the industry."

Devon Thyme
General Adjuster

"It was a pleasure to see all of the new features that are now available. The product has to be the most stable, comprehensive, and user-friendly application that I've seen in the business. As a claim site investigator/estimator, it makes my job more fun" and easier to look forward to doing the sketches and completing the estimates more quickly and professionally."

Merrill House
R & F Construction

"The graphical estimating will save me a huge amount of time and allow for more accurate scopes. For me that means more commissions because I'll be able to increase my projects list."

Robert Felton
Estimator

"The new version of Xactimate brings estimating to a new level, with the graphical estimating as the driving force behind easy and simplicity for the user. My time saved estimating will allow for more free time personally."

Kevin Sobotka
Commercial Estimate Manager

"Xactware is a "must have" for anyone who writes building estimates."

Roosevelt Hayes
Claims Reinspector

"Great job keep up the good work. I always keep getting the other software vendors trying to get me to switch to their estimating programs, however when you are using the absolute best why would you ever want to settle for anything less. Thank you all at Xactware."

Steve Velasco
President, Velasco Construction Co. Inc

"I have been using Xactimate to generate estimates for over 15 years in the insurance restoration industry, and most recently as a consultant for the 2005 Hurricane catastrophes. Through all the industry changes, Xactimate has stood by their product, and always been there for me when any special attention was needed. I would recommend the Xactware family of industry software tools without hesitation."

Tom Sullivan
Young & Associates

"We use an estimating system called Xactimate made by Xactware that helps us estimate the price lists and estimate the cost of the claim. The information from this technology is reliable and it results in a lot less guesswork. It has increased my productivity from about 25 claims a month to 50."

James Michael Smith, Field Adjuster and Technical Specialist for St. Paul Travelers as quoted in December 2005 issue of Insurance & Technology

James Michael Smith
St. Paul Travelers

"Xactimate is super easy. I learned Sketch in approximately 2-3 hours. I use Sketch on every estimate. It's very easy and fast. I could teach someone to use this tool in a few hours! I'm not considered a software guy and I picked it up in just a few hours! I help adjusters that have been using this software for years improve their skills on this program. Sketch rocks!"

Matt Taylor
Independent Adjuster

"I have been using Xactimate for years and have found Xactimate to be a program that is friendly to all. As an adjuster, I'm glad to say that this software is a life-saver. I was able to bring a restoration map to a family's home in a few days and the plan for scoping this restoration gave the family hope and confidence. Your software was an integral part of this story and has been for years. Thanks Xactimate."

Michael Kopp
Allure Home Inspections

"Xactimate has many improvements over previous versions, especially with regards to the insurance industry. The improvements will help IAs do more work in the same amount of time, therefore increasing the return on investment for these IAs."

David Borg
Pacesetter Claims Service, Inc.

"I have found the latest version of Sketch to be one of the most versatile tools in Xactimate. It has added a new level of accuracy and efficiency to estimating by creating the ability to revisit a property without leaving the estimate."

Doug Lipinski
Taylored Restoration

"Sketch is by far the easiest plan drawing tool that I have ever used. It makes my job of entering rooms easy and fun. I find it very beneficial to have a layout of my job that can easily be printed and shared with adjusters and trades people. I was using a stand alone program to plan out projects, now I can do it within the estimating program and not enter information twice."

Ted Foster
Signal Building Company

"Sketch makes changing an estimate much simpler and it is easy to provide a diagram to the customer or insurance company. I take my laptop to a customer's home and adjust the diagram to meet their wishes, then I can instantly tell them what those changes will cost. Very professional and impressive."

Will Markey
Modern Builders, Inc.

"Four months ago our office was drawing all our sketches by hand. This worked, but was time consuming so we decided to give Sketch a try and loved it immediately. Now we take our laptops to the job and use Sketch on-site. This works great! Sketch is quick, easy to learn, and has added that professional touch we've been looking for."

Jeff Skinner
Central Coast Casualty Restoration, Inc.

Order Today!

Demo — Experience the power of Xactimate today with a free demo

Subscribe — Start your subscription to Xactimate today
Do you have a promo code?

Renew — Extend your Xactimate subscription

Upgrade — Order the Xactimate 25.5 upgrade

Add-on version — Use multiple Xactimate versions on a single computer

Copyright 2011 Xactware Solutions, Inc. All rights reserved.

Automatic Extraction of Generic House Roofs from High Resolution Aerial Imagery *

Frank Bignone, Olof Henricsson, Pascal Fua+ and Markus Stricker

Communications Technology Laboratory
Swiss Federal Institute of Technology ETH
CH-8092 Zurich, Switzerland
+SRI International, Menlo Park, CA 94025, USA

Abstract. We present a technique to extract complex suburban roofs from sets of aerial images. Because we combine 2-D edge information, photometric and chromatic attributes and 3-D information, we can deal with complex houses. Neither do we assume the roofs to be flat or rectilinear nor do we require parameterized building models. From only one image, 2-D edges and their corresponding attributes and relations are extracted. Using a segment stereo matching based on all available images, the 3-D location of these edges are computed. The 3-D segments are then grouped into planes and 2-D enclosures are extracted, thereby allowing to infer adjoining 3-D patches describing roofs of houses. To achieve this, we have developed a hierarchical procedure that effectively pools the information while keeping the combinatorics under control. Of particular importance is the tight coupling of 2-D and 3-D analysis.

1 Introduction

The extraction of instances of 3-D models of buildings and other man-made objects is currently a very active research area and an issue of high importance to many users of geo-information systems, including urban planners, geographers, and architects.

Here, we present an approach to extract complex suburban roofs from sets of aerial images. Such roofs can neither be assumed to be flat nor to have simple rectangular shapes. In fact, their edges may not even form ninety degrees angles. They do tend, however, to lie on planes. This specific problem is a typical example of the general Image Understanding task of extracting instances of generic object classes that are too complex to be handled by purely image-based approaches and for which no specific template exists.

Because low-level methods typically fail to extract all relevant features and often find spurious ones, existing approaches use models to constrain the problem [15]. Traditional approaches rely almost exclusively on the use of edge-based features and their 2-D or 3-D geometry. Although 3-D information alleviates the problem, instantiating the models is combinatorially explosive. This difficulty

* We acknowledge the support given to this research by ETH under project 13-1993-4.

is typically handled by using very constrained models, such as flat rectilinear roofs or a parameterized building model, to reduce the size of the search space. These models may be appropriate for industrial buildings with flat roofs and perpendicular walls but not for the complicated suburban houses that can be found in scenes such as the one of Fig. 1.

It has been shown, however, that combining photometric and chromatic region attributes with edges leads to vastly improved results over the use of either alone [6, 11]. The houses of Fig. 1 require more flexible models than the standard ones. We define a very generic roof primitive: we take it to be a 3-D patch that is roughly planar and encloses a compact polygonal area with consistent chromatic and luminance attributes. We therefore propose an approach that combines 2-D and 3-D edge geometry with region attributes. This is not easy to implement because the complexity of the approach is likely to increase rapidly with the number of information sources. Furthermore, these sources of information should be as robust as possible but none of them can be expected to be error-free and this must be taken into account by the data-fusion mechanism.



Figure 1 Two of the four registered 1800×1800 images that are part of our residential dataset (Courtesy of Institute of Photogrammetry and Geodesy at ETH Zürich).

To solve this problem, we have developed a procedure that relies on hierarchical hypothesis generation, see Fig. 2. The procedure starts with a multi-image coverage of a site, extracts 2-D edges from a source image, computes corresponding photometric and chromatic attributes, and their similarity relationships. Using both geometry and photometry, it then computes the 3-D location of these edges and groups them to infinite planes. In addition, 2-D enclosures are extracted and combined with the 3-D planes to instances of our roof primitive, that is 3-D patches. All extracted hypotheses of 3-D patches are ranked according to their geometric quality. Finally, the best set of 3-D patches that are mutually consistent are retained, thus defining a scene parse. This procedure has proven powerful enough so that, in contrast to other approaches to generic

roof extraction (e.g. [14, 6, 4, 13, 7, 12]), we need not assume the roofs to be flat or rectilinear or use a parameterized building model.

Note that, even though geometric regularity is the key to the recognition of man-made structures, imposing constraints that are too tight, such as requiring that edges on a roof form ninety degrees angles, would prevent the detection of many structures that do not satisfy them perfectly. Conversely, constraints that are too loose will lead to combinatorial explosion. Here we avoid both problems by working in 2-D and 3-D, grouping only edges that satisfy loose coplanarity constraints, weak 2-D geometric and similarity constraints on their photometric and chromatic attributes. None of these constraints is very tight but, because we pool a lot of information from multiple images, we are able to retain only valid object candidates.

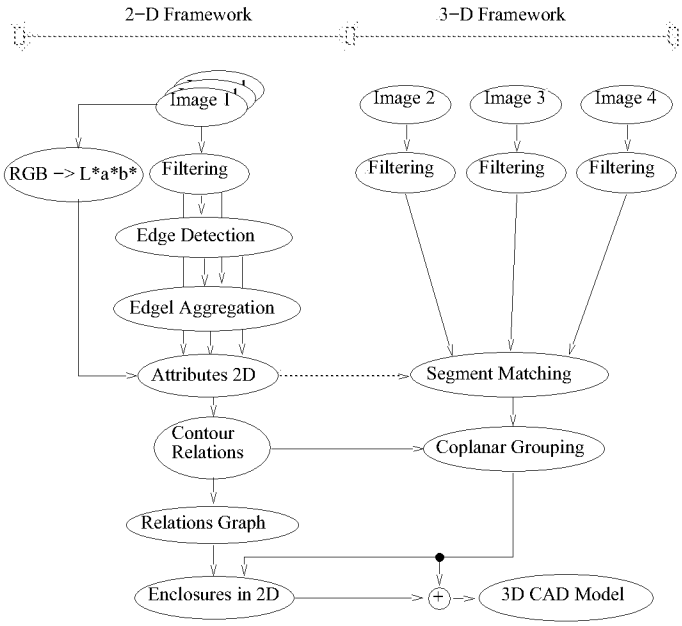


Figure 2 Our hierarchical framework, a feed-forward scheme, where several components in the 2-D scheme mutually exchange data and aggregates with the 3-D modules.

We view the contribution of our approach as the ability to robustly combine information derived from edges, photometric and chromatic area properties, geometry and stereo, to generate well organized 3-D data structures describing complex objects while keeping the combinatorics under control. Of particular importance is the tight coupling of 2-D and 3-D analysis.

For our experiments, we use a state-of-the-art dataset produced by the Institute of Geodesy and Photogrammetry at ETH Zürich. It consists of a residential and an industrial scene with the following characteristics: 1:5,000 image scale vertical aerial photography, four-way image overlap, color imagery, geometrically accurate film scanning with 15 microns pixel size, precise sensor orientation, and

accurate ground truth including DTM and manually measured building CAD-models. The latter are important to quantitatively evaluate our results.

Our hierarchical parsing procedure is depicted in Fig. 2. Below we describe each of its components: 2-D edge extraction, computation of photometric and chromatic attributes, definition of similarity relationships among 2-D contours, 3-D edge matching and coplanar grouping, extraction of 2-D enclosures, and finally, generation and selection of candidate 3-D object models. Last, we present and discuss our results.

2 Attributed Contours and their Relations

2.1 Edge Detection and Edgel Aggregation

Our approach is based on grouping contour segments. The presented work does not require a particular edge detector, however, we believe it is wise to use the best operator available to obtain the best possible results. For this reason we use the SE energy operator (suppression and enhancement) recently presented in [8]. The operator produces a more accurate representation of edges and lines in images of outdoor scenes than traditional edge detectors due to its superior handling of interferences between edges and lines, for example at sharp corners.

The edge and line pixels are then aggregated to coherent contour segments by using the algorithm described in [10]. The result is a graph representation of contours and vertices, as shown in Fig. 3B. Each contour has geometric attributes such as its coarse shape, that is *straight*, *curved* or *closed*.

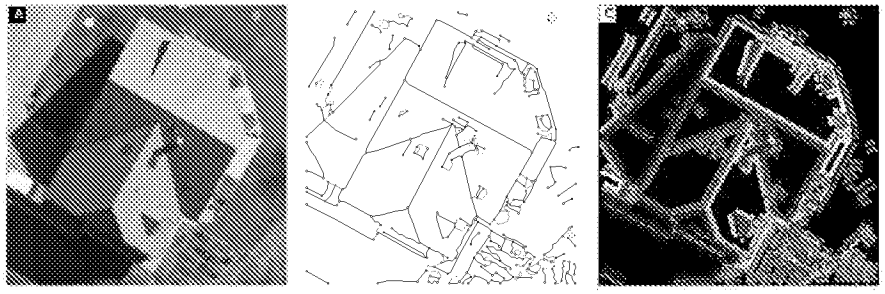


Figure 3 (A) a cut-out 350 × 350 from the dataset in Fig.1, (B) The resulting attributed graph with all its contours and vertices, (C) the flanking regions with their corresponding median luminance attributes. The background is black.

2.2 Photometric and Chromatic Contour Attributes

The contour graph contains only basic information about geometry and connectivity. To increase its usefulness, image attributes are assigned to each contour and vertex. The attributes reflect either properties along the actual contour (e.g. integrated gradient magnitude) or region properties on either side, such as chromatic or photometric homogeneity.

Since we are dealing with fairly straight contours the construction of the flanking regions is particularly simple. The flanking region is constructed by a

translation of the original contour in the direction of its normal. We define a flanking region on each side of the contour. When neighboring contours interfere with the constructed region, a truncation mechanism is applied. In Fig. 3C we display all flanking regions. For more details we refer to [9].

To establish robust photometric and chromatic properties of the flanking regions, we need a color model that accurately represents colors under a variety of illumination conditions. We chose to work with HVC color spaces since they separate the luminant and chromatic components of color. The photometric attributes are computed by analyzing the value component, whereas the chromatic attributes are derived from the hue and chroma components. As underlying color space we use the CIE(L*a*b*) color space because of its well based psychophysical foundation; it was created to measure *perceptual* color differences [16].

Since each flanking region is assumed to be fairly homogeneous (due to the way it is constructed), the data points contained in each region tend to concentrate in a small region of the color space. As we deal with images of aerial scenes where disturbances like chimneys, bushes, shadows, or regular roof texture are likely to be within the defined regions, the computation of region properties must take outliers into account. Following the approach in [11] we represent photometric attributes with the median luminance and the interquartile range (IQR), see Fig. 3C. The chromatic region properties are computed analogously from the CIE(a*b*) components and are represented by the center of the chromatic cluster and the corresponding spreads.

2.3 Contour Similarity Relations

Although geometric regularity is a major component in the recognition of man-made structures, neglecting other sources of information that corroborate the relatedness among straight contours imposes unnecessary restrictions on the approach. We propose to form a measure that relates contours based on similarity in position, orientation, and photometric and chromatic properties.

For each straight contour segment we define two directional contours pointing in opposite directions. Two such directional contours form a *contour relation* with a defined logical interior. For each contour relation we compute four scores based on similarity in *luminance*, *chromaticity*, *proximity*, and *orientation* and combine them to a single similarity score by summation.

Three consecutive selection procedures are applied, retaining only the best non-conflicting interpretations. The first selection involves only two contours (resp. four directional contours) and aims at reducing the eight possible interpretations to less or equal to four. The second selection procedure removes shortcuts among three directed contours. The final selection is highly data-driven and aims at reducing the number of contour relations from each directed contour to only include the *locally* best ones. All three selection procedures are based on analysis of the contour similarity scores. Due to lack of space we refer to [11] for more details.

3 Segment Stereo Matching

Many methods for edge-based stereo matching rely on extracting straight 2-D edges from images and then matching them [1]. These methods, although fast and reliable, have one drawback: if an edge extracted from one image is occluded or only partially defined in one of the other images, it may not be matched. In outdoor scenes, this happens often, for example when shadows cut edges. Another class of methods [2] consists of moving a template along the epipolar line to find correspondences. It is much closer to correlation-based stereo and avoids the problem described above. We propose a variant of the latter approach for segment matching that can cope with noise and ambiguities. Edges are extracted from *only one* image (the source image) and are matched in the other images by maximizing an "edginess measure" along the epipolar line. The source image is the nadir (most top-view) image because it is assumed to contain few (if any) self-occluded roof parts. Geometric and photometric constraints are used to reduce the number of 3-D interpretations of each 2-D edge. We outline this approach below and refer the interested reader to [3] for further details.

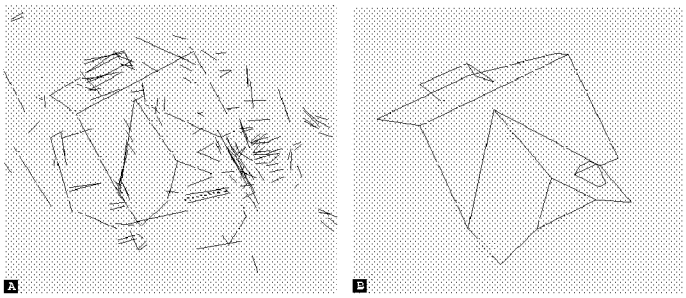


Figure 4 (A) Matched 3-D segments. Notice the false matches. (B) Manually measured 3-D CAD model.

For a given edge in the source image we want to find the location of its correspondences in the other image. A segment is described by the position of its middle point, its orientation and length. We use the epipolar geometry to constrain the location in the second image so that only 2 parameters are required to describe its counterpart: s_m, the position along the epipolar line, and θ the orientation. The length l, in the other images, is predicted by using (s_m, θ) and the epipolar geometry. For a given s_m and θ, we evaluate its probability of being correct by measuring the *edginess* f. It is a function of the image gradient:

$$f(s_m, \theta) = \sum_{r=-\frac{l}{2}}^{r=\frac{l}{2}} \|G(r)\| \cdot e^{-\frac{(\theta - \theta(r))^2}{2\sigma^2}}$$

where $G(r)$ is the image gradient at r, $\theta(r)$ its orientation. The function f is maximum when the virtual segment lies on a straight edge and decreases quickly

with any translation or rotation. Further, f can be large even if if the edge is only partially visible in the image, that is occluded or broken.

The search for the most likely counterparts for the source edge now reduces to finding the maxima of f by discretizing θ and s_m and performing a 2-D search. In the presence of parallel structures, the edginess typically has several maxima that cannot be distinguished using only two images. However, using more than two images, we can reduce the number of matches and only keep the very best by checking for consistency across image pairs.

We can further reduce the hypothesis set by using the photometric edge attributes of section 2.2 after photometric equalization of the images. We compute the 2-D projections of each candidate 3-D edge into all the images. The image photometry in areas that pertains to at least one side of the 2-D edges should be similar across images. Figure 4 shows all matched 3-D segments as well as the manually measured CAD model for the house in Fig. 3A.

4 Coplanar Grouping of 3-D Segments

To group 3-D segments into infinite planes, we propose a simple method that accounts for outliers in the data. It proceeds in two steps:

- **Explore**: We first find an initial set of hypotheses using a deterministic version of the RANSAC approach [5]: Given the relationships of section 2.3 and the 3-D geometry of the segments, we fit planes to pairs of related contours that are roughly coplanar. We then extend the support of those planes by iteratively including segments that are related to the hypothesis and that are close enough to the plane. After each iteration the plane parameters are re-approximated.
- **Merge**: We now have a set of plane hypotheses. Because all the edges belonging to the same physical plane may not be related in the sense of section 2.3, this plane may give rise to several hypotheses that must be merged. This is done by performing an F-test on pairs of parallel planar hypotheses to check whether or not they describe the same plane.



Figure 5 Selection of planes extracted from the 3-D segments of the house in Fig. 3A.

Each plane in Fig. 5 consists of a number of 3-D segments, some of which are correctly matched and do belong to a planar object part. However, quite a few 3-D segments are incorrectly matched and accidentally lie on the plane and other segments, such as the contours on the ground aligned with the roof plane, are correctly matched but do not belong to the object part.

5 Extracting and Selecting 2-D Enclosures

In the preceding section we presented an approach to group 3-D segments into *infinite* planes. However, only a subset of all segments on each plane actually belongs to valid 3-D patches, see Fig. 5. To obtain an ordered list of 2-D contours describing a 3-D patch, we propose to group contours in 2-D where *more complete* data is available and subsequently merge the extracted enclosures with the corresponding planes. The tight coupling between the 2-D and 3-D processes plays an important role; the extracted planes that are *not* vertical initialize the enclosure finding algorithm. We therefore do not need to find *all* possible 2-D enclosures, only those that overlap with non-vertical planes.

We use the edge and region based approach described in [11] since it allows to group contours on other grounds than geometric regularity. The method consists of defining contour similarity relations (section 2.3), which are then used to build a relations graph, in which each cycle defines a 2-D enclosure. At last, all extracted 2-D enclosures are ranked according to simple geometric shape criteria.

5.1 Extracting 2-D Enclosures

Instances of 2-D roof-primitives can be found by grouping related contours to polygonal shaped structures. A computationally attractive approach is to build a relations graph and use it to find these structures [6, 12]. By construction each cycle in the relations graph describe an enclosure. Each contour relation define a node in the graph and two nodes are linked together if they have a compatibly directed contour. We use a standard depth-first search algorithm to find cycles in the *directed* relations graph.

The procedure work as follows: select a not already used node *that belongs to the plane* and find all *valid* cycles in the graph given this start node. Pick the next not already used node *on the same plane* and iterate the procedure until there are no more nodes left. A *valid* cycle is a set of directed contours that have a boundary length not exceeding a large value and that does not form a self-loop; the boundary of the enclosure must be compact.

5.2 Selecting 2-D Enclosures

The above algorithm produces for each plane a set of 2-D enclosure hypotheses. To alleviate the fusion of enclosures and planes, we rank the enclosures within each plane according to simple geometrical shape criteria. We assume that each roof part has a compact and simple polygonal shape. In addition we require a large overlap between the contours in the 2-D enclosure and the corresponding 3-D segments of the plane. We propose the following criteria:

Shape simplicity Shape simplicity is defined as number of straight contours required to represent the enclosure boundary (including missing links). Given an error tolerance, we use a standard polygon approximation algorithm to compute the required number of straight lines. The simpler the description of a 2-D enclosure is, the more likely it is that it will describe a roof part.

Shape compactness Compactness is defined as the squared length of the boundary of the enclosure divided by the enclosed area.

3-D completeness The 3-D completeness is defined as the ratio of the length of the 3-D contours that lie on the enclosure boundary and on the plane, with respect to the total length of the enclosure boundary. This measure will be high whenever a large portion of the extracted 2-D contours have correctly matched 3-D segments that lie on the same infinite plane.

Figure 6 shows a few representative 2-D enclosures for the larger planes of the house in Fig. 3A. Two thresholds are applied, one for shape simplicity (≤ 10) and one for 3-D completeness (≥ 0.4). Together with the 3-D patch consistency test in next section these thresholds preclude highly unlikely hypotheses of 2-D enclosures *before* fusing them with planes to hypotheses of 3-D patches.

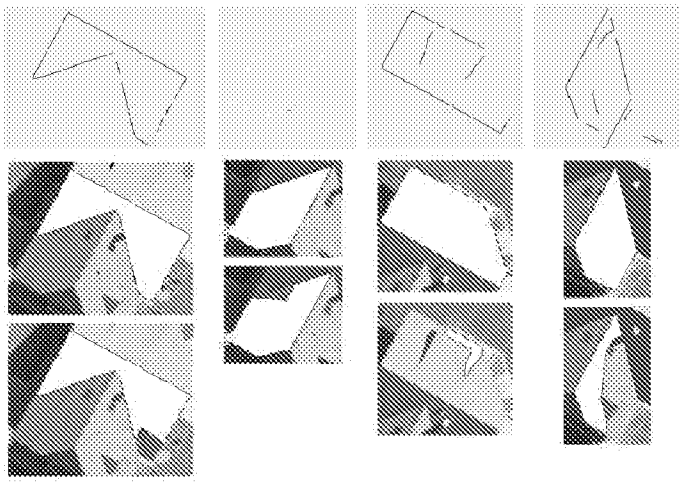


Figure 6 A few representative 2-D enclosures for the larger planes.

6 Finding Coherent 3-D Patches

Each 2-D enclosure describes a possible boundary description of the corresponding 3-D plane. It is reasonable to assume that roofs are usually constructed of adjoining planes. For this reason, only hypotheses of 3-D patches that mutually adjoin with other 3-D patches *along their boundaries* are retained. In addition we require that the 2-D contours belonging to the adjoining boundary of the 3-D patches are collinear in 2-D. Those 3-D patches that fulfill these constraints are consistent.

The iterative procedure initially selects a subset of 3-D patches and verifies the mutual consistency along the boundaries. If one or more 3-D patches do not fulfill this consistency, they are rejected and a new subset of 3-D patches is selected. Moreover, the subset of 3-D patches should be maximally consistent, i.e. have the maximum number of mutually consistent boundaries. The order of selection is initially based on shape simplicity, and in a second step on the product of the normalized compactness and 3-D completeness. To obtain the 3-D coordinates of those contours that are contained in the 2-D enclosure but not on the plane, we project their endpoints onto the plane. The result is a complete 3-D boundary for each plane that is likely to describe a roof.

7 Results

We use the presented framework to extract complex roofs of houses in suburban scenes, see Fig. 1. The process is initialized by selecting a rectangular window enclosing the same house in all four images. It has been demonstrated [7] that this initialization procedure can be automated by locating elevation blobs in the digital surface model. After this initialization, the roof is *automatically extracted.*

The roof depicted in Fig. 7A is complex because it consists of several adjoining planar and non-rectangular shapes. The feature extraction finds 171 straight 2-D edges. The segment stereo matching produces 170 3-D segments, and the coplanar grouping extracts 33 infinite planes of which 7 are mutually adjoining and non-vertical. Given these 7 non-vertical planes, the algorithm finds 373 valid 2-D enclosures (resp. 3-D patches). The five 3-D patches in Fig. 7B are finally selected since they maximizes the geometrical shape score and mutual consistency among all 3-D patches. The result is a 3-D CAD model with 3-D segments, 3-D planes and their topology. This procedure yields the main parts of the roof, however, 3-D patches that are not mutually consistent with the final set of 3-D patches, but nevertheless belongs to the house, are not included. One such example is the 3-D patch describing the dormer window in Fig. 7A.

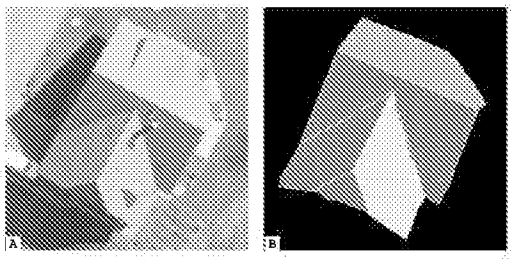


Figure 7 (A) cut-out from the aerial image in Fig.1A, (B) the reconstructed house roof in 3-D.

In Fig. 8 we demonstrate the performance of our approach on the entire scene in Fig. 1. To the automatically extracted CAD models of the roofs we add artificial vertical walls. The height of the vertical walls is estimated through

the available digital terrain model (DTM). Ten of the twelve house roofs are extracted, nine of them with a high degree of accuracy and completeness. The marked house to the right is not complete, since the algorithm fails to extract the two triangular shaped planes, however, the corresponding 2-D enclosures are correctly extracted. The algorithm fails to extract the two upper left houses. The lower of the two is under construction and should not be included in the performance analysis. Even manual measuring this house is troublesome. The upper house is complicated because a bunch of trees cast large shadows on the right roof part. Because of these shadows the algorithm fails to find the corresponding plane, however, the left roof part is correctly reconstructed.

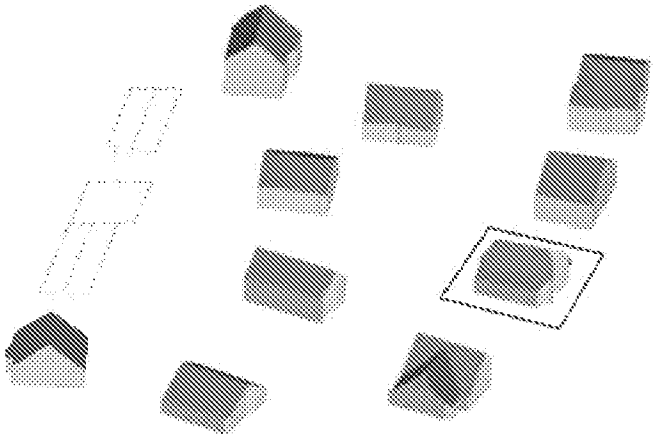


Figure 8 The result of running the algorithm on all houses in the scene of Fig.1. The artificial vertical walls are added and projected down to the ground. The ground height is estimated through the digital terrain model (DTM).

8 Conclusions and Future Work

We have addressed the problem of reconstructing complex objects in real images for which no specific template exists. We have implemented a working framework for the purpose of extracting complicated and generic roofs from sets of aerial images. The framework successfully performs the following tasks: hierarchical integration of multiple data sources, generic shape extraction, and efficient hypothesis generation and selection.

We combine geometry, photometry, chromaticity and stereo information about edges and their flanking regions. We thus make effective use of much of the available 2-D and 3-D information present in several images of a given site. As a result, our procedure is more robust than one that uses only partial information. We further use weak coplanarity constraints together with a generic extraction of 2-D enclosures; a combination that allow us to effectively find instances of 3-D patches. The polygonal shape of these 3-D patches can be arbitrarily complex.

Future work will concentrate on: improvement of each individual module (whenever possible), better exploitation of existing knowledge, e.g. DSMs and

color, better interaction between 2-D and 3-D information, further tests with other data, and improving the selection of 2-D enclosures by also modelling the color homogeneity of the enclosed area with for example MDL encoding, see [6].

Bibliography

[1] N. Ayache and F. Lustman. Fast and reliable passive trinocular stereo vision. In *International Conference on Computer Vision*, June 1987.

