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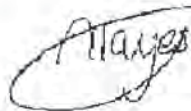
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Application number GB 1118777.0

1. Your reference	P28832GB/SSA/KE		
2. Full name, address and postcode of the applicant or of each applicant	Wright, Andrew William Cedar Springs Waverley Drive Virginia Water GU25 4PZ Surrey United Kingdom		
Patents ADP number (if you know it)			
3. Title of the invention	Mobile Device for Recording Vehicle Events		
4. Name of your agent (if you have one)	Keltie LLP		
"Address for service" to which all correspondence should be sent. This may be in the European Economic area or Channel Islands (see warning note below) (including the postcode)	Keltie LLP Fleet Place House 2 Fleet Place London EC4M 7ET United Kingdom		
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Country	Application number	Date of filing	Date available on PDAS
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Description: **18**

Claim(s): **n/a**

Abstract: **n/a**

Drawing(s): **19**

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(Patents Form 7): **0**

Request for search (Patents Form 9A): **0**

Request for a substantive examination (Patents Form 10): **0**

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Signature: **Subject: GB, Keltie, K. Elkiner 18943;
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Date: **31 Oct 2011**

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Mobile device for recording vehicle events

5 The present invention relates to a mobile device for recording the events associated with a vehicle such as a car. In particular, the present invention relates to a mobile device loaded with an application – a 'mobile app' – which is arranged to record and document the events surrounding an incident involving the vehicle such as a vehicle crash. The mobile application is hereinafter referred to as Witness.

10 A general overview of an embodiment of the present invention will now be described:

General overview

15 Witness interfaces with the hardware on a mobile device, such as a smart-phone, to provide an event recording device that can capture information in the lead up to, during and after a vehicle incident. In use, the mobile device is mounted adjacent the vehicle windscreen so that a camera on the mobile telephone can see the road ahead.

20 It will be appreciated that a more sophisticated telephone (e.g. a smart-phone) has a richer sensor set with which to record data and determine the occurrence of an incident. However, the general principles of the Witness application can be compatible with most mobile telephones provided that the sensor set is adequate.

Inputs

The Witness application can receive the following sensor/data inputs, as is typical for modern smart-phones:

- G-force / accelerometer
- 30 • Microphone (Audio capture and user voice command input)
- Camera (Picture/Video)
- GPS module (Speed, location, elevation, direction etc)
- 3D compass (Orientation: Pitch, Roll and Yaw)
- Time/date
- 35 • Touch-sensitive screen (receiving user data inputs)

Recording / Storage

- The Witness application is arranged to record a number of these sensor inputs continuously.
- The recording takes place at the highest update rate possible. However, to
5 conserve storage space on the smart-phone, data is stored / overwritten according to a recording strategy, to attempt to preserve the most relevant data.
- The recording strategy could be set up as follows:
 - The Witness application is arranged to register the occurrence of 'an event of significance' – for example, a potential vehicle crash.
 - 10 ○ All data recorded close to, and immediately after the time of the event of significance is preserved. Data recorded further away in time can be overwritten.
 - In effect, the data preservation/overwriting is such that the closer in time that recorded data is to the 'event of significance', the higher the
15 quality of data. This can also be thought of the recorded data having a higher update rate closer to the event of significance.
- Data can also be compressed.
- Data is also encrypted to preserve the authenticity of the data.

Data processing

As mentioned, the sensor data is used to determine the occurrence of 'an event of significance' such as a vehicle crash. Example ways this could be detected include one or a combination of the following inputs:

- 25 • A change in pitch + sharp deceleration (braking heavily / impact)
- A change in yaw at a given speed (swerve/skid)
- A roll (vehicle overturned)
- The sound of:
 - Tyre squeal
 - 30 ○ The crumple zone being crushed
 - Airbags deploying
 - Breaking glass
 - Impact (thud) with the vehicle chassis
 - Passengers shouting/screaming
- 35 • GPS – zero velocity for a predetermined period (vehicle not moving anymore) – especially after one of the above inputs.

Using such inputs, the Witness application can make an automatic determination that an 'event of significance' has taken place. Alternatively, the Witness application can receive an input from a user to say that an event to be recorded has taken place.

5

It will be appreciated that automatic detection may be selectively disabled by a user. This is useful if the Witness application is being used in an environment that would generate an unprecedented number of false positives. For example, if used on a bicycle or motorcycle, the Witness application may be subject to more noise and/or G-forces unexpected in a vehicle such as a car.

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Approximate parameter values for detecting certain events of significance via G-forces are as follows:

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- Harsh braking – a deceleration of greater than 2.5 m/s^2 or forward G-force of greater than 0.7G for more than 400msec.
- Harsh acceleration – from stationary, an acceleration greater than 2.5 m/s^2 or backward G-force of greater than 0.7G for more than 800msec.
- Harsh swerving - lateral G-forces greater than 0.7G for more than 400msec.

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Benchmarking

It will be appreciated that different sensor types, phones, mounting positions, vehicles, drivers and road conditions may generate differing outputs for driving behaviour that is 'safe'. To account for this, the Witness application may have the following functionality:

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- During a 'training mode' (e.g. first week of enabling the Witness application) the input from the sensors are used to build up a 'benchmark' for a particular driver's typical driving conditions.
 - Assuming an accident does not occur during this training mode, the benchmark data can be subsequently used to assess the occurrence of an event of significance.
- There is an option to notify the Witness application of a change in parameters (e.g. different driver, driving off-road etc). Thus a number of 'profiles' may be set up. Each profile may require an independent training mode period.
- If the Witness program incorrectly detects that an incident of significance has occurred, it can receive feedback from the user to modify its sensitivities. E.g. a

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more aggressive driver is actually driving.

