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Kim et al.

(54) **IMAGE DISPLAY APPARATUS AND METHOD FOR OPERATING THE SAME**

(76) Inventors: **Jongseok Kim**, Seoul (KR); **Jaeuk Kim**, Seoul (KR)

(21) Appl. No.: **13/044,340**

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**Publication Classification**

(51) **Int. Cl.**
*H04N 5/445* (2011.01)

(52) **U.S. Cl.** ..... **725/38**; 725/37

(57) **ABSTRACT**

A multifunctional display device and a method of controlling the same are disclosed herein. The method may include displaying a first card object in a first area of the display, displaying a second card object in a second area of the display, and partially displaying a third card object in a third area of the display to indicate that additional card objects are available for display. The first card object may be configured to display a video image and the second card object may have at least one link for connecting to a server. Based on a request to change the displayed card objects, the third card object may be displayed in the second area of the display and a fourth card object may be partially displayed in the third area of the display.

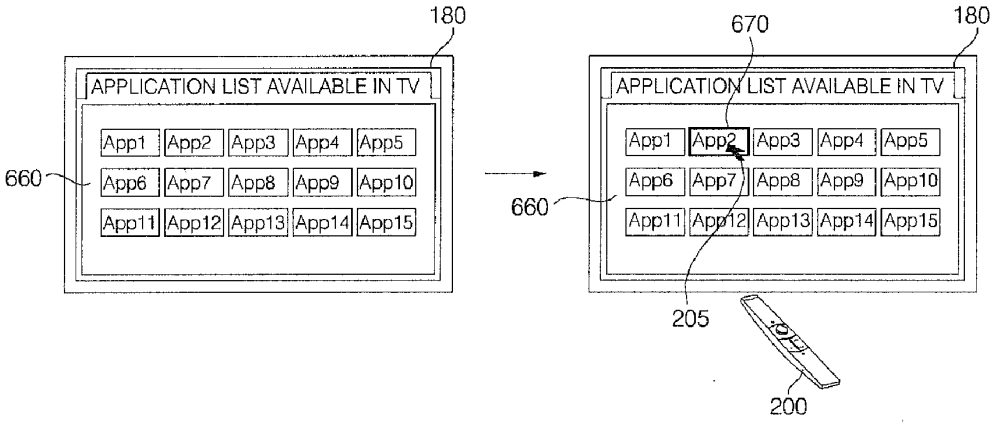


FIG. 1

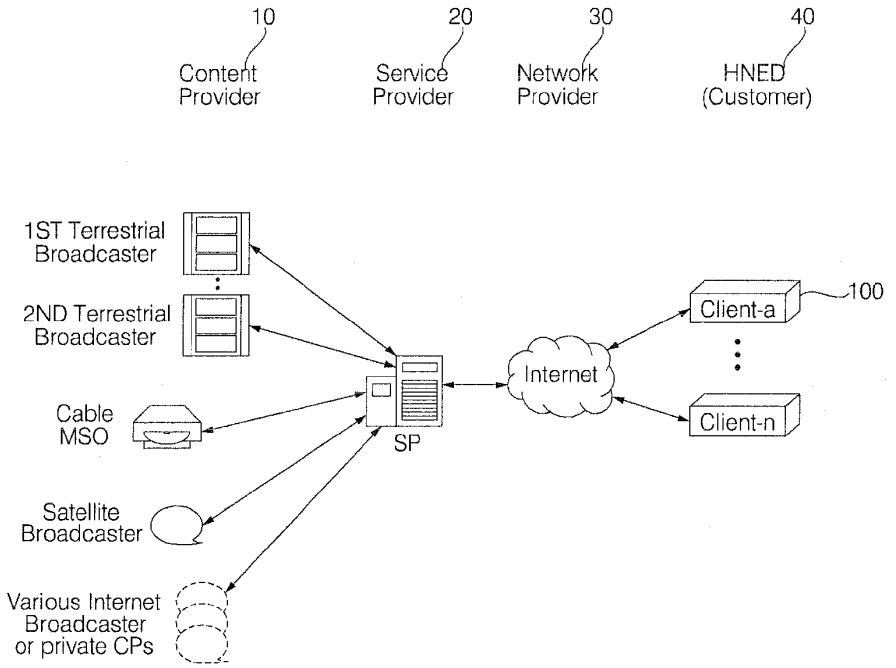

10
20
30
40
Content Provider
Service Provider
Network Provider
HNED (Customer)
1ST Terrestrial Broadcaster
2ND Terrestrial Broadcaster
Cable MSO
Satellite Broadcaster
Various Internet Broadcaster or private CPs
SP
Internet
Client-a
Client-n
100

FIG. 2

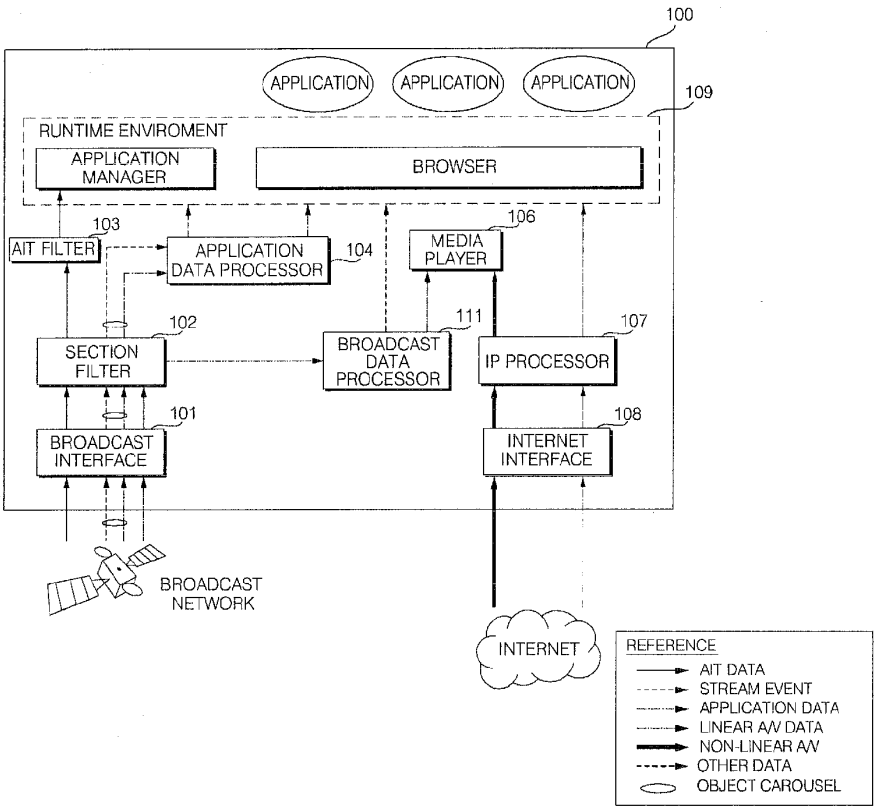

100
APPLICATION
APPLICATION
APPLICATION
109
RUNTIME ENVIROMENT
APPLICATION MANAGER
BROWSER
103
AIT FILTER
APPLICATION DATA PROCESSOR
104
106
MEDIA PLAYER
102
SECTION FILTER
111
BROADCAST DATA PROCESSOR
107
IP PROCESSOR
101
BROADCAST INTERFACE
108
INTERNET INTERFACE
BROADCAST NETWORK
INTERNET
REFERENCE
AIT DATA
STREAM EVENT
APPLICATION DATA
LINEAR A/V DATA
NON-LINEAR A/V
OTHER DATA
OBJECT CAROUSEL

FIG. 3

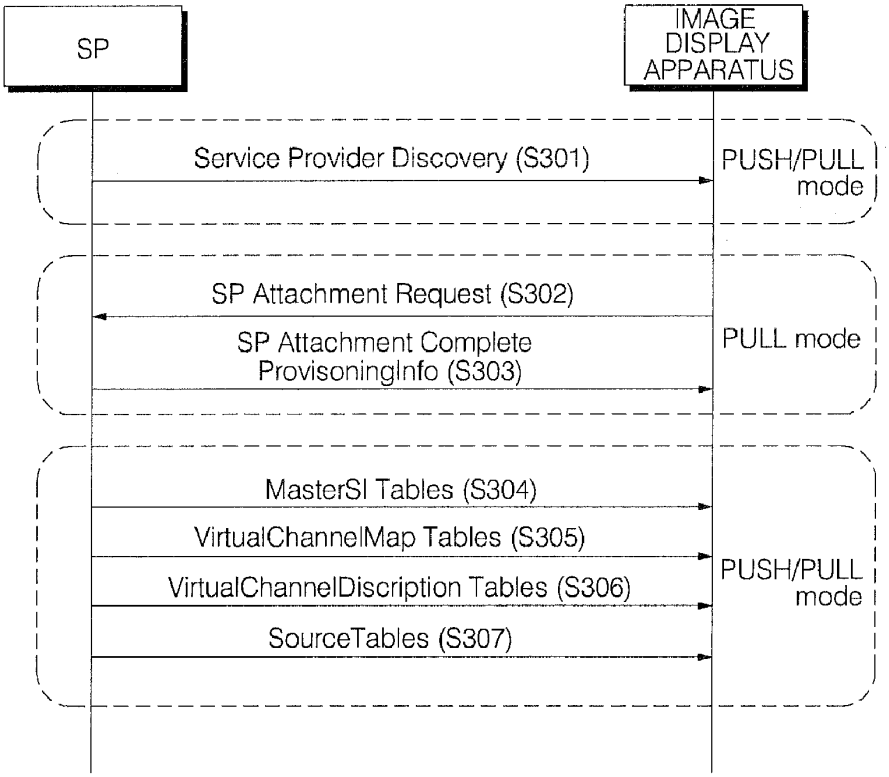

SP
IMAGE DISPLAY APPARATUS
Service Provider Discovery (S301)
PUSH/PULL mode
SP Attachment Request (S302)
SP Attachment Complete ProvisoningInfo (S303)
PULL mode
MasterSI Tables (S304)
VirtualChannelMap Tables (S305)
VirtualChannelDiscription Tables (S306)
SourceTables (S307)
PUSH/PULL mode

FIG. 4

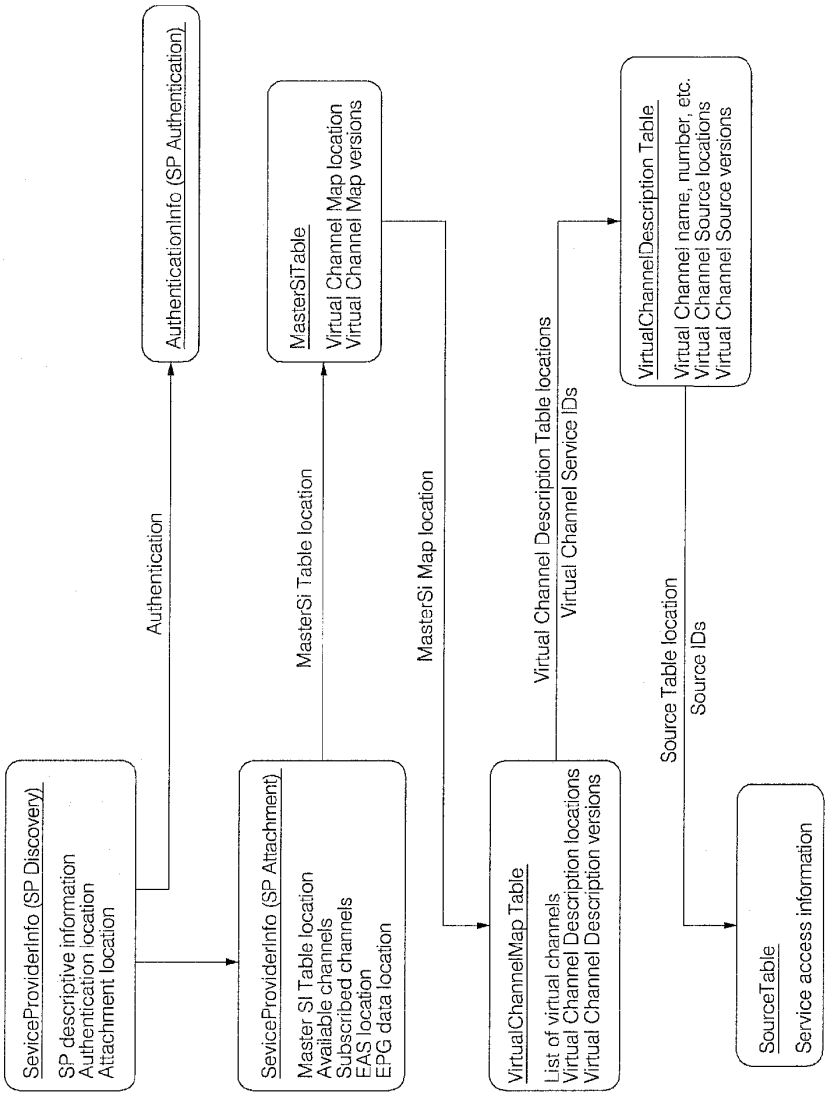

SeviceProviderInfo (SP Discovery)
SP descriptive information
Authentication location
Attachment location
Authentication
AuthenticationInfo (SP Authentication)
SeviceProviderInfo (SP Attachment)
Master SI Table location
Available channels
Subscribed channels
EAS location
EPG data location
MasterSi Table location
MasterSiTable
Virtual Channel Map location
Virtual Channel Map versions
MasterSi Map location
VirtualChannelMap Table
List of virtual channels
Virtual Channel Description locations
Virtual Channel Description versions
Virtual Channel Description Table locations
Virtual Channel Service IDs
VirtualChannelDescription Table
Virtual Channel name, number, etc.
Virtual Channel Source locations
Virtual Channel Source versions
Source Table location
Source IDs
SourceTable
Service access information

FIG. 5

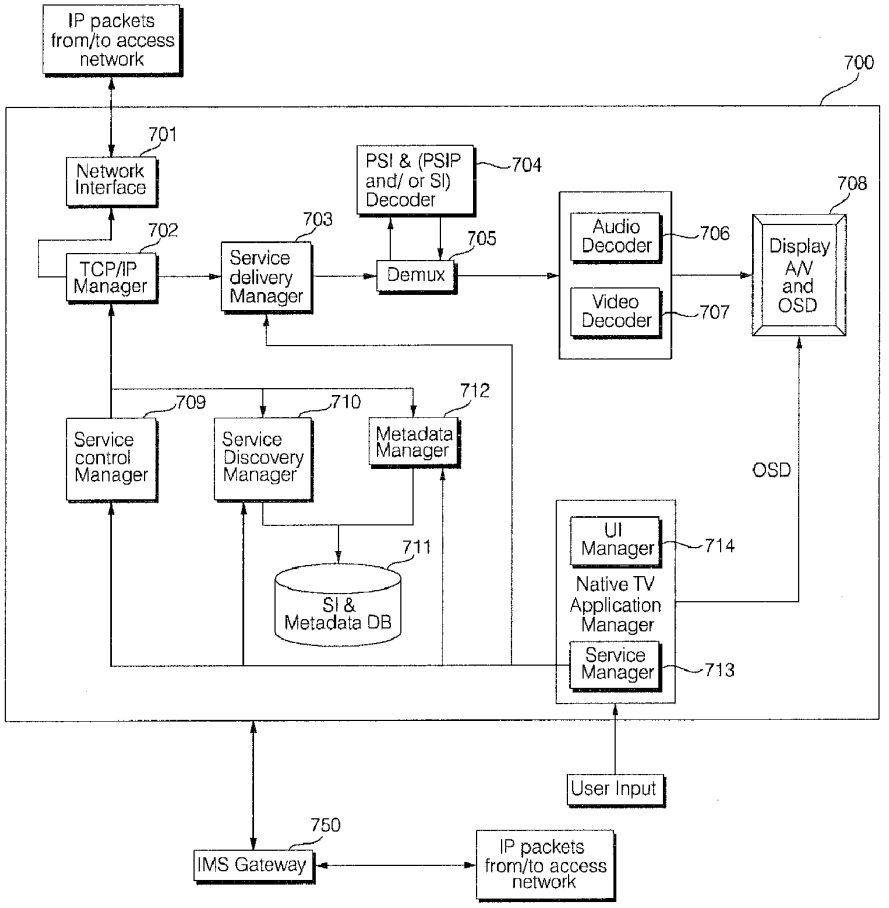

IP packets from/to access network
700
701
Network Interface
PSI & (PSIP and/ or SI) Decoder
704
708
702
703
705
Audio Decoder
706
Display A/V and OSD
TCP/IP Manager
Service delivery Manager
Demux
Video Decoder
707
709
710
712
Service control Manager
Service Discovery Manager
Metadata Manager
OSD
711
UI Manager
714
SI & Metadata DB
Native TV Application Manager
Service Manager
713
User Input
750
IMS Gateway
IP packets from/to access network