[2] E. Baltsavias. *Multiphoto Geometrically Constrained Matching*. PhD thesis, Institute for Geodesy and Photogrammetry, ETH Zurich, December 1991.

[3] F. Bignone. Segment Stereo Matching and Coplanar Grouping. Technical Report BIWI-TR-165, Institute for Communications Technology, Image Science Lab, ETH, Zürich, Switzerland, 1995.

[4] R.T. Collins, A.R. Hanson, M.R. Riseman, and H. Schultz. Automatic Extraction of Buildings and Terrain from Aerial Images. In *Automatic Extraction of Man-Made Objects from Aerial and Space Images*, pages 169–178. Birkhäuser Verlag,1995.

[5] M.A Fischler and R.C Bolles. Random Sample Consensus: A Paradigm for Model Fitting with Applications to Image Analysis and Automated Cartography. *Communications ACM*, 24(6):381–395, 1981.

[6] P. Fua and A.J. Hanson. An Optimization Framework for Feature Extraction. *Machine Vision and Applications*, 4:59–87, 1991.

[7] N. Haala and M. Hahn. Data fusion for the detection and reconstruction of buildings. In *Automatic Extraction of Man-Made Objects from Aerial and Space Images*, pages 211–220. Birkhäuser Verlag, Basel, 1995.

[8] F. Heitger. Feature Detection using Suppression and Enhancement. Technical Report TR-163, Image Science Lab, ETH-Z, Switzerland, 1995.

[9] O. Henricsson. Inferring Homogeneous Regions from Rich Image Attributes. In *Automatic Extraction of Man-Made Objects from Aerial and Space Images*, pages 13–22. Birkhäuser Verlag, Basel, 1995.

[10] O. Henricsson and F. Heitger. The Role of Key-Points in Finding Contours. In J.O. Eklundh, editor, *Computer Vision — ECCV'94*, volume II, pages 371–383. Springer Verlag, Berlin, 1994.

[11] O. Henricsson and M. Stricker. Exploiting Photometric and Chromatic Attributes in a Perceptual Organization Framework. In *ACCV'95, Second Asian Conference on Computer Vision*, pages 258–262, 1995.

[12] T. Kim and J.P. Muller. Building Extraction and Verification from Spaceborne and Aerial Imagery using Image Understanding Fusion Techniques. In *Automatic Extraction of Man-Made Objects from Aerial and Space Images*, pages 221–230. Birkhäuser Verlag, Basel, 1995.

[13] C. Lin, A. Huertas, and R. Nevatia. Detection of Buildings from Monocular Images. In *Automatic Extraction of Man-Made Objects from Aerial and Space Images*, pages 125–134. Birkhäuser Verlag, Basel, 1995.

[14] D.M. McKeown, W.A. Harvey, and J. J. McDermott. Rule-Based Interpretation of Aerial Images. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 7(5):570–585, 1985.

[15] P. Suetens, P. Fua, and A. Hanson. Computational Strategies for Object Recognition. *ACM Computing Surveys*, 24(1):5–61, 1992.

[16] G. Wyszecki and W.S. Stiles. *Color Science*. Wiley, New York, 1982.

EXECUTIVE SUMMARY 2

PHOTOGRAMMETRY 4

GEOVISTA SIX-DEGREES-OF-FREEDOM DIGITAL IMAGERY 4
GEOVISTA DATA ACCURACY 5
OBLIQUE AERIAL CAPTURE 6
MEASUREMENT AND SURFACE AREA 8
COORDINATE EXTRACTION TOOLS 9

PROJECT MANAGEMENT 10

PROJECT MANAGEMENT APPROACH 13
STATUS REPORTING 14

OBLIQUE IMAGERY 14

AREA OF COVERAGE AND RESOLUTION 14
IMAGE CAPTURE 14
IMAGE QUALITY 14
ACCURACY 15
IMAGERY OWNERSHIP 15

PROPOSED APPLICATION VIEWING SOFTWARE 16

GEOVISTA VIEWER API 16
APPLICATION ARCHITECTURE 18
INTEGRATION ARCHITECTURE 19
DESKTOP SOLUTION REQUIREMENTS 20
WEB-BASED SOLUTION REQUIREMENTS 20
SOFTWARE FUNCTIONAL REQUIREMENTS 20
GROUND-LEVEL IMAGERY INTEGRATION 21
CHANGE DETECTION 21
CAD 9-1-1 INTEGRATION 22
CAMA SYSTEM INTEGRATION 22
GEOVISTA® OBLIQUE VIEW PARCEL LIBRARY 23
DOCUMENTATION 27
TRAINING 27
SYSTEM SUPPORT 28
SOFTWARE MAINTENANCE 28
IMAGE REFRESH AND EMERGENCY IMAGERY 28

Tab Sections

References
Technical Documentation
Cost Section
Affidavits/Acknowledgements

GEO-NY0000868

Executive Summary

GEOSPAN is the advanced Photogrammetric industry provider of the highest resolution, most accurate, multi-angle oblique aerial and integrated 360° street-level imagery available. GEOSPAN's similar project experience includes oblique aerial imagery collection in New York, Boston, Chicago, Philadelphia, Calgary, San Francisco, Sacramento, Dallas, Minneapolis-St. Paul Metro area, and the San Diego coastal areas. Our extensive local experience includes oblique aerial imagery collection in Naples, Disney World, and the Disney Island in the Bahamas along with oblique street level imagery collection in Collier, Volusia, St. Johns, Boca Raton, Boynton Beach and Royal Palm Beach.

GEOSPAN supports a variety of state and local government GIS applications including E9-1-1, emergency management, homeland security, law enforcement, planning, property assessing and addressing, infrastructure inventory, pavement analysis, and transportation.

GEOVISTA® technology is used to create spatially accurate imagery under US Patent Number 5,633,946. This technology referred to as Direct Image Photogrammetric Measurement enables a paradigm shift in the use of cameras for surveying that is superior to technologies that are dependent upon Digital Terrain Data (DEM) for interpolated 3D locations. The concept implements rapid close range surveys with multiple high-resolution cameras to obtain superior levels of detail.

Expanding on the County expressed interest in CAMA imagery solutions, we propose including a library of GEOVISTA Oblique Property Views for every property at no additional charge. Please see Pages 22-26 for details regarding how this innovative automated approach is used to build a very valuable JPEG property imagery inventory that will import right into your CAMA System. Please see the City of Calgary project in the reference section to learn about a successful implementation of this technology.

GEO-NY0000869

GEOSPAN

GEOSPAN pioneered the field of Visual Geographic Information™ beginning in 1990. GEOSPAN now holds multiple key patents in the Geospatial Industry. The company has invested approximately $12 million in research and development of its patented technology, which is used to gather imagery from aircraft or vans, and supports infrastructure analysis at the desktop.

The mission of the company is the removal of the cost barriers to high value geographic information for the full universe of business and government applications.

GEOSPAN was awarded United States Patent Number 5,633,946 for its GEOVISTA® collection and photogrammetric surveying technology in 1996. The Company's technology enables the creation of visual geographic information consisting of spatially indexed oblique imagery from the air and street-level imagery from the ground.

GEOSPAN has recently been awarded United States Patent Number 7,233,691 for its GEOVISTA image processing method which automates the location and inventory of infrastructure assets using image correlation.

Important milestones:

1992 - Completed first GEOVAN. Introduced Visual Geographic Information™

1995 - Completed first virtual metro area. Introduced City Tour™

1997 - US Patent Number 5,633,946 awarded in for its GEOVISTA® Direct Image Measurement technology (Equivalent patents approved in Europe, Australia, and Canada)

1997 - Introduced Internet Property Views and Neighborhood Views

1998 - Introduced 360° Visual Surveyor Application

1999 - Completed first oblique aerial power transmission line survey for the Electrical Power Research Institute

2001 - Completed the largest property imagery contract ever awarded for Cook County, IL

2004 - Completed over 40,000 kilometers of data collection for the US Census Bureau Centerline MAF/TIGER Accuracy Improvement Project

2005 - Introduced high-resolution Oblique Aerial Imagery and Integrated Street-Level Imagery Products

2007 - US Patent for GEOVISTA® 3D Spatial Imaging™ granted

Expertise includes

- Property Imagery Data Collection
- Transportation Asset Data Collection
- Web Visualization Services
- GIS applications
- Address Normalization

Clients Include

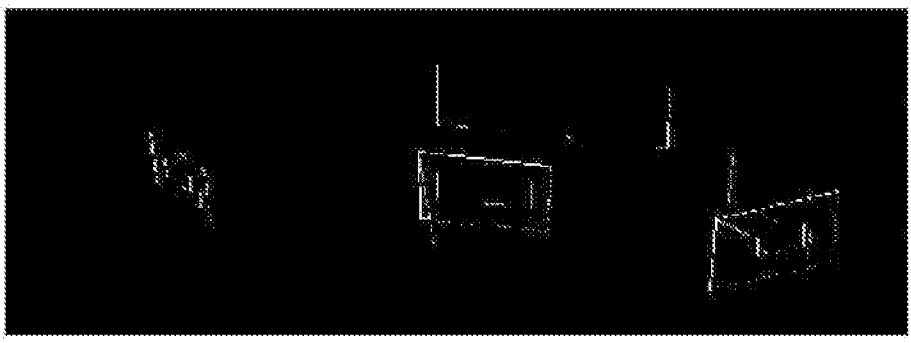
- Cook County, IL
- City of Chicago, IL
- City of Boston, MA
- City of St. Paul, MN
- Minnesota DOT
- Alabama DOT
- Florida DOT
- US Census Bureau

Office
GEOSPAN Corporation
10900 73rd Avenue North
Suite 136
Maple Grove, Minnesota 55369
www.geospan.com
(763) 493-9320 Telephone

Photogrammetry

GEOSPAN received a United States patent for its GEOVISTA technology incorporating real-time Six-Degrees of Freedom (6-DOF) imagery and spatial information from a moving platform and its associated oblique photogrammetric surveying methodology.

The significance of the GEOSPAN patent is that accurate surveying can be now accomplished using oblique and panoramic imagery. Oblique imagery has always been more desirable because it contains more information (such as the sides of buildings) than traditional aerial vertical photography. Furthermore, many more images are captured from different perspectives providing maximum detail of partially obscured objects.



Method and Apparatus for Collecting and Processing Visual and Spatial Position Information from a Moving Platform – United States Patent Number 5,633,946. Patents also issued in Canada, Australia, and Europe.

GEOVISTA Six-Degrees-of-Freedom Digital Imagery

Six-Degrees-of-Freedom (6-DOF) information describes the precise location of where the camera is located and where it was looking when the image is captured. The position is defined by the latitude, longitude, and height in WGS-84 coordinates. How the camera is pointed is defined by the roll, pitch and yaw of the camera. When the latitude and longitude of thousands of images are mapped in a GIS system, the map can be used as an index to all the images.

The ability to organize large numbers of images is required to effectively use images within a GIS. The patented technology permits the collection of this 6-DOF information for every image in real-time so that images can be collected at low cost for large geographic areas without the need for supplemental ground control.

GEOSPAN uses integrated GPS and INS location systems to provide precise 6-DOF data collection within all urban environments. This collection also is correlated to the cameras, such that, precise location is available for every single image collected. To enable latitude, longitude, and elevation to be collected in real-time, a Global Positioning Satellite (GPS) receiver is used. Since these three pieces of information alone only account for half the required 6-DOF data, a second device is also employed. This device is referred to as an Inertial Navigation System or INS. The INS unit employs ring-laser gyroscopes to measure very tiny changes in angular velocity. Every subtle motion of the vehicle is captured and integrated with the GPS data to provide precise roll, pitch and yaw information for each image to within 0.01 degrees.

GEO-NY0000871

GEOVISTA Data Accuracy

GEOSPAN is the industry accuracy leader. Accuracy is the key to automated picture assignments providing the lowest possible cost to assign the correct pictures to each parcel. There are three components of oblique imagery desktop surveying accuracy. Each component will be described in detail.

- Accuracy of the vehicle navigation solution
- Accuracy of each camera's calibration
- Particular Survey Geometry

The combined horizontal accuracy of surveyed points within 2000 feet of a light airplane will be within three meters 95% of the time. The combined horizontal accuracy of surveyed points within 100 feet of the GEOVAN will be typically be within one meter 95% of the time. The Accuracy is crosschecked to ensure that we achieve this result. Crosschecking is accomplished by surveying the same point from different points in time. For example, the same building corner can be surveyed from the imagery seen from the aerial imagery and from the ground imagery.

Vehicle navigation solution
GEOVISTA technology combines Global Positioning System (GPS) data (augmented by real-time differential corrections) and Inertial Navigation System (INS) data to provide real-time position of the camera system. In post-processing, the base station data replaces the real-time differential corrections. The differentially corrected GPS solution provides intermittent location data while the INS provides a continuous reference trajectory. The end result of post-processing is that the INS data and the GPS data are best fit into a unified navigation solution. Precise location of the Base Station (in WGS-84 coordinates) is critical to achievement of the required accuracy. Attitude accuracy (roll, pitch, and yaw) is .01 degrees in all axes.

Accuracy of each camera's calibration
Camera calibration includes both the 6-DOF offset of the camera with respect to the vehicle navigation solution and also the characterization of how image pixels map into lines-of-sight in camera coordinates. In the design of the system, care was taken to assure that the fixed cameras retain their geometry with respect to the navigation system. GEOSPAN's camera calibration techniques typically result in residual errors that are one to two pixels in magnitude.

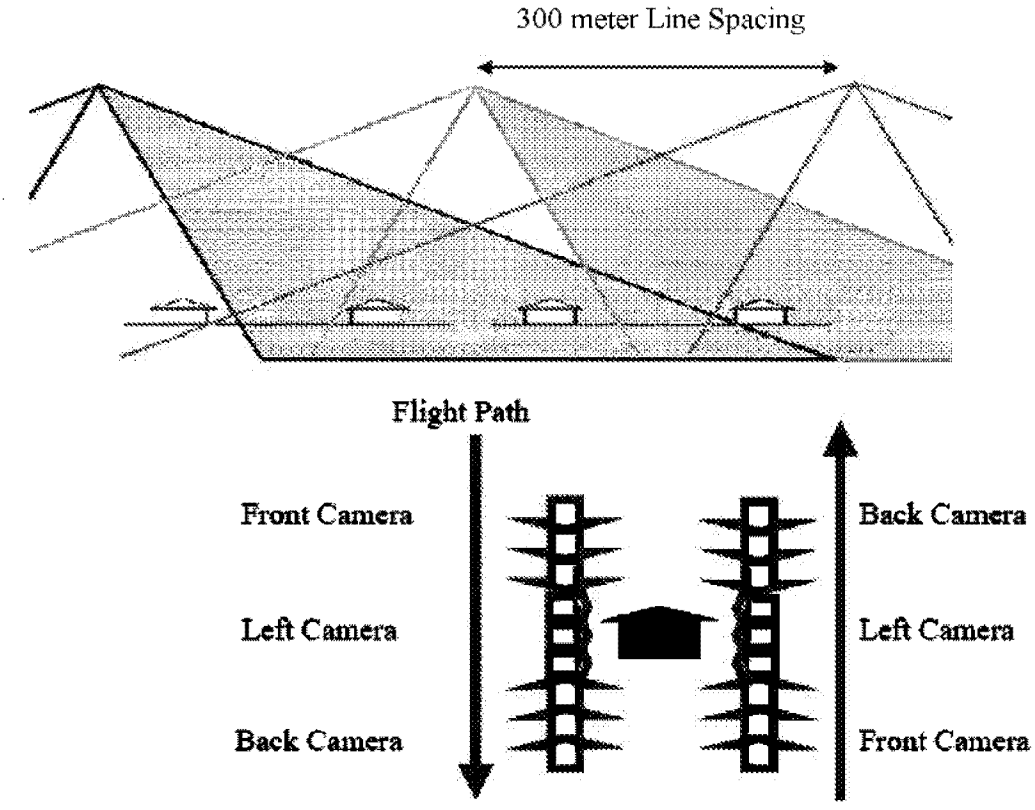
Particular survey geometry
In oblique imagery desktop surveying, the user is free to choose which two (or more) images of an object will be used in the survey. Images, which were taken close together typically, yield nearly parallel lines of sight in a survey, resulting in greater range uncertainty than would result from lines of sight with high crossing angles. GEOSPAN's desktop surveying software computes the uncertainty of the survey measurement, taking the uncertainties in the original image locations and factors them through the geometry of the particular survey, reporting the composite uncertainty.

GEO-NY0000872

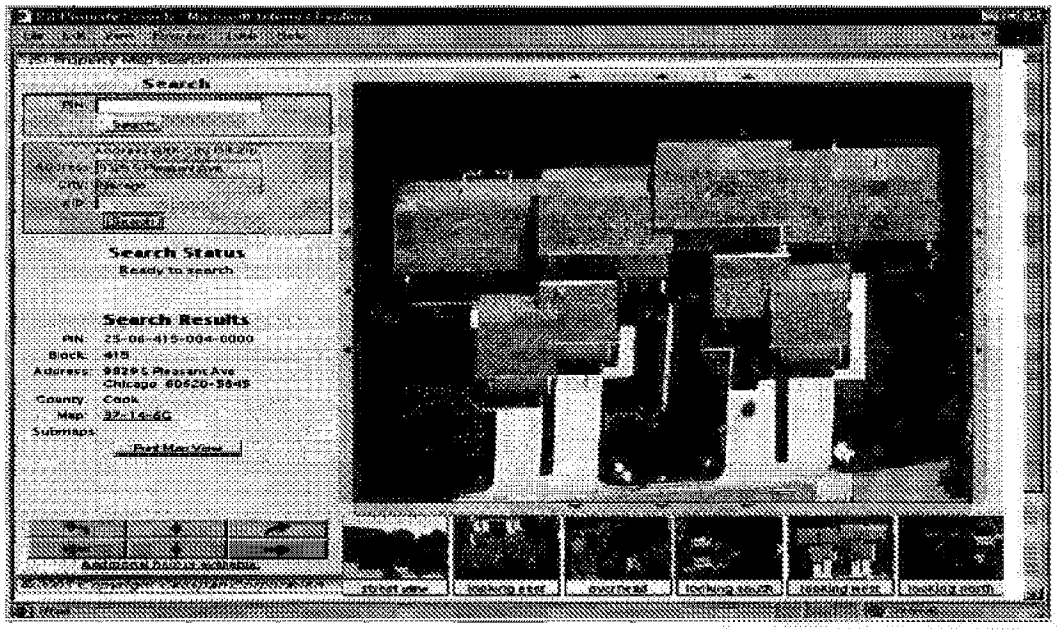
Oblique Aerial Capture

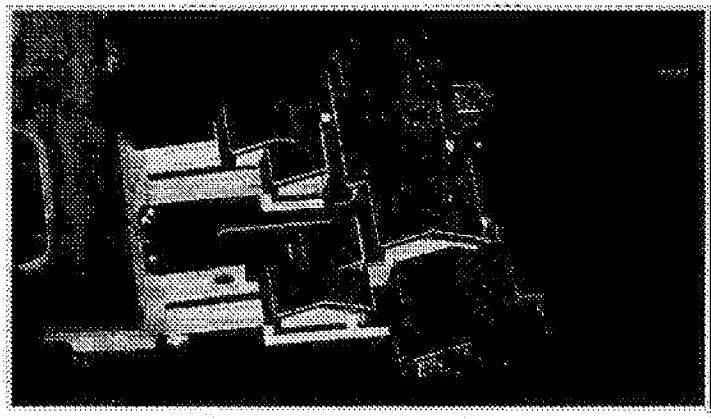
Front, back, left, and right cameras are all angled at 45 degrees. A down image is also captured. An image is captured from each of the cameras every three seconds (approximately 600 feet). At 1800 feet AGL, the ground footprint of each oblique image is approximately 1,800 ft. x 1,800 ft. Although there is flexibility, we recommend the camera configuration shown below:

Camera	Angle	Resolution	Front Line Ground Resolution at 600m AGL
Front	45° Oblique View	4992x3228	<4"
Back	45° Oblique View	4992x3228	<4"
Left	45° Oblique View	4992x3228	<4"
Right	45° Oblique View	4992x3228	<4"
Down	Vertical View	4992x3228	<4"

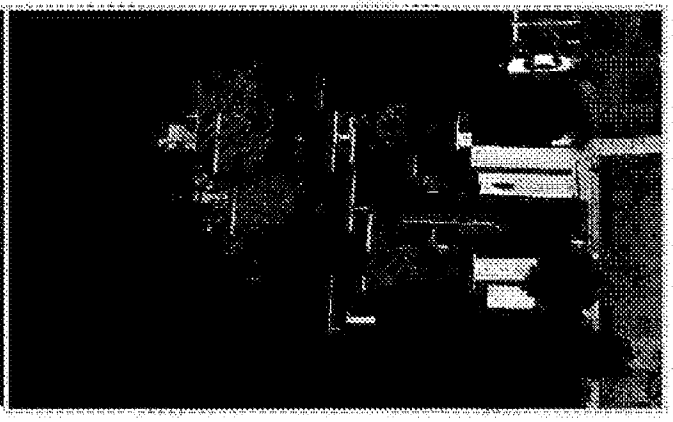


Web Based Imagery Access by Property Address or Property ID Number

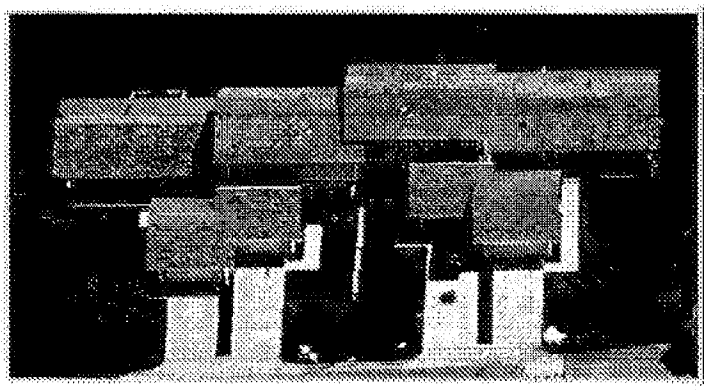




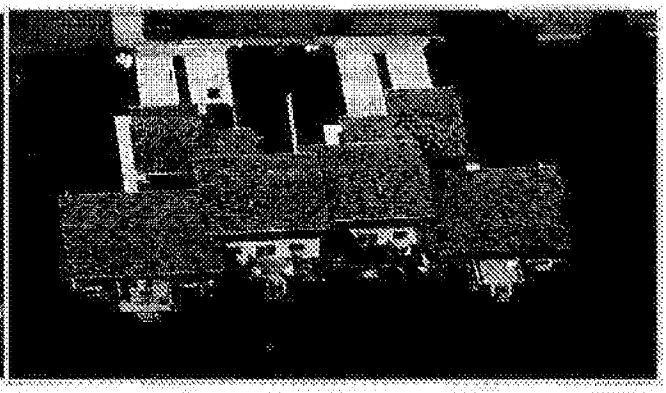
Left Camera Zoom



Right Camera Zoom

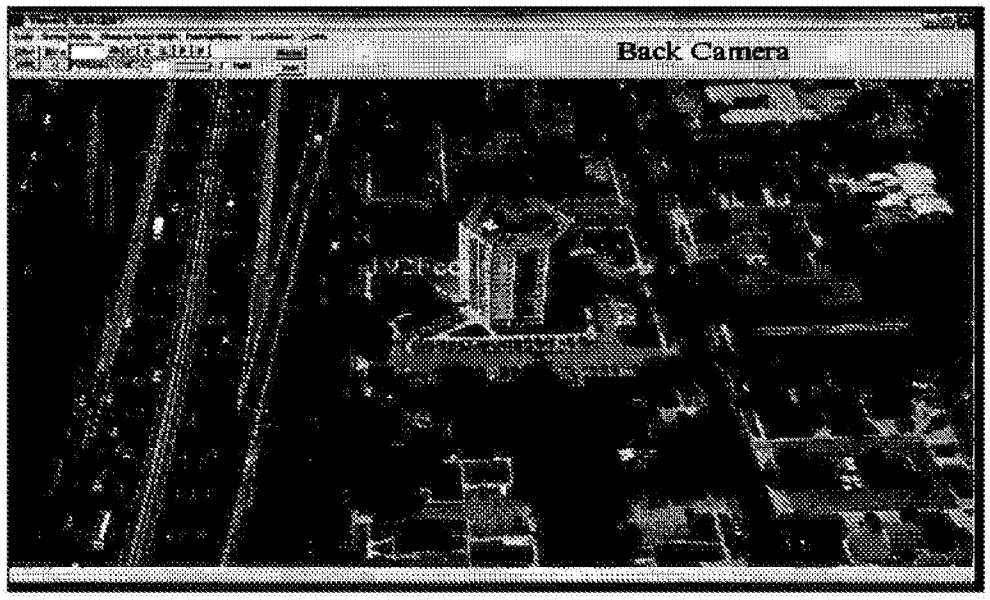


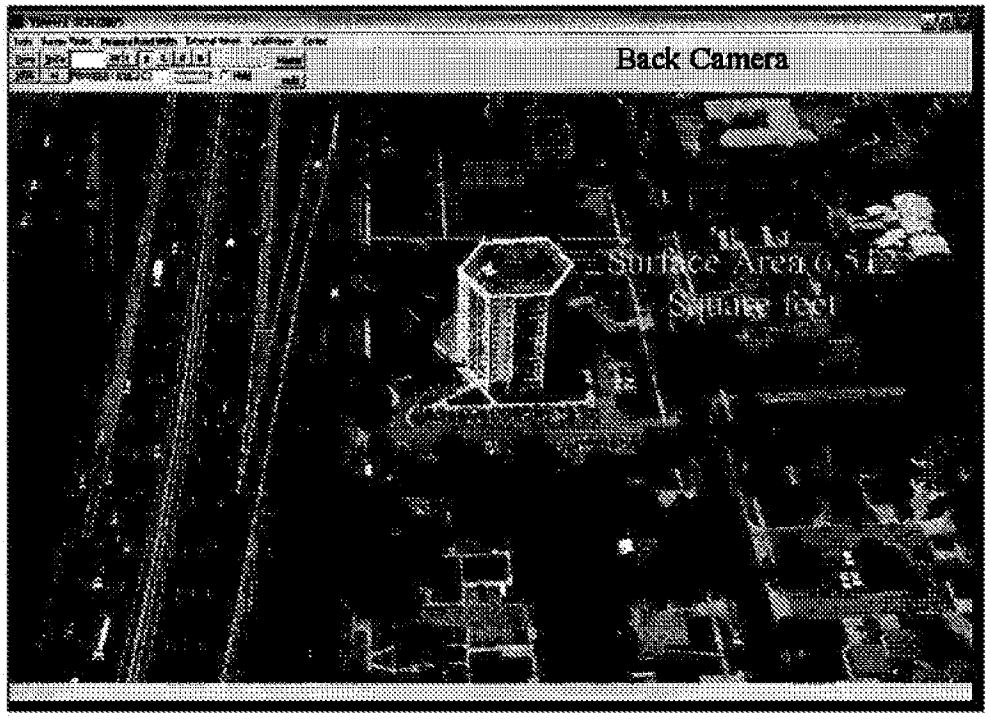
Front Camera Zoom



Back Camera Zoom

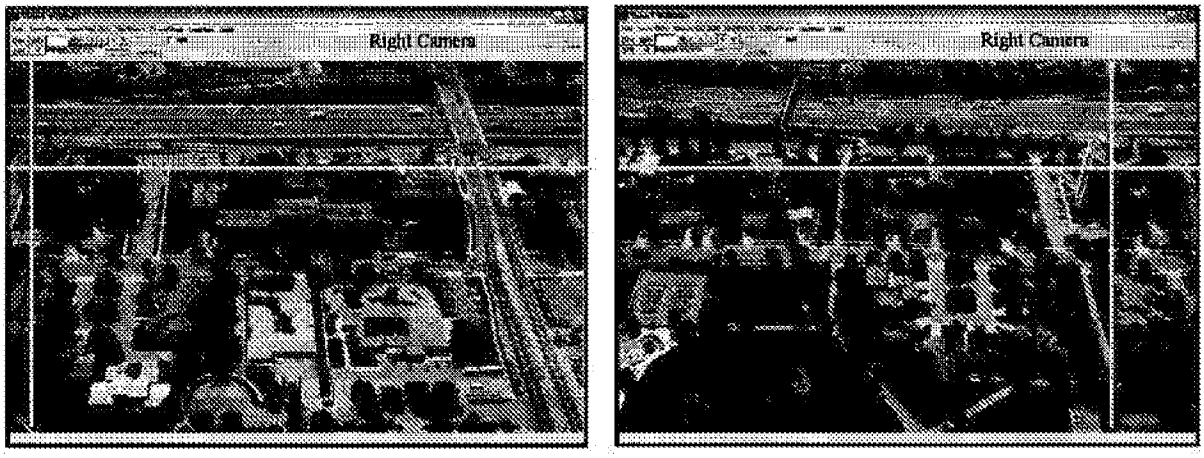
Measurement and Surface Area

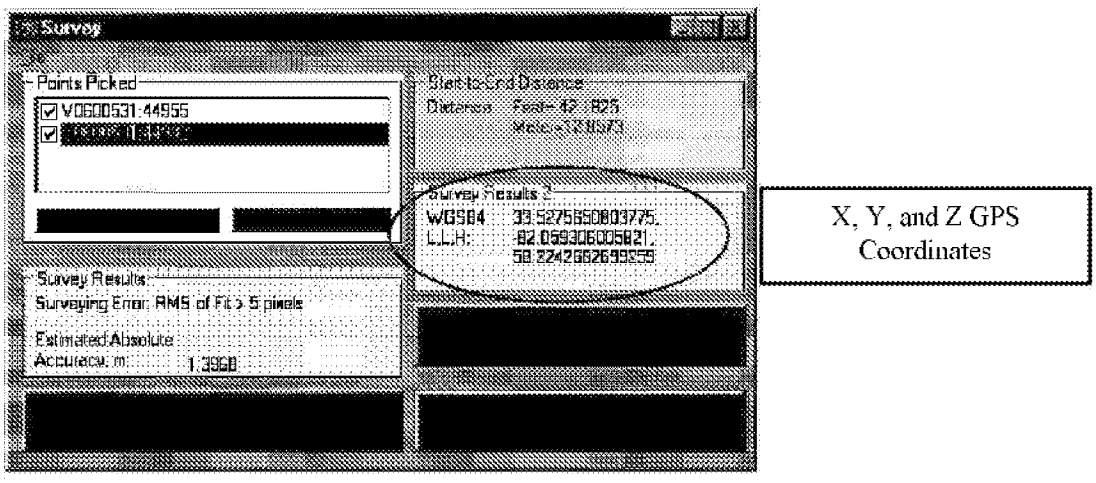




Coordinate Extraction Tools

GPS coordinate extraction is accomplished by simply selecting the same pixel location in two (2) images





Project Management

The GEOSPAN Team has broad technical background. Its knowledge and experience include: surveying, mapping, photogrammetry, cartography, Geographic Information Systems (GIS), navigation, Global Positioning Systems (GPS), Inertial Navigation Systems (INS), computer systems and networks, video technology, and computer imaging.