Crash Management

- On detection of a crash (or other event of significance) the Witness application is arranged to take one or more of the following actions:
 - Announce that it has detected an accident (audio/screen prompt)
 - Call the emergency services (with option to cancel) – e.g:
Audio/screen prompt: 'Witness has detected that you have been involved in a (serious) accident and will call the emergency services. If this is not the case, please cancel within 10 seconds.'
 - Provide reassurance
 - Provide the user with a checklist of things to do:
 - Take photographs of vehicles involved in the incident (inc number plates)
 - Take down name, address, insurance details etc of 3rd parties involved in incident
 - Communicate to the insurance company that an incident has been detected (e.g. low bandwidth data or text message)
 - Protect the high quality recorded data so it is not overwritten
 - If appropriate – or in response to a request from a communication to the phone from the insurance company – transmit all or selected portions of the recorded data associated with the incident.
 - N.B. Use of the communication channels is controlled by the Witness application to prioritise essential communications such as calls to the emergency services.
 - Note that data transmission from the mobile telephone to the insurance company may be automatic (for example, triggered by a detected incident) or manual (for example, in response to a request from the insurance company). In the latter case, the Witness application may include functionality to allow the insurance company to browse through the files available on the mobile telephone so as to select one or more for transmission to the insurance company.

Data processing for other purposes

- The recorded input from the sensors can be used for other purposes. In particular, for aiding the insurance company assess the risk profile of the driver (and potentially

modify an insurance premium accordingly). Various parameters may be used to determine this:

- If the Witness application incorrectly detects an incident of significance, and receives feedback that the vehicle was not in accident (but was in a near miss) – this could alter the risk profile of the driver. For example – if this happens frequently, but no accident occurs over a given period, this could be an indicator that the driver is good at reacting to potential hazards.
- Erratic driving (e.g. jerky steering or braking detected by G-force sensor).
- Driving faster than the speed limit allocated to a given road (detected by GPS).

A more detailed description of an embodiment of the present invention will now be described with reference to the accompanying Figures. It will be understood that features of this specific embodiment and the previously described general embodiment may be combined where context allows.

Specific description of Witness application

Referring to Figure 1, a first page of the Witness application user manual is shown in which an image of the Main Menu (the top-level menu) is displayed. The Main Menu is displayed when a user first runs the application on a smart-phone, such as the iPhone 4. The main menu includes the following user-selectable buttons:

- **Recording Screen**
- **File Management**
- **Settings**
- **Accident Management**
- **Information** (displays up a manual, as shown in Figures 1 to 10).

Selecting the Recording Screen button opens the Recording Screen – the second image shown in Figure 1. The Recording Screen contains a video feed from the camera of the smart-phone, which occupies the majority of the visible screen area. Overlaid on to the video feed is the detected speed of the vehicle (e.g. 0 mph), heading (e.g. south by south-west) and the elapsed recorded time (e.g. 00:00). Displayed in a left column of the Recording Screen are additional user selectable buttons:

- **Keep current video** (pressing this button will automatically copy the current video - and the previous video segment - to the 'kept videos' section of the smart-phone and so prevents that information from being overwritten via a Recording Strategy - as will be described. The user is advised to press this button in the event of a traffic incident that needs to be recorded).
- **Take photo** (captures a still photograph).
- **Exit Recorder** (returns to main screen).
- **Start / Stop Recording** (starts recording video footage - and other data).

Referring to Figure 2, a second page of the Witness application user manual is shown in which an image of the Recording Screen is shown and described operating in a map-displaying mode rather than a video-feed mode.

During recording, (i.e. when the 'Start / Stop Recording' button is pressed) the Exit Recorder button in the Recording Screen is substituted with a Map Display button. Pressing it will toggle between the modes showing the video feed and a map of the current location.

In alternatives, the Witness application may be arranged to hide the additional user-selectable buttons, thereby enabling a greater proportion of the screen to be used to display the footage being recorded. The hiding of user-interactable artefacts may be automatic (for example, after a predetermined period after the commencement of recording). Alternatively, these artefacts may be hidden under control of the user. For example, when on Camera View, a "swipe left" on the touch sensitive display will hide the controls, and a "swipe right" will display them again. Alternatively, a small chevron button or bar (to call up the additional functions) may be used. This would be useful in the Map Mode due to the multi-touch preferred for interaction with the map (e.g. to zoom in and out).

Referring to Figure 3, a third page of the Witness application user manual is shown in which the File Management Screen is shown and described. The File Management Screen can be accessed by pressing the File Management Button in the Main Menu.

The File Management Screen displays video and associated data (e.g. telemetry data) that has been previously recorded. The stored data is contained in either a "Kept" area of storage or in a "Recording Stack". Data files in the Kept area are

saved and so not overwritten as part of a Recording Strategy. In contrast, data files in the Recording Stack may be overwritten as part of the Recording Strategy.