FIG. 6

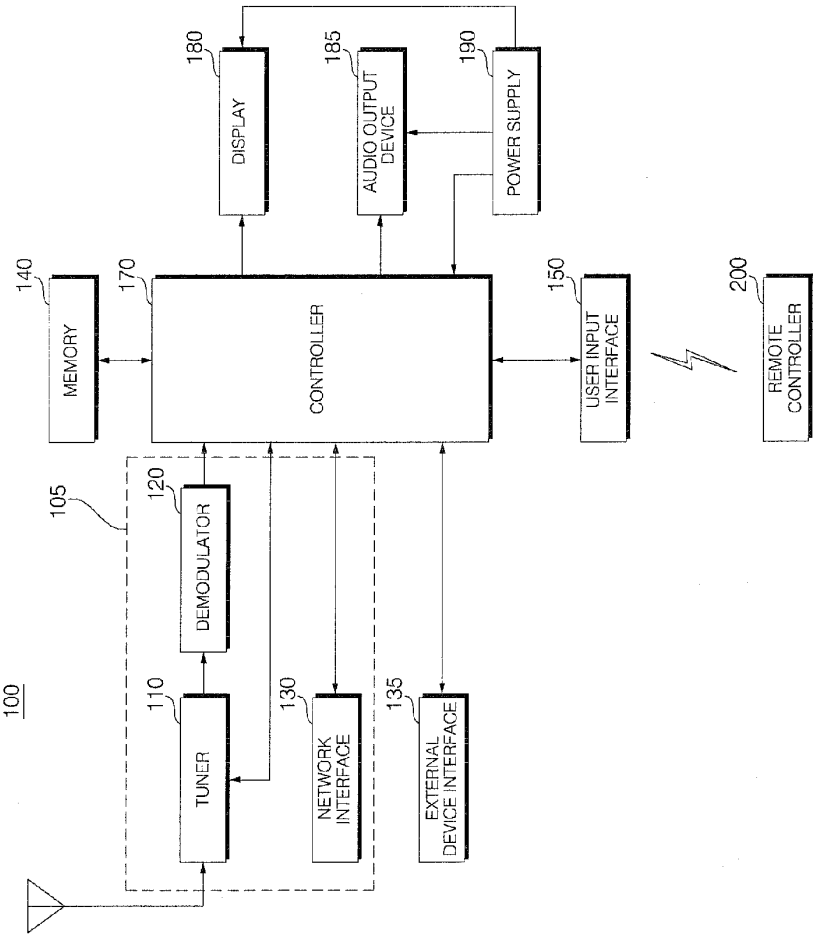

100
105
110
TUNER
120
DEMODULATOR
130
NETWORK INTERFACE
135
EXTERNAL DEVICE INTERFACE
140
MEMORY
170
CONTROLLER
150
USER INPUT INTERFACE
200
REMOTE CONTROLLER
180
DISPLAY
185
AUDIO OUTPUT DEVICE
190
POWER SUPPLY

FIG. 7

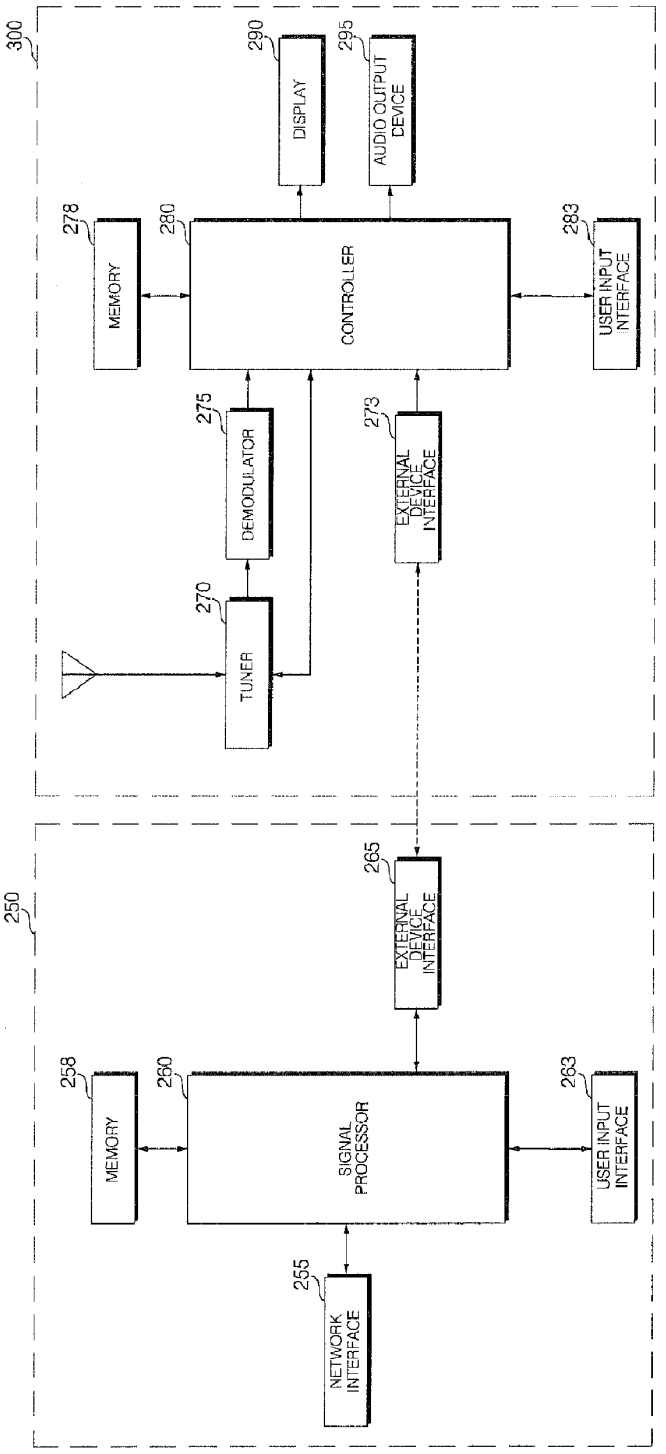

300
290
DISPLAY
295
AUDIO OUTPUT DEVICE
278
MEMORY
280
CONTROLLER
283
USER INPUT INTERFACE
275
DEMODULATOR
273
EXTERNAL DEVICE INTERFACE
270
TUNER
250
265
EXTERNAL DEVICE INTERFACE
258
MEMORY
260
SIGNAL PROCESSOR
263
USER INPUT INTERFACE
255
NETWORK INTERFACE

FIG. 8

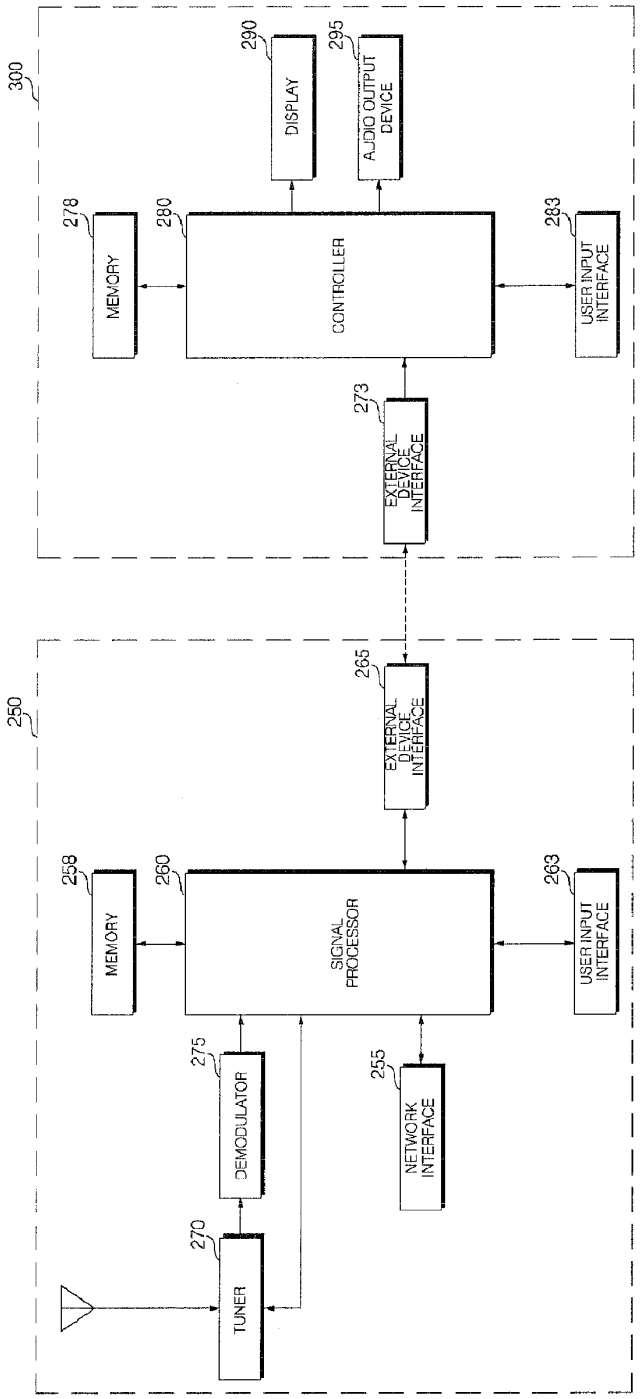

300
290
DISPLAY
295
AUDIO OUTPUT DEVICE
278
MEMORY
280
CONTROLLER
283
USER INPUT INTERFACE
273
EXTERNAL DEVICE INTERFACE
250
265
EXTERNAL DEVICE INTERFACE
258
MEMORY
260
SIGNAL PROCESSOR
263
USER INPUT INTERFACE
275
DEMODULATOR
255
NETWORK INTERFACE
270
TUNER

FIG. 9

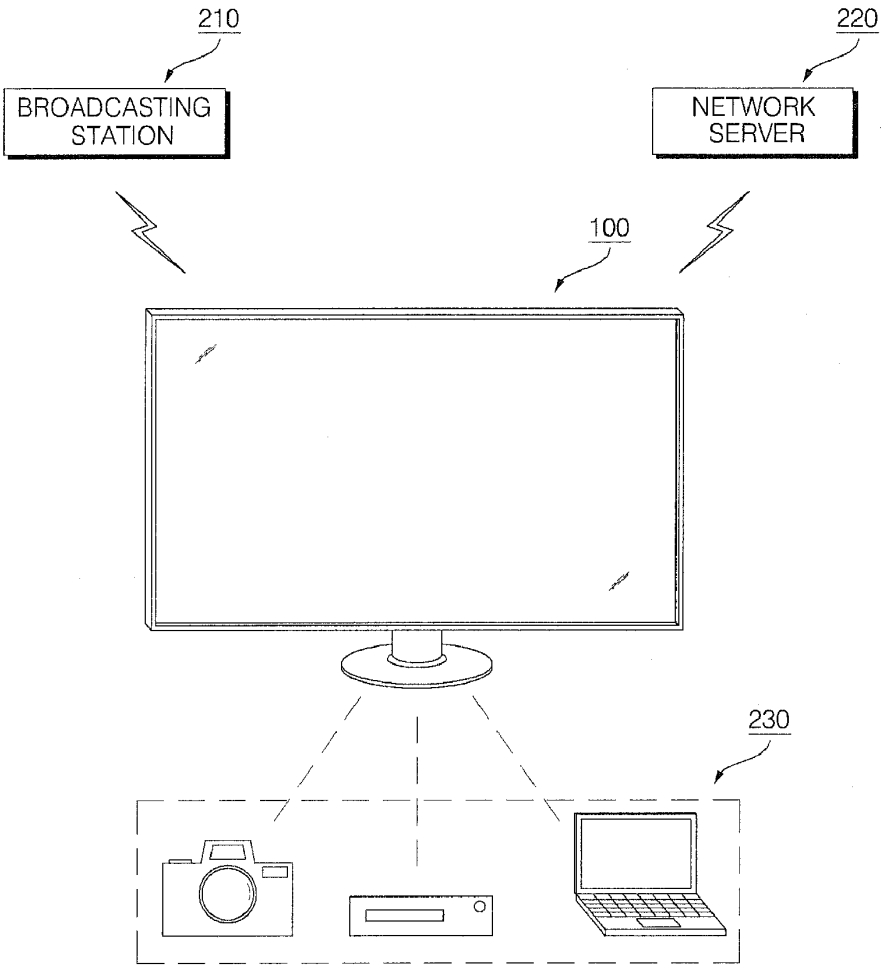


FIG. 10

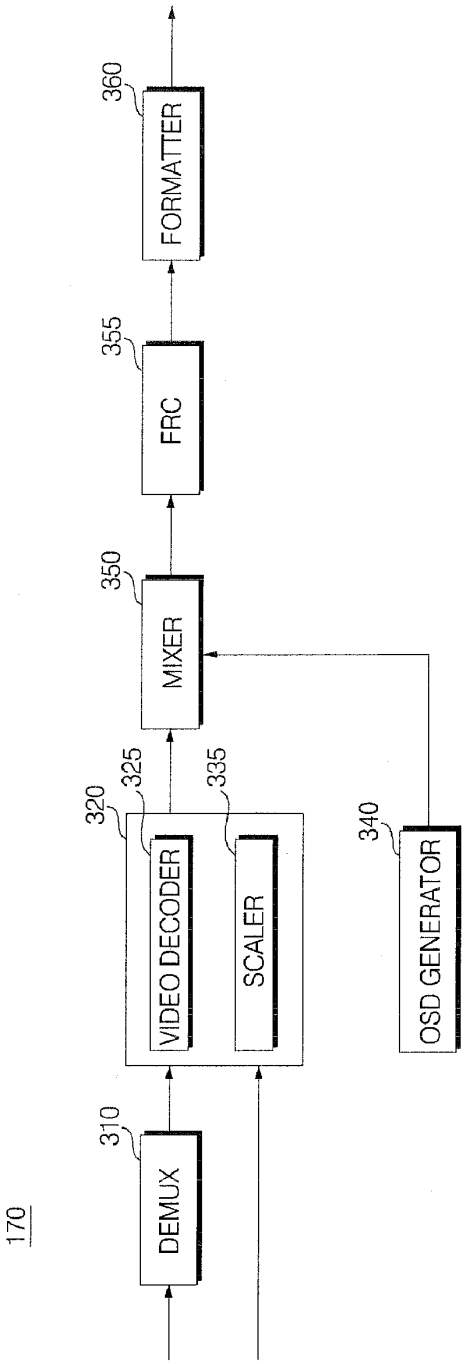

170
310
DEMUX
320
325
VIDEO DECODER
335
SCALER
340
OSD GENERATOR
350
MIXER
355
FRC
360
FORMATTER

FIG. 11

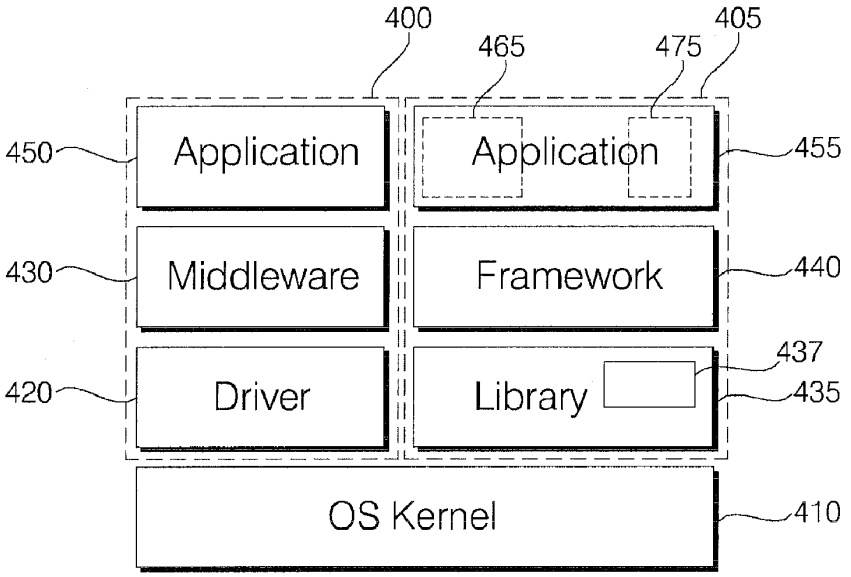

400
465
475
405
450
Application
Application
455
430
Middleware
Framework
440
437
420
Driver
Library
435
OS Kernel
410