Executive Team

GEOSPAN

Theodore M. Lachinski - President and Founder

Education

Mr. Lachinski attended the University of Minnesota with studies in mathematics, technical writing, systems analysis and computer science. He served in the USMCR as an Aerial Navigator from 1965 to1971.

Highlights and Qualifications

Mr. Lachinski has thirty years experience developing innovative technological solutions. He has served as GEOSPAN's President and as a director since the company's inception in June 1990. Prior to founding GEOSPAN, Mr. Lachinski served as a Vice President of Technology for UltiMap Corporation and as the Systems and Data Processing Manager for Hennepin County MN, where he was directly responsible for the development of their Property Mapping and Highway Information Systems. He is the primary inventor of the GEOSPAN patent and a pioneer in the spatial information industry. In addition, Mr. Lachinski was a ten-year member of the City Council for Andover, Minnesota.

Stephen H. Boggs - Vice President of Technology

Education

B.S., Honors, Biology, University of Illinois

Highlights and Qualifications

Mr. Boggs has 22 years experience providing system integration services. He has worked for GEOSPAN Corporation since 1992 with responsibility for developing the real time data acquisition and control software used in all of the GEOVANs and in end-user systems. Mr. Boggs is a co-inventor of the GEOVISTA process and is responsible for the development of all GEOVISTA software processes.

GEOSPAN

Jeffrey Setterholm - Geodetic Scientist

Education

B.S., Cum Laude, Engineering and Applied Science, Yale University
M.S., Science & Mathematics, Washington University
United States Air Force, Reese AB, Texas, 1970.Undergraduate Pilot Training (Distinguished Graduate)
George AFB, California, 1970. F-4C ("Phantom") Combat Crew Training.

Highlights and Qualifications

Mr. Setterholm is a Geodetic Scientist with 24 years experience in applied spatial mathematics and is directly responsible for the development of GEOSPAN's 6-DOF data collection/processing and non-coplanar desktop surveying systems including GPS/INS post-processing and analytical support. He joined GEOSPAN Corporation in 1994 and is currently available as a consultant. Mr. Setterholm is also the inventor of U.S. Patent Pending – "Any Aspect Passive Volumetric Imaging Method." This pending patent automates surveying from imagery buy creating 3D visualizations of multiple spatially accurate images.

Key qualifications

GEOVISTA Process Co-inventor
Mr. Setterholm is directly responsible for the development of GEOSPAN's 6-DOF data collection/processing and non-coplanar desktop surveying systems including GPS/INS post-processing and analytical support. Mr. Setterholm co-invented Honeywell's first analytical solution to TV-camera based optical Six-Degrees-of-Freedom (6-DOF) helmet tracking which was recognized by special achievement award MAvD & two U. S. Patents. Mr. Setterholm solved the fundamental analytical problem of determining 6-DOF camera position based on a single terrain image for the RISPS program, 1983. This opened the door to single image navigation.

Project Team

Steven H. Gilkey – Project Manager

Education

Arizona State University B.S. Degree 1981; Major Business Administration

Highlights and Qualifications

Mr. Gilkey has twenty years of product development experience in the information technology industry. Since joining GEOSPAN Corporation in early 1996, Mr. Gilkey has been involved with all aspects of product development and project management of GEOSPAN's Government Sector offerings. Mr. Gilkey will be the Project Manager for the Miami-Dade Oblique aerial project. Mr. Gilkey has assumed project management responsibility for all of the oblique aerial projects referenced in this RFP

Airborne Scientific provides aircraft and/or crew for specialized airborne remote sensing and data acquisition projects. Airborne Scientific has extensive experience in aerial data acquisition and familiarity with numerous specialized sensor systems, as well as general know-how in aerial photography, surveying, and remote sensing.
Airborne Scientific Inc.
12321 Rosewood Dr.
Overland Park, KS 66209
913 620 7780
cliff@airbornescientific.com
Year established:1994
Type of ownership: Corporation
Services: Flight Support and Aircraft Contracting

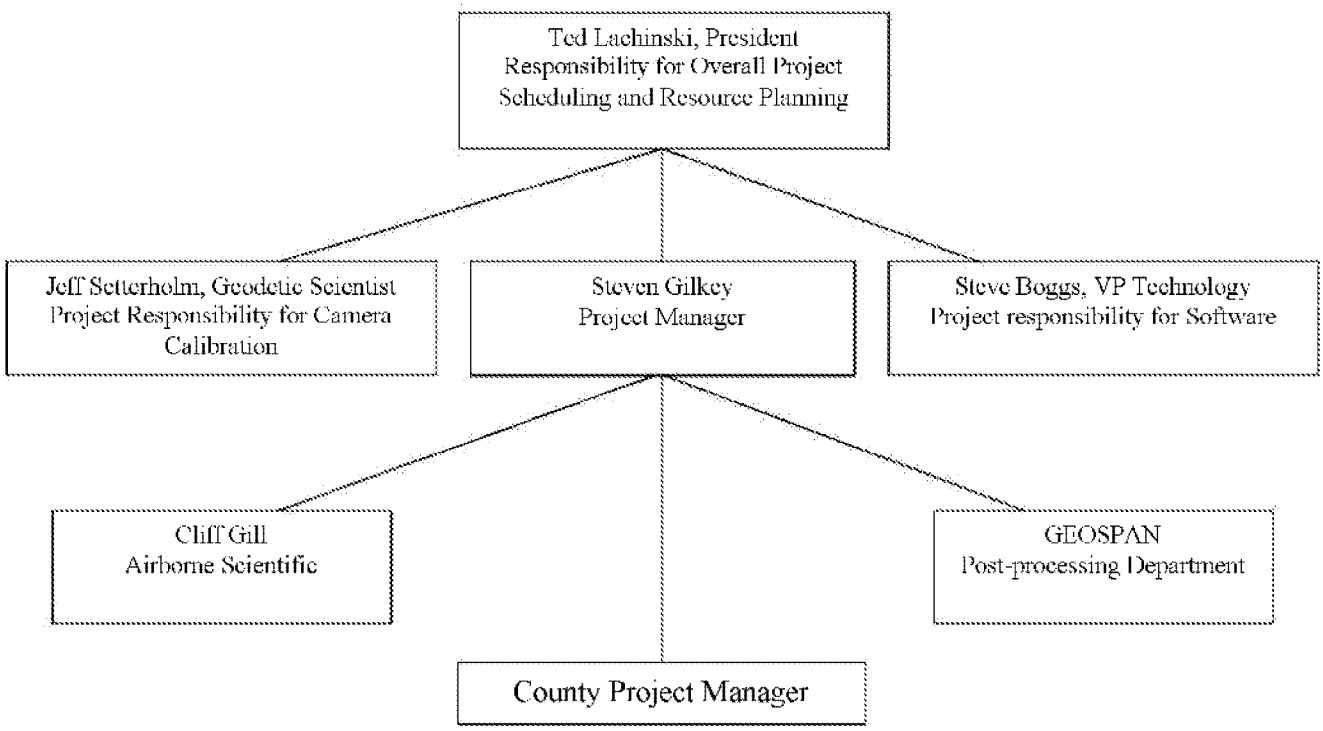
Airborne Scientific will be responsible for the oblique aerial flight mission

Clifford Gill - Pilot

Highlights and Qualifications

Clifford Gill of Airborne Scientific manages oblique aerial missions for GEOSPAN
Aerial Survey and Photography operator, 2004, 2005, 2006 summer season, Airborne Scientific, Homer Alaska. Flight support for aerial sensors, and small format aerial photography, survey grade GPS/IMU controlled camera system.
Aerial Survey Pilot, May 2002 to September 2002. Aeromap US. Survey pilot in Piper Navajo and Cessna 300 series. Operational experience with Zeiss cameras, Trackair Navigation, and Thales survey Grade GPS.
Web and Database Programmer, November 1999 to May 2002, Homer Alaska, part time and freelance work, active server pages/SQL 7.0.
Pilot and Mechanic, May 1995 to Sept 2002-seasonal summers, Airborne Scientific, FAA part 135 certified single pilot air taxi operator. Seasonal business offering floatplane tours of Alaska with some charter flying. Operated Helio Courier on amphibious floats, and Piper Aztec on straight floats. Performed maintenance on above aircraft.
Pilot, May to October 1997, September 1998, Royal Wolf Lodge. Floatplane pilot for sportfishing lodge in Katmai National Park.
Pilot and Mechanic, May to September 1995 and 1996, Egli Air Haul, King Salmon, Alaska. Floatplane and landplane air taxi pilot, FAA part 135 certified. Also served as mechanic during non flying time.
Field Geophysicist, May-September 1990, Geophysicist on the Trans Alaska Crustal Transect project, Brooks Range, Alaska; and with the GSC-Lithoprobe, Southern Cordillera Refraction Experiment, British Columbia. United States Geological Survey, Menlo Park, CA.

GEO-NY0000879



Project Management Approach

GEOSPAN firmly believes in working as partners with its customers through honest, two-way communication. The assigned GEOVISTA Project Manager to the Project will be responsible for ensuring that this partnership is established and maintained throughout the duration of the project. This will be accomplished through both informal, day-to-day communication, and weekly in-process reviews.

The mark of a successful project is sound planning, realistic budgeting, and full understanding of user requirements. Simply put, success in defining and solving business problems has more to do with effective project management than with meeting technical challenges.

Interface the County Manager - the GEOSPAN Project Manager who will work with the County Project Manager (s) to coordinate all project activities and schedules coordinates The GEOSPAN Project team. This single-point interface will help ensure consistency and constancy of purpose throughout the project. The Project Manager will be responsible for:

- Providing an active interface to the GEOSPAN Project Team through the GEOSPAN Project Executive
- Consulting with GEOSPAN department leaders in the development of recommendations or solutions
- Delivering progress reports/briefings
- Reviewing the project schedules with the City, and GEOSPAN management
- Obtaining required sign-offs from the City
- Attending City Overview Meetings, when requested.

GEO-NY0000880

Status Reporting

Bi-Weekly Status Report. The GEOSPAN Project Manager will prepare this report indicating the work completed the previous period. This is a less detailed report than the weekly report reporting on summary tasks. It will be in summary form identifying current activities, planned activities, variances and progress against milestones. The status of each deliverable will be identified and resolution or disposition of outstanding issues on the last report will be shown.

Ad Hoc Reports. During the life of the Project, the GEOSPAN Project Manager and/or the County Project Manager may conduct additional status meetings at their discretion, and request or provide ad hoc status reports as necessary.

Oblique Imagery

Oblique Imagery Area of Coverage



Area of coverage and resolution

We understand that the desired Oblique coverage area is 926 square miles represented by the red area. We propose a north/south South/North flying pattern at 2000 feet AGL to support a front line maximum ground pixel size of 4"

Image capture

We will allocate flight capacity for annual oblique aerial collection between December 1 and January 31 for the annual completion of the Miami-Dade project. We estimate 40 hours of flight time needed, which weather permitting will be completed during a 15 day consecutive period.
Our standard operating procedure is no photograph shall be taken when the sun is less than 30 degrees from the horizon. Light reflection from foliage and water shall be held to a minimum through judicious selection of filters and solar angles. Solar angle shall be chosen to minimize shadows.

Image quality

GEOSPAN will commit to these image quality specifications:

- Images will not be undertaken when the ground is obstructed by clouds, smoke, dust or fog or when cloud shadows appear on more than 5% of the area of any individual photography.
- Imagery will not contain defects such as out-of–focus, dust marks, scratches or inconsistencies in tone and density.

GEO-NY0000881

- Images shall have no gaps in imagery or missing imagery at area peripheries unless specified by the County.
- There shall be no areas of obliques with image gaps or lack of data.
- Imagery from all 4 perpendicular angles will be available for the entire Oblique Photography Coverage Area.

Accuracy

GEOSPAN's patented approach supports positional accuracy that is not reliant on the use Digital Elevation Model (DEM) data. GEOSPAN will commit to a combined horizontal accuracy of surveyed points within 1000 feet of a light airplane will be within three meters 95% of the time. The County provided DEM data will be used for positional accuracy Q/A purposes.

Format

GEOVISTA image data resides in an industry standard JPEG that does not require any special CODECs or drivers to display GEOVISTA images.

Delivery

USB external hard drive will be the primary media for oblique imagery delivery along with a copy of the imagery in a DVD library for archival purposes

Hardware

The County will need to allocate approximately 1 terabyte of Storage Array Network (SAN) space for efficient access to the imagery. All imagery viewing options support the ability to place imagery on multiple servers

Imagery Ownership

We agree with the following County indicted desired licensing rights:

- The County shall have the ability to use the imagery in perpetuity
- The County shall have unfettered access to the imagery including the ability to display oblique imagery on the Internet and Intranet via mapping Web applications.
- The County shall have the right to distribute the imagery to County cities, municipalities and other local governmental agencies.
- The County shall have the right to allow agencies working at the County's Emergency Operations Center during emergency activations to utilize the imagery.

Metadata

GEOSPAN typically provides Metadata in XML format along with ESRI shapefile coverage of each image's footprint. The following metadata will be delivered in an ArcCatalog 9.X. compatible XML format:

GEO-NY0000882

- General description of the dataset
- Area covered by the oblique imagery
- Type of sensor: digital/film
- Imagery supplier
- Ground sample distance
- Color bands of imagery: black/white, 3-band natural color, CIR, etc.
- Spatial reference system
- Datum
- Horizontal accuracy
- Original film photo scale (if applicable)
- Average image dimensions

Attributes associated with ESRI shapefile coverage of each image's footprint:

- The image name
- Compression ratio (if applicable)
- Capture date
- Capture time
- Post processing date
- Image direction (N, E, S ,W)

Proposed Application Viewing Software

GEOVISTA Viewer API

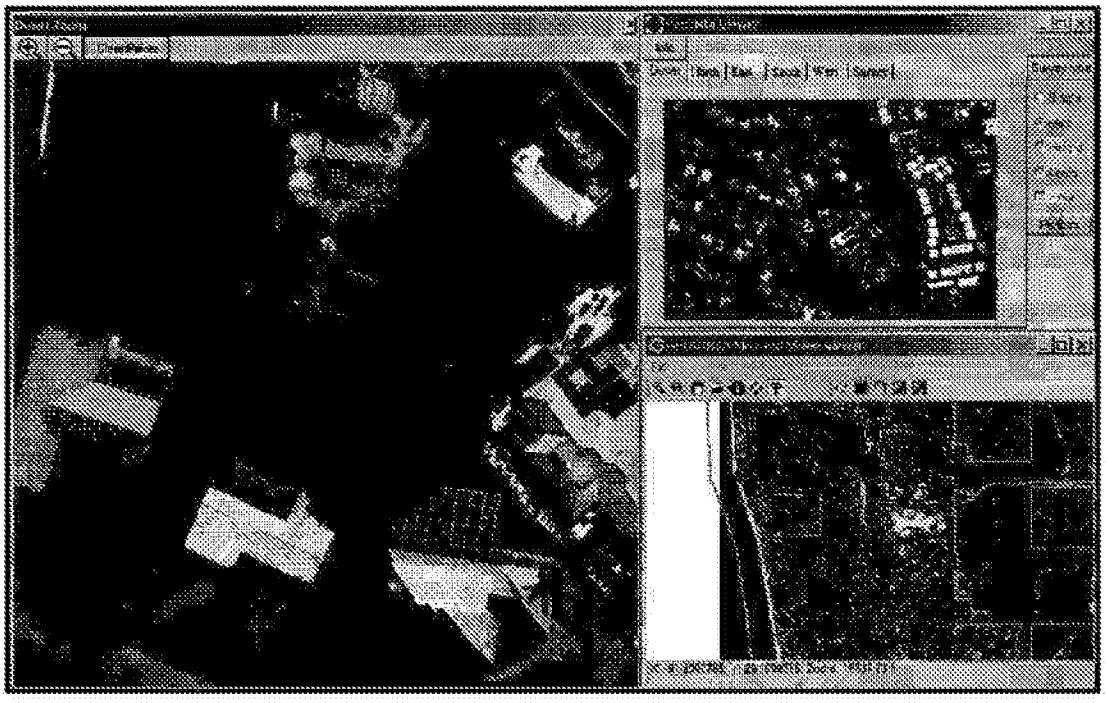
The existing GEOVISTA Viewer is designed to work with a GEOVISTA Image Server and to communicate with ArcGIS through an application Program Interface (API). GEOSPAN currently offers an ArcMAP API with viewing and measurement capability and an ArcIMS API with viewing and navigation. These Viewers will be delivered to support initial use of the delivered imagery.

The GEOVISTA API is designed to accommodate all County stated viewing options:

- Stand alone application software for the performance of browsing and analysis operations. The GEOVISTA Oblique Imagery Viewer includes an embedded map engine to serve the needs of the "stand alone" application user needs.
- A desktop-based solution that integrates oblique imagery browsing and analysis capabilities with ESRI ArcGIS 9.X.
- A web-based solution that works in conjunction with ESRI ArcIMS 9.X permits browsing and analysis of oblique imagery within ArcIMS 9.X applications.
- Integration with ArcGIS Server 9.X
- Interface to MDCPA CAMA system
- Interface to Miami Dade County's CAD 9-1-1 system

GEO-NY0000883

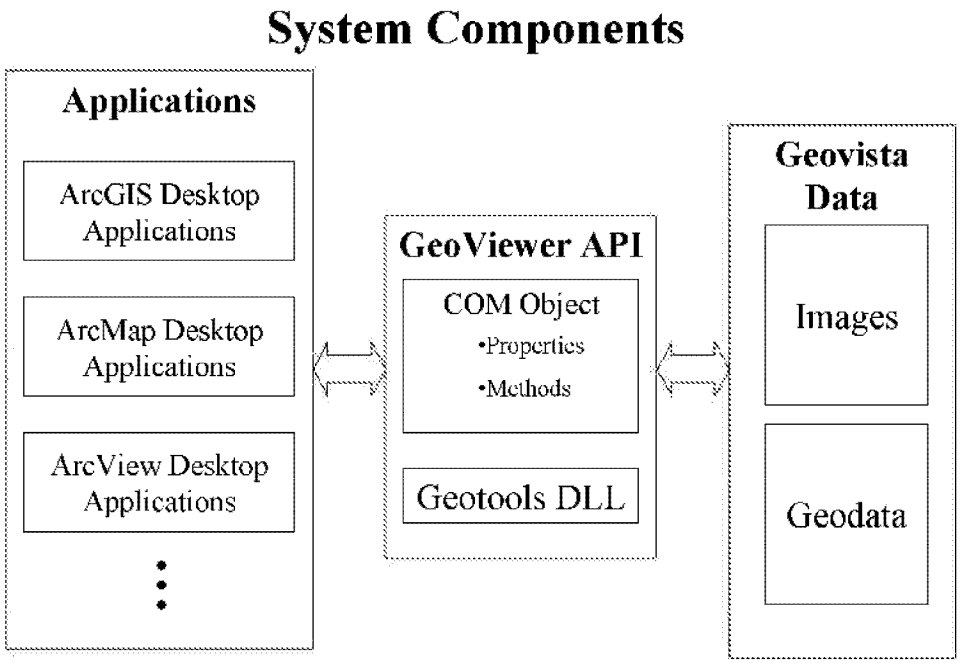
Example User Defined Flexibility of Screen Layout





GEO-NY0000884

Application Architecture



Applications are existing or new County-developed applications using the GeoViewer API and implemented in ArcGIS or any other Windows-based system.

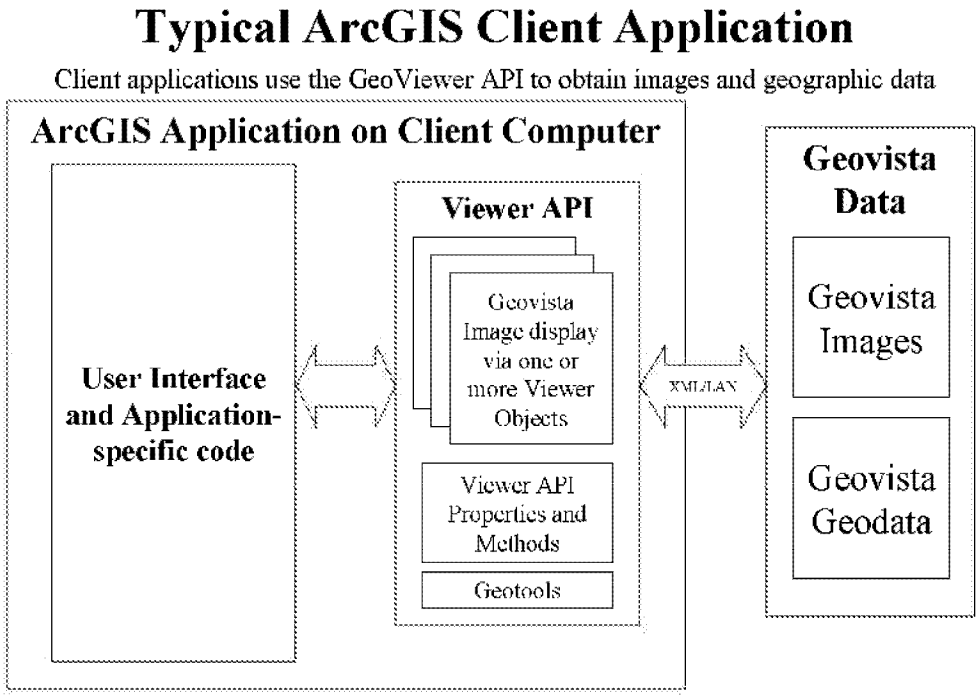
All access to GEOVISTA images and data is through the GeoViewer API, a COM object that can be embedded within existing ESRI applications. This COM object provides system functionality via a consistent and published interface as documented in the GeoViewer API Reference.

The following programming languages and environments were used during development of the proposed system.

- Microsoft C# using Visual Studio .NET 2003
- Microsoft C++ 6.0 using Developer Studio
- Microsoft Visual Basic 6.0 using the VB development environment
- Database access using Microsoft ADO and ADO.NET

GEO-NY0000885

Integration Architecture



All System functionality is provided by the GeoViewer COM object, which is embedded within existing ESRI applications. This COM object provides a consistent and published interface as documented in the GeoViewer API Reference.

The GeoViewer object responds to Windows events, such as mouse clicks and keystrokes, and raises its own events that can be handled by the host application within which it is embedded. Additionally, documented properties and methods of the GeoViewer object are exposed to and may be accessed at any time by the host application.

General System Requirements

- All proposed software is compatible with Windows XP, Windows 2000 Server and Windows 2003 Server.
- All Client software based solutions allow the visualization of oblique imagery with the County's GIS vector data. It is highly desirable that this integration of oblique imagery and vector data (ARCSDE 9.X, shape files, coverage format) be implemented without performing any modification, conversion or preprocessing to the GIS vector layers. The stand-alone application currently requires a simple procedure to convert shape files into the native format of the embedded mapping engine.

GEO-NY0000886

- Compatibility of all oblique software solutions with ArcSDE 9.X databases is highly desirable. There is complete compatibility with ArcSDE 9.X however most of GEOSPAN's expertise is with MS Sequel Server database applications.

Desktop Solution Requirements

- Oblique imagery software product contains an API(s) that allows integration with ESRI product ArcGIS 9.X
- The proposed API(s) are compatible with Citrix terminal server technology.
- The API(s) allow all stand alone software allows the overlay of oblique imagery with GIS vector layers.

Web-based Solution Requirements

- Oblique imagery application software contains an API, that integrates with ESRI product ArcIMS 9.X. via an ActiveX control
- GEOSPAN will provide programming code and API(s) that allows integrating the web-based solutions with ArcSDE 9.X.
- Integration with ArcGIS Server 9.X although optional is a highly desirable feature. GEOSPAN will provide programming code and API(s) that allows integrating the web-based solutions with ArcGIS Server 9.X The proposed API is currently being utilized by Disney World for the web viewing of GEOVISTA Oblique imagery through ArcGIS Server 9.X.

Software Functional Requirements

Description

Determines the best aerial and ground pictures looking at a given location. This consists of one ground picture, one aerial overhead picture and one aerial oblique picture looking at the location from each direction (North, South, East, and West).

Displays a set of supplied images and allows the user to select any one of the images for display in the large image display area. Features include:

1. Center, zoom and save cropped attributes for subsequent display
2. Fly or Drive in the large image display area dynamically updating the camera location and orientation on the map.
3. Scroll through available previously associated images (IMS PIN assignments, user generated lists, Query Results).

Converts any of the following inputs to coordinate location.

1. PIN
2. Building ID
3. Address
4. Intersection

GEOSPAN proposes to store the data in tables on the GEOVISTA Server with periodic updates by County personnel.

GEO-NY0000887

Description

Three survey measurement modes are used to locate points and supply ArcGIS with coordinate locations for display on the map as symbols and polylines.

1. Single click. This method uses a single photo pixel to establish the 3D location.
2. Two clicks. This method requires locating the same point in 2 different images.
3. More clicks. This method allows multiple clicks to obtain the highest possible accuracy.

All three methods can be used to measure distances including the height of buildings.

Displays 3D points and polylines in 6DOF GEOVISTA imagery.

Draws basic shapes such as lines, circles, rectangles and annotation on GEOVISTA or user supplied image.

Link a document (.doc, .xls, .pdf) to a location.

The mission component is used to instruct the Viewing Component how to further organize and toggle through display images. Examples include:

1. Archive
2. Current
3. All

The optional query component is used to instruct the Viewing Component how to further locate and toggle through display images. Examples include:

1. New PINS without pictures assigned
2. PINS with pictures assigned before QA
3. PINS with specific status code
4. Tax forfeit property
5. Tax exempt property

Saves large viewing image and optional associated point/line display and or drawing/annotation into a MS Word document, Excel spreadsheet, PDF, or Jpeg file.

Prints large viewing image and optional associated point/line display and or drawing/annotation to printer.

Ground-level Imagery Integration

As a leading provider of spatially-indexed street level imagery, GEOSPAN's API(s) provide some very robust integrated oblique and ground level interaction tools. GEOSPAN is responding to the Miami-Dade RFP # 8390 Visual Inventory of Roadway Assets Solution. If we are successfully in earning that project work, then there will be GEOVISTA street level imagery coverage throughout the County.

Change Detection

GEOSPAN recommends **Feature Analyst®** from Visual Learning Systems, Inc. (VLS) to provide industry leading change detection capabilities. VLS was formed In 1997 to develop an innovative software system that enabled computers to automatically analyze satellite images, aerial photos and any other raster format supported by ESRI's ArcGIS® suite.

GEO-NY0000888

VLS' flagship product, Feature Analyst, debuted in 2001 and quickly garnered industry-wide attention. ESRI awarded Feature Analyst in 2002 as "Most Innovative Solution," and honored VLS as ESRI Business Partner of the Year in 2004.

The Feature Analyst Application Program Interface (API) integrated with the GEOVISTA API tools for displaying oblique and nadir imagery from multiple missions provides the tools to flag and analyze changes that have occurred within the County. These tools can substantially increase property assessment tax revenues through the discovery of undocumented property improvements such as additions, decks and pools etc. Please see the technical Documentation Tab Section for more detail

CAD 9-1-1 Integration

The GEOVISTA API supports tight integration of GEOVISTA imagery into E-9-1-1 centers based:

- GEOVISTA Oblique imagery retrieval based on a latitude longitude or address fields contained in the ALI file passed by the E-911 system.
- The GEOVISTA API will continually refresh the imagery field of view footprints sent to the County 911 center mapping system

Software Licensing

- All proposed software provides a site license with unlimited access to all County employees.
- The County will have the right to distribute the software to County cities, municipalities and other local governmental agencies.
- The County will have the right to allow agencies working at the County's Emergency Operations Center during emergency activations to utilize the software.