As described in Figure 3, the bottom section of the list represents the "Kept" data files, whereas the top section of the list represents the "Recording Stack". "Kept" data files can be edited and deleted at this File Management Screen, whereas "Recording Stack" data files cannot. Editing "Kept" data files can involve renaming them.

The recorded data files are listed on screen along with the time and date of the recording and the electronic size of the data file. Accordingly, the user is provided with feedback about how big the data files are, and so if the smart-phone is low in storage, the user can elect to delete certain "Kept" data files. "Recording Stack" data files will be automatically overridden by the Recording Strategy.

The controls on the toolbar at the bottom of the recordings screen allow a user to change the selection mode of the video stack and includes:

- **Video** (when highlighted, if a data file is selected, a video recording playback screen will be displayed).
- **Map** (when highlighted, if a data file is selected, then a map will be displayed showing the area over which the recording was made).
- **Export** (when highlighted, a selected data file will be passed to an Export Screen where export options will be provided).
- **Keep** (when highlighted, if a "Recording Stack" data file is selected, then a user will be prompted to name it, and then it will be stored as a "Kept" data file).

The icons in the File Management Screen change in dependence on the selected mode. For example, Figure 16 shows the icons displayed when the Video selection mode is highlighted; Figure 17 shows the icons displayed when the Map selection mode is highlighted; Figure 18 shows the icons displayed when the Export selection mode is highlighted and Figure 19 shows the icons displayed when the Keep selection mode is highlighted. Advantageously, this provides improved feedback to a user about what selection mode is highlighted and so what action is likely from the selection of a data file.

Referring to Figure 4, a fourth page of the Witness application user manual is shown in which an image of a Recording Playback screen is shown and described. The Recording Playback screen is invoked by highlighting the Video Mode in the File Management Screen and selecting an appropriate data file.

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In the Recording Playback screen it is possible to play back a pre-recorded video feed associated with a chosen data file. As well as playing back the recorded video feed, the Recording Playback screen also displays other associated data such as telemetry data. For example, date, time, speed, forward/backward G-forces, latitude, longitude and heading information is overlaid onto the video feed. As the video is played back, these values will typically change depending on the behaviour of the vehicle, as recorded by the mobile device.

Forward and backward G-forces are those that correspond to the forward and backward movement of the vehicle and are the primary metric for determining an event such as a crash. However, other G-forces (e.g. up/down and side-to-side) may also be measured by the device – even if they are not necessarily display on the mobile screen.

As recited in Figure 4, the Recording Playback screen provides further user controls in the form of:

- **Playback Position Scrub Bar** (horizontal bar at bottom of screen)
- **Playback Speed Bar** (vertical bar at left side of screen)
- **Pause** (pauses playback)
- **Eject** (return to previous screen)
- **Loop** (plays the data file continuously)

The Playback Position Scrub Bar allows a user to jump to different positions within the recording without necessarily needing to watch all of the recorded footage. Advantageously, this allows a user to more quickly locate a desired item of footage within a given data file. Also, the Playback Speed Bar can be used to speed up or slow down the playback of the data file. This allows a desired item of footage to be found more quickly through sped-up playback, and also allows an item of footage to be more carefully analysed through slowed-down playback. Furthermore, it is possible to zoom in and out of a region of the video file using a 'pinch and zoom' movement as is standard with most multi-touch touch-screen devices.

Referring to Figure 5, a fifth page of the Witness application user manual is shown in which a different type of Recording Playback screen is shown and described. Specifically, the image represents playback of a pre-recorded data file as can be
5 invoked by highlighting the Map Mode in the File Management Screen and selecting an appropriate data file.

In contrast with the Video Mode playback, this Map Mode playback shows a map of the area where the recording took place. A blue breadcrumb trail is overlaid on to the
10 map showing the extent of movement of the vehicle during the recorded period. A scrub slider is shown which is user-operable to adjust the time within the recorded period. As the slider is adjusted, a pin moves along the blue breadcrumb to show the position of the vehicle at the time as specified by the slider. Tapping the pin displays associated telemetry data at that position and time.

15 Referring to Figure 6, a sixth page of the Witness application user manual is shown in which an image of a Video Export Screen is described. The Video Export Screen may be invoked by highlighting the Export button in the File Management Screen and selecting an appropriate data file.

20 The Video Export Screen allows the quality of the video associated with the selected data file to be adjusted before that video is exported. Advantageously, this can allow the user to control the size of the data to be exported. Telemetry data is also exported, embedded within the video file. Video data can be exported with or without
25 sound, depending on the permissions of the user. Export typically involves copying data files from the mobile device to a local computer (e.g. via a data cable) or a remote server (e.g. via a wireless connection).

Referring to Figure 7, a seventh page of the Witness application user manual is
30 shown, in which an image of the Settings Screen is displayed and described. The Settings Screen allows the operation of the Recording Strategy to be controlled. Specifically, the Settings Screen allows a user to select the number of video segments that the application should store, and the size of those segments. Accordingly, the user is able to set a limit to the storage usage of the Recording
35 Stack part of the program. The user can also control the storage usage of the Recording Stack through the use of the video quality buttons.

Note that the Witness application may be arranged to calculate the remaining memory available on the smart-phone and suggest the appropriate settings automatically.