FIG. 12

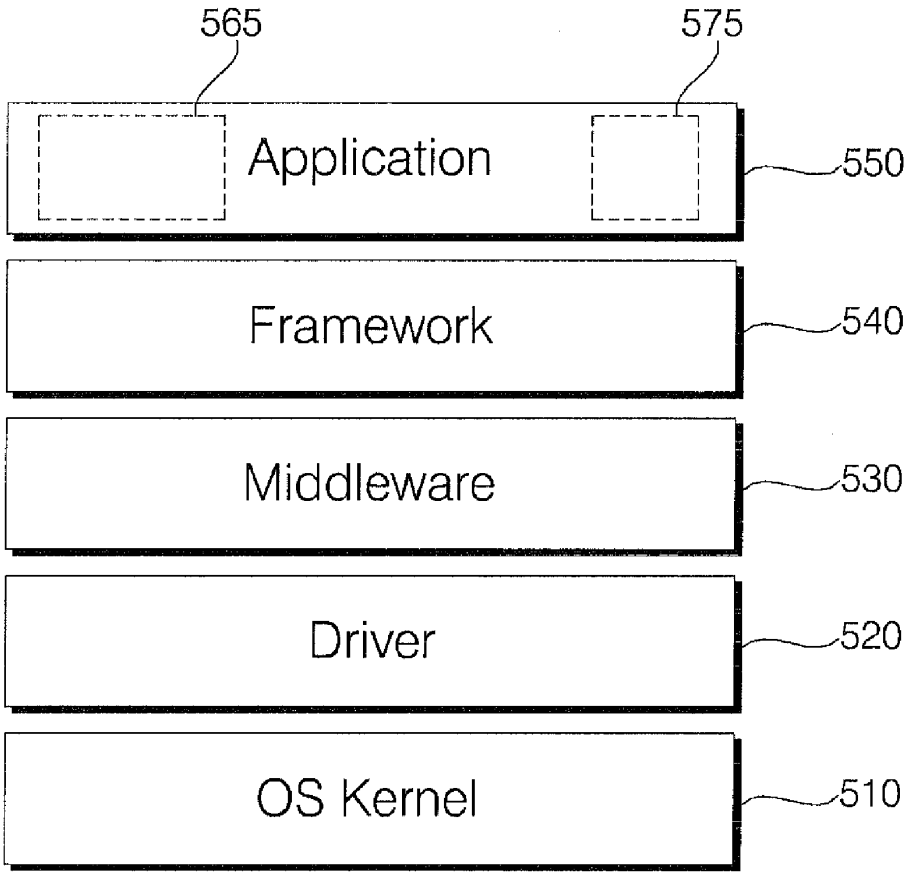

565
575
Application
550
Framework
540
Middleware
530
Driver
520
OS Kernel
510

FIG. 13

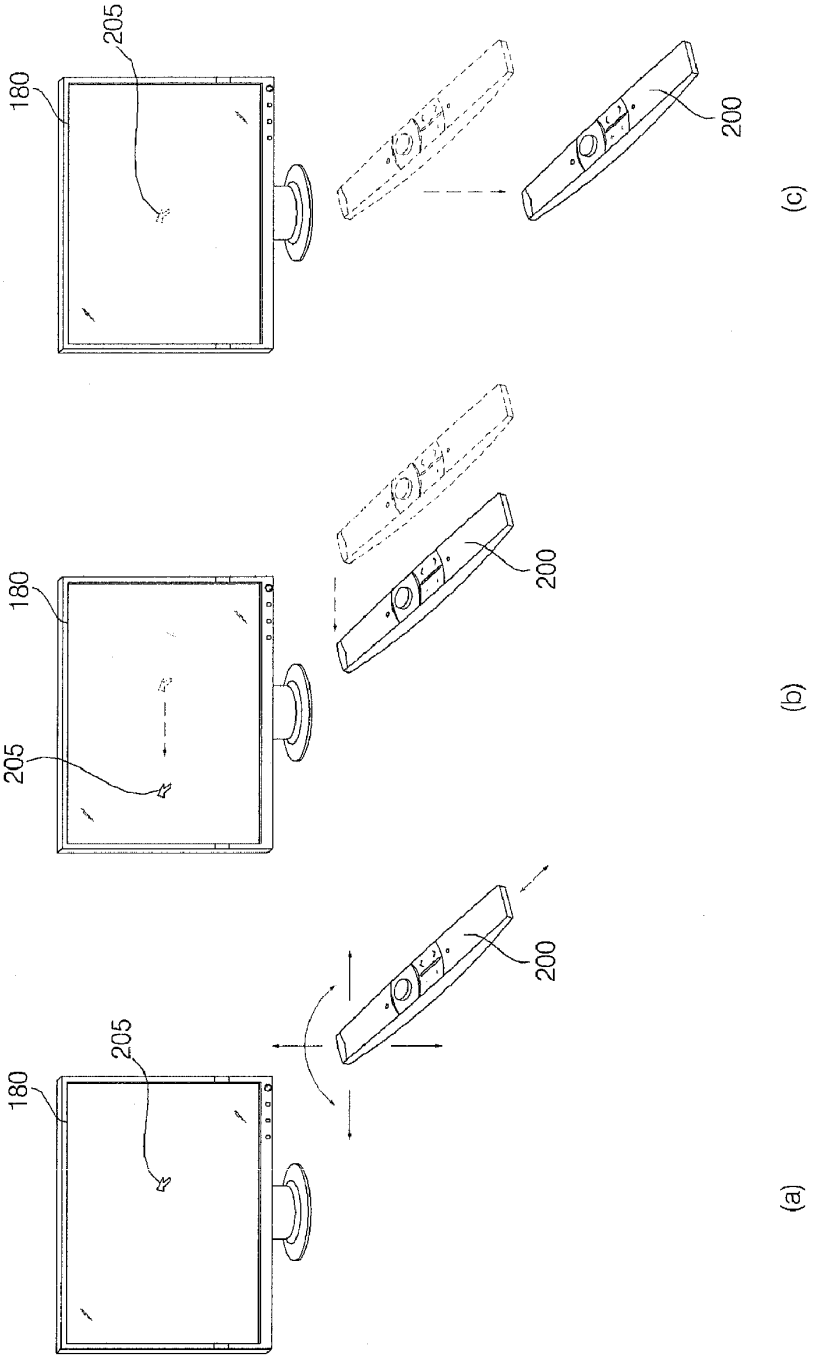


FIG. 14

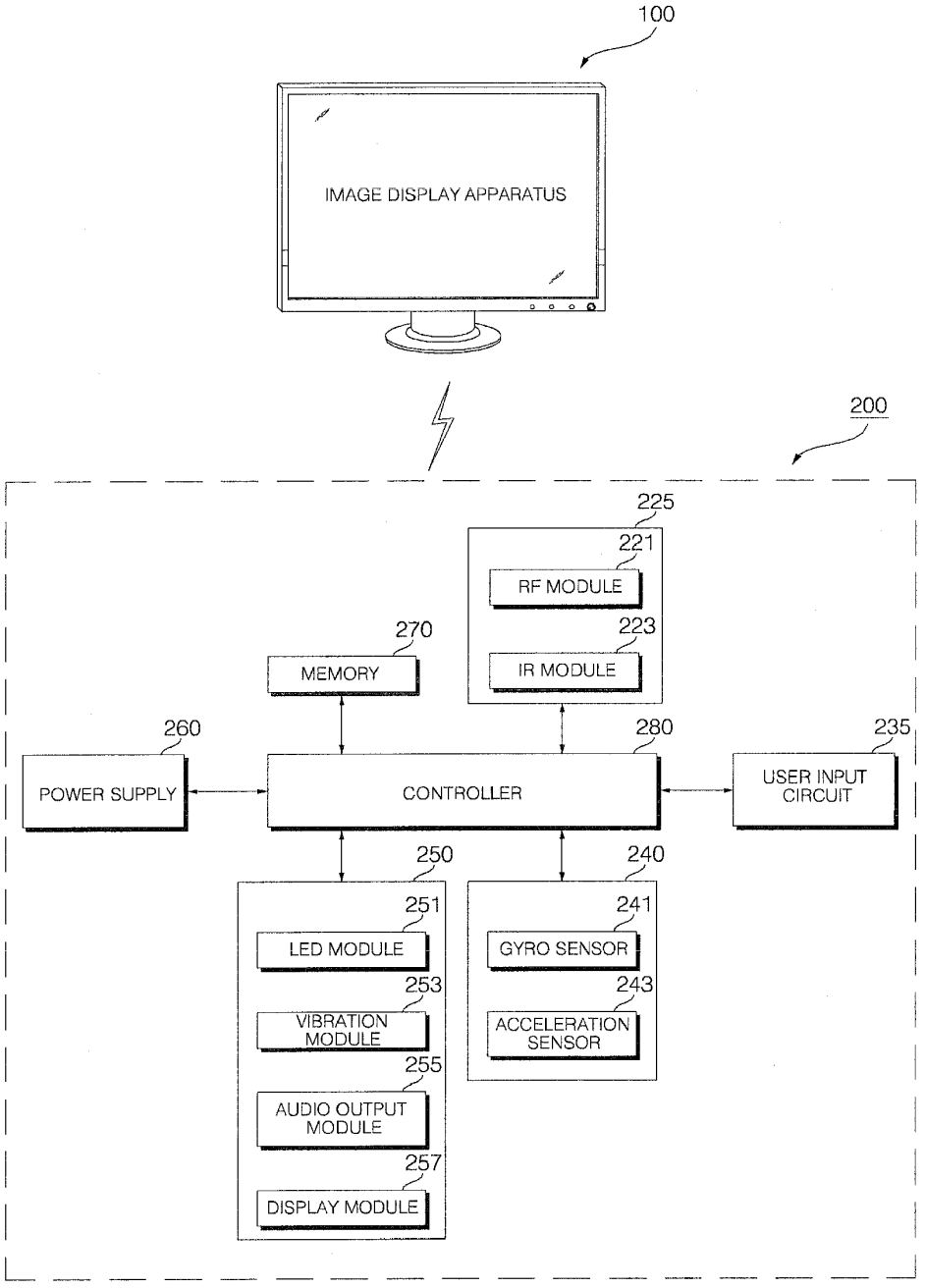

100
IMAGE DISPLAY APPARATUS
200
225
221
RF MODULE
223
IR MODULE
270
MEMORY
260
POWER SUPPLY
280
CONTROLLER
235
USER INPUT CIRCUIT
250
251
LED MODULE
253
VIBRATION MODULE
255
AUDIO OUTPUT MODULE
257
DISPLAY MODULE
240
241
GYRO SENSOR
243
ACCELERATION SENSOR

FIG. 15

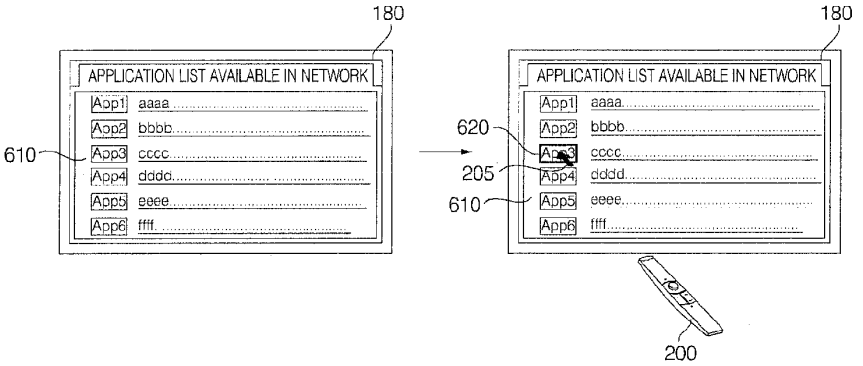

180
APPLICATION LIST AVAILABLE IN NETWORK
App1 aaaa
App2 bbbb
App3 cccc
App4 dddd
App5 eeee
App6 ffff
610
620
205
200
(a)
(b)

FIG. 16

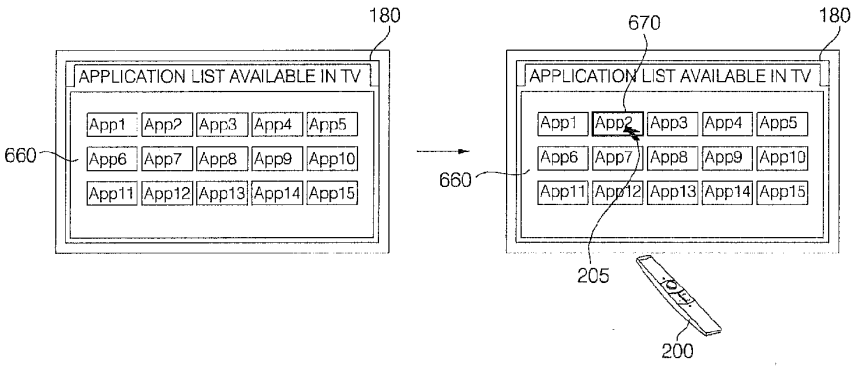

180
670
APPLICATION LIST AVAILABLE IN TV
App1 App2 App3 App4 App5
App6 App7 App8 App9 App10
App11 App12 App13 App14 App15
660
205
200
(a)
(b)

FIG. 17

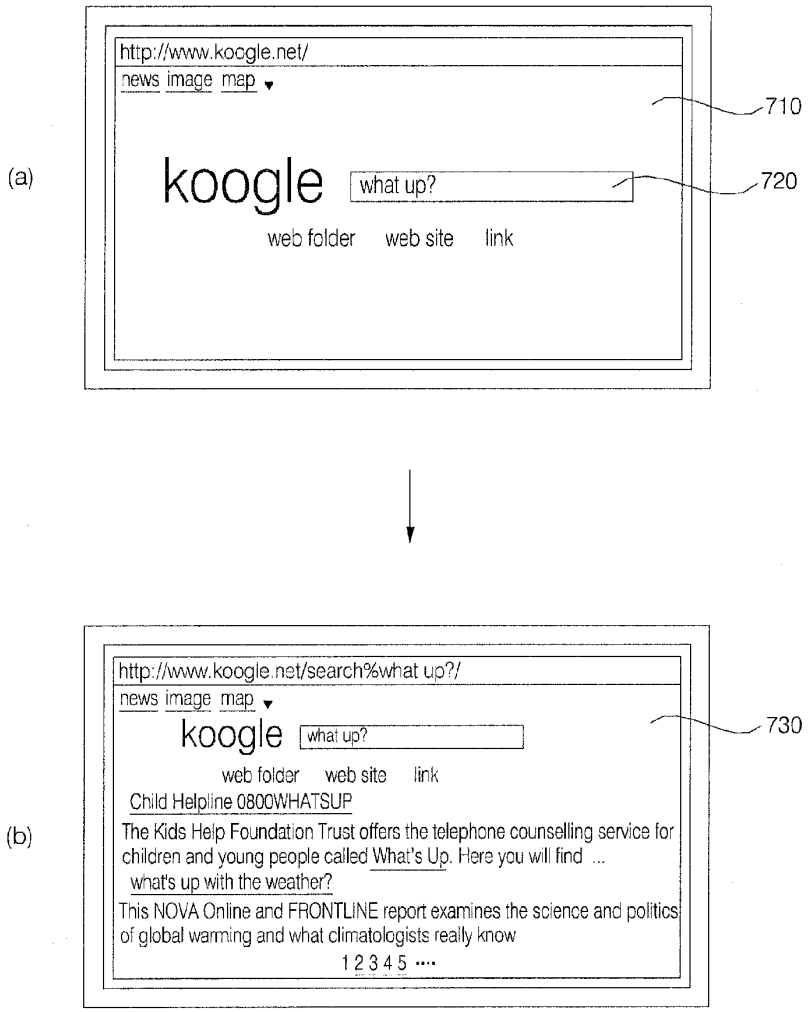

(a)
http://www.koogle.net/
news image map
koogle
what up?
web folder web site link
710
720
(b)
http://www.koogle.net/search%what up?/
news image map
koogle
what up?
web folder web site link
Child Helpline 0800WHATSUP
The Kids Help Foundation Trust offers the telephone counselling service for children and young people called What's Up. Here you will find ...
what's up with the weather?
This NOVA Online and FRONTLINE report examines the science and politics of global warming and what climatologists really know
1 2 3 4 5 ....
730