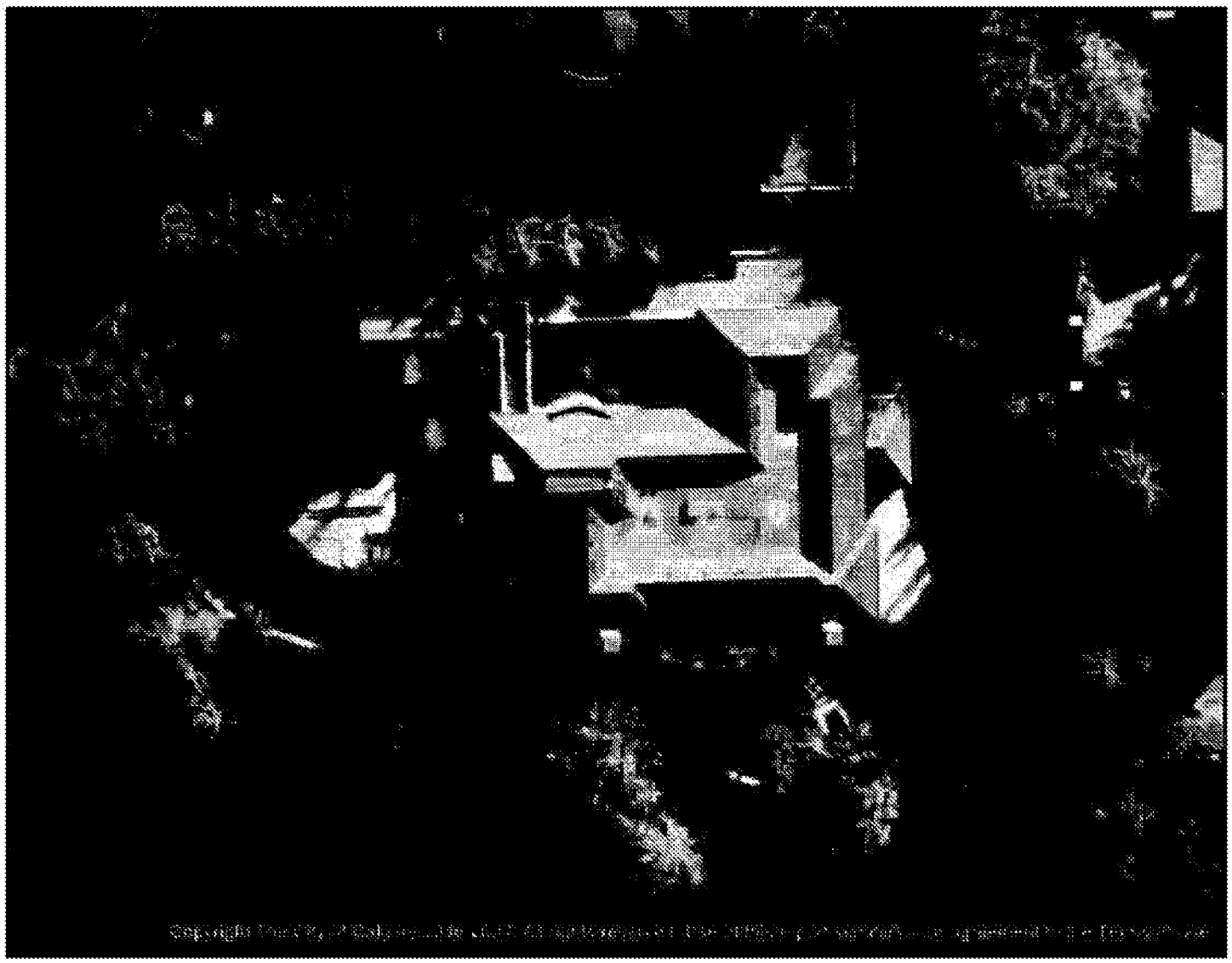
CAMA System Integration

GEOSPAN has rich history of property imagery collection and integration into CAMA systems. In addition to utilizing the GEOVISTA API to provide integrated oblique imagery through the County CAMA system, we also propose generating a library of cropped JPEG images for all properties. The following pages introduce this automated process and the reference section describes how this approach was successfully implemented for the City of Calgary.

GEO-NY0000889

GEOVISTA® Oblique View Parcel Library

From High Resolution Nadir (Down) Views….



…..In Convenient JPEG imagery format

GEO-NY0000890

To Views From The North, South, East, and West….





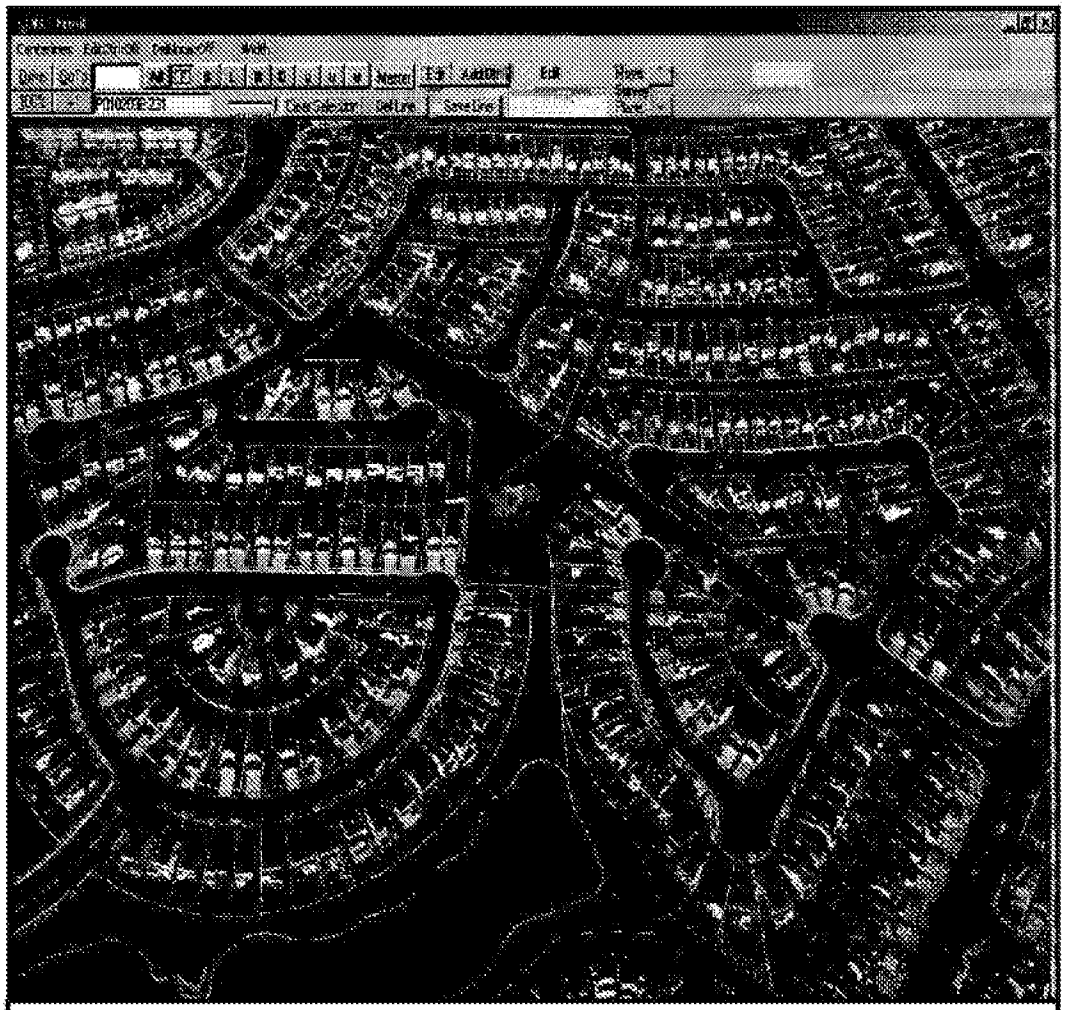




GEOVISTA® Oblique View Parcel Libraries are generated through a unique process of automatically cropping from the closest North, South, East, West and Nadir views of each parcel based on the property lot dimensions.

Each JPEG image file name can be assigned based on the County Parcel ID # combined with the viewing direction i.e. North 123-456-789.jpg

Copyright text and watermarks can also be added to the photos



County parcel boundary data projected into an oblique image

GEO-NY0000893

GEOSPAN recommends three methods to leverage the GEOVISTA oblique imagery to add efficiency to the County Property Appraisal services.

1. CAMA system sends County Property ID# to GEOVISTA ArcIMS application displaying GEOVISTA oblique imagery views of subject property

2. CAMA system sends County Property ID# to GEOVISTA ArcGIS 9.x application displaying GEOVISTA oblique imagery views of subject property

3. Import of cropped oblique views as described above

Installation Services

GEOSPAN is available to offer professional consulting services to the County for the following:

- Installation of oblique imagery library/database on County servers;
- Configuration and optimization of infrastructure;
- Installation and configuration of all software/applications that are part of the oblique imagery solution on either client machines or servers depending on software requirements;
- Configuration, optimization and test of any oblique imagery component that is part of the integration with ESRI or any other supported 3rd party software;
- Configuration of any Web application component such as IIS, .NET framework etc. that is required for the implementation of the oblique imagery solution;
- Testing of functionality and performance of installed system.

Documentation

Please see the Technical Documentation Tab section for copies of our End User, Software Developer, System Administration and Support Staff documentation

Training

GEOSPAN is prepared to offer three levels of County onsite training.

End User: Training includes an overview of products and detailed instructions on how to use them

Advanced User/Developer: Training includes advance analysis tools, integration of imagery solution with ArcGIS 9.X environment including programmatic customizations, etc.

System Administration and Support Staff: Training includes infrastructure design including hardware and software components that are required. Configuration of oblique imagery data and application servers taking into consideration operating system, security and application platforms:

GEO-NY0000894

Internet, intranet, CITRIX. Testing of oblique software components in the system. Common troubleshooting issues, including the description of problems and typical issue resolution.

System Support

- GEOSPAN will provide Miami-Dade County with telephone and onsite technical support. Web based support can be an alternative but not a substitute.
- A technical support representative will be assigned to work on the incident and establish communication with the County person who initiated the call or the delegated contact person.
- Support incidents will be prioritized based on their criticality. Incidents with a higher criticality should be given priority and the Proposer should allocate resources accordingly in order to minimize the response time for critical incidents.
- A final report with a summary of the resolution will be sent electronically via email once the incident is resolved.
- GEOSPAN will provide the County with support during normal County business hours from 8:00 am to 5:00 pm eastern (EST), Monday through Friday.

Software Maintenance

- GEOSPAN will provide the County with ongoing maintenance, updates and support of licensed software products.
- GEOSPAN will release software updates or new software versions to maintain compatibility with new releases of ESRI products or any other products integrated with the oblique imagery technology.

Image Refresh And Emergency Imagery

- GEOSPAN will refresh Oblique imagery at no cost for any areas in the County affected by a FEMA declared emergency. The imagery collection will begin within five days of FEMA declaration
- GEOSPAN is also available for non-FEMA declared emergencies as proposed in the Cost section

GEO-NY0000895

COMMERCIAL APPLICATIONS OF GPS–ASSISTED PHOTOGRAMMETRY

W. J. Trevor Greening
Bruce A. Chaplin
David G. Sutherland
D. Eric DesRoche

Measurement Science, Inc.
61 Inverness Drive E., Suite 203
Englewood, CO 80112

INTRODUCTION

GPS–assisted photogrammetry allows for a significant reduction in the amount of ground control required to support photogrammetric mapping campaigns. GPS technology is utilized to determine the camera station coordinates at each instant of exposure. These data are introduced as additional observations into a 'combined' block adjustment, resulting in densely controlled blocks with highly uniform accuracy distribution. The considerable economic advantages of these techniques when compared with the conventional approach is evident, especially in cases where conventional ground control is expensive or impossible.

These techniques have recently been declared operational and ready for practical application by a number of members of the photogrammetric and surveying engineering community. Although still likely to undergo considerable refinement in the near future, methodologies are already available which are capable of yielding the accuracies required for most scales of mapping. The economic advantages of implementing the system as it stands far outweigh the need to wait for these refinements. However, the effective application of GPS technology to photogrammetry requires an integrated approach addressing the photogrammetric and geodetic issues, in addition to the GPS technological aspects. This paper commences with a brief review of some of the primary geodetic considerations in GPS–assisted photogrammetry — coordinate systems and datums, the antenna-camera offset vector, ground control requirements, and the problem and solutions associated with geoidal modeling and orthometric height estimation techniques. These aspects require rigorous and careful treatment if the full potential of the technique is to be realized. Failure to deal effectively with the geodetic details may result in severe degradation of the results (Chaplin et al., 1994).

Finally, the paper summarizes the operational implementation and results of three commercial mapping projects which were recently undertaken within the United States. These projects were conducted outside the controlled environment of research projects, and relied solely on GPS–assisted photogrammetry for the determination of the aerial triangulation (AT) solutions. The successful completion of these projects further emphasizes the operational viability and economic advantages of the techniques.

COORDINATE SYSTEMS AND DATUMS

The meaningful representation and interpretation of the results of the GPS–assisted photogrammetric solution is dependent upon the use of appropriate coordinate systems and datums. The transformation of coordinate values between systems also requires special attention.

Reference coordinate systems in satellite geodesy are global and geocentric by nature, because the satellite motion refers to the center of mass of the earth (Seeber, 1993). Therefore, the integration of GPS techniques into photogrammetry results in accurate spatial positions for the camera stations relating to the World Geodetic System of 1984 (WGS 84). However, the results of the photogrammetric block adjustment to be utilized for mapping are generally required referenced to the national horizontal and vertical datums. The hori-

zontal datum is usually referenced to a best fitting ellipsoid, which may not coincide with the global ellipsoid system. In addition, elevations required for mapping are orthometric elevations relative to the geoid, an equipotential surface which, very nearly, coincides with mean sea level. GPS yields ellipsoidal heights relative the WGS 84 ellipsoid. The relationship between the two datums — geoid and ellipsoid — must be known, or estimated in some way if the GPS–derived ellipsoidal heights are to be transformed to the orthometric heights required for mapping (Chaplin et al., 1994). Values for the geoidal undulation may be obtained from suitable 'published' geoidal models or by local modeling techniques.

ANTENNA–CAMERA OFFSET VECTOR

The GPS positions collected during the photographic mission are referenced to the antenna phase center, and appropriate interpolation routines are required to derive the position of the antenna phase center at each instant of exposure. The subsequent reduction of the interpolated antenna position to the camera perspective center requires detailed knowledge of the offset vector. This vector is usually determined by a close–range survey, with angular and distance measurement between the camera fiducials and the antenna location. Additional measurements are necessary to position the nose and tail in order to determine the vector relative to the Aircraft Coordinate system.

The mounting of the antenna directly over the optical axis of the camera greatly simplifies the measurement and subsequent modeling of the offset vector, since the vector is reduced to a single vertical component. The extrapolation of the position of the camera perspective center from the interpolated antenna position requires some knowledge of the aircraft attitude. This includes the effects of roll, pitch and yaw at each instant of exposure. The angular components of aircraft attitude are determined by the bundle adjustment in the form of camera orientation parameters. Bundle adjustment routines may therefore be modified to resolve the vector into the ground coordinate system at every iteration, based on the updated values of the orientation parameters (Curry and Schuckman, 1993).

An alternative approach which allows for the rigorous reduction of the antenna offset vector to the camera perspective center incorporates three–dimensional coordinate transformations, and has the advantage that the angular components of the aircraft attitude are correctly modeled. However, accurate values of the camera orientation parameters are required for best results. These data may become readily available with the advent of gyro-stabilized camera mounts with digital output. Accurate camera orientation data can then be recorded directly in digital format at the instant of each exposure (Chaplin et al., 1994).

GROUND CONTROL REQUIREMENTS

GPS–assisted photogrammetry allows for a significant reduction in the amount of ground control required for photogrammetric blocks. The blocks are effectively controlled by the GPS air stations, and in such densely controlled blocks there is little propagation of errors, and the accuracy distribution within the block is highly uniform. In addition, accuracy depends very little on block size, and is close to the mere intersection accuracy of homologous rays (Ackerman and Schade, 1993). As a result, geodetic ground control is no longer required to control the accuracy of the photogrammetric block. However, as discussed below, the establishment of some ground control does has significant advantages.

The inclusion of limited ground control has become accepted as a convenient method of dealing with the problem of the datum transformation. Furthermore, the use of limited ground control has another significant advantage, relating directly to the concept of self-calibrating block adjustment in which the aim is to model and reduce residual effects in the camera calibration. The inclusion of at least three ground control points in the photogrammetric block adjustment is considered sufficient to adequately allow for the datum transformation to the local geodetic coordinate system, as well as the reliable estimation of the elements of interior orientation. A recommended control scenario would be the use of four control points, one in each corner of a regularly shaped block, thus bracketing the project area and adding redundancy to the solution.

In addition, since the ultimate aim of aerial triangulation is the reliable determination of ground coordinates, a truly conclusive test on the accuracy of the solution is the inclusion

of independent check points in the photogrammetric block adjustment (Cosandier, 1993). Although the use of existing control stations is possible, datum inconsistencies may be present within the control set. The establishment of a relatively sparse geodetic control network by differential GPS techniques within the project area has a number of important implications:

- if permanent monumentation is utilized, the existing national control framework is densified to support future integrated surveying activities;
- a suitable subset may be selected to support the datum transformation and self–calibration;
- a homogenous set of check points is provided as an independent means of evaluating the final AT solution; and
- the inclusion of well-distributed vertical control points in the new network enables the problem of vertical datums to be addressed through the geoidal modeling techniques discussed below (Chaplin et al., 1994).

As mentioned above, the elevations derived through the use of GPS techniques relate to a reference ellipsoid such as WGS84, and are completely geometric in nature. The inclusion of well-distributed vertical control points enables modeling of a local (relative) microgeoid, and the subsequent derivation of accurate orthometric elevations. The approach utilizes plane or polynomial surface fitting techniques by the method of least squares, and has been extensively implemented by the authors to support a full range of contouring applications. The least squares residuals provide an indication of the 'goodness of fit' of the surface to the existing control. The amount of vertical control required to adequately model the geoid is a function of the nature of the terrain, and of the requirements of the application being supported.

AERIAL TRIANGULATION (AT)

Photogrammetric block adjustments have traditionally been executed with reference to particular map projections, such as State Plane coordinate or UTM zones. Vertical control has always been referenced to a vertical datum representative of the geoid, which deviates substantially from the uniformity of the ellipsoid (Curry and Schukman, 1993). The integration of GPS techniques into photogrammetry results in accurate spatial positions for the camera stations relating to the WGS84 reference ellipsoid. The conversion of the positions to a map projection or vertical datum based on the geoid prior to the block adjustment degrades the solution, and is not recommended (Curry and Schukman, 1993). A simple three–dimensional transformation can be made from the Earth Centered Earth Fixed (ECEF) reference system to a local space rectangular (LSR) system for the purposes of executing the adjustment (Curry and Schukman, 1993; Cosandier, 1993). This approach is highly recommended since it is rigorous, thereby not distorting the geometry of the bundle, and it affords the convenience of traditional northing–easting–up systems for fine–tuning the adjustment. The adjustment results may then be transformed to State Plane, UTM or other arbitrary coordinate systems, as required. The elevations can also be converted to a vertical datum based upon the geoid, either through the use of high-resolution geoid models, or the surface fitting techniques previously discussed.

The value of the self–calibration technique in aerial triangulation has been well–proven (Ebner,1976). The concept of self–calibration involves the extension of the mathematical model to include additional parameters that attempt to model the residual systematic errors inherent in the real photogrammetric system (Granshaw, 1980). These may arise from accuracy limitations in the laboratory camera calibration, and a deviation of the elements of interior orientation from the laboratory calibrated values due to in situ environmental conditions. These deviations will result in systematic effects occurring in the exterior orientation and transformed ground control points, especially in the case of AT without ground control. The use of two or three ground control points enables the reliable estimation of the interior orientation parameters (Cannon, 1991).

As previously mentioned, the inclusion of a set of independent check points in the bundle adjustment allows for a truly conclusive indication of the accuracy and consistency of the final solution, and is therefore highly recommended.

SUMMARY OF THE GPS–ASSISTED AERIAL TRIANGULATION METHODOLOGY

The above constitute key geodetic issues which need to be addressed in appropriate detail if project accuracy requirements are to be met effectively. Figure 1 below outlines a rigorous, integrated approach to the GPS–assisted aerial triangulation procedure. This has been successfully implemented by the authors on a number of commercial projects. In principle, the photogrammetric bundle adjustment involves the simultaneous, 3-dimensional adjustment of all observations in a single solution. The input into the GPS–assisted adjustment therefore comprises the following appropriately weighted observations: reduced photo measurements, GPS–derived camera station coordinates, and ground control values. The methodology discussed below applies directly to all three of the commercial applications reviewed in this paper.

All photogrammetric measurements were undertaken on a Wild BC1 analytical stereoplotter, with point transfer being undertaken with a Wild PUG device. An interior orientation was undertaken on all photo measurements to reduce the observations to the fiducial coordinate system, and to correct for systematic errors such as film and platen deformation, principal point displacement, radial lens distortion, and atmospheric refraction. Photo measurements are not corrected for the effects of earth curvature, since the bundle adjusment is executed in an LSR system, thereby not distorting the geometry of the bundle. This system, however, still affords the convenience of a northing–easting–up system for the fine–tuning of the adjustment and the interpretation of the results. The reduced photo measurements serve as input into the adjustment.

All GPS data were collected utilizing state–of–the–art, dual–frequency geodetic receivers. Rapid–static surveying techniques were employed for the determination of the inital integer ambiguities. During the photographic mission, all camera exposures are stored as time-tagged events within the GPS data file. The raw data are processed using software which incorporates sophisticated Kalman Filtering techniques, and On-The-Fly (OTF) ambiguity resolution, when required. The OTF capabilities are therefore invoked in cases of severe loss of lock only. Each instant of exposure is interpolated from the data using cubic spline interpolation techniques, and subsequently reduced to the camera perspective center. These WGS 84 positions are then transformed to the LSR coordinate system by rigorous 3-D transformations prior to input into the adjustment. An origin for this system is selected approximately in the center of the project area such that the LSR X,Y, and Z coordinate axes are closely oriented with respect to the northing–easting–up system.

The ground control coordinates are determined through static or rapid–static surveying techniques, and the baseline vectors rigorously adjusted using 3–dimensional, least squares adjustment software. The 3D–cartesian coordinates are then transformed to the LSR system.

As mentioned, the bundle adjustment is executed and fine–tuned in the LSR coordinate system. No parameters are included to account for systematic drifts of the airborne GPS solution, although the capability exists. Initial runs include well–distributed control stations as independent check points, which provide a truly conclusive measure of the accuracy of the solution. The final solutions typically include all ground control points and additional parameters for self-calibration to account for a deviation of the elements of interior orientation from the laboratory calibrated values.

The final coordinates from the adjustment are transformed back to geodetic coordinate values, and subsequently to the desired map projection, e.g., state plane, UTM. Note that the elevations derived from this transformation refer to the WGS 84 ellipsoid. Final orthometric elevations are derived through the application of 'published' geoidal models, such as OSU91A or GEOID93. Alternatively, least squares surface fitting techniques are employed to model a micro-geoid in the area of interest. The model is based upon existing vertical control, and has the capability of yielding orthometric heights of appropriate quality. The technique utilized depends on individual project accuracy requirements, as well as on the nature of the terrain within the project area.

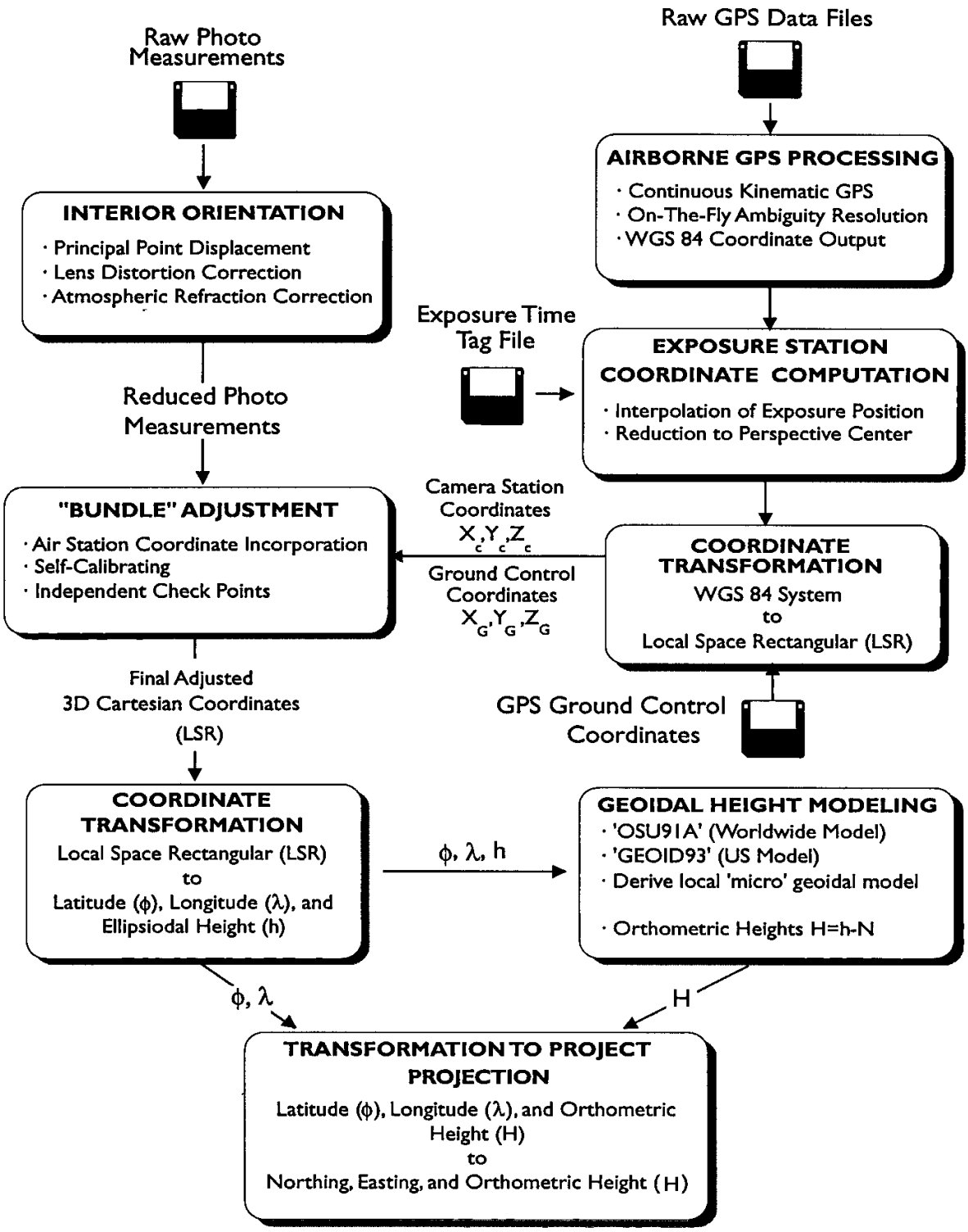


Fig. 1. Flow chart showing the processing methodology for GPS–assisted AT

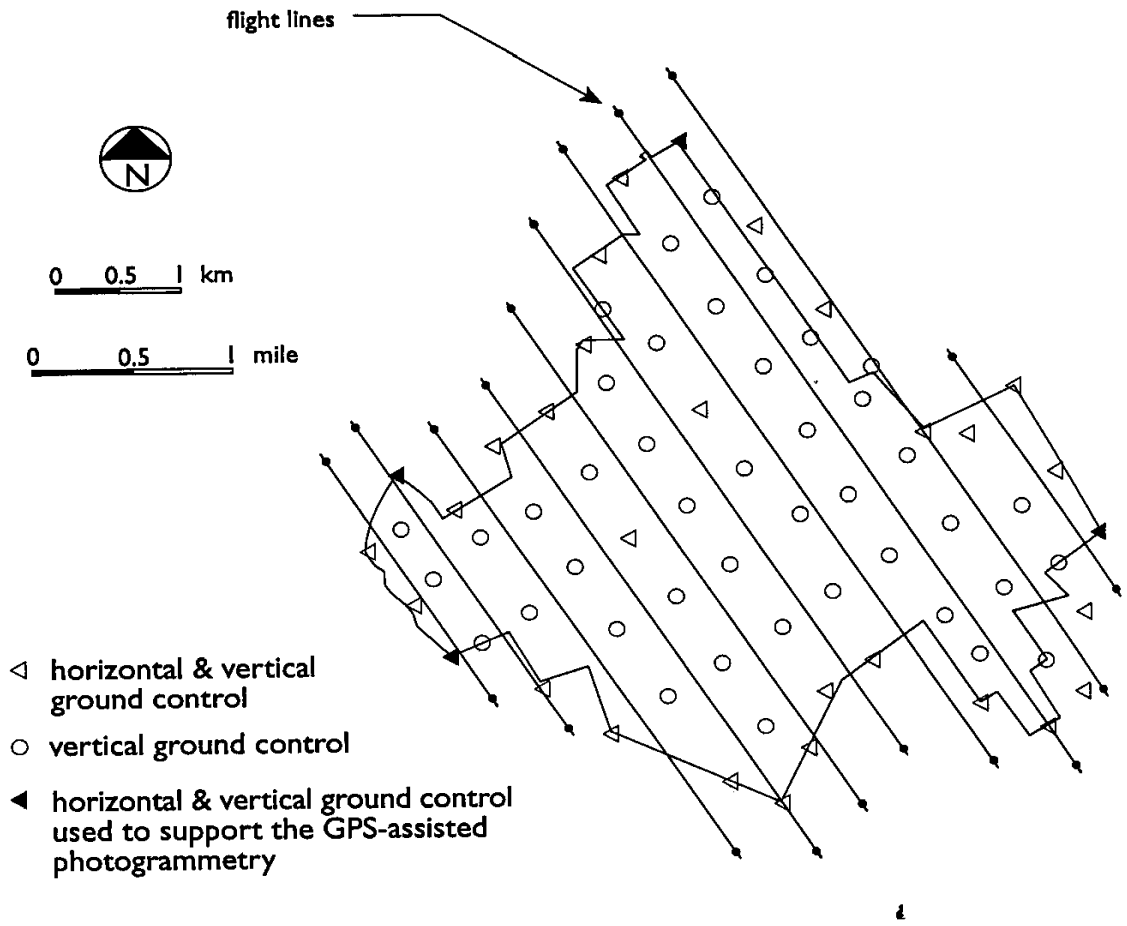


Fig. 2. Charleston AFB showing the flight plan and ground control layout.

CHARLESTON AIR FORCE BASE

Large scale topographic mapping at a scale of 1" = 100' with a 1 foot contour interval was undertaken at the Charleston Air Force Base in Charleston, South Carolina. The project spans an area approximately 5 km x 6 km in extent, requiring 141photographs at a contact scale of 1" = 275'.