- 5 The Recording Strategy involves maintaining a user-controlled number of video segments. When a new video recording is initialised – instantiating a new segment – this is written over the oldest video segment. Thus only the most recently recorded videos are maintained in the Recording Stack.
- 10 Another setting that can be controlled in the Settings Screen is the G-force threshold at which the Witness application will assume that a crash has taken place. It is expected that different vehicles and driving styles will need different G-force thresholds to be set to ensure a reasonable sensitivity to crash forces whilst also prevent crash detection false positives. It should be noted that although the manual
- 15 recites “*Raise the sensitivity if you find that crash detection is triggered during normal driving...*” it is the sensitivity *threshold* that is to be raised, and not the sensitivity itself. A slider allows the sensitivity threshold to be set via the touch-sensitive screen.
- 20 The Settings Screen also has a button to allow a user to define more settings via a More Settings Screen.

- Another feature of the Settings Screen is the ability to turn off audio capture. This enables a user to play music in the background without it interfering with the video
- 25 recording or functionality of the Witness application.

- A further optional feature of the Settings Screen is allowing “auto record” as soon as the application is first initialised. Thus, instead of waiting for the mobile application to be loaded before being able to record driving footage (e.g. by then manually pressing
- 30 the appropriate button), a user merely needs to open the application. This enables the user to start driving even though the Witness application may not have fully loaded on the mobile device.

- Referring to Figure 8, an eighth page of the Witness application user manual is
- 35 shown in which an image of the More Settings Screen is displayed and described. Here it is possible for the user to select speed units and also select whether the map should be displayed during recording, and at which speed it should be displayed in

favour of the video feed. This is a safety feature of the Witness application that hides the video feed during recording when the vehicle is detected as travelling above a predetermined speed. The video feed is replaced by a map of the location of the vehicle – as is typical with in-vehicle GPS devices. Note that although the on-screen video feed is replaced with a map, video recording continues in the background.

In alternatives, the application may be arranged to detect the vehicle speed, and at a particular speed, switch off the screen entirely. It should be understood that the device will continue to record video, telemetry and other information even when the screen is switched off. Entirely switching off the screen of the device is advantageous as it significantly reduces the drain on the battery of the mobile device.

Note that the Witness application is also arranged to interface with the phone to detect low-light conditions and in response change the brightness of the screen to prevent the user/driver being dazzled. This can also save battery life. Alternatively, the Witness application may allow user control of the screen brightness – for example, swipe up or down to respectively increase or decrease screen brightness.

The Witness application may also be arranged to alert the user when the battery level is too low, and in the event that the battery level reaches a predetermined level, the Witness application may be arranged to automatically stop recording and save data to permanent storage to prevent video footage being lost when power to the mobile device is lost. A battery level indicator may be provided on the main recording view so that a user is provided feedback about battery levels. Moreover, the battery indicator is displayed (and may only be displayed) when the device is recording footage. Accordingly, this provides a useful indication to the user that the mobile device is recording.

The More Settings Screen also includes a Personal Details button which, when pressed invokes a Personal Details Screen.

Referring to Figure 9, an ninth page of the Witness application user manual is shown in which an image of the Personal Details Screen is displayed and described.

Here, the name, vehicle registration number, mobile number and email address to be used in an emergency can be specified by the user. In the event of a detected incident, these details, along with information regarding the detected incident (e.g.

time of incident, location and optionally telemetry data) will be emailed to the specified email address automatically. This can ensure that the chosen recipient of that email will be informed immediately about the occurrence and nature of the detected incident. In particular, a hyperlink may be provided in an email to a mapping application or website (such as Google® Maps) to enable a chosen recipient to be conveniently informed about the location of the occurrence.

In alternatives, in the event of an automatically detected incident, a countdown may be displayed. The countdown is presented to the user with an "option to cancel". If the option to cancel is selected by the user, then this will prevent transmission of information regarding the detected incident to the chosen recipient. If the option to cancel is not selected by a user within the countdown period, only then will the data regarding the incident be transmitted.

In another alternative, the user may be provided with an option to manually initiate the transmission of selected data to a chosen recipient. This option may be presented in the form of a "Panic Button". A user in distress would simply select the "Panic Button" and this would transmit a dearth of information, including the whereabouts of the user, and the fact that the "Panic Button" had been activated to a chosen recipient. This would be useful if a user were being harassed, or threatened and may not have time to contact a chosen recipient to relay the details of the problem.

This Personal Details Screen also allows the user to set whether it is possible for the video stack to be deleted. A security PIN protects the changing of this option so that if a first user having the PIN (for example, a parent) can review the driving style and behaviour of a second user not having the PIN (for example, their son or daughter) by reviewing the Recording Stack – as the Recording Stack cannot be deleted by that second user. As shown in Figure 20, the PIN can be set for the first time by entering it twice into the appropriate PIN fields.

Referring to Figure 10, a tenth page of the Witness application user manual is shown in which images of an Accident Management Screen and Witness Details Screen is displayed and described.

The Accident Management Screen can be invoked by the user via the Main Menu, or can be automatically switched to after the Witness application has detected that there

has been an incident (e.g. via G-forces exceeding a threshold level). Similarly, data can automatically permanently stored as "Kept" and/or sent if high G-forces are detected.

5 As can be seen on the Accident Management Screen, there are the following user selectable buttons:

- **Accident Advice / What to do**

This option provides guidance as to what to do during an accident – see Figures 11 and 12 for the displayed Accident Advice Screens.