FIG. 18

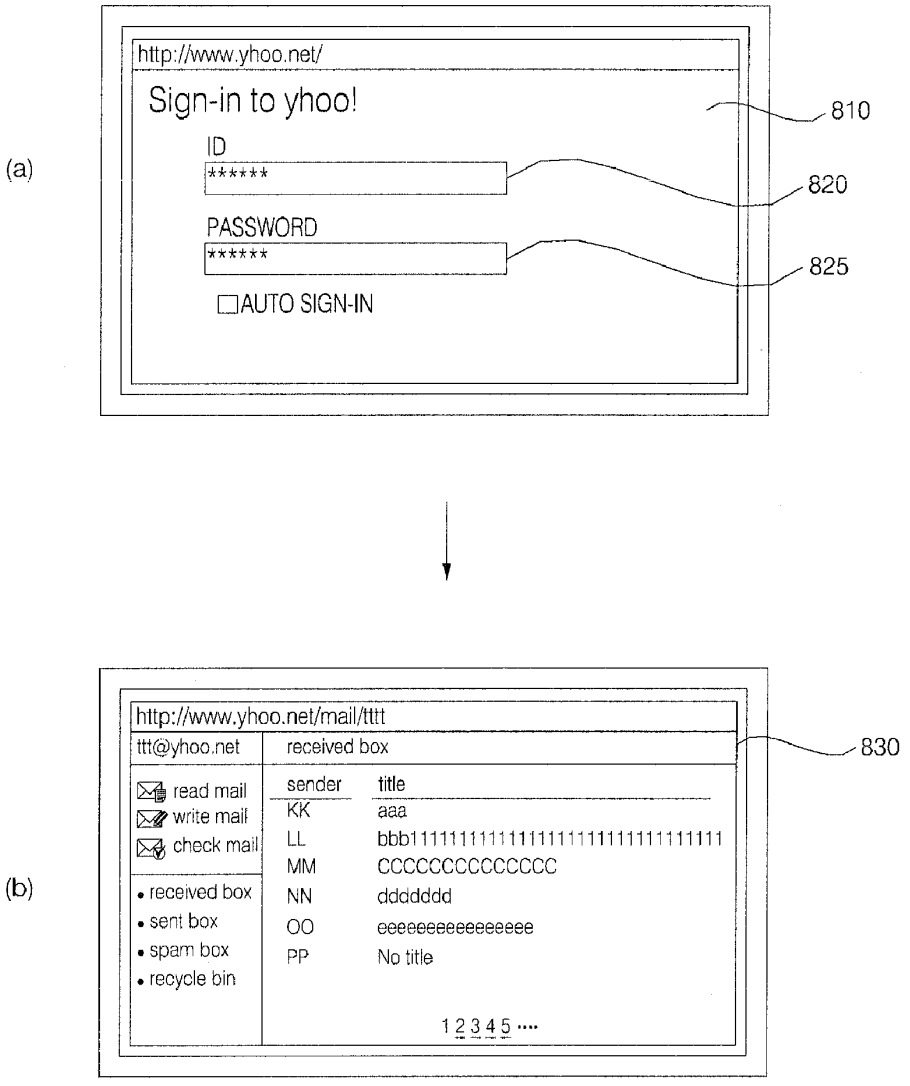
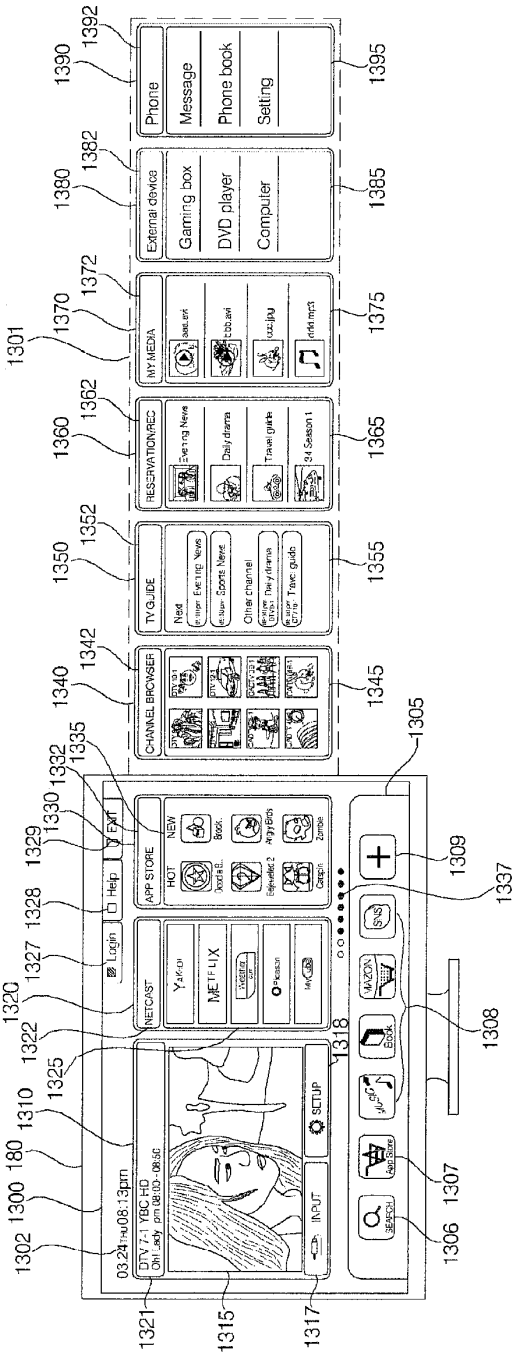

(a)
http://www.yhoo.net/
Sign-in to yhoo!
ID
******
PASSWORD
******
AUTO SIGN-IN
810
820
825
(b)
http://www.yhoo.net/mail/tttt
ttt@yhoo.net
received box
read mail
write mail
check mail
• received box
• sent box
• spam box
• recycle bin
sender
title
KK
aaa
LL
bbb1111111111111111111111111111111
MM
CCCCCCCCCCCCC
NN
ddddddd
OO
eeeeeeeeeeeeee
PP
No title
1 2 3 4 5 ····
830

FIG. 19


Phone
Message
Phone book
Setting
External device
Gaming box
DVD player
Computer
MY MEDIA
RESERVATION/REC
TV GUIDE
CHANNEL BROWSER
APP STORE
NETCAST
Login
Help
EXIT
SETUP
INPUT
1301
1302
1305
1306
1307
1308
1309
1310
1315
1317
1318
1320
1321
1322
1325
1327
1328
1329
1330
1332
1335
1337
1340
1342
1345
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1362
1365
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1372
1375
1380
1382
1385
1390
1392
1395

FIG. 20

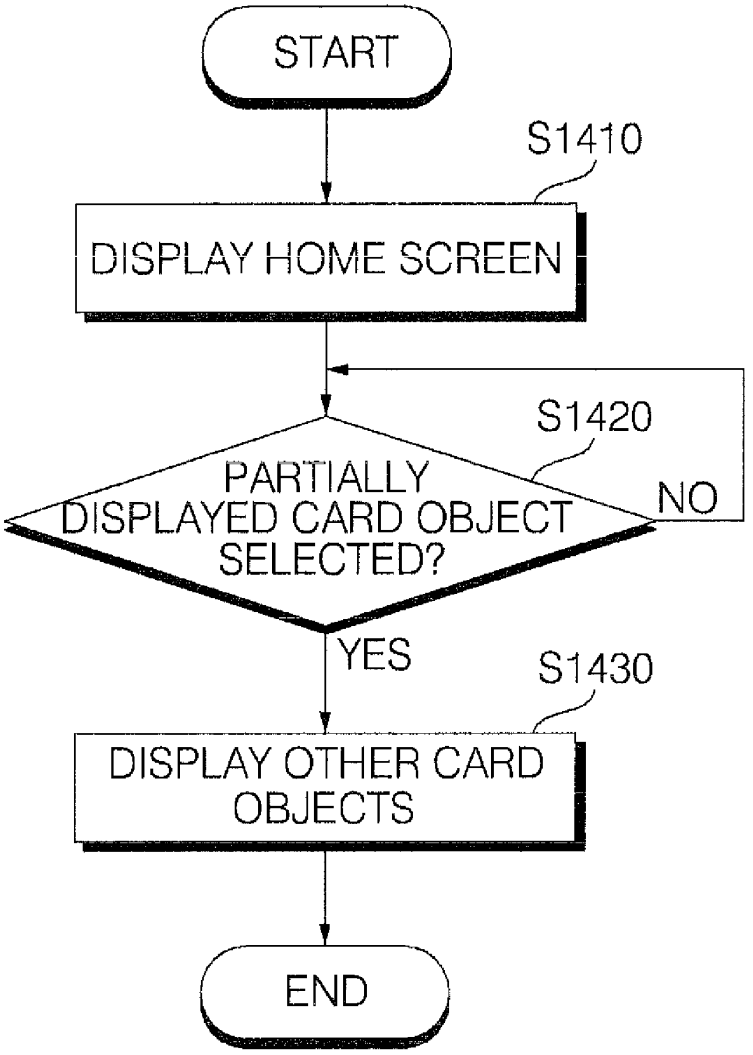

START
S1410
DISPLAY HOME SCREEN
S1420
PARTIALLY DISPLAYED CARD OBJECT SELECTED?
NO
YES
S1430
DISPLAY OTHER CARD OBJECTS
END

FIG. 21

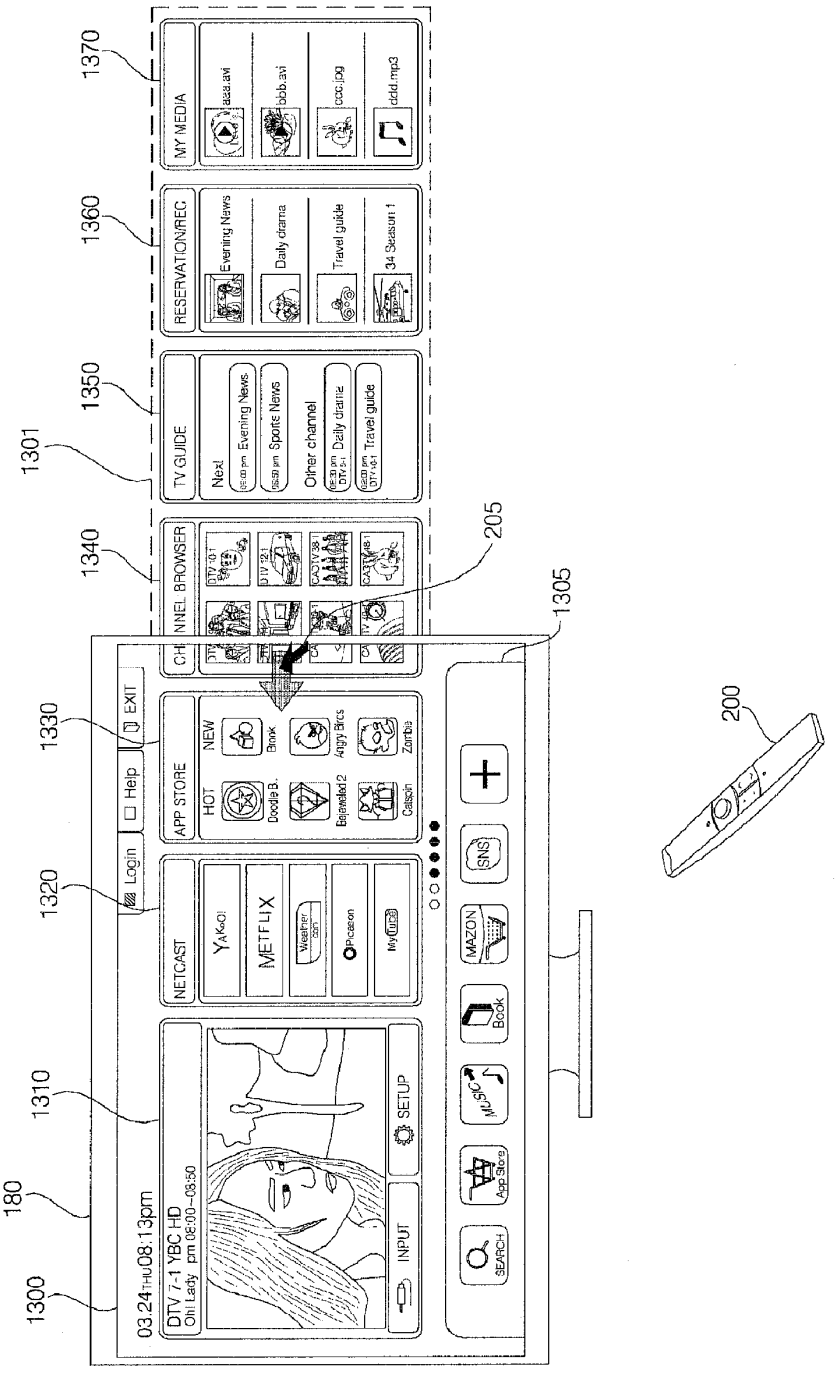

1300
180
1310
1320
1330
1340
1301
1350
1360
1370
205
1305
200
03.24THU08:13pm
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
INPUT
SETUP
NETCAST
METFLIX
APP STORE
HOT
NEW
Doodle B.
Bejeweled 2
Catspin
Angry Birds
Zombie
Login
Help
EXIT
CHANNEL BROWSER
TV GUIDE
Next
Evening News
Sports News
Other channel
Daily drama
Travel guide
RESERVATION/REC
Evening News
Daily drama
Travel guide
34 Season 1
MY MEDIA
aaa.avi
bbb.avi
ccc.jpg
ddd.mp3
SEARCH
App Store
MUSIC
Book
MAZON
SNS

FIG. 22

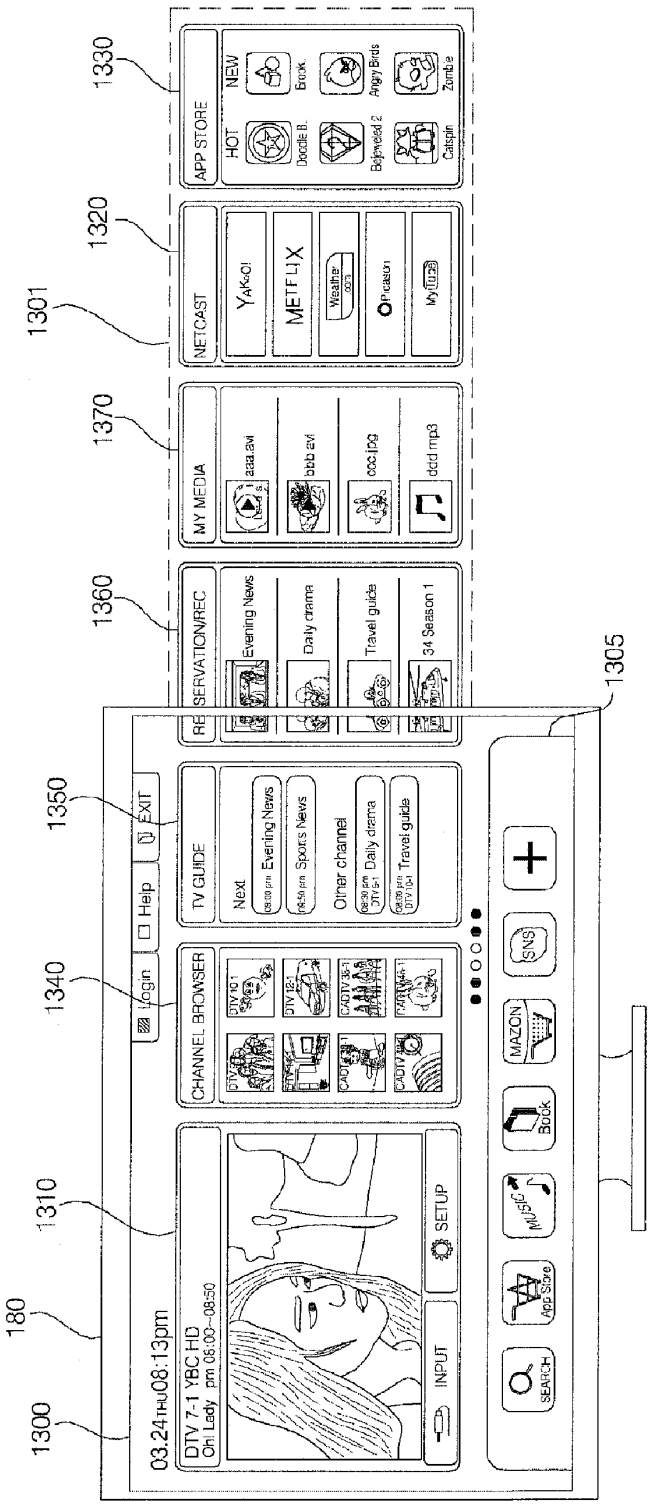

1300
180
1310
1340
1350
1360
1370
1301
1320
1330
1305
03.24 THU 08:13pm
DTV 7-1 YBC HD
Oh! Lady pm 06:00~08:50
INPUT
SETUP
Login
Help
EXIT
CHANNEL BROWSER
TV GUIDE
Next
Evening News
Sports News
Other channel
Daily drama
Travel guide
RESERVATION/REC
MY MEDIA
aaa.avi
bbb.avi
ccc.jpg
ddd.mp3
NETCAST
APP STORE
HOT
NEW
SEARCH
App Store
MUSIC
Book
MAZON
SNS