Figure 2 shows the flight line layout and associated ground control scheme required for a conventional AT solution — i.e., with no airborne GPS–derived camera station positions. Required are 31 horizontal and vertical points and 42 additional vertical points yielding a total of 73 control stations. The horizontal ground control was established to Federal Geodetic Control Subcommittee (FGCS) first order standards using differential GPS surveying techniques, while the vertical control was performed to FGCS third order leveling standards. All points were targeted prior to the acquisition of the aerial photography.

Results

Static baseline initialization techniques were utilized at the beginning and end of the flight to resolve the satellite ambiguities. In addition, OTF ambiguity resolution techniques were performed and compared with the conventional kinematic solution. A conventional self–calibrating bundle adjustment was performed in which the full set of 73 ground control points was utilized. The ground control points were assigned weights based on standard deviations of 0.1 m in the horizontal components and 0.05 m in the vertical compo-

Table 1

Charleston AFB: Comparison of AT Solutions

AT Solution	Ground Control	RMS - Ground Control [N E H - meters]	No. of Check Points	RMS - Check Points [N E H - meters]
Conventional	31 H/V + 42 V	0.042 0.029 0.007	-	-
GPS-assisted	4 H/V	-	27 H/V	0.045 0.031 0.056

nent, with the photo measurements being assigned standard deviations of 5 μm. The solution yielded RMS values for the ground control components of 0.042 m, 0.029 m, and 0.007 m in northing, easting and height respectively. This result confirmed the high quality of the photo measurements and ground control surveys.

A second AT solution was undertaken using camera station positions derived from the continuous kinematic GPS observations along with the four horizontal and vertical stations indicated in Figure 2. The camera station positions were assigned standard deviations of 0.05 meters in all three components, while the horizontal and vertical positions of the four ground control points were held fixed.

A summary of the results of the conventional and GPS–assisted bundle adjustments is presented in Table 1. Similar results were obtained in the bundle adjustment solution using OTF techniques to determine the satellite ambiguities. It is evident that the results are more than capable of supporting the production of the required mapping.

JACKSON UTILITY DIVISION

This project is situated within and around the City of Jackson, Tennessee. The AT was required to support planimetric mapping at two different scales: 1"=100' for the low altitude photography and 1"=200' for the region covered by high altitude photography (Figures 3 and 4). Facility and land-based elements on the finished orthophotographs were to be located to a horizontal accuracy of ±2.5 feet. The AT was also required to support the generation of 4 foot contours within the area covered by the low altitude photography and 20 foot contours within the region of high altitude coverage.

Twenty ground control points were established using conventional DGPS static and rapid static techniques. FGCS *first order* (10mm + 10 ppm) standards were achieved. Elevations (orthometric heights) were estimated from the GPS-derived ellipsoidal heights by means of geoidal modeling techniques and were checked using GEOID93.

Results

The initial cycle ambiguities for the airborne GPS missions were determined in each case utilizing the fixed baseline technique and the data were then processed in a continuous kinematic mode. Both data sets were completely continuous throughout the flight mission, and no serious loss of lock was experienced, i.e., OTF ambiguity resolution was not employed. The re-initialization performed after each photo mission verified the correct determination of the ambiguities, and provided an independent check on the data processing.

Low Altitude (1"=1000' Scale) Photography. An initial adjustment was undertaken in which the AT was constrained to a single ground control point. The input data and subsequent output are presented in Table 2. As indicated, all image points were assigned standard deviations of 7 μm, while the GPS–derived camera station coordinates were assigned standard deviations of 0.05 m in X, Y and Z. The single ground control control point was weighted at 0.001 m in X,Y and Z. All remaining control point values were included in this adjustment as *independent* check points. Coordinate values were calculated using the AT solution, and a comparison was made with the 'true' ground surveyed values. As indicated,

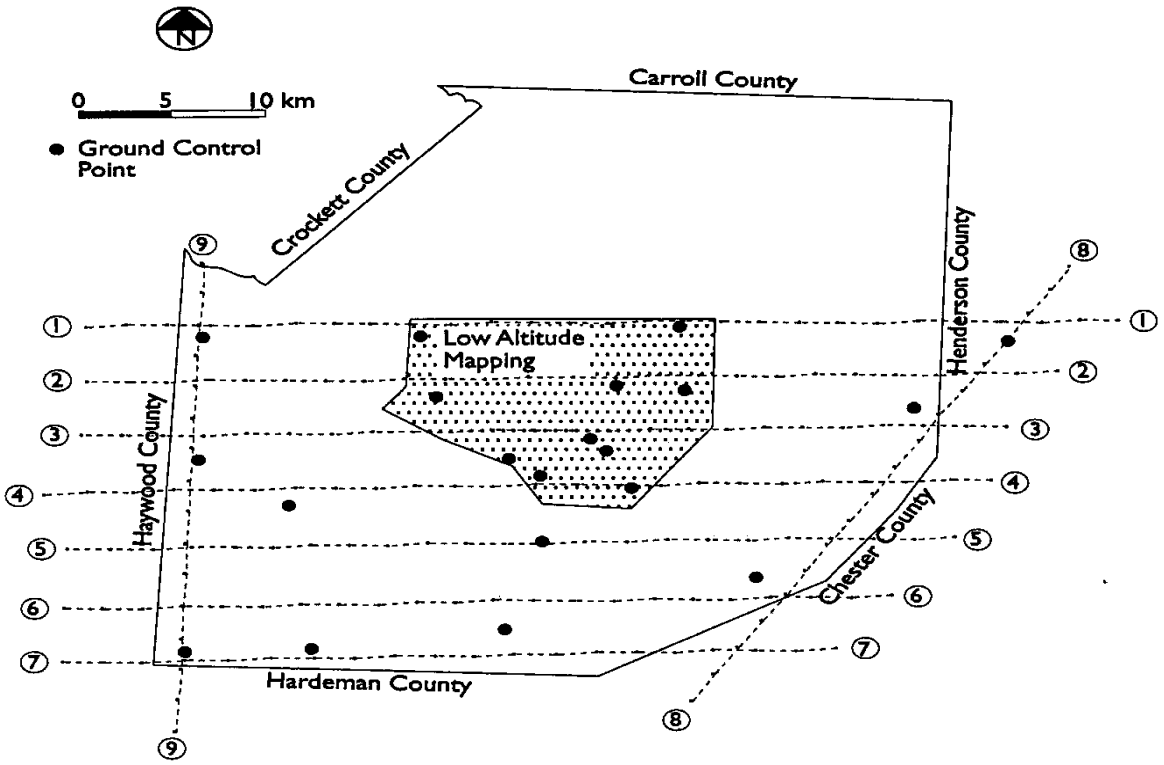


Fig. 3. Actual high altitude flight lines associated with the JUD mapping project.

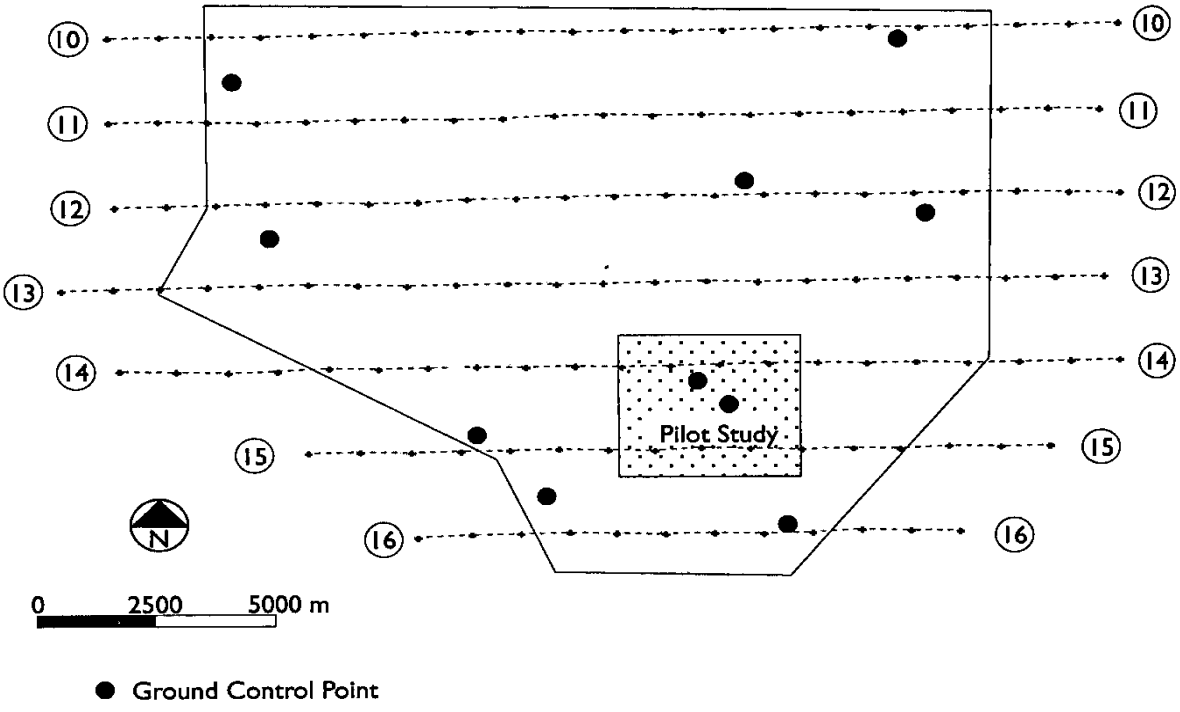


Fig. 4. Actual low altitude flight lines associated with the JUD mapping project.

Table 2

Jackson Utility Division AT Results

	High Altitude 1" = 2000'		Low Altitude 1" = 1000'
	all strips	no cross strips	all strips
No. of strips	9	7	7
No. of photos	179	150	120
No. of tie points	695	692	516
No. of ground control points	1	1	1
No. of check points	18	18	8
σ_{xy}-photo measurements	7μm	7μm	7μm
σ_{XYZ}-air station coords.	0.2 m	0.2 m	0.05 m
RMS-photo measurements (x,y)	4.4 5.5 μm	3.7 4.3 μm	3.8 4.8 μm
RMS-air station coords. (X,Y,Z)	0.13 0.11 0.14 m	0.10 0.09 0.11 m	0.02 0.01 0.03 m
RMS-check points (N, E, H)	0.32 0.38 0.40 m	0.30 0.49 0.47 m	0.18 0.11 0.13 m

Table 3

Jackson Utility Division: Comparison of Tie Point Coordinates*

	Δ Northing [m]	Δ Easting [m]	Δ Elevation [m]
RMS	0.37	0.34	0.46
|average Δ|	0.03	0.12	0.12

*based on a comparison of 24 common tie points.

RMS values of 0.18, 0.11 and 0.13 m in Northing, Easting and Elevation were obtained for the independent check points. Final RMS values of 3.8 μm and 4.8 μm resulted for the image coordinates. No additional parameters for self–calibration were introduced. The verification of the GPS–derived camera station coordinates was thus completed through the independent check points included in the first adjustment scenario. The final adjustment, and the optimal solution to be used for mapping, included all control points as constraints, while additional parameters were introduced for blockwise self–calibration.

High Altitude (1"=2000' Scale) Photography. Once again, an initial 'minimally constrained' adjustment was undertaken. The results are presented in Table 2. As is indicated, all image points were assigned standard deviations of 7 μm, while the GPS–derived camera station coordinates were assigned standard deviations of 0.20 m in X,Y and Z. The control point was weighted at 0.001 m in X,Y and Z. All 18 remaining control point values were included in the initial adjustment as *independent* check points. RMS values of 0.32, 0.38 and 0.40 meters in X,Y and Z were obtained for the independent check points. Final RMS values of 4.4 μm and 5.0 μm were obtained on the image coordinates. No additional

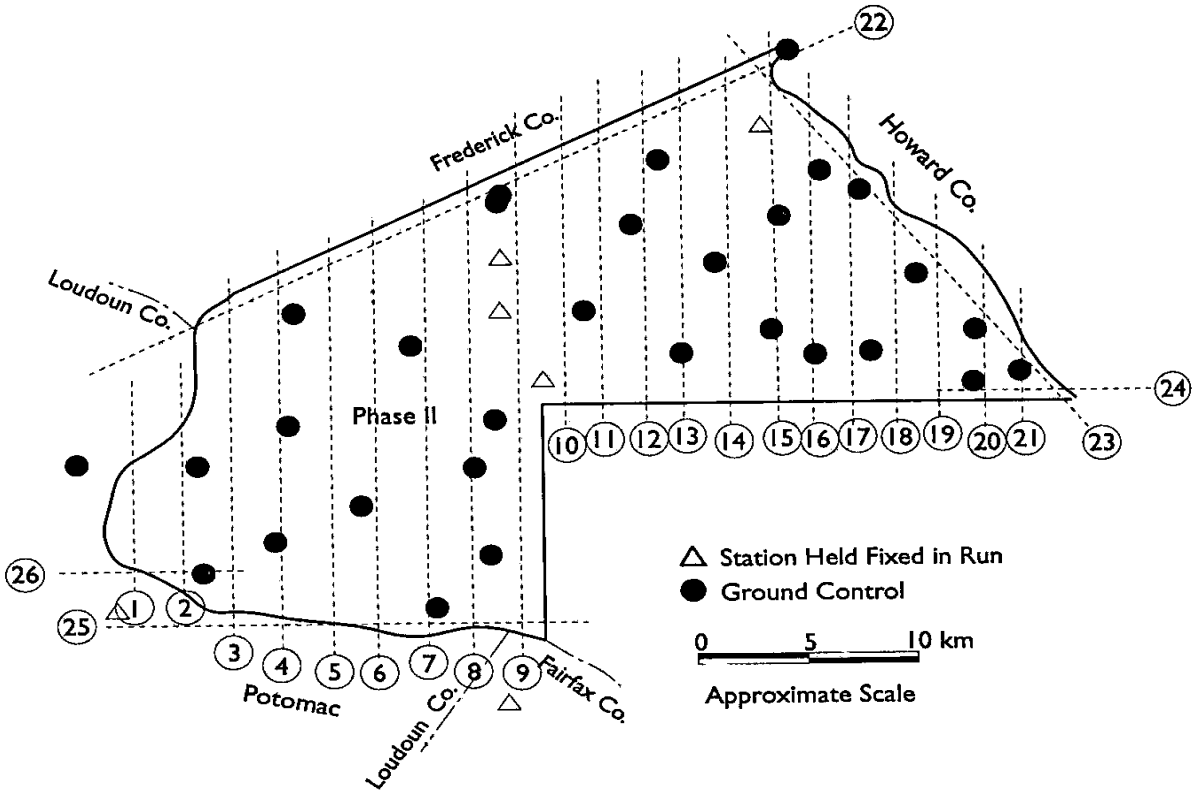


Fig. 5. The Montgomery Co., Project Area and Flight Plan.

parameters for self–calibration were introduced. In an attempt to assess the importance of the cross-strips, a second adjustment was performed. This was identical to the first adjustment, however in this case the two cross-strips were removed. As indicated in Table 2, the results are somewhat worse than the other solution. The final adjustment included all control points as constraints. Furthermore, additional parameters were introduced for the blockwise self–calibration.

Comparison of High and Low Altitude Results. Twenty four tie points were common to both the low and high altitude AT adjustments. Since the associated airborne GPS missions, photography and AT adjustments were completely independent, a comparison of their coordinates provides insight into the quality of the results. Bearing in mind the differences in altitude, the results appear to be quite acceptable (Table 3). In particular, there does not seem to be any significant displacement between the two solutions.

MONTGOMERY COUNTY, MARYLAND

The project area is situated within Montgomery County, Maryland. It is covered by 1"=1200' photography, thus providing economical coverage of the total project area (Figure 5). The AT was required to support planimetric mapping, with facility and land–based elements on the finished orthophotographs located to a horizontal accuracy of ±5 feet. In addition, the AT was also required to support the generation of 5 foot contours within the area of coverage. The final map scale is 1"=200'.

Thirty five ground control points were employed. These included 11 existing National Geodetic Reference System (NGRS) points and 24 new stations which were established using DGPS techniques to FGCS *first order* standards (10mm + 10ppm). Elevations (orthometric heights) were estimated from the GPS–derived ellipsoidal heights by means of geoidal modeling techniques and were checked using GEOID93. The photo mission was conducted on April 2, 1994 under excellent visibility and flying conditions.

Table 4

Montgomery County AT Results

	Phase 2 1" = 1200'	
	all strips	no cross strips
No. of strips	26	21
No. of photos	427	150
No. of tie points	1240	692
No. of ground control points	6	6
No. of check points	29	29
$\sigma_{xy\text{-photo measurements}}$	7μm	7μm
$\sigma_{XYZ\text{-air station coords.}}$	0.2 0.2 0.3 m	0.2 0.2 0.3 m
RMS-photo measurements (x,y)	6.4 5.8 μm	5.7 5.0 μm
RMS-air station coords. (X,Y,Z)	0.15 0.17 0.35 m	0.15 0.18 0.35 m
RMS-check points (N, E, H)	0.25 0.24 0.38 m	0.34 0.24 0.45 m

Results

The initial cycle ambiguities were determined utilizing the fixed baseline technique. The data were then processed in a continuous kinematic mode. The data set was continuous throughout the flight mission, and no serious loss of lock was experienced, i.e., OTF ambiguity resolution was not employed. The re-initialization performed after each photo mission verified the correct determination of the ambiguities, and provided an independent check on the data processing.

An initial adjustment was completed, constrained to six ground control points. The input data and subsequent output are presented in Table 4. As indicated, all image points were assigned standard deviations of 7 μm, while the GPS–derived camera station coordinates were assigned standard deviations of 0.2 m in X and Y and 0.3m in Z. The six control points were weighted at 0.001 m in X,Y and Z.

All remaining control point values (29) were included in the initial adjustment as *independent* check points. Coordinate values were calculated using the aerial triangulation solution, and a comparison made with the 'true' ground surveyed values. As indicated, RMS values of 0.25, 0.24 and 0.38 meters in Northing, Easting and Elevation were obtained for the independent check points. Final RMS values of 6.4 μm and 5.8 μm resulted for the image coordinates. No additional parameters for self-calibration were introduced.

The final adjustment, and the optimal solution to be used for mapping, included all control points as constraints and full blockwise self-calibration.

In an attempt to assess the importance of the cross-strips, an additional adjustment was performed. This is identical to the first, however in this case the five cross-strips were removed. As indicated in Table 2, the results are slightly worse than those of the other runs.

CONCLUSIONS

GPS–assisted photogrammetry has been shown to be viable over a wide range of photogrammetric mapping applications. However, the authors contend that considerable care must still be exercised to ensure that accurate results are obtained. This is particularly true of the geodetic aspects such as the kinematic and OTF GPS solutions and coordinate systems and datums. Failure to properly address the technical details can lead to the occurrence of gross systematic errors. The commercial applications described in this paper have provided some insight into the results that can be expected for a variety of photo scales, and give some indication of the effects of modifying flight line schemes, such as the impact of the removal of cross–strips from a block.

The authors have identified several areas where improvements are required and where further real-world experience will enhance the efficacy of the technique:

- improvements to the robustness of OTF algorithms;
- systems and techniques for rigorous aircraft attitude determination;
- optimization of the design of strip, block and ground control configurations;
- enhancement of modeling techniques for orthometric height estimation in areas exhibiting high frequency non-linear geoidal undulations (e.g., in mountainous terrain).

ACKNOWLEDGEMENTS

The authors wish to acknowledge the cooperation and assistance of Analytical Surveys, Inc. (ASI) and Air Photographics, Inc. The authors are grateful to Greg Robinson for preparing Figure 5 of this manuscript.

REFERENCES

[1] Ackerman, F. and H. Schade (1993). 'Application of GPS for Aerial Triangulation'. Photogrammetric Engineering and Remote Sensing, Vol. 59, No. 11, November 1993, pp. 1625-1632.

[2] Cannon, M.E. (1991). 'Airborne GPS/INS with an Application to Aerotriangulation'. PhD Thesis, Department of Geomatics Engineering, The University of Calgary, Calgary, Alberta.

[3] Chaplin, B.A., D.E. DesRoche, W.J.T. Greening and G.L. Robinson (1994). 'Geodetic Considerations in GPS-Assisted Photogrammetry'. Paper presented at the Fourth International GPS/GIS Conference, Washington, D.C., May, 1994.

[4] Cosandier, D. (1993). Verbal Communication.

[5] Curry, S. and K. Schuckman (1993). 'Practical Considerations for the Use of Airborne GPS for Photogrammetry'. Photogrammetric Engineering and Remote Sensing, Vol. 59, No. 11, November 1993, pp. 1611-1617.

[6] Ebner, H. (1976). 'Self Calibrating Block Adjustment'. International Archives of Photogrammetry, Vol. 21, Part 3, Helsinki.

[7] Granshaw, S.I. (1980). 'Bundle Adjustment Methods in Engineering Photogrammetry'. Photogrammetric Record, 10(56), pp. 181-207.

[8] Measurement Science, Inc. (1994). 'Final Report: Ground Control Surveys, Photography, Aerial Triangulation — Jackson Utility Division, TN'.

[9] Measurement Science, Inc. (1994). 'Final Report: Aerial Triangulation — Montgomery County, MD'.

[10] Seeber, G. (1993). 'Satellite Geodesy: Foundations, Methods and Applications'. de Gryter, Berlin, 1993.

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:
BROCKHAUS MARC A.

DUNLAP CODDING, P.C. P.O. BOX 16370 OKLAHOMA CITY OK 73113 USA

DOCKETED
adp
Notify Client/VA+WC 07/31/2013
check Family for PA 08/10/2013
Voluntary Amendment 09/10/2013
Resp to Written Opn 10/10/2013

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference ~~5129.85PWO~~ 6338.215WC	Date of mailing *(day/month/year)* 10 July 2013 (10.07.2013)
International application No. **PCT/US2013/032760**	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
Applicant **PICTOMETRY INTERNATIONAL CORP. et al**	International filing date *(day/month/year)* **18 March 2013 (18.03.2013)**

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 . 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19months.

For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the PCT Applicant's Guide, National Chapters.

Name and mailing address of the ISA/KR Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer COMMISSIONER Telephone No. 82-42-481-8755

Form PCT/ISA/220 (July 2010)

* Attention

Copies of the documents cited in the international search report can be searched in the following Korean Intellectual Property Office English website for three months from the date of mailing of the international search report.

http://www.kipo.go.kr/en/ => PCT Services => PCT Services

ID : PCT international application number
PW : **5985BG48**

Inquiries related to PCT International Search Report or Written Opinion prepared by KIPO as an International Searching Authority can be answered not only by KIPO but also through IPKC (Intellectual Property Korea Center), located in Vienna, VA, which functions as a PCT Help Desk for PCT applicants.

Homepage: http://www.ipkcenter.com

Email: ipkc@ipkcenter.com

Notes to Form PCT/ISA/220 (July 2010)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 5129.854WO	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. **PCT/US2013/032760**	International filing date *(day/month/year)* **18 March 2013 (18.03.2013)**	(Earliest) Priority Date *(day/month/year)* 19 March 2012 (19.03.2012)

Applicant
PICTOMETRY INTERNATIONAL CORP. et al

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language**, the international search was carried out on the basis of:
      ☒ the international application in the language in which it was filed
      ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.
2. ☐ **Certain claims were found unsearchable** (See Box No. II)
3. ☐ **Unity of invention is lacking** (See Box No. III)
4. With regard to the **title,**
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established by this Authority to read as follows:
5. With regard to the **abstract,**
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. With regard to the drawings,
   a. the figure of the **drawings** to be published with the abstract is Figure No. 1
      ☒ as suggested by the applicant.
      ☐ as selected by this Authority, because the applicant failed to suggest a figure.
      ☐ as selected by this Authority, because this figure better characterizes the invention.
   b. ☐ none of the figure is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/032760

A. CLASSIFICATION OF SUBJECT MATTER

G06Q 50/10(2012.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06Q 50/10; G06F 3/048; G06F 17/60; G06Q 30/00; G06Q 50/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords:location, roof, property, report, image

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2002-123589 A (DAINIPPON PRINTING CO., LTD.) 26 April 2002 See paragraphs [0006]-[0009], [0018]-[0026], [0031]-[0032], [0047]-[0053], [0067]-[0072], claims 1-2, 8-9 and figures 4-10.	1-13
Y	US 2006-0036513 A1 (JERRY WHATLEY et al.) 16 February 2006 See abstract, paragraphs [0024], [0032]-[0035], claims 1-2, 8 and figures 2-4b.	1-13
A	JP 2001-306667 A (OSHIMA KENJI) 02 November 2001 See paragraphs [0014]-[0017], [0029]-[0030], claims 1-3 and figures 7-14, 20.	1-13
A	US 2009-0259568 A1 (LEE CHUN KYOUNG) 15 October 2009 See abstract, claims 1-4 and figures 1-4, 7-9.	1-13
A	JP 2006-031087 A (NEC CORP.) 02 February 2006 See abstract, claims 1-3, 7-8 and figures 3-4.	1-13

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
09 July 2013 (09.07.2013)	**10 July 2013 (10.07.2013)**
Name and mailing address of the ISA/KR Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea Facsimile No. +82-42-472-7140	Authorized officer OH Eung Gie Telephone No. +82-42-481-8744

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2013/032760

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2002-123589 A	26/04/2002	None	
US 2006-0036513 A1	16/02/2006	US 2002-0052755 A1	02/05/2002
JP 2001-306667 A	02/11/2001	None	
US 2009-0259568 A1	15/10/2009	EP 2033155 A1	11/03/2009
		EP 2033155 A4	20/07/2011
		JP 2009-540427 A	19/11/2009
		JP 4933613 B2	16/05/2012
		KR 10-1084374 B1	16/11/2011
		KR 10-2009-0015120 A	11/02/2009
		US 2008-154740 A1	26/06/2008
		WO 2007-142494 A1	13/12/2007
JP 2006-031087 A	02/02/2006	None	

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
BROCKHAUS MARC A.

DUNLAP CODDING, P.C. P.O. BOX 16370 OKLAHOMA CITY OK 73113 USA

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing *(day/month/year)*	**10 July 2013 (10.07.2013)**
Applicant's or agent's file reference 5129.854WO	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2013/032760	**18 March 2013 (18.03.2013)**	19 March 2012 (19.03.2012)

International Patent Classification (IPC) or both national classification and IPC

G06Q 50/10(2012.01)i

Applicant

PICTOMETRY INTERNATIONAL CORP. et al

1. This opinion contains indications relating to the following items:

- [x] Box No. I Basis of the opinion
- [ ] Box No. II Priority
- [ ] Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- [ ] Box No. IV Lack of unity of invention
- [x] Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- [ ] Box No. VI Certain documents cited
- [ ] Box No. VII Certain defects in the international application
- [ ] Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.
For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/KR	Date of completion of this opinion	Authorized officer
Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea Facsimile No. +82-42-472-7140	09 July 2013 (09.07.2013)	OH Eung Gie Telephone No. +82-42-481-8744

Form PCT/ISA/237 (cover sheet) (July 2011)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2013/032760

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of :

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into _____ , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of:

   a. a sequence listing filed or furnished
      ☐ on paper
      ☐ in electronic form

   b. time of filing or furnishing
      ☐ contained in the international application as filed.
      ☐ filed together with the international application in electronic form.
      ☐ furnished subsequently to this Authority for the purposes of search.

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additioanl copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2013/032760

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-13	YES
	Claims	NONE	NO
Inventive step (IS)	Claims	NONE	YES
	Claims	1-13	NO
Industrial applicability (IA)	Claims	1-13	YES
	Claims	NONE	NO

2. Citations and explanations :

Reference is made to the following documents:

D1: JP 2002-123589 A (DAINIPPON PRINTING CO., LTD.) 26 April 2002
D2: US 2006-0036513 A1 (JERRY WHATLEY et al.) 16 February 2006

1. Novelty and Inventive Step

1.1 Claims 1-12

1.1.1 Independent claim 1

D1, which is considered to be the closest prior art to the subject matter of claim 1, discloses a method comprising the steps of: searching map information of selected real estate information; determining real estate information which suits an input search conditions including position information; displaying map information which has a searched area where a property object contained in real estate information consisting of the searched conditions; and determining a real estate contractor and selecting the real information based on the search conditions including an area-along-the-railroad-line, area, room arrangement and house rent (See paragraphs [0019]-[0025], [0031]-[0032], [0050]-[0053], claim 1, 8-9 in D1). Claim 1 differs from D1 in determining a footprint of the roof and determining predominant pitch of the roof. However, D2 discloses a method comprising the steps of: displaying pictures of the property; and providing a summary of details such as contact information, the address of the property, the type of property including a property outline like a size (See paragraphs [0032]-[0034] in D2). Claim 1 would have been obvious over D1 and D2. Therefore, claim 1 lacks an inventive step under PCT Article 33(3).

1.1.2 Dependent claims 2-12

The additional feature of claim 2 is identical to the feature of D1 in providing detailed information on a specific property object, wherein the property object includes house rent, room arrangement, conditions and map displaying interest of the geographic location of the real estate (See paragraphs [0026], [0067]-[0072], claims 1, 8-9 in D1). Claim 2 would have been obvious over D1 and D2. Therefore, claim 2 lacks an inventive step under PCT article 33(3).

Continued on Supplemental Box

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of: Box No. V

The additional feature of claim 3 is identical to the feature of D2 in that the details include a summary of details such as contact information (See paragraph [0032], figure 2 in D2). Claim 3 would have been obvious over D1 and D2. Therefore, claim 3 lacks an inventive step under PCT article 33(3).

The additional feature of claim 4 discloses the set of instructions comprising a first computer readable medium of a first host system and a second computer readable medium of a second host system, but this feature of claim 4 is considered to be a minor difference, over the disclosure of D1 and D2, which falls under the general knowledge of a person skilled in the art. Therefore, claim 4 lacks an inventive step under PCT article 33(3).