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- **Witnesses**

This option invokes functionality to allow collection of information from or about witnesses to an incident. An image of the Witnesses Detail information summary screen is shown in Figure 10. Figure 13 shows the Witness Detail information collection screen. Voice notes can also be taken via the microphone of the smart-phone.

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- **Photos**

This option enables the camera to allow a user to capture images associated with an incident.

- **Drivers**

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This option invokes functionality to allow collection about the other drivers involved in an incident, such as their vehicle and insurance details. The Drivers Detail information collection screen is shown in Figure 14.

- **Your Details**

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This option provides a readily available store of the details of the user - as to be provided to other drivers – and can contain name, address and insurance details. The 'Your Details' screen is shown in Figure 15.

Details recorded via the Accident Management Screen are electronically authenticated and feature a time-stamp. In alternatives, this data may be encrypted to ensure the integrity of the stored data.

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Furthermore, in alternatives, the exchange of the details of the drivers and witnesses can be conducted, at least in part, via Bluetooth® (for example, between mobile devices) – and/or via email. The relevant information associated with the driver that is pre-stored on the Witness application in a format that can be sent readily via a communication channel such as Bluetooth® or email.

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Finally, note that in each Screen or Menu, there is a button provided to go back to the previous menu. Also, when certain actions are performed or selected by a user, the Witness application is arranged to provide an audible feedback signal (for example, a beep). For example, this could be in response to starting a recording, keeping a video segment and/or a stopped recording.

User control of the Witness application has been described above to be primarily via selection of virtual buttons provided on a touch-sensitive display. However, it will be appreciated that "hands-free" operation of the Witness application is also possible via a voice-activation and recognition system onboard the mobile device. Accordingly, if a user wants a command to be carried out (for example, to record a video clip or select a menu item), it is possible to do this by speaking the appropriate command to a suitably configured mobile device. This is particularly convenient if the user is driving.

Embodiment alternatives and extensions

So far, the Witness application has been described primarily in the context of a personalised smart-phone application for the sole use of a smart-phone user. However, the Witness application can be extended to interface with remote users to allow them to control the operation of the application as well as view information logged by the application. A remote user may be an employee of an insurance company, or a fleet manager wanting an insight into how vehicles of the fleet are being driven.

In particular, the present application can be extended to a scenario where the Witness application is interfaced with or is under the control of an insurance company. Such an insurance company may provide insurance to the user, and so may have an interest in the behaviour of that user, and moreover, a vehicle under the control of that user.

The Witness application can assist the insurance company in making informed decisions about a user's insurance policy by allowing access to logged driving behaviour. For example, if it is determined from video logs that a driver drives safely, then the insurance premium associated with that driver may be lowered.

In such a scenario, the insurance company will maintain a device monitoring system that can interface with a mobile device running the Witness application. In fact, the device monitoring system may interface with a large number of mobile devices, each running an individual copy of the Witness application logging respective user/vehicle behaviours. Such a device monitoring system may be arranged to generate a “driving score” on the basis of the data received from each device.

With such a monitoring system, it is impractical to actively monitor each and every mobile device and receiving and handling the sheer quantity of data from each and every device would also be very difficult.

Consequently, the device monitoring system and the mobile devices are advantageously arranged to automatically and intelligently interface with one another in a way that minimises the computational and bandwidth burden on the device monitoring system.

For example, the Witness application may simply generate a score such as a “driving score” to be passed to the remote user to log against a respective user and/or vehicle. Thus in this case, the computation of the score would take place solely on the mobile device, minimising the amount of data to be transmitted to a remote system (and thereby the associated computational burden of processing that data).

Alternatively, a determination about which data is kept on the mobile device and which is transmitted from it to a device monitoring system may be made dynamically or on a case-by-case basis.

In particular, each mobile device running the Witness application is arranged to make a determination as to whether there is a need to transfer data to the device monitoring system. For example, the Witness application may be arranged to automatically send data to the device monitoring system that only has high G-force activity associated with it, as this may be indicative of a crash or another event of significance. Alternatively, the Witness application may be arranged to send detailed or high-bandwidth information if a user indicates that an accident has occurred.

In either case, the video segments and associated telemetry data associated with the relevant event will be sent. However, no other data (for example, from another date) will be sent.

Alternatively, less computationally or bandwidth intensive information may be sent on a periodic basis – for example, every day, week or month. Such general information may be sent to establish a profile of a particular user. For example, many high G-
5 force related activities may indicate that the driver is driving aggressively. A determination about the profile can be made automatically by requesting and automatically analysing further data. For example, the location and speed information can be used to determine whether a vehicle is found to frequently break the speed limit. If this is the case, then the profile of the user can be set accordingly.
10

Such general and periodically obtained information can also be used to remotely adjust the settings of the application. For example, many high G-force related activities may instead indicate that the set up of the car is such that the mobile device is subjected to high G forces (rather than the driver driving aggressively). If the
15 driving is determined to be safe, but the mobile device is setting off many false positives, then the device monitoring system can automatically adjust the settings of the application. For example, the G-force sensitivity threshold may be increased remotely.

20 Thus the initial data that is automatically transmitted from the mobile device to the vehicle monitoring system is limited in bandwidth so as not to overload the vehicle monitoring system as a whole. However, after processing or analysis is performed on the initial data, further information may be requested. For example, further information may be requested automatically by the system or manually by a
25 controller acting for the insurance company. Such further information may include high resolution video logs and telemetry data such as G-force measurements.