FIG. 23

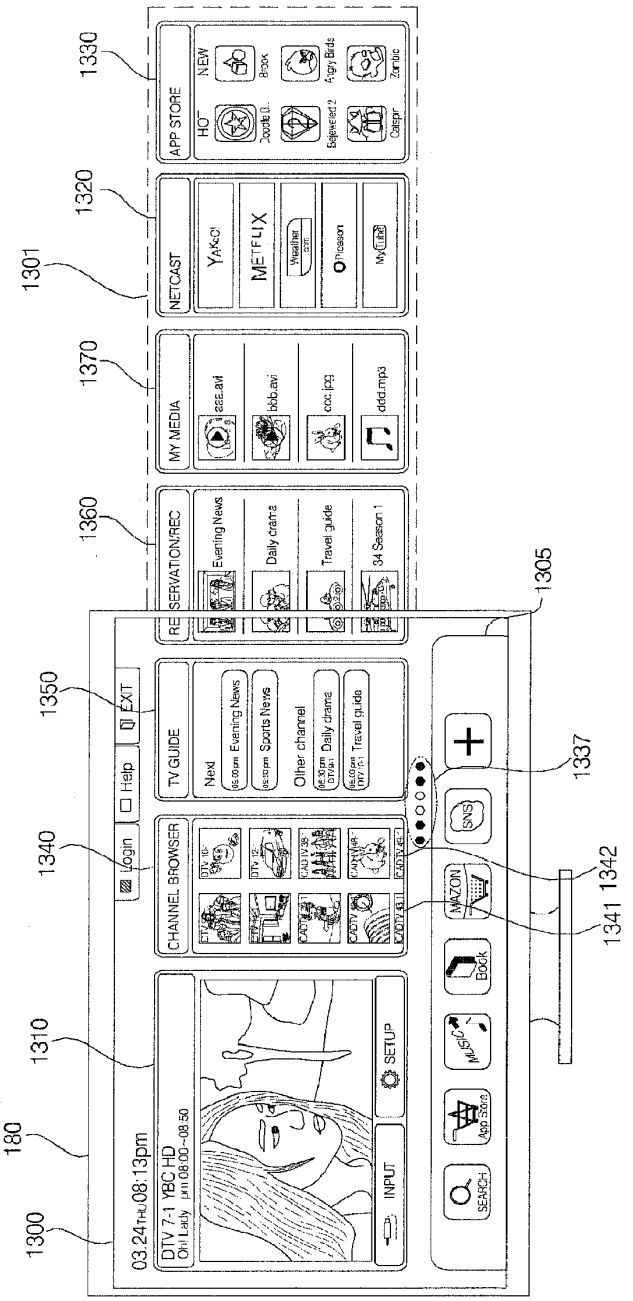

1330
1320
1301
1370
1360
1350
1340
1310
180
1300
1305
1337
1341
1342
APP STORE
NETCAST
MY MEDIA
SERVICE/REC
TV GUIDE
CHANNEL BROWSER
Login
Help
EXIT
INPUT
SETUP
SEARCH
App Store
MUSIC
BOOK
AMAZON
SNS
03.24 THU 08:13pm
DTV 7-1 YBC HD
Oh! Lady 1pm 08:00~08:50

FIG. 24

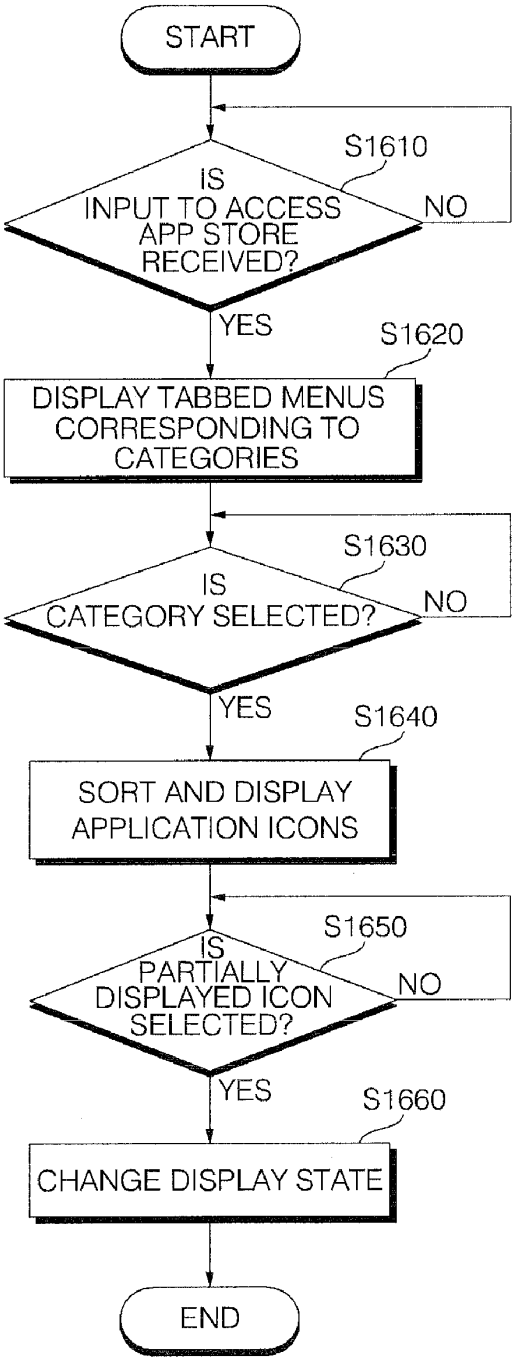

START
S1610
IS INPUT TO ACCESS APP STORE RECEIVED?
NO
YES
S1620
DISPLAY TABBED MENUS CORRESPONDING TO CATEGORIES
S1630
IS CATEGORY SELECTED?
NO
YES
S1640
SORT AND DISPLAY APPLICATION ICONS
S1650
IS PARTIALLY DISPLAYED ICON SELECTED?
NO
YES
S1660
CHANGE DISPLAY STATE
END

FIG. 25

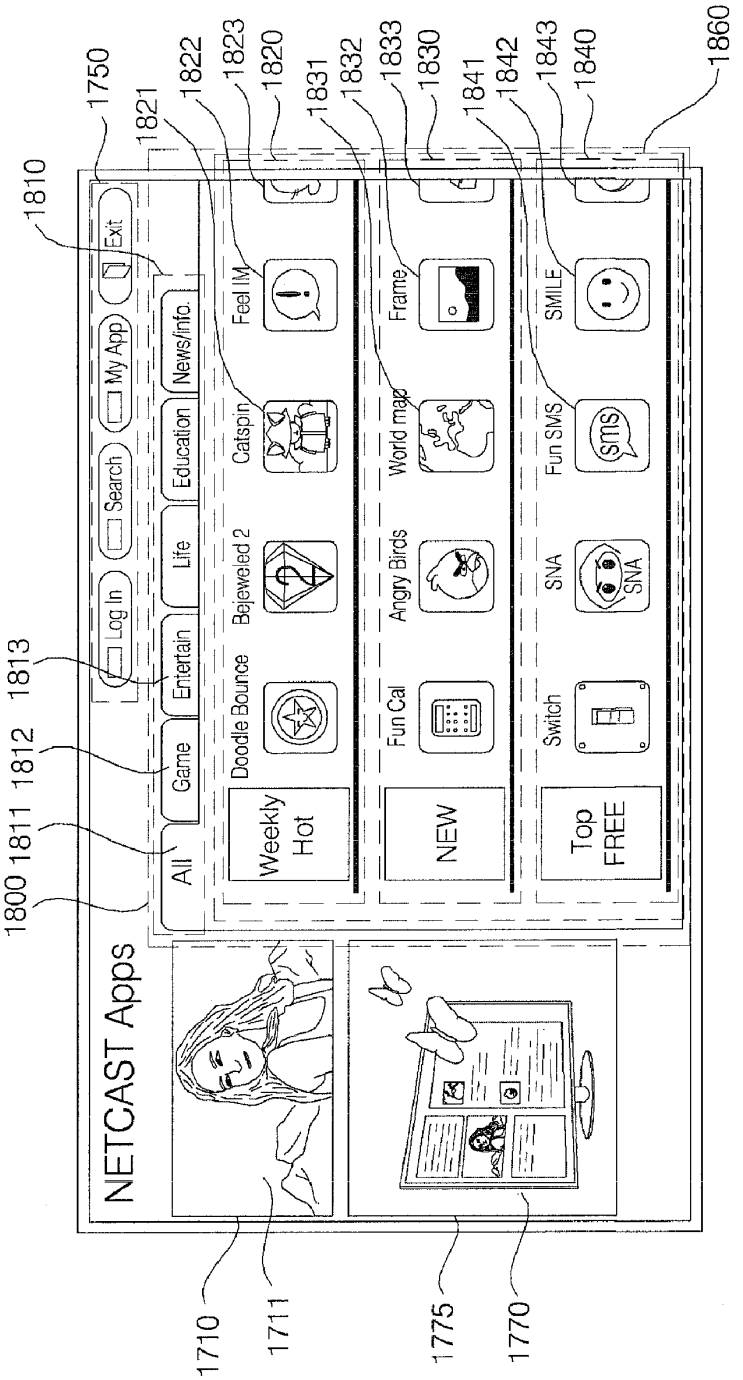

NETCAST Apps
Log In
Search
My App
Exit
All
Game
Entertain
Life
Education
News/info.
Weekly Hot
NEW
Top FREE
Doodle Bounce
Bejeweled 2
Catspin
Feel IM
Fun Cal
Angry Birds
World map
Frame
Switch
SNA
Fun SMS
SMILE
1710
1711
1775
1770
1800
1811
1812
1813
1810
1750
1821
1822
1823
1820
1831
1832
1833
1830
1841
1842
1843
1840
1860

FIG. 26

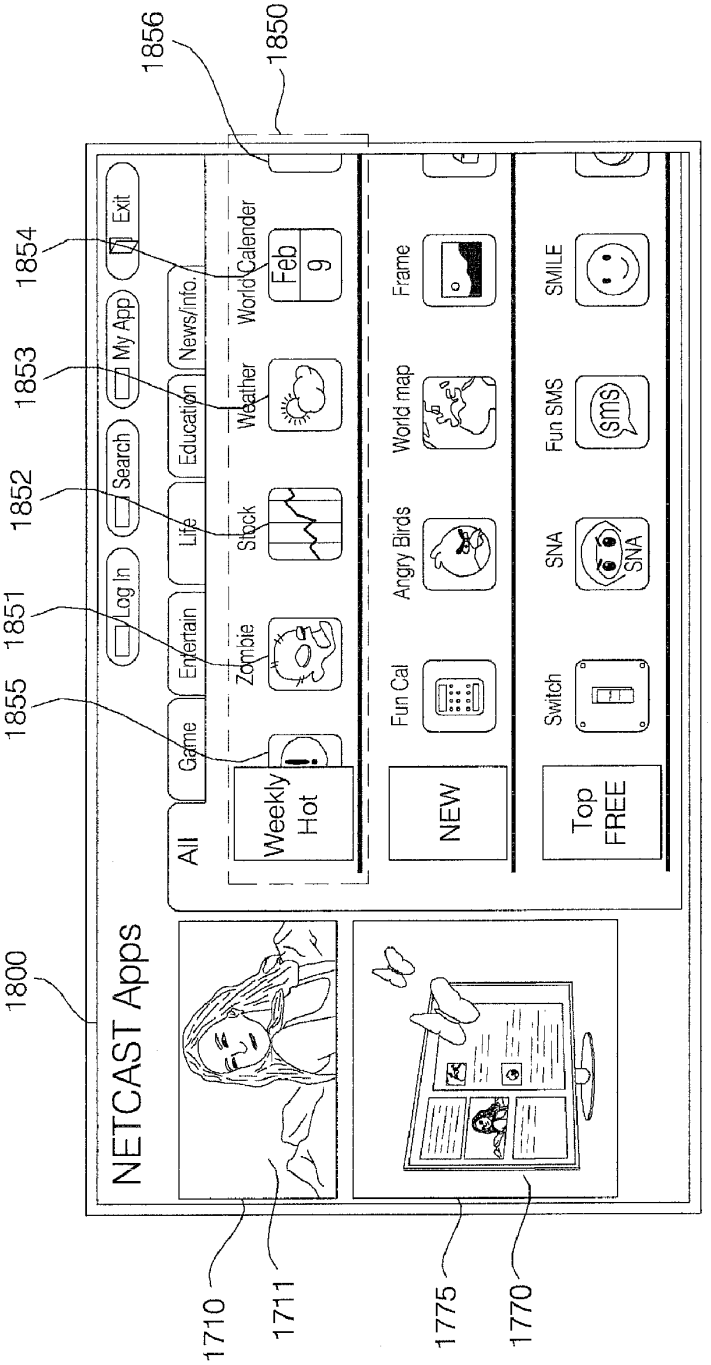

1856
1850
1854
1853
1852
1851
1855
1800
NETCAST Apps
All
Game
Entertain
Life
Education
News/info.
Log In
Search
My App
Exit
Weekly Hot
Zombie
Stock
Weather
World Calender
Feb 9
NEW
Fun Cal
Angry Birds
World map
Frame
Top FREE
Switch
SNA
Fun SMS
SMILE
1710
1711
1775
1770

FIG. 27

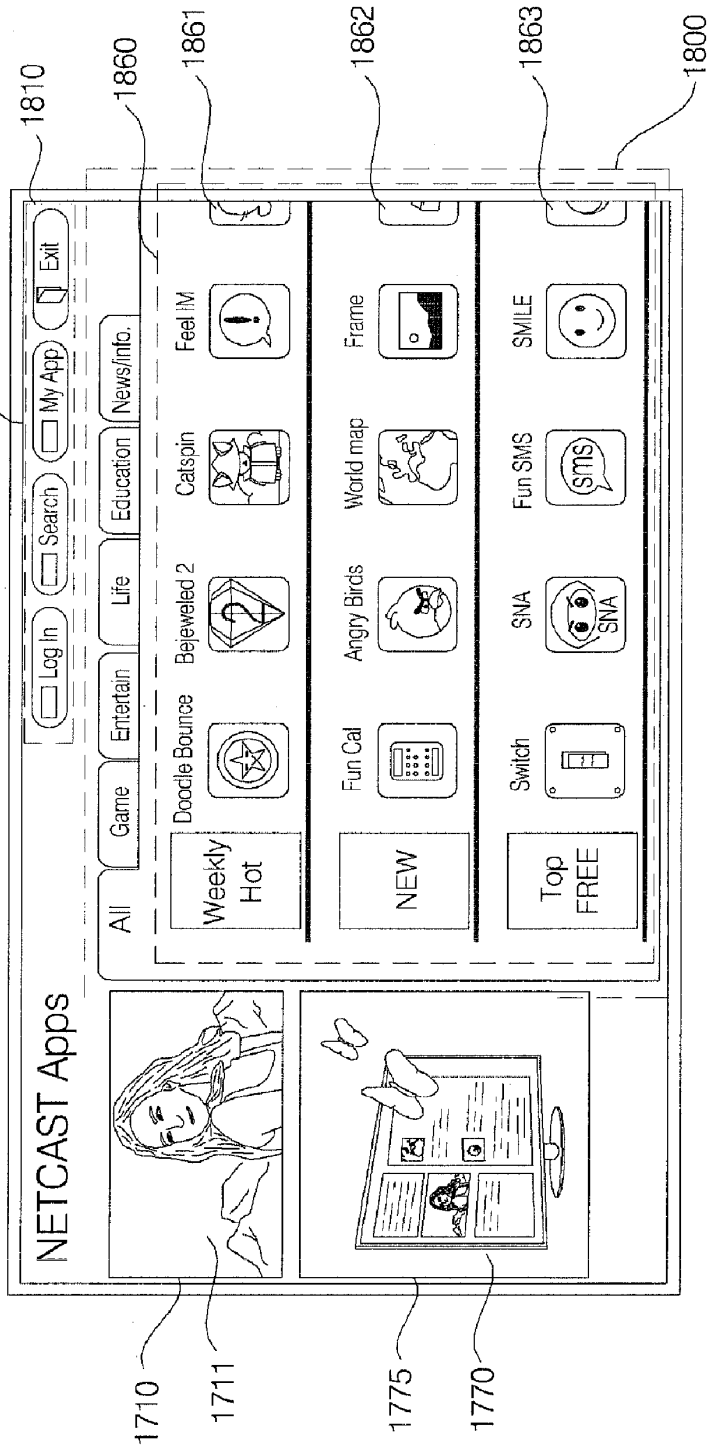

1800
1810
1860
1861
1862
1863
1800
NETCAST Apps
Log In
Search
Entertain
Life
Education
My App
Exit
All
Game
Weekly Hot
NEW
Top FREE
Doodle Bounce
Bejeweled 2
Catspin
Feel IM
Fun Cal
Angry Birds
World map
Frame
Switch
SNA
Fun SMS
SMILE
1710
1711
1775
1770