The additional feature of claim 5 is identical to the feature of D1 in identifying the location of real estate for displaying property information (See paragraphs [0006]-[0009] in D1). Claim 5 would have been obvious over D1 and D2. Therefore, claim 5 lacks an inventive step under PCT article 33(3).

The additional feature of claim 6 is identical to the feature of D1 in receiving inputted search conditions including location information (See claims 1-2 in D1). Claim 6 would have been obvious over D1 and D2. Therefore, claim 6 lacks an inventive step under PCT article 33(3).

The additional feature of claim 7 is virtually suggested by the feature of D1 in that the geographic location is selected by inputting a location (See paragraph [0067] in D1). Claim 7 would have been obvious over D1 and D2. Therefore, claim 7 lacks an inventive step under PCT article 33(3).

The additional feature of claim 8 is virtually suggested by the feature of D2 in showing a category of graphic objects and selecting object's dimensions (See paragraph [0035] in D2). Claim 8 would have been obvious over D1 and D2. Therefore, claim 8 lacks an inventive step under PCT article 33(3).

The additional feature of claim 9 is identical to the feature of D1 in displaying a two-dimensional image and three-dimensional image of the position of the property object (See paragraphs [0018], [0023], [0047]-[0049] in D1). Claim 9 would have been obvious over D1 and D2. Therefore, claim 9 lacks an inventive step under PCT article 33(3).

Claims 10-11 further comprise determining the predominant pitch which includes determining a plurality of pitch values, the predominant pitch being based on the pitch values. However, the additional features of claims 10-11 are merely matters of design option when the general knowledge in relevant field of the art is used. Claims 10-11 would have been obvious over D1 and D2. Therefore, claims 10-11 lack an inventive step under PCT Article 33(3).

The additional feature of claim 12 is identical to the feature of D1 in providing the property object which includes a map displaying interest of the geographic location of the real estate (See paragraphs [0067]-[0072], claims 1, 8-9 in D1). Claim 12 would have been obvious over D1 and D2. Therefore, claim 12 lacks an inventive step under PCT article 33(3).

Continued on The Next Page

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of: Previous Page

1.2 Claim 13

Claim 13 relates to a system comprising two or more host systems, but it shares the same technical features of a set of instructions with a claim 1. Accordingly, the same reasoning as in claim 1 applies to claim 13. Therefore, claim 13 lacks an inventive step under PCT Article 33(3).

2. Industrial Applicability

Claims 1-13 are industrially applicable under PCT Article 33(4).

Electronic Patent Application Fee Transmittal

Application Number:	13424054
Filing Date:	19-Mar-2012
Title of Invention:	Method and System for Quick Square Roof Reporting
First Named Inventor/Applicant Name:	Chris T. Thornberry
Filer:	Marc Alan Brockhaus/Lori Radford
Attorney Docket Number:	6338.157

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	2806	1	90	90
		Total in USD ($)		**90**

Electronic Acknowledgement Receipt

EFS ID:	20457942
Application Number:	13424054
International Application Number:	
Confirmation Number:	7006
Title of Invention:	Method and System for Quick Square Roof Reporting
First Named Inventor/Applicant Name:	Chris T. Thornberry
Customer Number:	30589
Filer:	Marc Alan Brockhaus/Lori Radford
Filer Authorized By:	Marc Alan Brockhaus
Attorney Docket Number:	6338.157
Receipt Date:	20-OCT-2014
Filing Date:	19-MAR-2012
Time Stamp:	12:34:01
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$90
RAM confirmation Number	9721
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Transmittal Letter	6338157_Transmittal10202014.pdf	66383 50479f11f963dc2ddf73bac3f48ecf31d0202c2b	no	1
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	6338157_IDS.pdf	617813 f7a1da7e54bc71dff26162ca10ad2539d25017be	no	10
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	F1_F10.pdf	10948354 7c7dbd4ac11644d14f54466b69742a1d06703c79	no	260
Warnings:					
Information:					
4	Foreign Reference	F11_F20.pdf	16625133 5dac95febc52d31540df7340f65c690f27e20b5a	no	357
Warnings:					
Information:					
5	Non Patent Literature	NPL1_NPL13.pdf	22843030 cbc77dcf6e9d011bc5e3b77e2a2be9eec7ff1e72	no	130
Warnings:					
Information:					
6	Non Patent Literature	NPL14a.pdf	24981132 2590670a69f40198741cc3b08786b5b41fc81188	no	199
Warnings:					
Information:					
7	Non Patent Literature	NPL14b.pdf	25540082 6946921c024c9ed37a9284af4021dd1b9a3fa034	no	200
Warnings:					
Information:					
8	Non Patent Literature	NPL15_NPL32.pdf	22453488 70968cbf8514c86451d6cdd1b02a082aa38200da	no	138
Warnings:					
Information:					
9	Non Patent Literature	NPL33a.pdf	20109431 c6078bb572a9f573daa6f480553fd1829805552d	no	83

Warnings:					
Information:					
10	Non Patent Literature	NPL33b.pdf	18688215 305df84d338e3278deee11eccb2169f3e844a2db	no	83
Warnings:					
Information:					
11	Non Patent Literature	NPL34_NPL66.pdf	25496597 58df4364ffbfe5e966d90d99a4401a43d4f6dc696	no	265
Warnings:					
Information:					
12	Non Patent Literature	NPL67_NPL74.pdf	23029642 0ac47bb7571a4a22c965841c530ae6c1d38d34a7	no	231
Warnings:					
Information:					
13	Non Patent Literature	NPL75_NPL84.pdf	7271147 702543b3b567086cc9e275f6434a8cb8265b854c	no	41
Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
14	Non Patent Literature	NPL85_NPL90.pdf	9196207 26b70459b77174b7a9b936bb5b595ab4811d4497	no	105
Warnings:					
Information:					
15	Non Patent Literature	NPL91_NPL95.pdf	18280857 a91eb87ba5dbe833eb52947a794f38899691a8ac	no	194
Warnings:					
Information:					
16	Non Patent Literature	NPL96.pdf	1235765 6db7c86eabd2fee4ba00d5d1ecba88d8e700206b	no	12
Warnings:					
Information:					
17	Non Patent Literature	NPL97.pdf	442381 b3e83071f6762ce950de1e17408e855da0ff4a0e	no	10
Warnings:					
Information:					

18	Fee Worksheet (SB06)	fee-info.pdf	30294 790415f5a22ed95dc631b698134362a7d2043f57	no	2

Warnings:	
Information:	
Total Files Size (in bytes):	247855951

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc Code: TRAN.LET

Document Description: Transmittal Letter

PTO/SB/21 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission	

Application Number	13/424,054
Filing Date	03/19/2012
First Named Inventor	Chris T. Thornberry
Art Unit	3684
Examiner Name	Matthew E. Zimmerman
Attorney Docket Number	6338.157

ENCLOSURES *(Check all that apply)*

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment/Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☑ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Reply to Missing Parts/ Incomplete Application
  - ☐ Reply to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert to a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s) _____
  - ☐ Landscape Table on CD
- ☐ After Allowance Communication to TC
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- ☐ Proprietary Information
- ☐ Status Letter
- ☑ Other Enclosure(s) (please Identify below):
  See Remarks

Remarks

ELECTRONICALLY TRANSMITTED:
1. SB21 Transmittal Form (1 pg);
2. Information Disclosure Statement (10 pgs); and
3. Referenced Foreign and Non-patent literature documents.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	DUNLAP CODDING, P.C.		
Signature	Ann M. Robl		
Printed name	Ann M. Robl		
Date	10/20/2014	Reg. No.	71,541

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:

Signature	Ann M. Robl		
Typed or printed name	Ann M. Robl	Date	10/20/2014

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/424,054	03/19/2012	Chris T. Thornberry	6338.157	7006

30589 7590 11/28/2014

DUNLAP CODDING, P.C.
PO BOX 16370
OKLAHOMA CITY, OK 73113

EXAMINER
ZIMMERMAN, MATTHEW E

ART UNIT	PAPER NUMBER
3684	

NOTIFICATION DATE	DELIVERY MODE
11/28/2014	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

dsorocco@dunlapcodding.com

Office Action Summary	Application No. 13/424,054	Applicant(s) THORNBERRY ET AL.	
	Examiner MATTHEW ZIMMERMAN	Art Unit 3684	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10/20/2014*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-18* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-18* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

1. The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Status of Claims

2. Claim(s) 1-18 have been examined.

Drawings

Information Disclosure Statement

3. The information disclosure statement filed 10/20/2014 fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent listed that is not in the English language. It has been placed in the application file, but the information referred to therein has not been considered.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. Claims 1-18 are rejected under 35 U.S.C. 101. The claimed invention is directed to non-statutory subject matter because the claim(s) as a whole, considering all claim

elements both individually and in combination, do not amount to significantly more than an abstract idea. The claim(s) is/are directed to the abstract idea of estimating area. The additional element(s) or combination of elements in the claim(s) other than the abstract idea per se amount(s) to no more than: (i) mere instructions to implement the idea on a computer, and/or (ii) recitation of generic computer structure that serves to perform generic computer functions that are well-understood, routine, and conventional activities previously known to the pertinent industry. Viewed as a whole, these additional claim element(s) do not provide meaningful limitation(s) to transform the abstract idea into a patent eligible application of the abstract idea such that the claim(s) amounts to significantly more than the abstract idea itself. Therefore, the claim(s) are rejected under 35 U.S.C. 101 as being directed to non-statutory subject matter.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 14-18 are rejected under pre-AIA 35 U.S.C. 102(b) as being anticipated by Thornberry (US 2010/0296693).

Referring to claims 14-18, Thornberry teaches:

- receiving [data] (*see Thornberry Fig. 4A-B*);

- providing [data] (*see Thornberry Fig. 4A-B*);

The Examiner notes that the data provided and data received is non-functional descriptive material because it does functionally affect the way in which the receiving and providing are performed.

Remarks

8. In regards to the rejections under 35 U.S.C. 101, the present amendments have overcome the prior rejections under this section. However, the amendments have necessitated a new rejection under 35 U.S.C. 101. Accordingly, claims 1-13 are not in condition for allowance because they are rejected under 35 U.S.C. 101.

9. In regards to the response by the applicant to the prior prior art rejections, the Examiner notes that the applicant's remarks were persuasive and the rejections have been withdrawn. The Examiner agrees that the prior art of record fails to teach “predominant pitch” as explained in paragraphs [0076] to [0078] and Fig. 7 of the applicant's specification. Predominant pitch as explained by the remarks and specification is completely different than a pitch and involves a weighted average of individual pitch factors for two or more portions of a roof according to the formulas and description in the abovementioned paragraphs.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW ZIMMERMAN whose telephone number is (571)270-5278. The examiner can normally be reached on Mon-Fri 9:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason B. Dunham can be reached on (571) 272-8109. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MATTHEW ZIMMERMAN/
Primary Examiner, Art Unit 3684

Notice of References Cited	Application/Control No. 13/424,054	Applicant(s)/Patent Under Reexamination THORNBERRY ET AL.	
	Examiner MATTHEW ZIMMERMAN	Art Unit 3684	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2010/0296693	11-2010	Thornberry et al.	382/100
*	B	US-8,078,436	12-2011	Pershing et al.	703/2
*	C	US-2010/0114537	05-2010	Pershing, Chris	703/1
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	http://www.eagleview.com/Portals/0/PortalContent/EagleView-iPhone-Application-Guide.pdf, 2011
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

ELECTRONICALLY FILED ON: October 20, 2014

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

Substitute for form PTO/SB/08a

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13/424,054
Filing Date	03/19/2012
First Named Inventor	Chris T. Thornberry
Art Unit	3684
Examiner Name	ZIMMERMAN, MATTHEW E.
Attorney Docket Number	6338.157

U. S. PATENT DOCUMENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	P1	2,273,876		02/24/1942	Lutz et al.	
	P2	3,153,784		10/20/1964	Petrides et al.	
	P3	3,594,556		07/20/1971	Edwards	
	P4	3,614,410		10/18/1971	Bailey	
	P5	3,621,326		11/11/1971	Hobrough	
	P6	3,661,061		05/09/1972	Tokarz	
	P7	3,716,669		02/13/1973	Watanabe et al.	
	P8	3,725,563		04/03/1973	Woycechowsky	
	P9	3,864,513		02/04/1975	Halajian et al.	
	P10	3,866,602		02/18/1975	Furihata	
	P11	3,877,799		04/15/1975	O'Donnell	
	P12	4,015,080		03/29/1977	Moore-Searson	
	P13	4,044,879		08/30/1977	Stahl	
	P14	4,184,711		01/22/1980	Wakimoto	
	P15	4,240,108		12/16/1980	Levy	
	P16	4,281,354		07/28/1981	Conte	
	P17	4,344,683		08/17/1982	Stemme	
	P18	4,360,876		11/23/1982	Girault et al.	
	P19	4,382,678		05/10/1983	Thompson et al.	
	P20	4,387,056		06/07/1983	Stowe	
	P21	4,396,942		08/02/1983	Gates	
	P22	4,463,380		07/31/1984	Hooks	
	P23	4,489,322		12/18/1984	Zulch et al.	
	P24	4,490,742		12/25/1984	Wurtzinger	
	P25	4,491,399		01/01/1985	Bell	
	P26	4,495,500		01/22/1985	Vickers	
	P27	4,527,055		07/02/1985	Harkless et al.	
	P28	4,543,603		09/24/1985	Laures	
	P29	4,586,138		04/29/1986	Mullenhoff et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.Z./

	P30	4,635,136		01/06/1987	Ciampa et al.	
	P31	4,653,136		03/31/1987	Denison	
	P32	4,653,316		03/31/1987	Fukuhara	
	P33	4,673,988		06/16/1987	Jansson et al.	
	P34	4,686,474		08/11/1987	Olsen et al.	
	P35	4,688,092		08/18/1987	Kamel et al.	
	P36	4,689,748		08/25/1987	Hofmann	
	P37	4,707,698		11/17/1987	Constant et al.	
	P38	4,758,850		07/19/1988	Archdale et al.	
	P39	4,805,033		02/14/1989	Nishikawa	
	P40	4,807,024		02/21/1989	Mclaurin et al.	
	P41	4,814,711		03/21/1989	Olsen et al.	
	P42	4,814,896		03/21/1989	Heitzman et al.	
	P43	4,843,463		06/27/1989	Michetti	
	P44	4,899,296		02/06/1990	Khattak	
	P45	4,906,198		03/06/1990	Cosimano et al.	
	P46	4,953,227		08/28/1990	Katsuma et al.	
	P47	4,956,872		09/11/1990	Kimura	
	P48	5,034,812		07/23/1991	Rawlings	
	P49	5,086,314		02/04/1992	Aoki et al.	
	P50	5,121,222		06/09/1992	Endoh et al.	
	P51	5,138,444		08/11/1992	Hiramatsu	
	P52	5,155,597		10/13/1992	Lareau et al.	
	P53	5,164,825		11/17/1992	Kobayashi et al.	
	P54	5,166,789		11/24/1992	Myrick	
	P55	5,191,174		03/02/1993	Chang et al.	
	P56	5,200,793		04/06/1993	Ulich et al.	
	P57	5,210,586		05/11/1993	Grage et al.	
	P58	5,231,435		07/27/1993	Blakely	
	P59	5,247,356		09/21/1993	Ciampa	
	P60	5,251,037		10/05/1993	Busenberg	
	P61	5,265,173		11/23/1993	Griffin et al.	
	P62	5,267,042		11/30/1993	Tsuchiya et al.	
	P63	5,270,756		12/14/1993	Busenberg	
	P64	5,296,884		03/22/1994	Honda et al.	
	P65	5,335,072		08/02/1994	Tanaka et al.	
	P66	5,342,999		08/30/1994	Frei et al	
	P67	5,345,086		09/06/1994	Bertram	
	P68	5,353,055		10/04/1994	Hiramatsu	
	P69	5,369,443		11/29/1994	Woodham	
	P70	5,402,170		03/28/1995	Parulski et al.	
	P71	5,414,462		05/09/1995	Veatch	
	P72	5,467,271		11/14/1995	Abel et al.	
	P73	5,481,479		01/02/1996	Wight et al.	
	P74	5,486,948		01/23/1996	Imai et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.Z./

	P75	5,506,644		04/09/1996	Suzuki et al.	
	P76	5,508,736		04/16/1996	Cooper	
	P77	5,555,018		09/10/1996	von Braun	
	P78	5,604,534		02/18/1997	Hedges et al.	
	P79	5,617,224		04/01/1997	Ichikawa et al.	
	P80	5,633,946		05/27/1997	Lachinski et al.	
	P81	5,668,593		09/16/1997	Lareau et al.	
	P82	5,677,515		10/14/1997	Selk et al.	
	P83	5,798,786		08/25/1998	Lareau et al.	
	P84	5,835,133		11/10/1998	Moreton et al.	
	P85	5,841,574		11/24/1998	Willey	
	P86	5,844,602		12/01/1998	Lareau et al.	
	P87	5,852,753		12/22/1998	Lo et al.	
	P88	5,894,323		04/01/1999	Kain et al.	
	P89	5,899,945		05/04/1999	Baylocq et al.	
	P90	5,963,664		10/05/1999	Kumar et al.	
	P91	6,037,945		03/14/2000	Loveland	
	P92	6,088,055		07/11/2000	Lareau et al.	
	P93	6,094,215		07/25/2000	Sundahl et al.	
	P94	6,097,854		08/01/2000	Szeliski et al.	
	P95	6,108,032		08/22/2000	Hoagland	
	P96	6,130,705		10/10/2000	Lareau et al.	
	P97	6,157,747		12/05/2000	Szeliski et al.	
	P98	6,167,300		12/26/2000	Cherepenin et al.	
	P99	6,222,583		04/24/2001	Matsumura et al.	
	P100	6,236,886		05/22/2001	Cherepenin et al.	
	P101	6,256,057		07/03/2001	Mathews et al.	
	P102	6,373,522		04/16/2002	Mathews et al.	
	P103	6,434,280		08/13/2002	Peleg et al.	
	P104	6,597,818		07/22/2003	Kumar et al.	
	P105	6,639,596		10/28/2003	Shum et al.	
	P106	6,421,610		07/16/2002	Carroll et al.	
	P107	6,731,329		05/04/2004	Feist et al.	
	P108	6,711,475		03/23/2004	Murphy	
	P109	6,747,686		06/08/2004	Bennett	
	P110	6,810,383		10/23/2004	Loveland	
	P111	6,816,819		11/09/2004	Loveland	
	P112	6,826,539		11/30/2004	Loveland	
	P113	6,829,584		12/07/2004	Loveland	
	P114	6,834,128		12/21/2004	Altunbasak et al.	
	P115	6,876,763		04/05/2005	Sorek et al.	
	P116	7,009,638		03/07/2006	Gruber et al.	
	P117	7,018,050		03/28/2006	Ulichney et al.	
	P118	7,046,401		05/16/2006	Dufaux et al.	
	P119	7,061,650		06/13/2006	Walmsley et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.Z./

	P120	7,065,260		06/20/2006	Zhang et al.	
	P121	7,123,382		10/17/2006	Walmsley et al.	
	P122	7,127,348		10/24/2006	Smitherman et al.	
	P123	7,142,984		11/28/2006	Rahmes et al.	
	P124	7,233,691		06/19/2007	Setterholm	
	P125	7,262,790		08/28/2007	Bakewell	
	P126	7,348,895		03/25/2008	Lagassey	
	P127	8,078,396		12/13/2011	Meadow	
	P128	7,509,241		03/24/2009	Guo	
	P129	7,133,551		11/07/2006	Chen	
	P130	7,728,833		06/01/2010	Verma	
	P131	7,832,267		11/16/2010	Woro	
	P132	7,844,499,		11/30/2010	Yahiro	
	P133	7,184,072		02/27/2007	Loewen et al.	
	P134	8,705,843		04/22/2014	Lieckfeldt, Peter	
	P135	7,424,133		09/09/2008	Schultz et al.	

U. S. PATENT APPLICATION PUBLICATIONS						
Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	PB1	2002/0041328		04/11/2002	LeCompte et al.	
	PB2	2003/0043824		03/06/2003	Remboski et al.	
	PB3	2003/0088362		05/08/2003	Melero et al.	
	PB4	2002/0114536		08/22/2002	Xiong et al.	
	PB5	2003/0214585		11/20/2003	Bakewell	
	PB6	2004/0105090		06/03/2004	Schultz et al.	
	PB7	2005/0169521		08/04/2005	Hel-Or	
	PB8	2005/0073241		04/07/2005	Yamauchi et al.	
	PB9	2005/088251		04/28/2005	Matsumoto	
	PB10	2006/0028550		02/09/2006	Palmer et al.	
	PB11	2006/0238383		10/26/2006	Kimchi et al.	
	PB12	2006/0250515		11/09/2006	Koseki et al.	
	PB13	2006/0092043		05/04/2006	Lagassey	
	PB14	2007/0024612		02/01/2007	Balfour	
	PB15	2007/0046448		03/01/2007	Smitherman	
	PB16	2008/0123994		05/29/2008	Schultz et al.	
	PB17	2002/0041717		04/11/2002	Murata et al.	
	PB18	2003/0014224		01/16/2003	Guo et al.	
	PB19	2004/0167709		08/26/2004	Smitherman et al.	
	PB20	2008/0120031		05/22/2008	Rosenfeld et al.	
	PB21	2007/0237420		10/11/2007	Steedly et al.	
	PB22	2004/0105090		06/03/2004	Schultz et al.	
	PB23	2009/0177458		07/09/2009	Hochart et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.Z./

	PB24	2009/0304227		12/10/2009	Kennedy et al.	
	PB25	2009/0208095		08/20/2009	Zebedin	
	PB26	2011/0033110		02/10/2011	Shimamura et al.	
	PB27	2010/0296693		11/25/2010	Thornberry et al.	
	PB28	2006/0036513		02/16/2006	Whatley et al.	
	PB29	2009/0259568		10/15/2009	LEE CHUN KYOUNG	

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	County code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	T[5]
	F1	WO99/18732	WO		04/15/1999	Ciampa	
	F2	WO/2000/053090	WO		09/14/2000	Cherepenin et al.	
	F3	CA2402234	CA		09/14/2000	Cherepenin et al.	
	F4	EP1180967	EP		02/27/2002	Cherepenin et al.	
	F5	DE60017384T	DE		03/02/2006	Cherepenin et al.	
	F6	2003/317089A	JP		11/07/2003	Dainippon Printing Co., Ltd.	
	F7	WO/2004/044692	WO		05/27/2004	Schultz et al.	
/M.Z./	F8	EP1418402	EP		05/12/2004	Schultz et al.	
	F9	CN 1735897A	CN		02/15/ 2006	Schultz et al.	
	F10	BR0316110	BR		09/27/2005	Schultz et al.	
	F11	EP1696204	EP		08/30/2006	Schultz et al.	
	F12	CA 2,505,566	CA		05/27/2004	Schultz et al.	
	F13	MXPA05004987	MX		02/17/2006	Schultz et al.	
	F14	AT331204T	AT		07/15/2006	Schultz et al.	
/M.Z./	F15	DK1418402T	DK		10/23/2006	Schultz et al.	
	F16	DE60306301T	DE		11/16/2006	Schultz et al.	
/M.Z./	F17	ES2266704T	ES		03/01/2007	Schultz et al.	
	F18	WO/2008/028040	WO		03/06/2008	Schultz et al.	
	F19	WO/2005/088251	WO		09/22/2005	McCleese	
	F20	EP1010966	EP		02/12/1999	Aerowest GmbH	
	F21	JP 2002-123589 A	JP		04/26/2002	Dainippon Printing Co., Ltd.	
	F22	JP 2001-306667 A	JP		11/02/2001	OSHIMA KENJI	
	F23	JP 2006-031087 A	JP		02/02/2006	NEC Corp.	

NON-PATENT LITERATURE DOCUMENTS

Examiner Initial*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	NPL1	ACKERMANN, Prospects of Kinematic GPS Aerial Triangulation, ITC Journal, 1992.	
	NPL2	CIAMPA, John A., "Pictometry Digital Video Mapping", SPIE, Vol. 2598, pp. 140-148, 1995.	
	NPL3	CIAMPA, J. A., Oversee, Presented at Reconstruction After Urban earthquakes, Buffalo, NY, 1989.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.Z./

	NPL4	DUNFORD et al., Remote Sensing for Rural Development Planning in Africa, The Journal for the International Institute for Aerial Survey and Earth Sciences, 2:99-108, 1983.	
	NPL5	GAGNON, P.A., AGNARD, J. P., NOLETTE, C., & BOULIANNE, M., "A Micro-Computer based General Photogrammetric System", Photogrammetric Engineering and Remote Sensing, Vol. 56, No. 5., pp. 623-625, 1990.	
	NPL6	KONECNY, G., "Issues of Digital Mapping", Leibniz University Hannover, Germany, GIS Ostrava 2008, Ostrava 27. - 30.1.2008, pp. 1-8.	
	NPL7	KONECNY, G., "Analytical Aerial Triangulation with Convergent Photography", Department of Surveying Engineering, University of New Brunswick, pp. 37-57, 1966.	
	NPL8	KONECNY, G., "Interior Orientation and Convergent Photography", Photogrammetric Engineering, pp. 625-634, 1965.	
	NPL9	GRAHAM, Lee A., "Airborne Video for Near-Real-Time Vegetation Mapping", Journal of Forestry, 8:28-32, 1993.	
	NPL10	GRAHAM, Horita TRG-50 SMPTE Time-Code Reader, Generator, Window Inserter, 1990.	
	NPL11	HESS, L.L, et al., "Geocoded Digital Videography for Validation of Land Cover Mapping in the Amazon Basin", International Journal of Remote Sensing, Vol. 23, No. 7, pp. 1527-1555, 2002.	
	NPL12	HINTHORNE, J., et al., "Image Processing in The Grass GIS", Geoscience and Remote Sensing Symposium, 4:2227-2229, 1991.	
	NPL13	IMHOF, Ralph K., "Mapping from Oblique Photographs", Manual of Photogrammetry, Chapter 18, 1966.	
	NPL14	JENSEN, John R., "Introductory Digital Image Processing: A Remote Sensing Perspective, Prentice-Hall, 1986; 399 pages.	
	NPL15	LAPINE, Lewis A., "Practical Photogrammetric Control by Kinematic GPS", GPS World, 1(3):44-49, 1990.	
	NPL16	LAPINE, Lewis A., "Airborne Kinematic GPS Positioning for Photogrammetry - The Determination of the Camera Exposure Station, Silver Spring, MD, 11 pages, at least as early as 2000.	
	NPL17	LINDEN et al., Airborne Video Automated Processing, US Forest Service Internal report, Fort Collins, CO, 1993.	
	NPL18	MYHRE, Dick, "Airborne Video System Users Guide", USDA Forest Service, Forest Pest Management Applications Group, published by Management Assistance Corporation of America, 6 pages, 1992.	
	NPL19	MYHRE et al., "An Airborne Video System Developed Within Forest Pest Management - Status and Activities", 10 pages, 1992.	
	NPL20	MYHRE et al., "Airborne Videography - A Potential Tool for Resource Managers"- Proceedings: Resource Technology 90, 2nd International Symposium on Advanced Technology in Natural Resource Management, 5 pages, 1990.	
	NPL21	MYHRE et al., Aerial Photography for Forest Pest Management, Proceedings of Second Forest Service Remote Sensing Applications Conference, Slidell, Louisiana, 153-162, 1988.	
	NPL22	MYHRE et al., "Airborne Video Technology", Forest Pest Management/Methods Application Group, Fort Collins, CO, pp. 1-6, at least as early as July 30, 2006.	
	NPL23	NORTON-GRIFFITHS et al., 1982. "Sample surveys from light aircraft combining visual observations and very large scale color photography". University of Arizona Remote Sensing Newsletter 82-2:1-4.	
	NPL24	NORTON-GRIFFITHS et al., "Aerial Point Sampling for Land Use Surveys", Journal of Biogeography, 15:149-156, 1988.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.Z./

	NPL25	NOVAK, Rectification of Digital Imagery, Photogrammetric Engineering and Remote Sensing, 339-344, 1992.	
	NPL26	SLAYMAKER, Dana M., "Point Sampling Surveys with GPS-logged Aerial Videography", Gap Bulletin number 5, University of Idaho, http://www.gap.uidaho.edu/Bulletins/5/PSSwGPS.html, 1996.	
	NPL27	SLAYMAKER, et al., "Madagascar Protected Areas Mapped with GPS-logged Aerial Video and 35mm Air Photos", Earth Observation magazine, Volume 9, Number 1, http://www.eomonline.com/Common/Archives/2000jan/00jan_tableofcontents.html, pp. 1-4, 2000.	
	NPL28	SLAYMAKER, et al., "Cost-effective Determination of Biomass from Aerial Images", Lecture Notes In Computer Science, 1737:67-76, http://portal.acm.org/citation.cfm?id=648004.743267&coll=GUIDE&dl=, 1999.	
	NPL29	SLAYMAKER, et al., "A System for Real-time Generation of Geo-referenced Terrain Models", 4232A-08, SPIE Enabling Technologies for Law Enforcement Boston, MA, ftp://vis-ftp.cs.umass.edu/Papers/schultz/spie2000.pdf, 2000.	
	NPL30	SLAYMAKER, ET AL.," Integrating Small Format Aerial Photography, Videography, and a Laser Profiler for Environmental Monitoring", In ISPRS WG III/1 Workshop on Integrated Sensor Calibration and Orientation, Portland, Maine, 1999.	
	NPL31	SLAYMAKER, ET AL., "Calculating Forest Biomass With Small Format Aerial Photography, Videography And A Profiling Laser", In Proceedings of the 17th Biennial Workshop on Color Photography and Videography in Resource Assessment, Reno, NV, 1999.	
	NPL32	SLAYMAKER et al., Mapping Deciduous Forests in Southern New England using Aerial Videography and Hyperclustered Multi-Temporal Landsat TM Imagery, Department of Forestry and Wildlife Management, University of Massachusetts, 1996.	
	NPL33	STAR et al., "Geographic Information Systems an Introduction", Prentice-Hall, 1990.	
	NPL34	TOMASI et al., "Shape and Motion from Image Streams: a Factorization Method" - Full Report on the Orthographic Case, pp. 9795-9802, 1992.	
	NPL35	WARREN, Fire Mapping with the Fire Mousetrap, Aviation and Fire Management, Advanced Electronics System Development Group, USDA Forest Service, 1986.	
	NPL36	WELCH, R., "Desktop Mapping with Personal Computers", Photogrammetric Engineering and Remote Sensing, 1651-1662, 1989.	
	NPL37	WESTERVELT, James, "Introduction to GRASS 4", pp. 1-25, 1991.	
	NPL38	"RGB Spectrum Videographics Report, Vol. 4, No. 1, McDonnell Douglas Integrates RGB Spectrum Systems in Helicopter Simulators", pp. 1-6, 1995.	
	NPL39	RGB "Computer Wall", RGB Spectrum, 4 pages, 1995.	
	NPL40	"The First Scan Converter with Digital Video Output", Introducing...The RGB/Videolink 1700D-1, RGB Spectrum, 2 pages, 1995.	
	NPL41	ERDAS Field Guide, Version 7.4, A Manual for a commercial image processing system, 1990.	
	NPL42	"Image Measurement and Aerial Photography", Magazine for all branches of Photogrammetry and its fringe areas, Organ of the German Photogrammetry Association, Berlin-Wilmersdorf, No 1, 1958.	
	NPL43	"Airvideo Analysis", MicroImages, Inc., Lincoln, NE, 1 page, December 1992.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.Z./