It will be understood that the mobile device may also automatically keep certain data at random. Furthermore, the reason for keeping certain data may also be logged
30 (e.g. logged as a result of a manual request by the user, or in response to a high G-force event).

The mobile device and device monitoring system may also be arranged to highlight detected transgressions. For example, driving during curfew hours, or driving at
35 locations where insurance is not valid (e.g. other countries, off-road, race tracks etc).

As will be appreciated, the interaction of the mobile device and the device monitoring system has the advantage of actively improving user driving behaviour. That is, if the user knows that their logged driving behaviour may adversely effect their insurance policy, then it is likely that the user will be dissuaded from driving recklessly. In view of this, an insurance company may be able to incentivise users through lower insurance premiums.

However, so that users do not wrongfully benefit from such incentives, it is necessary to enforce the correct and consistent use of the Witness application.

It would not be beneficial from the perspective of the insurance company if the user could choose when to enable the application. For example, if a user could choose to disable the application when speeding then the effectiveness of the application would be reduced.

Accordingly, the application may include measures to guarantee that the application is enabled whenever a given insured vehicle is being driven.

Such measures may involve matching data recorded by the Witness application with that recorded independently by the vehicle. For example, the Witness application records the distance travelled during every journey. To ensure the summed distances of all journeys tracked by the Witness application tally with the total travelled distance of the vehicle, the user may be prompted to enter the odometer mileage periodically.

If the distance recorded by the Witness application does not correlate with the difference between odometer readings, then the discrepancy will be flagged to the user and/or the insurance company. A substantial discrepancy will typically indicate that the Witness application has not been monitoring all vehicle journeys and the appropriate action can be taken (e.g. the user can be warned, insurance premium may be raised etc).

It will be appreciated that such a tallying exercise depends on the Witness application being used every time one particular vehicle is driven. However, in alternatives, if the Witness application is used with different vehicles, the Witness application may be arranged to register the different vehicles so that their respective odometer readings can be tallied with distance recordings associated with each respective vehicle.

Other measures can be implemented in conjunction with the Witness application to guarantee that the application is enabled whenever a given vehicle is being driven. For example, the mobile device on which the Witness application is installed may
5 comprise a near-field communication (NFC) device, such as an RFID tag. The NFC device may be compatible with a complementary device on a so-called 'smart-holster' into which the mobile device may be fitted during operation.

The smart-holster positions and holds the mobile device correctly so that the video
10 camera on the mobile device can clearly view the road ahead via of the front windscreen of the vehicle. However, the smart-holster also interacts with the NFC device on the smart-phone to determine whether or not the smart-phone is inserted into the smart-holster. The smart-holster can then be interfaced with the engine management system of the vehicle so that the vehicle may be activated and driven
15 only when the mobile device is in place within the smart-holster and/or the Witness application has been enabled.

Alternatively, the vehicle may be fitted with an immobilisation device arranged to interface with an onboard vehicle computer or the like (e.g. the vehicle engine
20 management system), so as to selectively control whether the vehicle can be started and driven away by a user. The immobilisation device may be arranged to permit a user to activate the vehicle on detection that the mobile device is within the vicinity of the vehicle. Moreover, the immobilisation device may prevent activation of the vehicle if the mobile device is not within the vicinity of the vehicle and/or the Witness
25 application has not been suitable activated. To this end the mobile device running the Witness application is in communication with the immobilisation device, for example via a wireless communication protocol such as Bluetooth®.

A further extension is that the mobile device, through wireless communication with
30 the onboard vehicle computer, may be used as a remote-control 'key' to gain access to the vehicle.

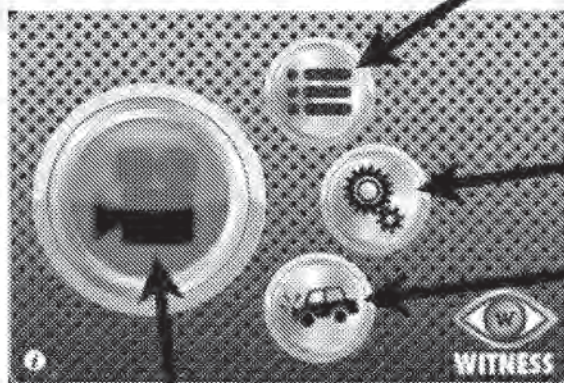
It will be appreciated that the mobile device has so far been described in the context of a smart-phone. However, it will be appreciated by a person skilled in the art that
35 other devices may also be suitable for performing the functions described in relation to the Witness application. For example, the Witness application may be adapted to run on a general purpose tablet-style computing device, such as an iPad.



Witness User Manual

Main Menu

File Management



Settings

Accident
Management

Recording Screen Button

Recording Screen

Keep Current
Video

Take Photo

Exit Recorder

Start / Stop



Figure 1

The recording screen also displays your current heading, speed and recording time.