FIG. 28

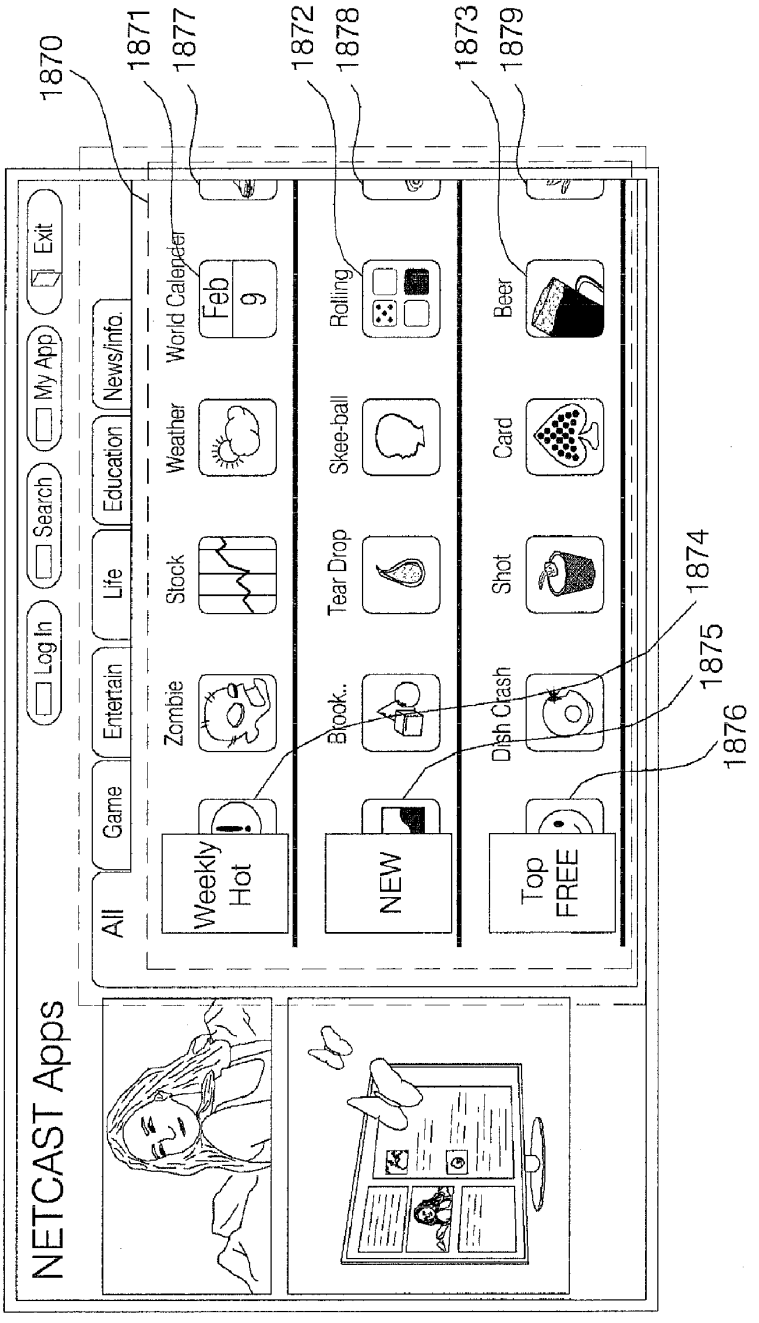

1870
1871
1877
1872
1878
1873
1879
1874
1875
1876
NETCAST Apps
Log In
Search
My App
Exit
All
Game
Entertain
Life
Education
News/Info
Weekly Hot
NEW
Top FREE
Zombie
Stock
Weather
World Calender
Feb 9
Block..
Tear Drop
Skee-ball
Rolling
Dish Crash
Shot
Card
Beer

FIG. 29

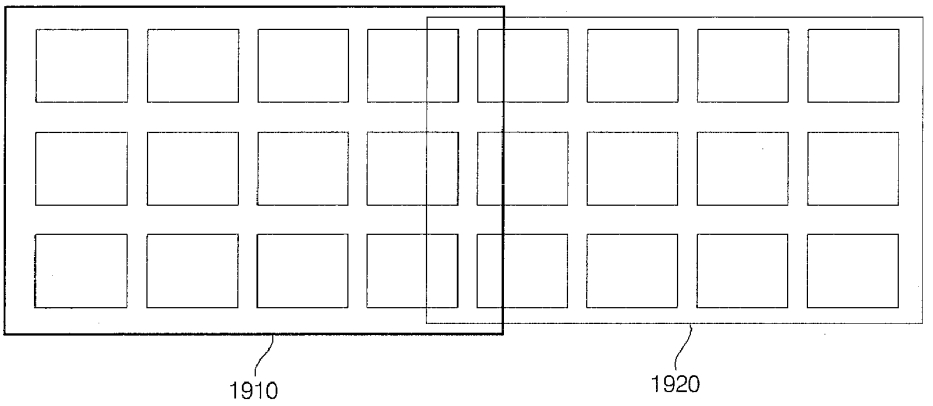



FIG. 30

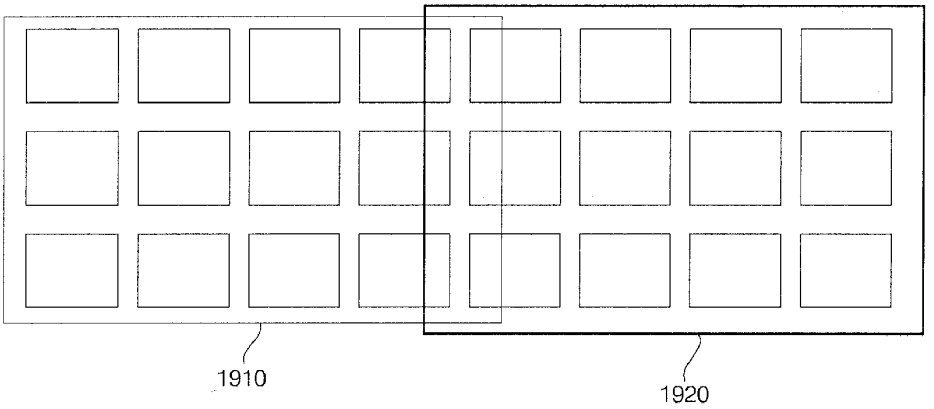


FIG. 31

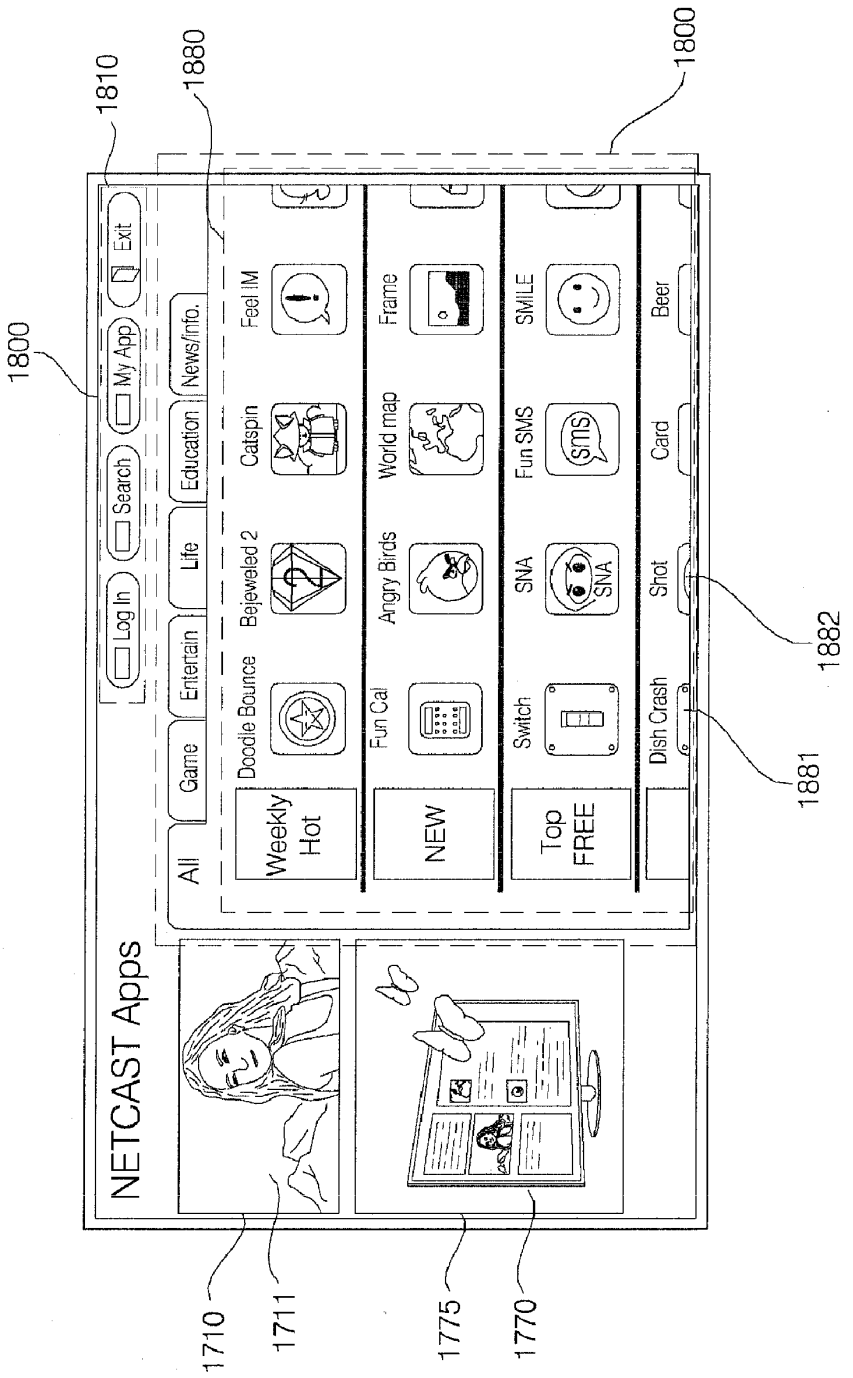

1800
1810
1880
1800
NETCAST Apps
Log In
Search
My App
Exit
All
Game
Entertain
Life
Education
News/info.
Weekly Hot
Doodle Bounce
Bejeweled 2
Catspin
Feel IM
NEW
Fun Cal
Angry Birds
World map
Frame
Top FREE
Switch
SNA
Fun SMS
SMILE
Dish Crash
Shot
Card
Beer
1882
1881
1710
1711
1775
1770

FIG. 32

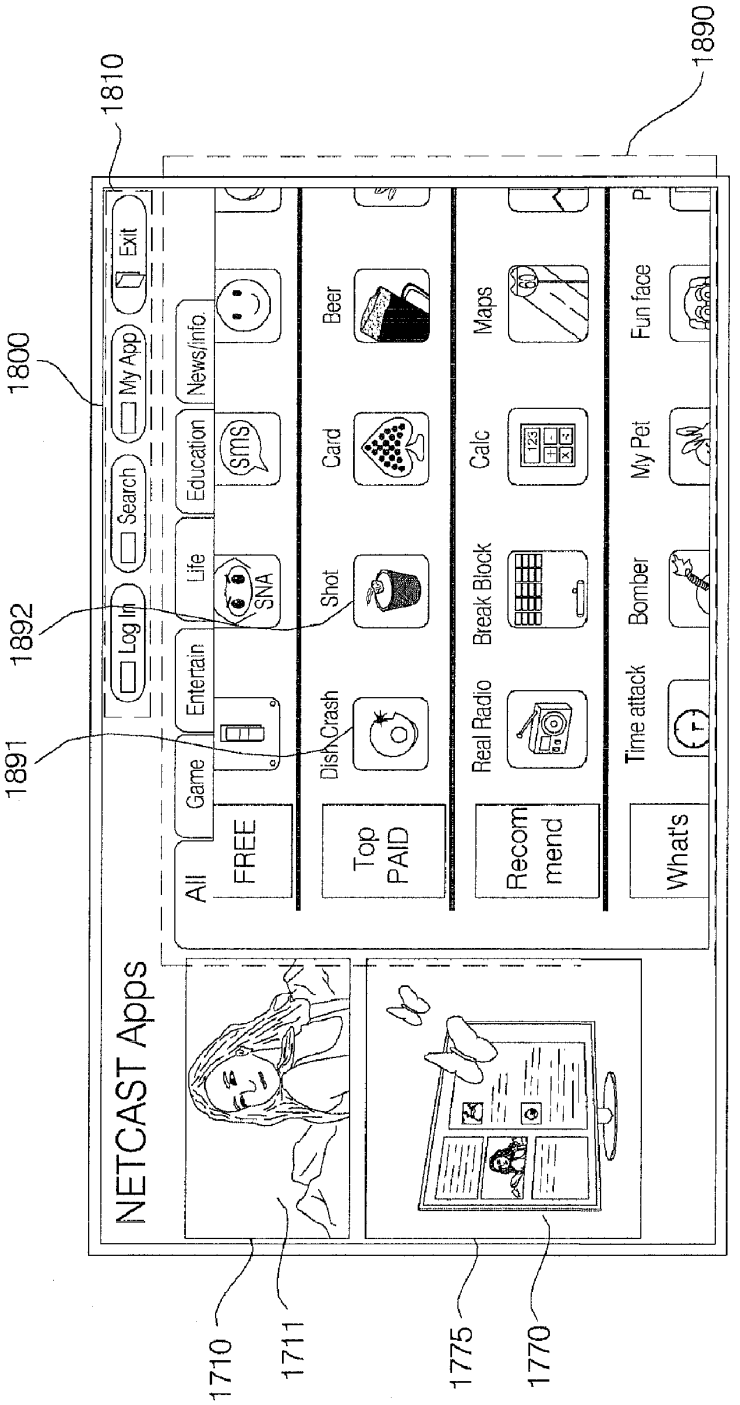

1890
1810
1800
1892
1891
1710
1711
1775
1770
NETCAST Apps
Log In
Search
My App
Exit
All
Game
Entertain
Life
Education
News/info
FREE
Top PAID
Recom mend
What's
Dish Crash
Shot
Card
Beer
Real Radio
Break Block
Calc
Maps
Time attack
Bomber
My Pet
Fun face
SNA
SMS

FIG. 33

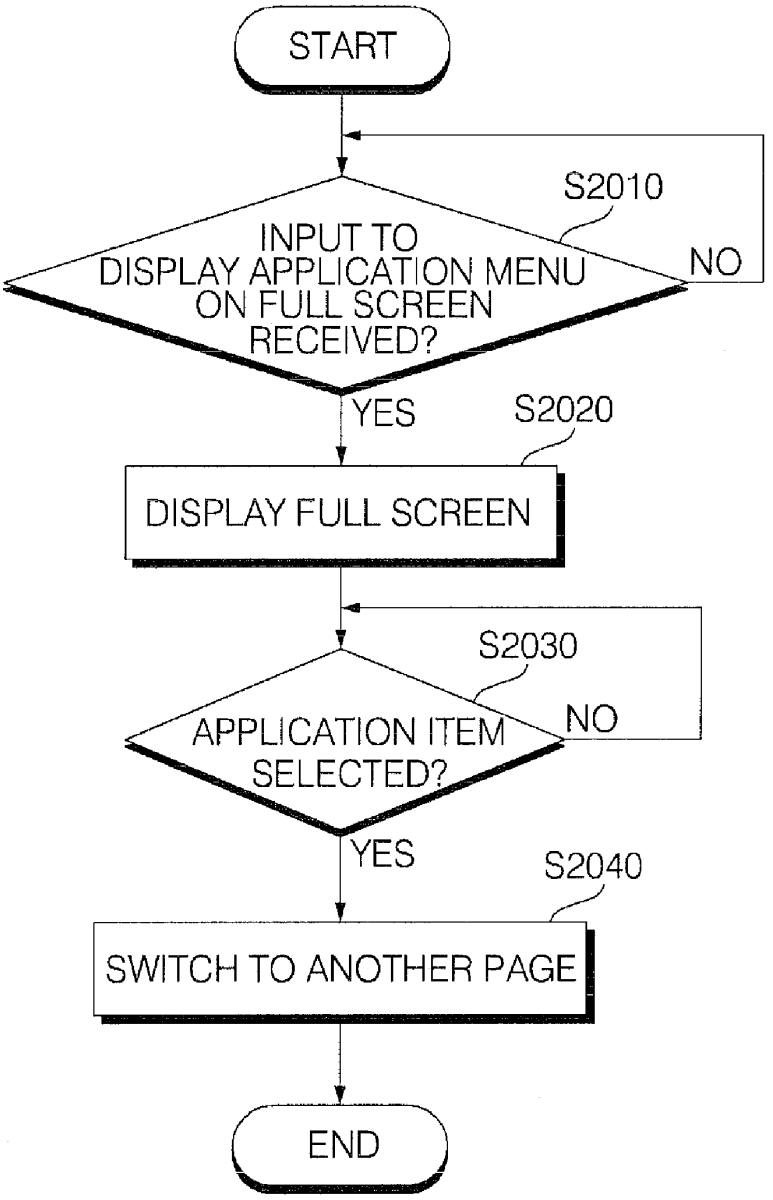

START
S2010
INPUT TO DISPLAY APPLICATION MENU ON FULL SCREEN RECEIVED?
NO
YES
S2020
DISPLAY FULL SCREEN
S2030
APPLICATION ITEM SELECTED?
NO
YES
S2040
SWITCH TO ANOTHER PAGE
END