	NPL44	ZHU, ZHIGANG, HANSON, ALLEN R., "Mosaic-Based 3D Scene Representation and Rendering", Image Processing, 2005, ICIP 2005, IEEE International Conference on 1(2005).	
	NPL45	MOSTAFA, et al., "Direct Positioning and Orientation Systems How do they Work? What is the Attainable Accuracy?", Proceeding, American Society of Photogrammetry and Remote Sensing Annual Meeting, St. Louis, MO, April 24-27, 2001.	
	NPL46	"POS AV" georeferenced by APPLANIX aided inertial technology, http://www.applanix.com/products/posav_index.php	
	NPL47	MOSTAFA, et al., "Ground Accuracy from Directly Georeferenced Imagery", Published in GIM International Vol. 14 N. 12 December 2000.	
	NPL48	MOSTAFA, et al., "Airborne Direct Georeferencing of Frame Imagery: An Error Budget", The 3rd International Symposium on Mobile Mapping Technology, Cairo, Egypt, January 3-5, 2001.	
	NPL49	MOSTAFA, M.R. and HUTTON, J., "Airborne Kinematic Positioning and Attitude Determination Without Base Stations", Proceedings, International Symposium on Kinematic Systems in Geodesy, Geomatics, and Navigation (KIS 2001) Banff, Alberta, Canada, June 4-8, 2001.	
	NPL50	MOSTAFA, et al., "Airborne DGPS Without Dedicated Base Stations for Mapping Applications", Proceedings of ION-GPS 2001, Salt Lake City, Utah, USA, September 11-14.	
	NPL51	MOSTAFA, "ISAT Direct Exterior Orientation QA/QC Strategy Using POS Data", Proceedings of OEEPE Workshop: Integrated Sensor Orientation, Hanover, Germany, September 17-18, 2001.	
	NPL52	MOSTAFA, "Camera/IMU Boresight Calibration: New Advances and Performance Analysis", Proceedings of the ASPRS Annual Meeting, Washington, D.C., April 21-26, 2002.	
	NPL53	HIATT, "Sensor Integration Aids Mapping at Ground Zero", Photogrammetric Engineering and Remote Sensing, September 2002, Page 877-878.	
	NPL54	MOSTAFA, "Precision Aircraft GPS Positioning Using CORS", Photogrammetric Engineering and Remote Sensing, November 2002, Page 1125-1126.	
	NPL55	MOSTAFA, et al., "System Performance Analysis of INS/DGPS Integrated System for Mobile Mapping System (MMS), Department of Geomatics Engineering, University of Calgary, Commission VI, WG VI/4, March 2004.	
	NPL56	ARTES F., & HUTTON, J., "GPS and Inertial Navigation Delivering", September 2005, GEOconnexion International Magazine, Page 52-53, September 2005.	
	NPL57	"POS AV" APPLANIX, Product Outline, airborne@applanix.com, 3 pages, March 28, 2007.	
	NPL58	POSTrack, "Factsheet", APPLANIX, Ontario, Canada, www.applanix.com, March 2007.	
	NPL59	POS AV "Digital Frame Camera Applications", 3001 Inc., Brochure, 2007.	
	NPL60	POS AV "Digital Scanner Applications", Earthdata Brochure, March 2007.	
	NPL61	POS AV "Film Camera Applications" AeroMap Brochure, March 2007.	
	NPL62	POS AV "LIDAR Applications" MD Atlantic Brochure, March 2007.	
	NPL63	POS AV "OEM System Specifications", 2005	
	NPL64	POS AV "Synthetic Aperture Radar Applications", Overview, Orbisat Brochure, March 2007.	
	NPL65	"POSTrack V5 Specifications" 2005	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.Z./

	NPL66	"Remote Sensing for Resource Inventory Planning and Monitoring", Proceeding of the Second Forest Service Remote Sensing Applications Conference - Slidell, Louisiana and NSTL, Mississippi, April 11-15, 1988.	
	NPL67	"Protecting Natural Resources with Remote Sensing", Proceeding of the Third Forest Service Remote Sensing Applications Conference - April 9-13, 1990.	
	NPL68	HEIPKE, et al, "Test Goals and Test Set Up for the OEEPE Test - Integrated Sensor Orientation", 1999.	
	NPL69	KUMAR, et al., "Registration of Video to Georeferenced Imagery", Sarnoff Corporation, CN5300, Princeton, NJ, 1998.	
	NPL70	McCONNEL, "Proceedings Aerial Pest Detection and Monitoring Workshop – 1994.pdf, USDA Forest Service Forest Pest Management, Northern Region, Intermountain region, Forest Insects and Diseases, Pacific Northwest Region.	
	NPL71	"Standards for Digital Orthophotos ", National Mapping Program Technical Instructions, US Department of the Interior, 12/1996	
	NPL72	TAO, "Mobile Mapping Technology for Road Network Data Acquisition", Journal of Geospatial Engineering, Vol. 2, No. 2, pp. 1-13, 2000.	
	NPL73	"Mobile Mapping Systems Lesson 4", Lesson 4 SURE 382 Geographic Information Systems II, pp. 1-29, July 2, 2006.	
	NPL74	KONECNY, G., "Mechanische Radialtriangulation mit Konvergentaufnahmen", BILDMESSUNG und LUFTBILDWESEN, 1958, Nr. 1.	
	NPL75	MYHRE, "ASPRS/ACSM/RT 92" Technical papers, Washington, D.C., Vol. 5 Resource Technology 92, August 3-8, 1992.	
	NPL76	RATTIGAN, "Towns get new view from above," *The Boston Globe,* Sept. 5, 2002.	
	NPL77	MOSTAFA, *et al.,* "Digital image georeferencing from a multiple camera system by GPS/INS," *ISP RS Journal of Photogrammetry & Remote Sensing,* 56(I): I -12, June 2001.	
	NPL78	DILLOW, "Grin, or bare it, for aerial shot," *Orange County Register* (California), Feb. 25, 200I.	
	NPL79	ANONYMOUS, "Live automatic coordinates for aerial images," *Advanced Imaging,* 12(6):51, June 1997.	
	NPL80	ANONYMOUS, "Pictometry and US Geological Survey announce - Cooperative Research and Development Agreement," Press Release published October 20, 1999.	
	NPL81	MILLER, "Digital software gives small Arlington the Big Picture," *Government Computer NewsState & Local,* 7(12), December 2001.	
	NPL82	GARRETT, "Pictometry: Aerial photography on steroids," *Law Enforcement Technology* 29(7):114-116, July 2002.	
	NPL83	WEAVER, "County gets an eyeful," *The Post-Standard* (Syracuse, NY), May 18, 2002.	
	NPL84	REED, "Firm gets latitude to map O.C. in 3D," *Orange County Register* (California), September 27, 2000.	
	NPL85	REYES, "Orange County freezes ambitious aerial photography project," *Los Angeles Times,* October 16, 2000.	
	NPL86	Aerowest Pricelist of Geodata as of October 21, 2005 and translations to English 3 pages.	
	NPL87	www.archive.org Web site showing archive of German AeroDach Web Site http://www.aerodach.de from June 13, 2004 (retrieved September 20, 2012) and translations to English 4 pages.	
	NPL88	"AeroDach®Online Roof Evaluation Standard Delivery Format and 3D Data File: Document Version 01.00.2002 with publication in 2002, 13 pages.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.Z./

	NPL89	Noronha et al., "Detection and Modeling of Building from Multiple Aerial Images, " Institute for Robotics and Intelligent Systems, University of Southern California, November 27, 2001, 32 pages.	
	NPL90	Applicad Reports dated 11/25/1999 – 03/09/2005, 50 pages.	
/M.Z./	~~NPL91~~	~~Applicad Online Product Bulletin archive from 01/07/2003, 4 pages.~~	
	NPL92	Applicad Sorcerer Guide, Version 3, 09/08/1999, 142 pages.	
	NPL93	Xactimate Claims Estimating Software archive from 02/12/2010, 8 pages.	
	NPL94	BIGNONE et al, Automatic Extraction of Generic House Roofs from High Resolution Aerial Imagery, Communication Technology Laboratory, Swiss Federal Institute of Technology ETH, CH-8092 Zurich, Switzerland, 12 pages, 1996.	
	NPL95	Geospan 2007 Job proposal.	
	NPL96	GREENING et al., Commercial Applications of GPS-Assisted Photogrammetry, Presented at GIS/LIS Annual Conference and Exposition, Phoenix, AZ, October 1994	
	NPL97	Korean Intellectual Property Office, International Search Report and Written Opinion, Mail Date 07/10/2013.	

EXAMINER SIGNATURE			
Examiner Signature	/Matthew Zimmerman/ (11/20/2014)	Date Considered	11/20/2014

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.Z./

Calculator.net

Like 32 +1 4 Tweet 2

Financial Calculators
Weight Loss Calculators
Math Calculators
Pregnancy Calculators
Other Calculators
- Love Calculator
- Gas Mileage Calculator
- Mileage Calculator
- Conversion Calculator
- GPA Calculator
- Time Zone Calculator
- Height Calculator
- GDP Calculator
- Concrete Calculator
- Marriage Calculator
- Age Calculator

Calculators for Your Site

Search

Roofing Estimates
Find Five-Star Rated Roofing Pros Backed by Our Service

Roofing Calculator

Use the following tools to estimate the area and the materials needed for the root. The "House Base Area" is the area of the land the house covers. When measuring, be sure to include the eaves covered areas. Our area calculator can be used to estimate the area coverage of the house. If the house is irregular in shape, you can divide the house covered area into a few simple shapes and add their area together. The roof pitch defines the steepness of the root. It can be measured or can be estimated via by comparing your roof with our images.

Roofing Area Calculator

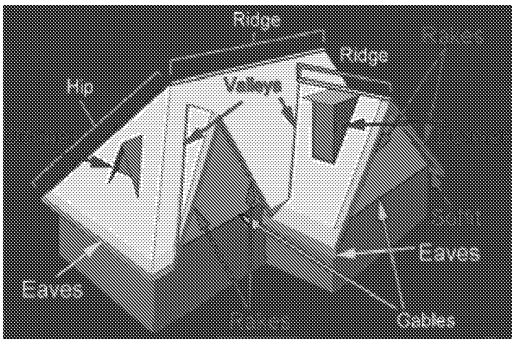
House Base Area [ ] square foot
Roof Pitch 1/12 ? 2
Calculate

Roofing Material Calculator

Roof Area [ ] square foot
Calculate

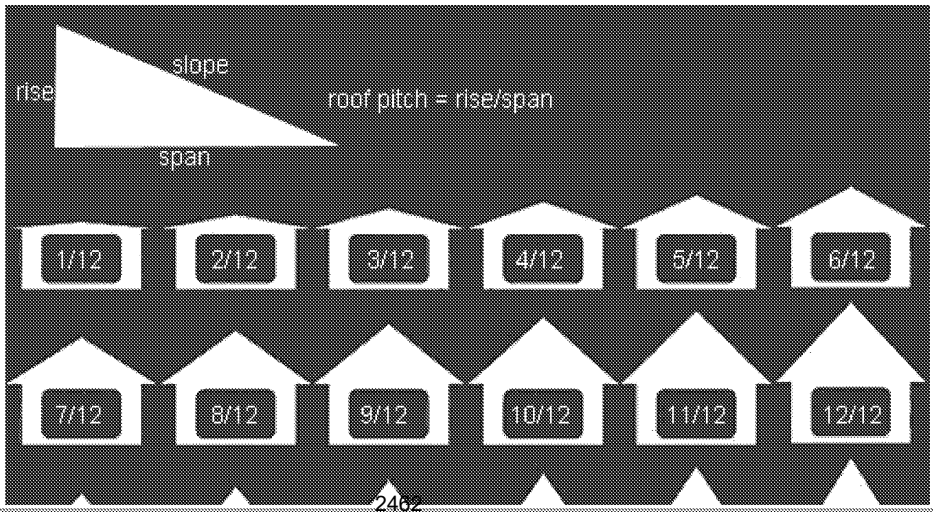
References:

The area we give out is estimation only. If the roof of your house has complex shape like the one in the right, the most accurate way is to measure all the dimensions and add the areas of all surfaces. You can use our area calculator to calculate the area of each surface. The most common roof materials in the United States are shingles, membrane roofing, ceramic tile, etc. Typically shingle roofs have a life expectancy of 15 to 30 year. Membrane roofing normally can last 5-15 years. Ceramic tile roof is expensive, yet it has a life of more than 100 years.



Roof Pitch

By definition, the roof pitch is the vertical rise divided by the horizontal span.



Calculator.net

Like 32 +1 4 Tweet 2

Financial Calculators
Weight Loss Calculators
Math Calculators
Pregnancy Calculators
Other Calculators
- Love Calculator
- Gas Mileage Calculator
- Mileage Calculator
- Conversion Calculator
- GPA Calculator
- Time Zone Calculator
- Height Calculator
- GDP Calculator
- Concrete Calculator
- Marriage Calculator
- Age Calculator

Calculators for Your Site

Search

Home / Other Calculators / Roofing Calculator

Roofing Calculator

Use the following tools to estimate the area and the materials needed for the root. The "House Base Area" is the area of the land the house covers. When measuring, be sure to include the eaves covered areas. Our area calculator can be used to estimate the area coverage of the house. If the house is irregular in shape, you can divide the house covered area into a few simple shapes and add their area together. The roof pitch defines the steepness of the root. It can be measured or can be estimated via by comparing your roof with our images.

Roofing Area Calculator

House Base Area [ ] square foot

Roof Pitch 1/12 ?

Calculate

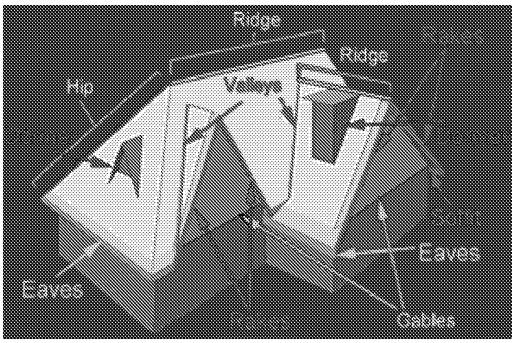
Roofing Material Calculator

Roof Area [ ] square foot

Calculate

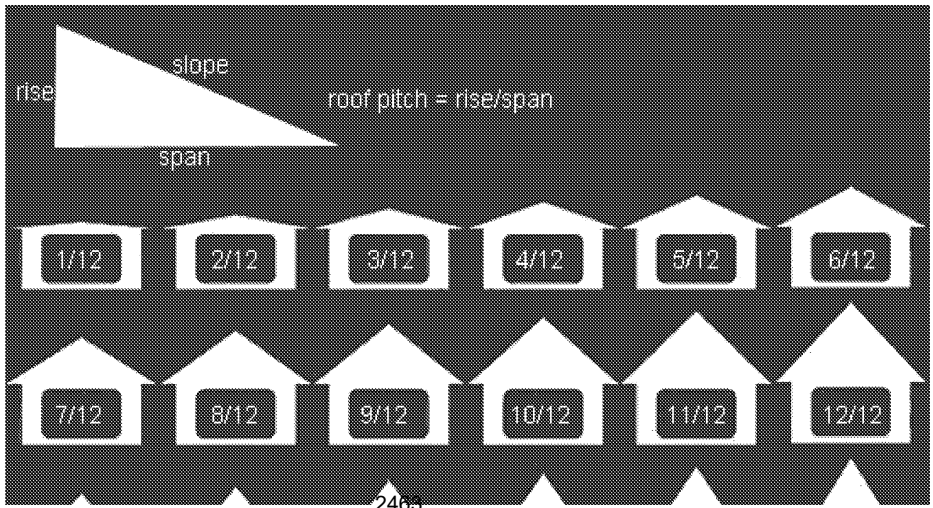
References:

The area we give out is estimation only. If the roof of your house has complex shape like the one in the right, the most accurate way is to measure all the dimensions and add the areas of all surfaces. You can use our area calculator to calculate the area of each surface. The most common roof materials in the United States are shingles, membrane roofing, ceramic tile, etc. Typically shingle roofs have a life expectancy of 15 to 30 year. Membrane roofing normally can last 5-15 years. Ceramic tile roof is expensive, yet it has a life of more than 100 years.



Roof Pitch

By definition, the roof pitch is the vertical rise divided by the horizontal span.



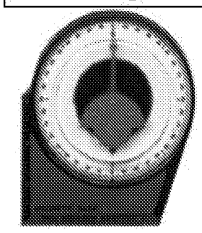
Roofing Estimates
Find Five-Star Rated Roofing Pros Backed by Our Service
JOIN
FEE-F
CHECKING
AND G
$50 BO
• No fees & no
• Access to ove
free Allpoint®
• Mobile check
with CheckMa
LEARN M
CapitalO

Roof Calculator Software

Instant Roof Prices for Comp Shingles, Shakes, Tile, Metal and all others !

Work and play with Intel Inside ®
ThinkPad T540p
Intel® Core™ i5 processor
lenovo FOR THOSE WHO DO.
SHOP NOW

Pitch and angle finder



Read more..

Tweet

Roof Pitch, how much to add

lenovo FOR THOSE WHO DO.
Lenovo Y40 Laptop
Intel® Core™ i7 processor
14" 5.50 lbs+
SHOP NOW
Work and play with Intel Inside ®

This roof pitch table displays a multiplier for adding for different roof pitches

How to find your roof pitch

If you know the pitch of a roof, you can use the numbers in the following pitch table to do the following:

Determine how many square feet of roof area a building has by measuring from the ground.

Determine how many square feet of roof area a building has by measuring blueprints or plans.

This Roof Pitch Chart will give you your multiplier

Or just enter your numbers into this Roof Pitch Calculator

Roof Pitch	Roof Pitch Multiplier
2/12	1.01
3/12	1.03
4/12	1.05
5/12	1.08
6/12	1.12
7/12	1.16
8/12	1.20
9/12	1.25
10/12	1.30
12/12	1.41
14/12	1.54
16/12	1.67
18/12	1.80
20/12	1.94
22/12	2.09
24/12	2.24

Example:

Roof is 6/12 pitch and measures at 2,400 square feet

CHOOSE ANY INTERNET
THEN ADD PHONE + TV
JUST $34.90 more a month
GET IT NOW
(888) 250 3918
COMCAST BUSINESS B2B BUILT FOR BUSINESS

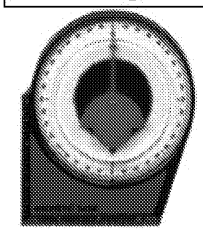
Roof Calculator Software

Instant Roof Prices for Comp Shingles, Shakes, Tile, Metal and all others !

Edit in JS Bin

BuildDirect
CERAMIC & PORCELAIN TILE
FROM $0.99/sq ft
SHOP NOW

Pitch and angle finder



Read more..

Tweet

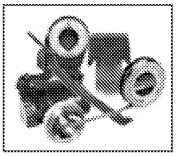
Roof Pitch Calculator

Roofing Prices fast !

Roof Pricing
Downloads
About RoofCalcWriter
Buy
Sample estimate sheet
$PerSquare Worksheet
RoofCalculator Faq
Site Map

Roofing Tips How-to's
Determine pitch
Measure a roof
Measure roof plans
Roof measuring tips
Plan measuring tips
Roofing Tools
Roofing books
Roofing Tarps
Roof design
Material selection guide
Pitch-degrees equivalents
Amount to add for pitch
More tips HowTos

Popular Roof Materials
This article covers the positive and negative features of the following roofing materials.
- Composition Shingles
- Wood shakes
- Clay Tile
- Slate
- Concrete Tile
- Metal
- Hot Mop



Roofing Tools here

Roof Pitch Calculator Why ?
(Also referred to as roof slope or roof angle)
Adding for roof pitch is needed if you are measuring your roof from the ground or measuring roof blueprints

You can determine how many squares you will need by the square footage of floor plans by adding overhangs,and porches (single stories only, no basements) Although this method is not real accurate

Determine how much roofing you need by using this pitch calculator in 2 easy steps
1. Enter your roofing square feet
2. Select your roof pitch

(Valid entries 100 to 90,000)

Input roof measurements

* Required

Select Your Roof Pitch

Select Pitch

* Required

Select Pitch

Reset

Multiplier	Feet added for pitch	Total	Total Squares
Na	Na	Na	Na

Example:
Your roof area is 3500 sq feet Your Roof Pitch is 6/12 pitch
Your Output
Multiplier 0.12
Feet added for pitch = Multiplier x 3500 = 420 sq feet
Total = 3500 + 20 = 3920
Total Squares = 3920 / 100 = 339.20 squares

Free Conversion Calculator
Calculators: Different Calculators For Every Situation - Free!

Roof Pitch Related
How to determine roof pitch
Roof Pitch Visual Examples
Roof Pitch Degrees°

Roofing Calculator

RoofCalc.org - Estimate Your Re-Roof Costs

Download from the App Store FREE
Android Market FREE

Roof Pitch Calculator



The Roof Pitch Calculator tools below will help you calculate the slope from every possible angle. Each tool performs a specific operation that involves measuring and calculating the slope.

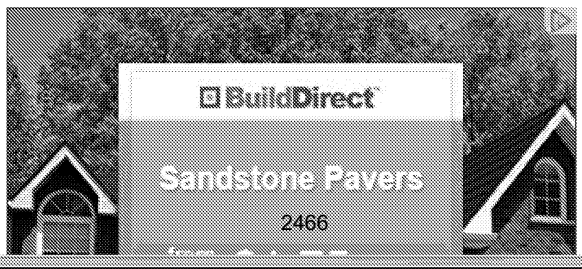
Using this Pitch Calculator(s), you can calculate slope, area, rafter length and other dimensions, and convert Pitch to Degrees (at the bottom). We will explain how to measure roof pitch, using simple tools.

1) Calculate Slope based on Rafters Length:

Roof Span:	24	ft.	0	in.
Roof Rise:	8	ft.	0	in.

Calculate

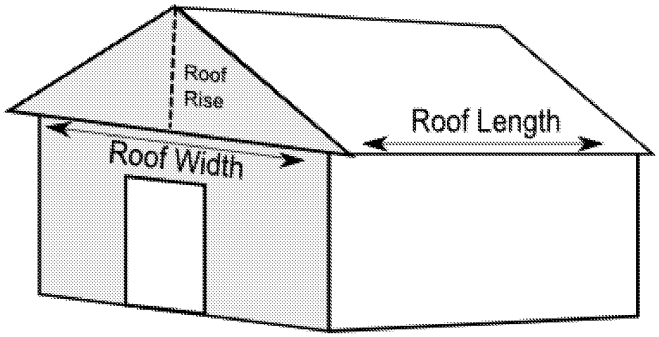
Roof Pitch = / 12"



How to use Roof Pitch Calculator:

To estimate roof area, enter width and length (as shown in the measuring diagram below), and either Rise or Pitch – second value will auto-calculate. Click calculate. The results will pop below the calculate button, and will include: Rafter Length, Total Size / Area, and Pitch.

The approximate roof replacement prices above are calculated assuming removal of 1 layer of old shingles, 1 chimney flashing, ridge vent and Ice & Water Shield installation, for both 30 years shingles, and metal roof options. If you want a more accurate price estimate, use our cost estimator tool



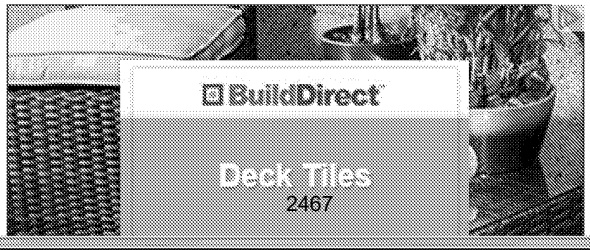
Using the diagram below, measure your roof from the ground, and enter building dimensions into the calculator #2 above. Enter the span (also known as gable side width), and the rise above the base line.

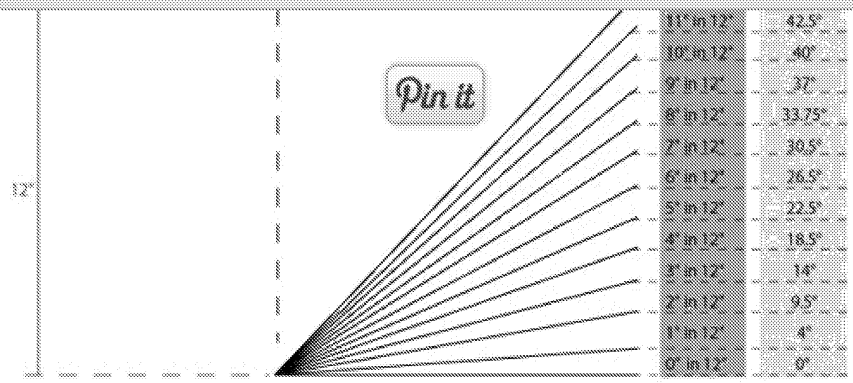
To calculate your pitch and size, measure your roof and plug in your measurements in accordance with the diagram below. Enter EITHER Roof Rise or Roof Pitch.

2) Pitch to Angle (Degrees) Calculator – enter pitch in the first box – calculation is automatic.

Enter Roof Pitch: [ ] / 12"

Results: degrees angle





Related article:

Asphalt Shingles Calculator – estimate cost of materials, using our tool here.

How Much Does a New Roof Cost?
Get Instant Price Quote

Roof Size: 1500 Sq. Ft.
Roofing Material: Asphalt Shingles
Remove Old Roof: YES - 1 layer
Your Budget: Economy
US Region: National Average

GET ROOF QUOTE

Written by: Alex – the Roofing Wiz

Alex is passionate about Green Building, Metal Roofing, and Loves Ballroom Dancing!

→ Join Alex on Google+

Share RoofCalc.org with Friends!

estimate roof area from "average pitch"

+Matt

Web Shopping Videos News Images More Search tools

About 8,350 results (0.60 seconds)

Patent WO2013142406A1 - Method and system for quick ...
www.google.com/patents/WO2013142406A1?cl=en Google
Sep 26, 2013 - The set of instructions of claim 10, wherein each pitch value is associated with an **estimated** percentage of **roof area** to provide an **average pitch** ...

Statistics can save you money: Estimates, areas, and ...
blogs.sas.com › SAS Blogs Home › The DO Loop
Nov 4, 2010 - You can compute the **area** of **roof** by knowing the square footage of the ... What happens if I use the **average pitch** to compute the multiplier?

How to Calculate the Unit Replacement Cost of Roofing ...
www.ehow.com › Home & Garden
The **average pitch** multiplier for a low-sloping **roof** is 1.15 to 1.25; for a ... in your **area** or visit local home improvement outlets to **calculate** the price of the material ...

United States solar PV roof policy method - Appropedia: The ...
www.appropedia.org/United_States_solar_PV_**roof**_policy_method
Mar 4, 2014 - A method needs to be determined to **estimate** the potential **roof** square footage ... I'm going to use 1.5 so that the eventual usable **roof area** is not inflated. ... Additionally, the **average pitch** is 4/12, the industry standard and I will ...

Roof Replacement costs in CT - ballpark? (Fairfield, Stratford ...
www.city-data.com › ... › US Forums › Connecticut City-Data
Apr 5, 2011 - 10 posts - 9 authors
I'm trying to get a ballpark **figure** for getting **roof** replaced for a 2 story 2100 ... ft) cape with **average pitch**...so If I am **calculating** this correctly, it would be 1/2 my .... Looking for someone to fix the **area** over my kitchen, and also ...

FAQ - Newsome Roofing
www.newsome**roofing**.com/FAQ.html
Prices vary depending on manufacturer, **length** of warranty, and type of shingle. What types of ... A house with average size, **average pitch** and few complexities can be done in 1-2 days. A house ... What is included in an **estimate** for a **roof**?

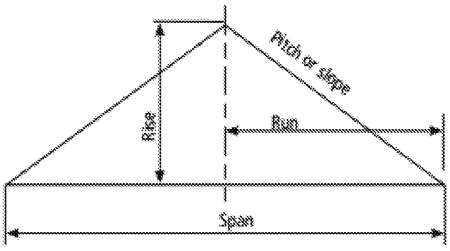
ESTIMATE INSTRUCTIONS - Peterson Roofing
www.peterson**roofing**.com/instruction.html
ESTIMATE INSTRUCTIONS. 1.) Square ... Just **figure** the **length** of the room by the width. Do not count ... If your **roof** is multi-pitch just enter an **average pitch**. 4.