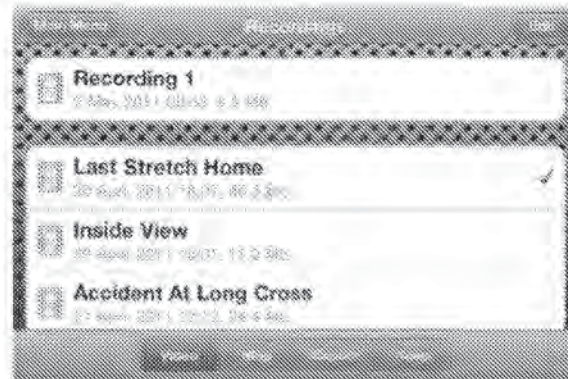
During recording, the exit button becomes the map display button. Pressing this toggles the display of a map overlay showing your current position.

Pressing the "Keep Current Video" button will automatically copy the current video and the previous video to the kept videos section in the library. Use this button if an incident occurs whilst you are driving and you wish to keep it.



Figure 2

File management



The top section of the file management screen contains the recording stack. The recording stack contains your recent video segments, the number of which depends upon your personal settings.

The bottom section contains videos segments that you have chosen to keep.



Your kept recordings can be deleted individually, but the video stack can only be cleared from the settings screen.

Figure 3

Recording Playback

5 of 11



The playback screen shows your recorded video along with the associated telemetry data. The data displayed shows the date and time of the recording, the current speed, the forward and reverse G force, the current GPS position and the current heading.

The G force measures the force of braking and acceleration with the phone mounted with the screen facing rearward, and the back of the phone facing forwards.

Video playback is controlled via the scrub bar at the bottom. The vertical slider on the left is the playback speed. Other controls are loop, pause and eject.

Figure 4

Please Note:

The playback video screen is a floating view and can be zoomed by pinching and moved with a single finger. A double tap will reset the view.

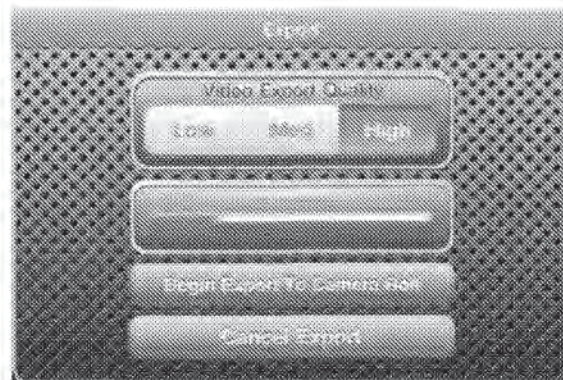
Map Playback

Map playback shows where a recording was made via a blue breadcrumb trail. A pin shows the vehicle position and can be tapped to reveal telemetry data.

The scrub slider will move the pin according to the recorded telemetry.

Figure 5

Video Export



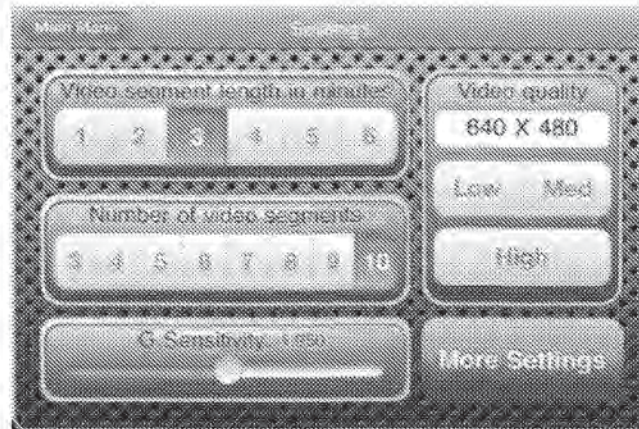
Choose the video quality according to your preference and the video will be exported to the camera roll with the telemetry data embedded within the video.

Medium and high quality reveal good results but with fairly large files usually too big to e-mail, although trimming within the camera roll can shorten the video to just the bit you need. Low quality produces small files but the quality suffers.

Please remember that the iPhone is not a desktop computer and therefore long video segments exported at high quality may take several minutes to complete.

Figure 6

Settings



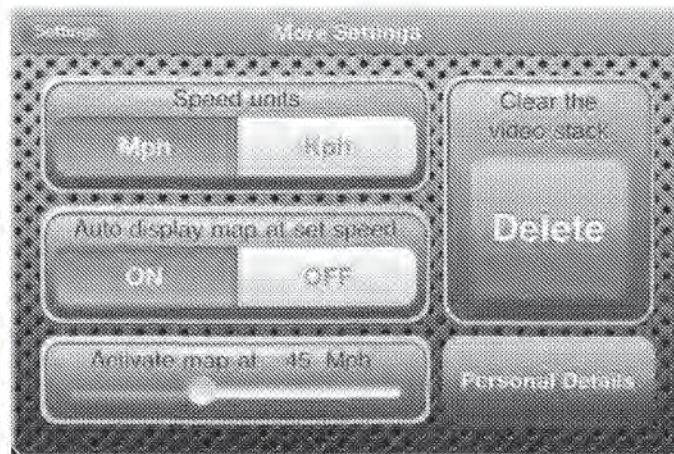
Video recording can be adjusted to allow up to an hour of recorded video in the video stack.

Choose the segment length in minutes and the number of segments you would like according to the available space on your device. Each minute of video at high quality will use 26Mb of space. 1 hour will use 1.5Gb.

G Sensitivity adjusts the automatic triggering of crash detection. Raise the sensitivity if you find that crash detection is triggered during normal driving due to differences in vehicle suspension.