FIG. 34

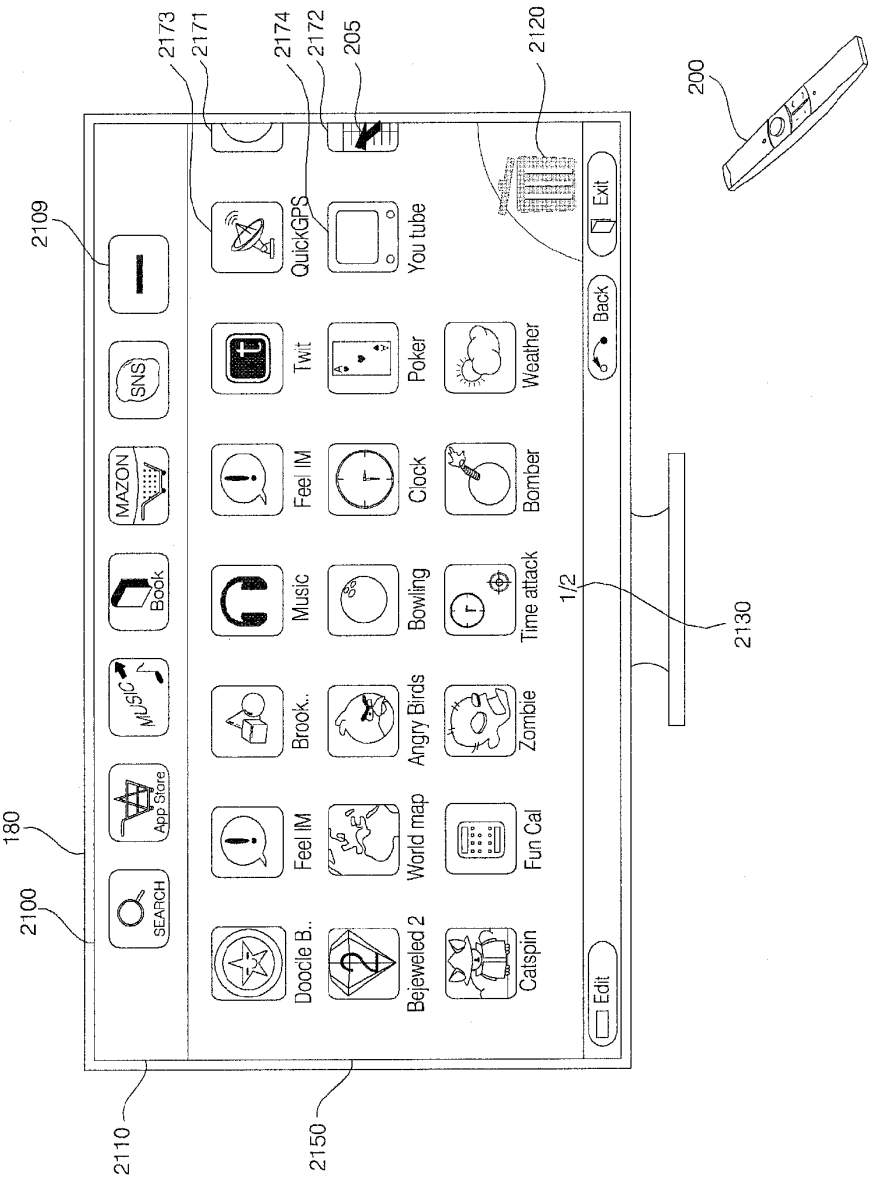

2173
2171
2174
2172
205
2120
200
2109
QuickGPS
You tube
Twit
Poker
Weather
Feel IM
Clock
Bomber
Music
Bowling
Time attack
Brook..
Angry Birds
Zombie
Feel IM
World map
Fun Cal
Doodle B..
Bejeweled 2
Catspin
SEARCH
App Store
MUSIC
Book
MAZON
SNS
Edit
Back
Exit
1/2
2130
180
2100
2110
2150

FIG. 35

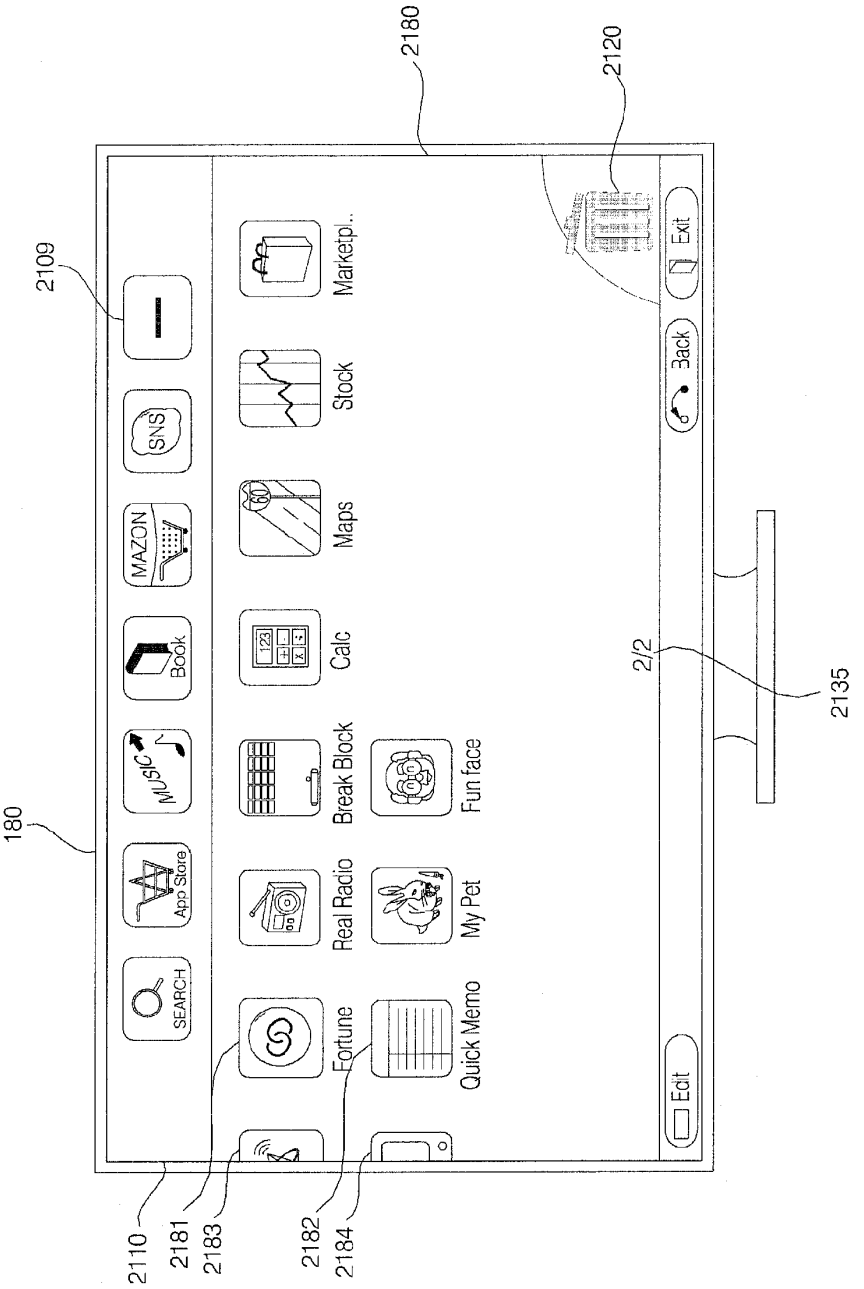

180
2109
2180
2120
2135
2/2
2110
2181
2183
2182
2184
SEARCH
App Store
Book
SNS
Fortune
Real Radio
Break Block
Calc
Maps
Stock
Marketpl...
Quick Memo
My Pet
Fun face
Edit
Back
Exit

FIG. 36

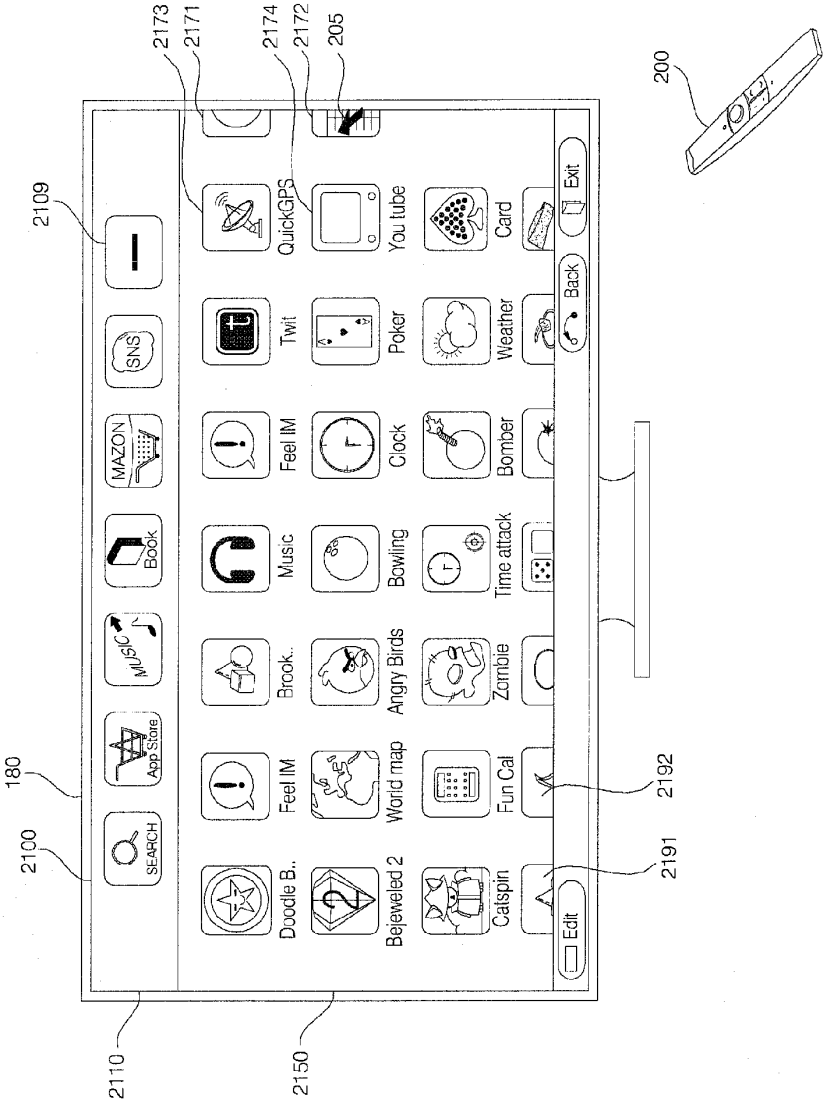

2173
2171
2174
2172
205
200
2109
180
2100
2110
2150
2191
2192
SEARCH
App Store
MUSIC
Book
MAZON
SNS
Doodle B..
Feel IM
Brook..
Music
Feel IM
Twit
QuickGPS
You tube
Card
Bejeweled 2
World map
Angry Birds
Bowling
Clock
Poker
Weather
Back
Catspin
Fun Cal
Zombie
Time attack
Bomber
Edit
Exit

FIG. 37

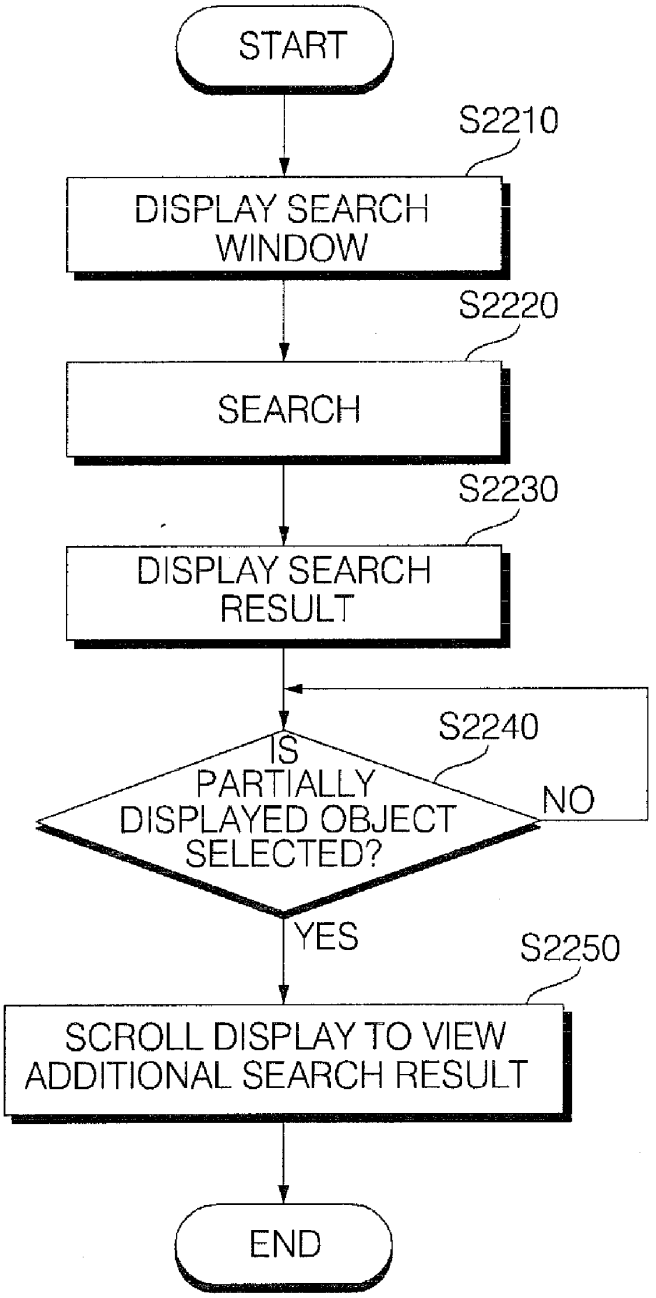

START
S2210
DISPLAY SEARCH WINDOW
S2220
SEARCH
S2230
DISPLAY SEARCH RESULT
S2240
IS PARTIALLY DISPLAYED OBJECT SELECTED?
NO
YES
S2250
SCROLL DISPLAY TO VIEW ADDITIONAL SEARCH RESULT
END

FIG. 38

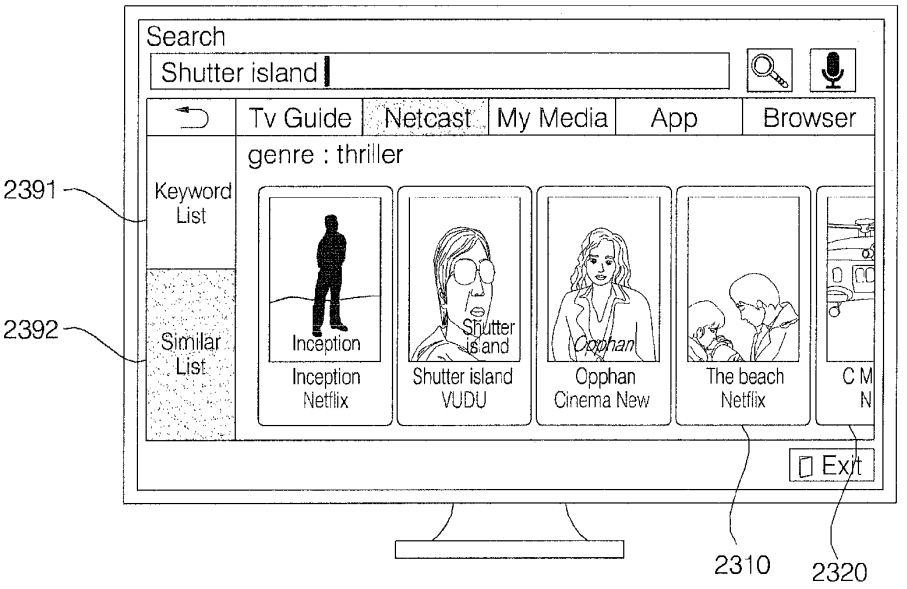

Search
Shutter island
Tv Guide
Netcast
My Media
App
Browser
genre : thriller
Keyword List
Similar List
2391
2392
Inception
Inception
Netflix
Shutter island
VUDU
Opphan
Cinema New
The beach
Netflix
C M
N
Exit
2310
2320