How to Calculate the Unit Replacement Cost of Roofing
gms.or.id › eHow › Home & Garden
The **average pitch** multiplier for a low-sloping **roof** is 1.15 to 1.25; for a ... Call local roofers in your **area** or visit local home improvement outlets to **calculate** the ...

estimate roof area from | EstimatingHowMuchRoof | https://www.google.com
file:///C:/Users/mzimmerman1/Downloads/EstimatingHowMuchRoofingIsRequired-EN-WEB.pdf
Apps

A) Roof Pitch and Slope

Figure 2
Pitch and slope relationships



The degree of incline a roof possesses is usually expressed as its "pitch" or "slope." Pitch is the ratio of the rise of the roof to the span of the roof. (See Figure 2.) Slope is the ratio of rise in inches to horizontal run in feet (run equals half the span). For example, if the span of a roof is 24' and the rise is 8', the pitch is 8/24 or 1/3. Expressed as a slope, the same roof is said to rise 8" per foot of horizontal run [Slope (inches per foot) = Rise (in inches) / Run (in feet)]. If the rise of the same roof span were 6', the pitch would be ¼ and its slope would be 6" per foot of run. Whether a particular roof incline is expressed in pitch or slope, the results of area calculations will be the same.

It is not necessary to go onto a roof to measure pitch or slope. It can be closely approximated from the ground with the aid of a pitch card (available from many manufacturers) or a carpenter's folding rule as follows:

Stand away from the building and form the rule into a triangle with the 6" joint at the apex and the 12" joint at one side of the horizontal base line. Holding the rule at arm's length, line up the sides of the triangle with the roof as shown in Figure 3, being sure to keep the base of the triangle horizontal. Then, with the zero point of the rule aligned with the center of the base, read the intersection of the zero point with the base. In the example shown in Figure 3, this occurs at the 22" mark. Next, locate the "rule reading" in Figure 4 nearest to the one read in the field and directly under it read the pitch and slope of the roof. For the example, the slope as 8" per foot.

Figure 3
Use of carpenter's folding rule to determine pitch and slope

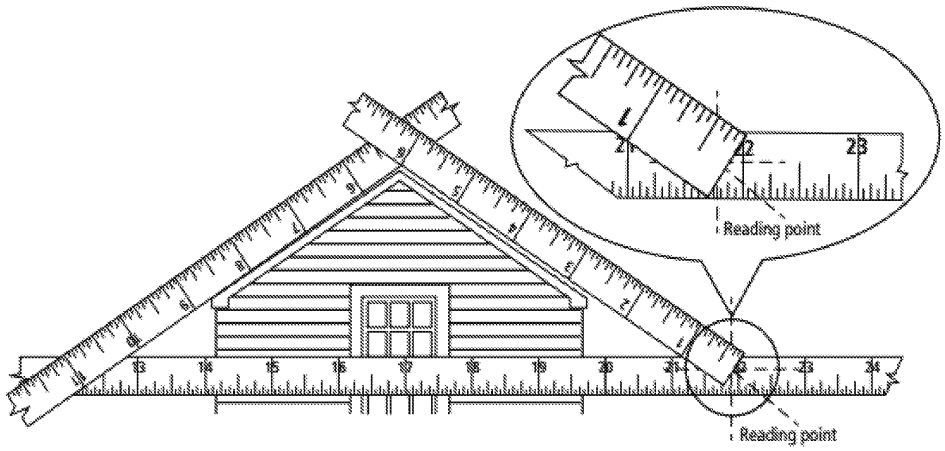
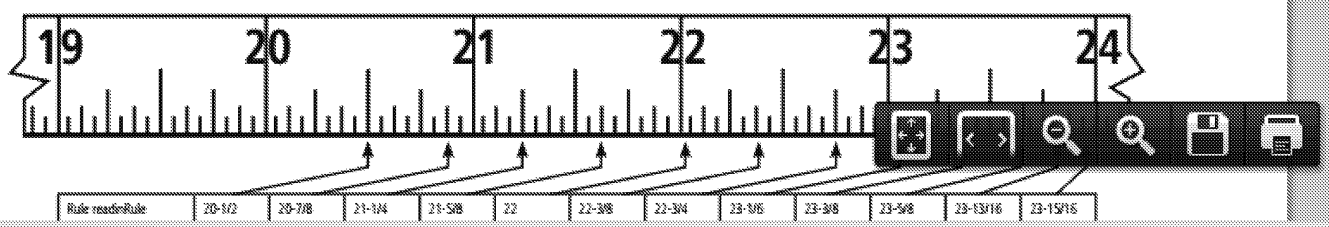


Figure 4
Reading point conversions to pitch and slope



EstimatingHowMuc....pdf
Show all downloads...

estimate roof area from "r ×
Patent WO2013142406A1 ×
www.google.com/patents/WO2013142406A1?cl=en
Apps
Google
+Matt
Patents English French
Find prior art
Discuss this application

Method and system for quick square roof reporting

WO 2013142406 A1

Publication number	WO2013142406 A1
Publication type	Application
Application number	PCT/US2013/032760
Publication date	Sep 26, 2013
Filing date	Mar 18, 2013
Priority date	Mar 19, 2012
Also published as	US20130246204
Inventors	Chris T. THORNBERRY, Dale R. THORNBERRY
Applicant	Pictometry International Corp.
Export Citation	BiBTeX, EndNote, RefMan

Patent Citations (5), Classifications (2), Legal Events (2)

External Links: Patentscope, Espacenet

ABSTRACT

A set of instructions stored on one or more computer readable medium for running on one or more computer systems is described herein. The set of instructions generally may include instructions for identifying a geographic location of a roof, instructions for determining contact information of one or more contractors within a region of interest of the geographic location of the roof, instructions for determining a footprint of the roof, instructions for determining predominant pitch of the roof, and/or instructions for determining an estimated roofing area based on the predominant pitch and the footprint of the roof.

DESCRIPTION (OCR text may contain errors)

Electronically Transmitted: 2013 March 18

A Method and System for Quick Square Roof Reporting Cross-Reference to Related Applications [0001] Not Applicable.

Background

[0002] Residential and/or commercial property owners approaching a major roofing project may be unsure of the amount of material needed and/or the next step in completing the project. Generally, such owners contact one or more contractors for a site visit. Each contractor must physically be present at the site of the structure in order to make a determination on material needs and/or time. The time and energy for providing such an estimate becomes laborious and may be affected by contractor timing, weather, contractor education, and the like. Estimates may be varied even between contractors in determination of estimated square footage causing variance in supply ordering as well. Additionally, measuring an actual roof may be costly and potentially hazardous - especially with steeply pitched roofs. Completion of a proposed roofing project may depend on ease in obtaining a simplified roofing estimate and/or obtaining reputable contractors for the roofing project.

[0003] Images are currently being used to measure objects and structures within the images, as well as to be able to determine geographic locations of points within the image when preparing estimates for a variety of construction projects, such as roadwork, concrete work, and roofing. Estimating construction projects using software may increase speed at which an estimate can be 2471

CLAIMS (OCR text may contain errors)

What is claimed is:

1. A set of instructions stored on one or more computer readable for running on one or more computer systems, comprising:

instructions for identifying a geographic location of a roof;

instructions for determining contact information of one or more cc within a region of interest of the geographic location of the roof; a

instructions for determining a footprint of the roof;

instructions for determining predominant pitch of the roof;

instructions for determining an estimated roofing area based on tl predominant pitch and the footprint of the roof.

2. The set of instructions of claim 1 , further comprising instructio providing a roof report, wherein the roof report includes one or m images of the roof, one or more oblique images of the roof, the e roofing area and contact information of one or more contractor wi region of interest of the geographic location of the roof.

3. The set of instructions of claim 2, wherein the roof report incluc contact information of the customer.

4. The set of instructions of claim 1 , wherein the one or more cor

"Where your satisfaction is taken personally"

PETERSON ROOFING CO.

About Us
Estimates
FAQ's
Products
Gallery
References
Contact Us
Licensing
Insurance
Terminology
Homeowner Site Prep
Services
Our Warranty
Financing
Coupons
Radar

ESTIMATE INSTRUCTIONS

1.) Square footage is the amount of floor space you have under a roof inside or outside of your house. Just figure the length of the room by the width. Do not count multiple floors.

2.) Enter the number of layers you have that need to be removed, or enter 0 if you would like to install a new roof over the existing. Note most cities allow only two layers.

3.) The steepness of the roof is determined by the amount of rise in relation to the amount of run and is expressed in terms as 4/12 pitch, 6/12 pitch etc. Click here to see a diagram to help figure the pitch of your roof. If your roof is multi-pitch just enter an average pitch.

4.) How close can we get a dumpster to the house? On a scale of 1-5 , 1, being very close in the driveway next to the house, 5, being out in the street far from the house. This number indicates the degree of difficulty in cleaning the job-site.

5.)"Starts" are the number of times the shingles will have to be installed on another section of roof that is not in a straight contiguous line with the previous "start". A two sided gable roof with no valleys or dormers has 2 "starts". Click here for help.

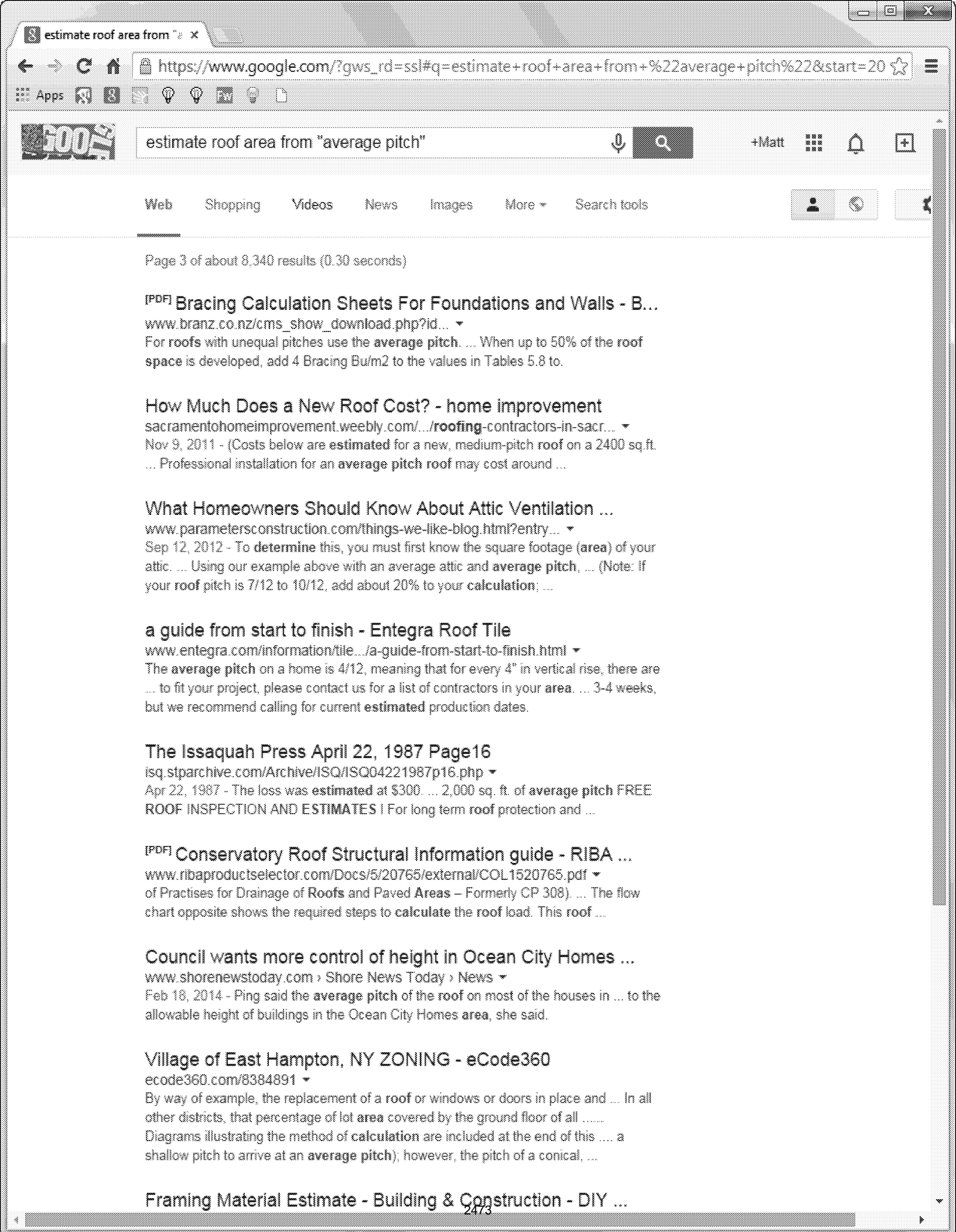
6.) "Duration" architectural shingles are installed on about 95% of the homes we roof. Click here.

7.) Vents are usually installed at a rate of 1 per 300 square feet of attic floor space. Click here for more info on all vent types.

8.) Many older homes have 3/8 inch plywood and really should have all new sheathing installed. Many of the real old homes (80 plus years old) have wood shingles and spaced 1 x 6 deck boards. These homes must have new sheathing installed to span the spaces in the deck boards.

Back to Estimate Page

©2013 Peterson Roofing Co. All rights reserved.


estimate roof area from "a
https://www.google.com/?gws_rd=ssl#q=estimate+roof+area+from+%22average+pitch%22&start=20
Apps
estimate roof area from "average pitch"
+Matt
Web
Shopping
Videos
News
Images
More
Search tools
Page 3 of about 8,340 results (0.30 seconds)
[PDF] Bracing Calculation Sheets For Foundations and Walls - B...
www.branz.co.nz/cms_show_download.php?id...
For roofs with unequal pitches use the average pitch. ... When up to 50% of the roof space is developed, add 4 Bracing Bu/m2 to the values in Tables 5.8 to.
How Much Does a New Roof Cost? - home improvement
sacramentohomeimprovement.weebly.com/.../roofing-contractors-in-sacr...
Nov 9, 2011 - (Costs below are estimated for a new, medium-pitch roof on a 2400 sq.ft. ... Professional installation for an average pitch roof may cost around ...
What Homeowners Should Know About Attic Ventilation ...
www.parametersconstruction.com/things-we-like-blog.html?entry...
Sep 12, 2012 - To determine this, you must first know the square footage (area) of your attic. ... Using our example above with an average attic and average pitch, ... (Note: If your roof pitch is 7/12 to 10/12, add about 20% to your calculation; ...
a guide from start to finish - Entegra Roof Tile
www.entegra.com/information/tile.../a-guide-from-start-to-finish.html
The average pitch on a home is 4/12, meaning that for every 4" in vertical rise, there are ... to fit your project, please contact us for a list of contractors in your area. ... 3-4 weeks, but we recommend calling for current estimated production dates.
The Issaquah Press April 22, 1987 Page16
isq.stparchive.com/Archive/ISQ/ISQ04221987p16.php
Apr 22, 1987 - The loss was estimated at $300. ... 2,000 sq. ft. of average pitch FREE ROOF INSPECTION AND ESTIMATES ! For long term roof protection and ...
[PDF] Conservatory Roof Structural Information guide - RIBA ...
www.ribaproductselector.com/Docs/5/20765/external/COL1520765.pdf
of Practises for Drainage of Roofs and Paved Areas – Formerly CP 308). ... The flow chart opposite shows the required steps to calculate the roof load. This roof ...
Council wants more control of height in Ocean City Homes ...
www.shorenewstoday.com › Shore News Today › News
Feb 18, 2014 - Ping said the average pitch of the roof on most of the houses in ... to the allowable height of buildings in the Ocean City Homes area, she said.
Village of East Hampton, NY ZONING - eCode360
ecode360.com/8384891
By way of example, the replacement of a roof or windows or doors in place and ... In all other districts, that percentage of lot area covered by the ground floor of all ..... Diagrams illustrating the method of calculation are included at the end of this .... a shallow pitch to arrive at an average pitch), however, the pitch of a conical, ...
Framing Material Estimate - Building & Construction - DIY ...
2473

Google estimate roof area from "average pitch"

Scholar About 170 results (0.11 sec) Any time

Rollover far side **roof** strength test and simulation
T Chen, EC Chirwa, M Mao... - International Journal of ..., 2007 - Taylor & Francis
... As a consequence, the **estimate** that 75% of the cases had major damage to the far side of the **roof** is conservative. **...** In this test rig, load normal to the load platen and the rotation angle of the plate are needed to **calculate** the energy **...** **Figure** 28 **Roof** crush simulation model. **...**
Cited by 15 Related articles All 2 versions Cite Save

A model for predicting the potential diffusion of solar energy systems in complex urban environments
M La Gennusa, G Lascari, G Rizzo, G Scaccianoce... - Energy Policy, 2011 - Elsevier
... In order to **calculate** the shadowing factor, the hillshading extension (ArcView® GIS, 1996a and ArcView® GIS, 1996b) is applied to the GRID, that allows to **estimate** the size **...** In the **calculation** of the shadowing factor, all the building coverings of urban layout have been **...**
Cited by 19 Related articles All 9 versions Cite Save

Collyweston Stone Slating Techniques
HB Sharp - Folk life, 1980 - maneyonline.com
... The results bear out the slaters' own **estimates** that: (a) a slater's 'thousand' (= 840 slates), also known as a 'heap', should be **...** ft is **estimated** to weigh II S6lb., orjust over half a ton; reasonably close to the slater's allowance. **...** ft were counted, and near-**estimate** results obtained. **...**
All 3 versions Cite Save

Method and System for Quick Square **Roof** Reporting
CT Thornberry, DR Thornberry - US Patent App. 13/424,054, 2012 - Google Patents
... be able to determine geographic locations of points within the image when preparing **estimates** for a **...** a request for contractor information and/or a bid request for **estimate** costs and **...** The **estimated area** detail 206 may provide the total **estimated roof area** as determined using the **...**
All 2 versions Cite Save

Study on Energy and Stress of Irregular Failure Zone of Upper Layered in Slice Mining
XB Zhang, K Zhou, HT Li, JX Liu... - Advanced Materials ..., 2013 - Trans Tech Publ
... Simulating the site by means of numerical Simulation , the mined-out **area** will be restored. **...** 3 **Roof** Mudstone 35.1 1.5 Low~Mid Level Firmness **...** model According to the above information of Laokengkou coal mine of Maozequ, the basic model was established shown in **Figure** 1. **...**
Related articles Cite Save

[PDF] ... STUDY OF RELATIONSHIP BETWEEN URBAN STRUCTURE AND AMBIENT MICROCLIMATE IN NEW DEVELOPED HOUSING **AREA** IN JOHOR, MALAYSIA utm.my [PDF]
K Saito, I Said, MH Rasidi, M Shinozaki - epublication.fab.utm.my
... it allows us to manage spatial data integrating as a platform whenever **figure** data update is **...** Building Type / Building Shape / Block Density and Ambient Microclimate Continuously, we **calculate** average of **...** Soil (0), Concrete (0.4), Asphalt (0.2) 3) Albedo: Wall (0.25), **Roof** (0.3) 4 **...**
Cited by 1 Related articles Cite Save More

ALLDRITT googleapis.com [PDF]
LL Alldritt - US Patent 3,101,662, 1963 - Google Patents
... ly tatl -1 and comprising la round casing 3 mounted with its axis vertical on a **roof** S over **...** It should also be noted that, yas shown in **FIGURE** 7, blade 35 has an edgewise profile which **...** Furthermore, it Ishould be noted that the **area** of the upper surface of portion 37 is considerably **...**
Cited by 36 Related articles All 2 versions Cite Save

A COBPOBATION OF googleapis.com [PDF]
SO PITCH - US Patent 1,088,635, 1914 - Google Patents
... In the drawing already mentioned, **Figure** 1 is **...** By the use of pitch prepared under my in vention, it will not be necessary for the **roof** ing contractor to cart **...** are of a pre cise spacing which has been

Google +estimate +roof +area +"average pitch"

Scholar About 67 results (0.09 sec) Any time

Rollover far side **roof** strength test and simulation
T Chen, EC Chirwa, M Mao... - International Journal of ..., 2007 - Taylor & Francis
... connections. As a consequence, the **estimate** that 75% of the cases had major damage to the far side of the **roof** is conservative. **...** side. The most deformed **area** was **roof** rail, A-pillar, B-pillar and front **roof** rail or header rail. A **...**
Cited by 15 Related articles All 2 versions Cite Save

Collyweston Stone Slating Techniques
HB Sharp - Folk life, 1980 - maneyonline.com
... Example 1 A small pent-**roof** of **area** 100 sq. ft. **...** is correspondingly just over the slater's 2240 lb. These two examples carefully worked from asmall **roof** and alarge one, with reliable average weighings, demonstrate the validity of the slater's **estimate** based on centuries of **...**
All 3 versions Cite Save

Method and System for Quick Square **Roof** Reporting
CT Thornberry, DR Thornberry - US Patent App. 13/424,054, 2012 - Google Patents
... report includes one or more ortho images of the **roof**, one or more oblique images of the **roof**, the estimated roofing **area** and contact **...** The time and energy for providing such an **estimate** becomes laborious and may be affected by contractor timing, weather, contractor **...**
All 2 versions Cite Save

Structural geology of the Knife Lake **area** of northeastern Minnesota
JW GRUNER, CE Dutton... - Geological Society of ..., 1941 - gsabulletin.gsapubs.org
... 82. PP. 1577-1042. 5 PLS., 5 FIGS. OCTOBER 1, 1941 STRUCTURAL GEOLOGY OF THE KNIFE LAKE **AREA** OF NORTHEASTERN MINNESOTA BY JOHN W. GKUNER **...** 1614 (1577) Page 3. 1578 JW GRÜNER----GEOLOGY OF KNIFE LAKE **AREA** Page **...**
Cited by 48 Related articles All 2 versions Cite Save More

A model for predicting the potential diffusion of solar energy systems in complex urban environments
M La Gennusa, G Lascari, G Rizzo, G Scaccianoce... - Energy Policy, 2011 - Elsevier
... ArcView® GIS, 1996a and ArcView® GIS, 1996b) is applied to the GRID, that allows to **estimate** the size **...** The effective extension of the **area** of surfaces with flat coverings is directly obtainable from urban planimetry **...** Main characteristics of the **roof** buildings of the town of Palermo. **...**
Cited by 19 Related articles All 9 versions Cite Save

Prosody as a marker of information flow in spoken discourse
M Swerts, R Geluykens - Language and speech, 1994 - las.sagepub.com
... a more global level, speakers appear to use relative height of pitch peaks and of **average pitch** values as **...** an independent theory of topic-structure is formulated, much of our argument in this **area** is in **...** of a house from a set of ready- made pieces of cardboard (eg, a **roof**, a front **...**
Cited by 146 Related articles All 4 versions Cite Save

Do voice recordings reveal whether a person is intoxicated? A case study nih.gov [HTML]
K Johnson, DB Pisoni, RH Bernacki - Phonetica, 1990 - karger.com
... If the tongue tip is kept close to the front teeth and the constriction at the **roof** of the **...** provide a good example of the conceptual distinctions which need to be maintained in this **area**, although they **...** We **estimate** that the signal-to-noise ratio in these samples ranges from 5 to 10 dB. **...**
Cited by 50 Related articles All 8 versions Cite Save

Female-pitched sound-producing voice prostheses–initial experimental and clinical results researchgate.net [PDF]
M Van der Torn, IM Verdonck-de Leeuw... - European archives of ..., 2001 - Springer
... fundamental frequency, we also estimated the 10%– 90% interquantile F0 range to **estimate** the intonation **...** Sound-producing modules with a small cross-section **area** (SPVP-2S and 2L) have

+roof +area +"average pit

scholar.google.com/scholar?q=%2Broof+%2Barea+%2B"average+pitch"&btnG=&hl=en&as_sdt=0%2C

Apps

Web Images More... MEZimm@gmail.com

Google +roof +area +"average pitch"

Scholar About 189 results (0.09 sec) Any time

Rollover far side **roof** strength test and simulation
T Chen, EC Chirwa, M Mao... - International Journal of ..., 2007 - Taylor & Francis
... average pitch angle was 6 ◦ where the test specimen body- in-white was fixed securely on a base frame at a pitch angle (longitudinal angle) of 6 ◦ above the horizontal plane (Figure 22). **...** The most deformed **area** was **roof** rail, A-pillar, B-pillar and front **roof** rail or header rail. **...**
Cited by 15 Related articles All 2 versions Cite Save

Vehicle **roof** with a series of raisable cover strips
W Salz - US Patent 5,836,642, 1998 - Google Patents
... This increase is especially pronounced on roughly the last tenth of the crank path, so that the **average pitch** there is greater than on the corresponding path **...** In the **area** of the rear end of the guide rail 75, there is a counterpiece 51 which is fixed to the **roof** (this stationary **...**
Cited by 10 Related articles All 2 versions Cite Save

[PDF] ... STUDY OF RELATIONSHIP BETWEEN URBAN STRUCTURE AND AMBIENT MICROCLIMATE IN NEW DEVELOPED HOUSING **AREA** IN JOHOR, MALAYSIA utm.my [PDF]
K Saito, I Said, MH Rasidi, M Shinozaki - epublication.fab.utm.my
... This particular number of distance is derived from **average pitch** of building (5.76m) and a **...** more deeply consideration about impact to surrounding environment in the housing **area** from differences **...** Albedo: Soil (0), Concrete (0.4), Asphalt (0.2) 3) Albedo: Wall (0.25), **Roof** (0.3) 4 **...**
Cited by 1 Related articles Cite Save More

A COBPOBATION OF googleapis.com [PDF]
SO PITCH - US Patent 1,088,635, 1914 - Google Patents
... An **average pitch** barrel and its contents weigh at an average 550 lbs, making it both a **...** of pitch prepared under my in vention, it will not be necessary for the **roof** ing contractor to **...** which has been determined by actual experiment, and are of relatively small **area** with comparatively **...**
Cited by 8 Related articles Cite Save

Roof scaffold
CJF Courchesne, TR Palmer - US Patent 4,957,185, 1990 - Google Patents
... extension leg 10 is provided with a pad 26 distributing the force over an **area** of the **...** work is necessary since the cleat has in no way interfered with the installation of the **roof**. **...** member 13 should be such that the plank 14 is substantially perpendicular to the **average pitch** of **roof**. **...**
Cited by 36 Related articles All 2 versions Cite Save

[CITATION] Deep coal mining in Springhill No. 2 Mine
WF CAMPBELL - Min. Eng.(New York), 1958
Cited by 2 Related articles Cite Save

Collyweston Stone Slating Techniques
HB Sharp - Folk life, 1980 - maneyonline.com
... unusually low one (38°), though the essential practice differs not at all from that in the **average pitch** for this **area** (48°). The **average pitch** for thatch is 54 **... Roof** details , (alater retimbering): one tie beam (6inches by 4 inches) to wall plates (4inches by 11/2 inches) and to the centre **...**
All 3 versions Cite Save

Method and System for Quick Square **Roof** Reporting
CT Thornberry, DR Thornberry - US Patent App. 13/424,054, 2012 - Google Patents
... based on the plurality of pitch values. 11. The set of instructions of claim 10 , wherein each pitch value is associated with an estimated percentage of **roof area** to provide an **average pitch** value. 12. The set of instructions of claim **...**
All 2 versions Cite Save

Roof inspection systems with autonomous guidance

Google +roof +area +"average pitch"

+Matt

Web Shopping Videos News Images More Search tools

About 480 results (0.77 seconds)

No results found for **+roof +area +"average pitch"**.

Results for **+roof +area +average pitch** (without quotes):

Roof pitch - Wikipedia, the free encyclopedia
en.wikipedia.org/wiki/**Roof_pitch** ▾ Wikipedia ▾
Some types of stone **roofs** have a very restrictive **roof pitch**, too low a **pitch** ... Thus, **pitch** is typically greater in **areas** of high rain or snowfall. ... The high, steeply-**pitched** gabled **roofs** of northern Europe are **typical** in regions of heavy snowfall.
Description - Historical pitches - See also - References
You visited this page on 11/20/14.

Roof Pitch » Roof Pitch Calculator - APB Pole Barns
www.pole-barn.info/**roof-pitch**.html ▾
Find out how to calculate **roof pitch** on an existing **roof**. Use our **roof pitch** calculator to convert the **roof** angle to **pitch** if using an angle finder. ... 3/12 **typical** in southern climates 14.04°. 2/12 - low **roof pitch** ... **Length**. Rafter **Length** Calculator.

How Do You Calculate Square Footage for a Roof? | Home ...
homeguides.sfgate.com › Construction & Remodeling › Square Footage ▾
... one of the first steps you may perform is figuring out the **roof area**. Both the **roof area** and **pitch** contribute to the cost of a **roofing** job. Calculate square footage .

What defined the pitch of the average house roof? - The Nake...
www.thenakedscientists.com › ... › Non Life Sciences › Technology ▾
Oct 19, 2010 - 18 posts - 4 authors
Area rules and may determine building design and permits, Ideally you ... Anther common approach is to use a metal **roof** with a steep **pitch**.

How to Determine Roof Pitch
www.carpentry-pro-framer.com/**roof-pitch**.html ▾
Determining **roof pitch** is a rather simple process if you use one of these five techniques. ... Keeping the level tight to the **roof surface**, the tongue of the framing square, ... These **roofs** can be walked safely by an **average** person and require no ...

Roof Pitch Calculator | RoofCalc.org
www.**roof**calc.org/**roof-pitch**-calculator/ ▾
The **Roof Pitch** Calculator tools below will help you calculate the **slope** from every ... To estimate **roof area**, enter width and **length** (as shown in the measuring ... you can accurately estimate the rise by measuring 3 spans of siding (**typical** vinyl ...

Roofing Calculator
www.calculator.net › Other Calculators ▾