Figure 7

More Settings



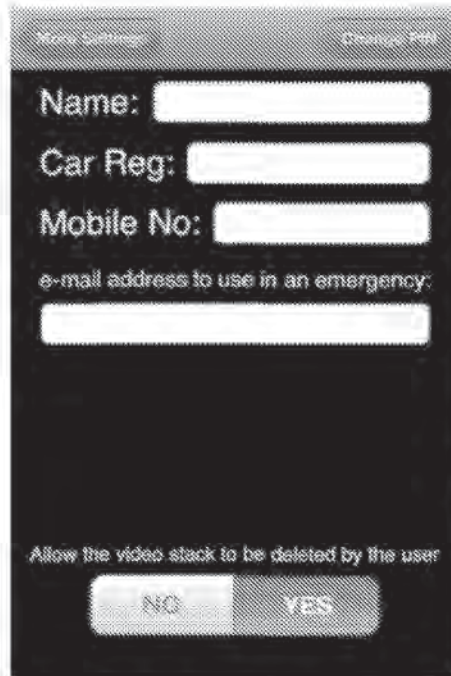
Choose your preferred speed units here which will be used throughout the app. Even if you change the speed units after a recording is made, then the correct speed units will be used in playback and export.

You are able to choose whether to have the map overlay display at a certain speed during recording on the main recording screen. Please select the option and set the speed if you would like this to happen.

Please note: If you change the speed units, you will need to re-adjust the map trigger speed accordingly.

Figure 8

Personal Details



More Settings Change PIN

Name:

Car Reg:

Mobile No:

e-mail address to use in an emergency:

Allow the video stack to be deleted by the user

NO YES

These details will be used in the event of an accident to send an automated message.

Enter your name, the registration number of the car the device will be used in, the telephone number of this device and the e-mail address of the person you would like contacted.

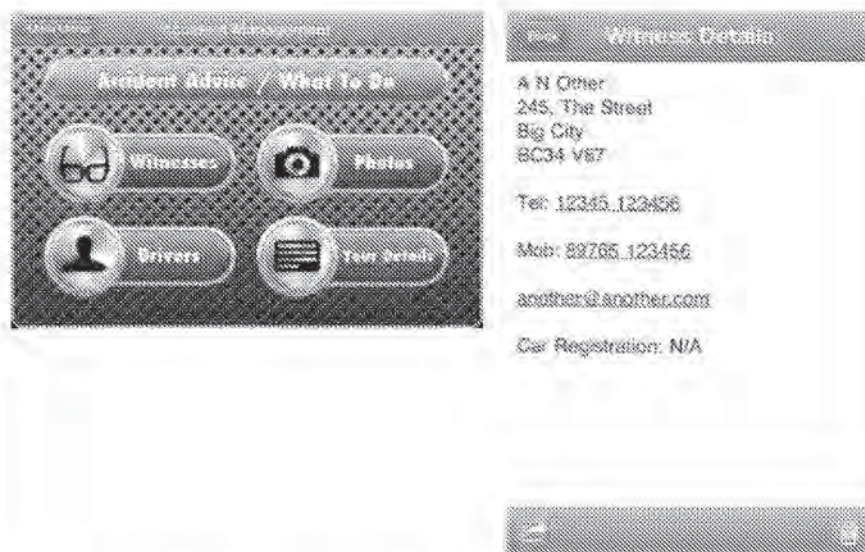
You can also set here the option to prevent the video stack from being cleared.

This screen can be protected with a PIN number, but please make sure you remember it or make a note of it somewhere. Re-setting the PIN can only be accomplished by deleting and re-installing the app which will result in all video and data being lost.

Figure 9

Accident Management

In the event of an accident, Witness provides the necessary tools you need in order to gather and keep the correct information.



Witness and driver details can be stored and viewed from within the internal database.

There is also a place to store your insurance details should you need them. Please enter these now so they are in the phone for future use.

Figure 10

What should you do?

Make sure you and others are safe

- * Is anyone injured?
- * Is the accident causing a hazard?
- * Has someone left the scene?

If yes to any of these, then call the emergency services.

1. Witnesses – Collect the names and addresses of any witnesses.
2. Photographs – Take pictures of the scene of the accident, damage to cars and other property, and the occupants of the other vehicle.
3. Drivers – Collect names, addresses, registration numbers and insurance details of all other drivers involved.

Figure 11

4. Your details – You must give your details to other drivers. DO NOT ADMIT LIABILITY.
5. Inform your insurance company – Even if you aren't going to make a claim.
6. Inform the Police – If someone is injured (or a dog or farm animal) Report in person to a Police Station and take your insurance details, driver's licence and MOT certificate.

Close this view and use the built in tools included with this application to help you collect the data.

Figure 12

[Back](#)

Witness Details

Full name of witness

House number or name

Street name

Postal town or city name

Postal / Zip code

Home telephone number

Mobile telephone number

Figure 13

Back Drivers Details

Full name of driver

House number or name

Street name

Postal town or city name

Postal / Zip code

Home telephone number

Mobile telephone number

Figure 14

Accident Management Your Details

Insurance company:

Insurance policy number:

Policy expiry date:

Figure 15



Figure 16



Figure 17



Figure 18



Figure 19

PIN

Repeat PIN

Set PIN

Done

Figure 20