FIG. 39

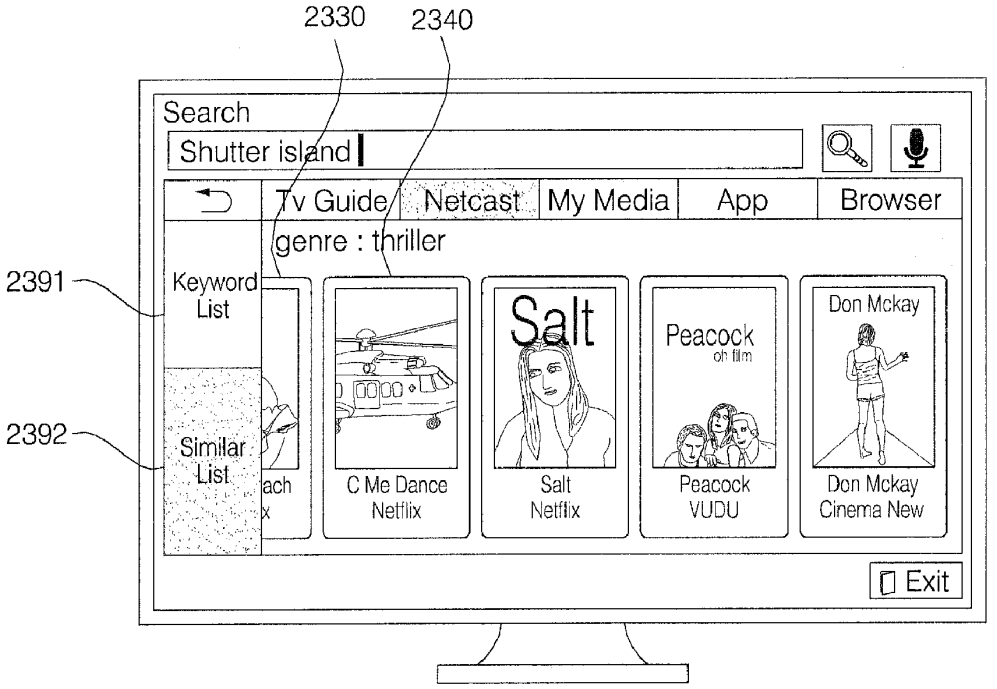

2330
2340
Search
Shutter island
Tv Guide
Netcast
My Media
App
Browser
genre : thriller
2391
Keyword List
2392
Similar List
C Me Dance Netflix
Salt
Salt Netflix
Peacock
oh film
Peacock VUDU
Don Mckay
Don Mckay Cinema New
Exit

FIG. 40

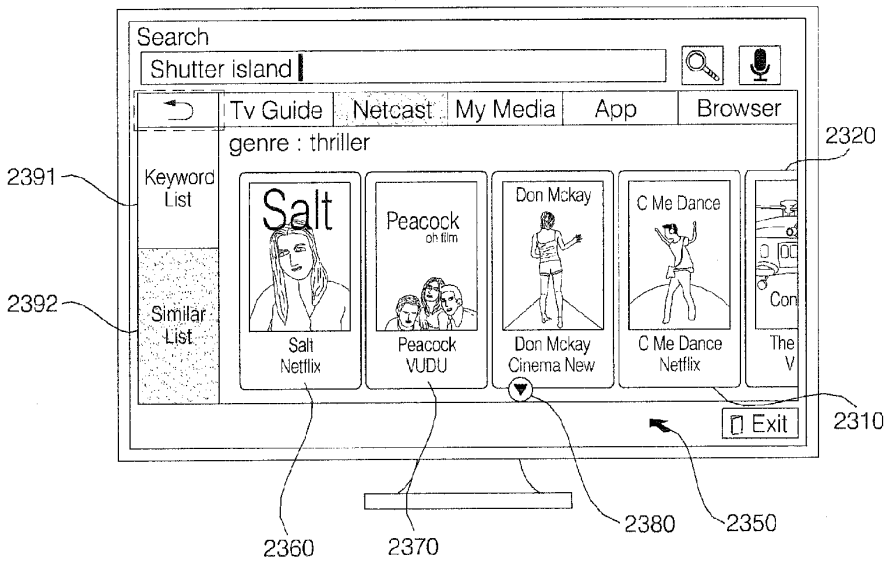

Search
Shutter island
Tv Guide
Netcast
My Media
App
Browser
genre : thriller
Keyword List
Similar List
Salt
Peacock
oh film
Don Mckay
C Me Dance
Salt
Netflix
Peacock
VUDU
Don Mckay
Cinema New
C Me Dance
Netflix
Exit
2391
2392
2320
2310
2360
2370
2380
2350

FIG. 41

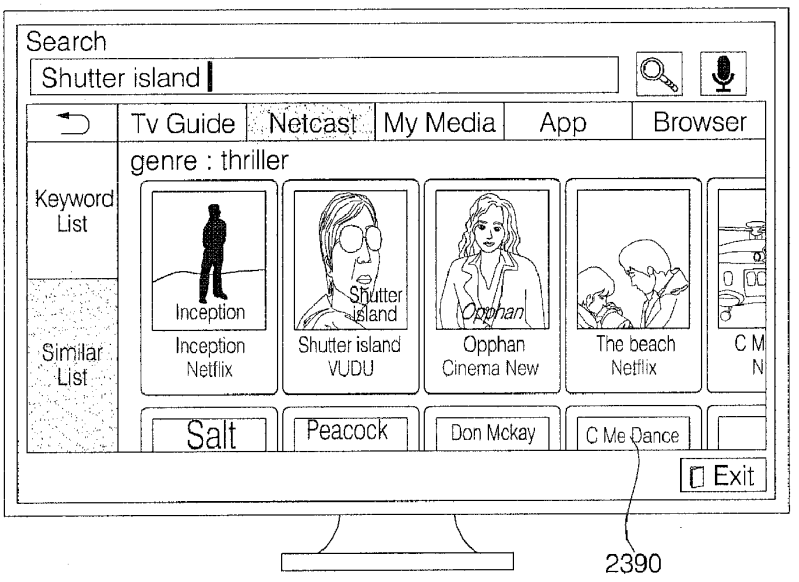

Search
Shutter island
Tv Guide
Netcast
My Media
App
Browser
genre : thriller
Keyword List
Similar List
Inception
Inception
Netflix
Shutter island
Shutter island
VUDU
Opphan
Opphan
Cinema New
The beach
Netflix
Salt
Peacock
Don Mckay
C Me Dance
Exit
2390

FIG. 42

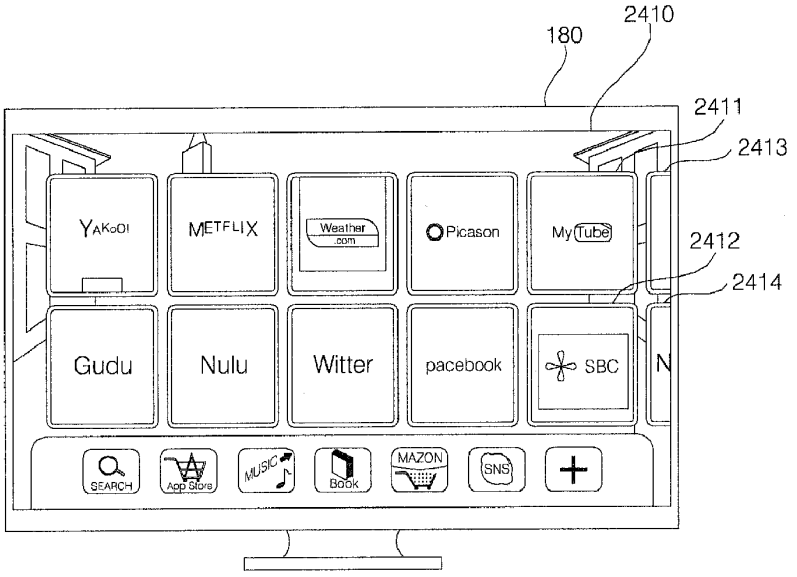

180
2410
2411
2413
2412
2414
YAKOO!
METFLIX
Weather .com
Picason
My Tube
Gudu
Nulu
Witter
pacebook
SBC
SEARCH
App Store
MUSIC
Book
MAZON
SNS

FIG. 43

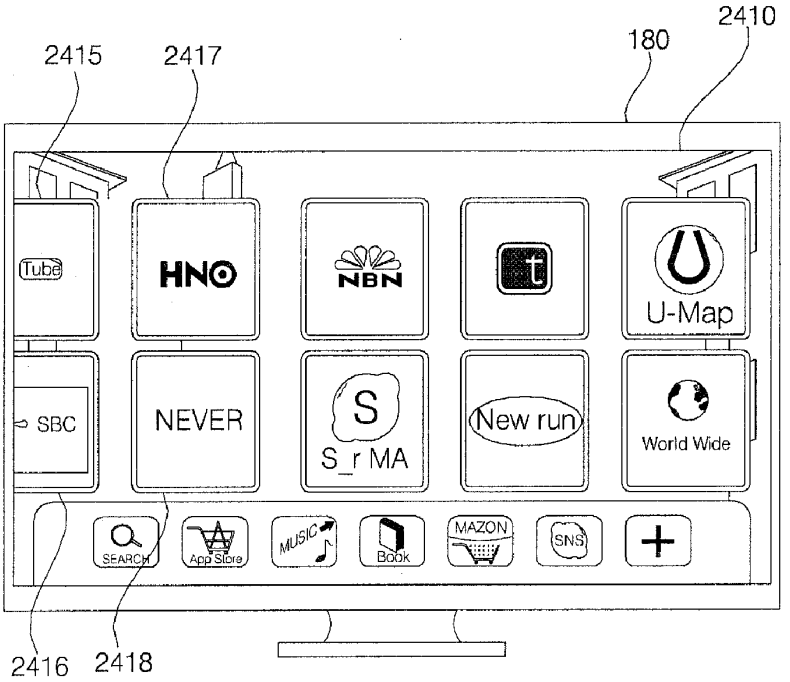
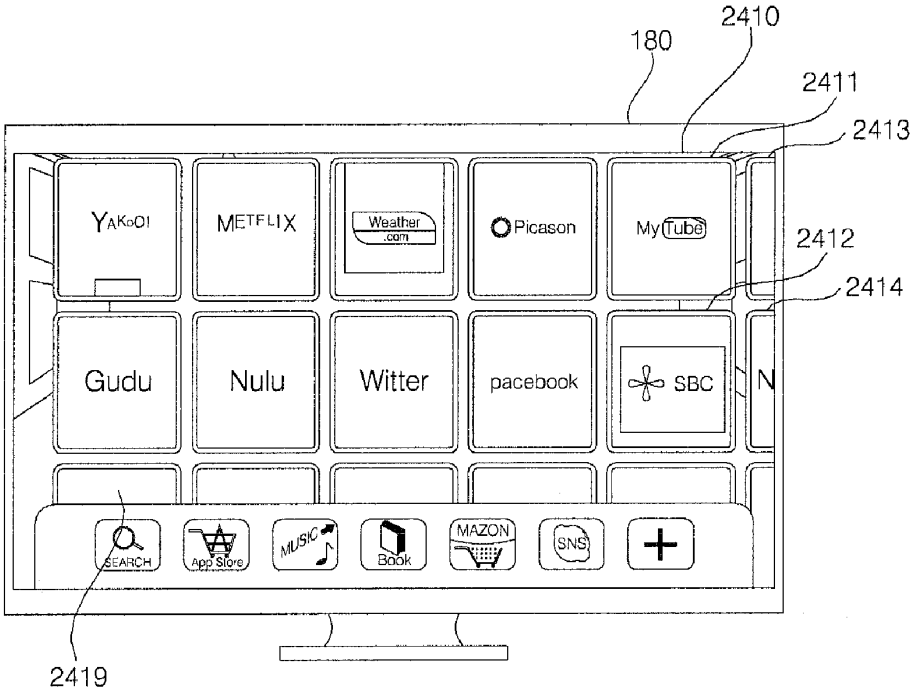

2410
180
2415
2417
Tube
HNO
NBN
U-Map
SBC
NEVER
S
S_r MA
New run
World Wide
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2416
2418

FIG. 44


180
2410
2411
2413
2412
2414
YAHOO!
METFLIX
Weather .com
Picason
My Tube
Gudu
Nulu
Witter
pacebook
SBC
N
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2419

# IMAGE DISPLAY APPARATUS AND METHOD FOR OPERATING THE SAME

## CROSS-REFERENCE TO RELATED APPLICATION(S)

**[0001]** This application claims the benefit of Korean Patent Application No. 10-2010-0086151, filed in Korea on Sep. 2, 2010 in the Korean Intellectual Property Office, and U.S. Provisional Patent Application No. 61/379,369 filed in USA on Sep. 1, 2010 in the USPTO, the disclosure of which is hereby incorporated by reference in its entirety.

## BACKGROUND

**[0002]** 1. Field

**[0003]** A display apparatus and a method for operating the same are disclosed herein.

**[0004]** 2. Background

**[0005]** Display apparatuses and methods for operating the same are known. However, they suffer from various disadvantages.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0006]** The embodiments will be described in detail with reference to the following drawings in which like reference numerals refer to like elements, wherein:

**[0007]** FIG. **1** is a diagram of a configuration of a broadcasting system that includes an image display apparatus according to an embodiment of the present disclosure;

**[0008]** FIG. **2** shows a broadcasting system including an image display apparatus according to another embodiment of the present disclosure;

**[0009]** FIG. **3** is a diagram illustrating a signal flow between a Service Provider (SP) and an image display apparatus of FIG. **1** or **2**, according to an embodiment of the present disclosure;

**[0010]** FIG. **4** illustrates data accessed during the operation of FIG. **3**;

**[0011]** FIG. **5** is a block diagram of an image display apparatus according to an embodiment of the present disclosure;

**[0012]** FIG. **6** is a block diagram of an image display apparatus according to another embodiment of the present disclosure;

**[0013]** FIGS. **7** and **8** are block diagrams showing a set-top box and a display device of an image display apparatus according to an embodiment of the present disclosure;

**[0014]** FIG. **9** shows a plurality of external devices in communication with an image display apparatus according to an embodiment of the present disclosure;

**[0015]** FIG. **10** is a block diagram of a controller of an image display apparatus according to an embodiment of the present disclosure;

**[0016]** FIG. **11** illustrates a platform architecture for an image display apparatus according to an embodiment of the present disclosure;

**[0017]** FIG. **12** illustrates a platform architecture for an image display apparatus according to another embodiment of the present disclosure;

**[0018]** FIG. **13** illustrates a remote controller controlling a pointer displayed on an image display apparatus according to an embodiment of the present disclosure;

**[0019]** FIG. **14** is a block diagram of a remote controller according to an embodiment of the present disclosure;

**[0020]** FIGS. **15-18** illustrate various types of a user interface (UI) in an image display apparatus according to embodiments of the present disclosure;

**[0021]** FIG. **19** shows an exemplary home screen displayed on an image display apparatus according to an embodiment of the present disclosure;

**[0022]** FIG. **20** is a flowchart of a method for operating an image display apparatus according to an embodiment of the present disclosure;

**[0023]** FIGS. **21**, **22** and **23** show home screens to illustrate the method of FIG. **20**;

**[0024]** FIG. **24** is a flowchart of a method for operating an image display apparatus according to another embodiment of the present disclosure;

**[0025]** FIGS. **25** to **32** show views of the image display apparatus to illustrate the method of FIG. **24**;

**[0026]** FIG. **33** is a flowchart of a method for operating an image display apparatus according to another embodiment of the present disclosure;

**[0027]** FIGS. **34**, **35** and **36** show views of the image display apparatus to illustrate the method of FIG. **33**;

**[0028]** FIG. **37** is a flowchart illustrating a method for operating an image display apparatus according to a further embodiment of the present disclosure;

**[0029]** FIGS. **38** to **41** show views of search screens to illustrate the method of FIG. **37**; and

**[0030]** FIGS. **42**, **43** and **44** show views of the image display apparatus according to another embodiment of the present disclosure.

## DETAILED DESCRIPTION

**[0031]** FIG. **1** is a diagram of a configuration of a broadcasting system that includes an image display apparatus according to an embodiment of the present disclosure. Referring to FIG. **1**, the broadcasting system may include a Content Provider (CP) **10**, a Service Provider (SP) **20**, a Network Provider (NP) **30**, and a Home Network End Device (HNED) **40**. The HNED **40** corresponds to, for example, a client **100** which is an image display apparatus according to an embodiment. The image display apparatus may be a network TV, a smart TV, an Internet Protocol TV (IPTV), etc.

**[0032]** The CP **10** may create and provide content. The CP **10** may be, for example, a terrestrial broadcaster, a cable System Operator (SO) or Multiple System Operator (MSO), a satellite broadcaster, an Internet broadcaster, as illustrated in FIG. **1**, or another appropriate content provider. Besides broadcast content, the CP **10** may also provide various applications.

**[0033]** The SP **20** may provide content received from the CP **10** in a service package. For instance, the SP **20** may package a first terrestrial broadcasting, second terrestrial broadcasting, cable broadcasting, satellite broadcasting, Internet broadcasting, and/or applications and may provide the package to users. The SP **20** may unicast or multicast a service to the client **100**. Unicast is a form of transmission in which information is sent from only one transmitter to only one receiver. In other words, unicast transmission is point-to-point, involving two nodes only. In an example of unicast transmission, upon receipt of a request for data from a receiver, a server may transmit the data to a single receiver.

**[0034]** Multicast is a type of transmission or communication in which a transmitter transmits data to a group of receivers. For example, a server may transmit data to a plurality of

pre-registered receivers at one time. For multicast registration, the Internet Group Management Protocol (IGMP) may be used.

**[0035]** The NP **30** may provide a network over which a service may be provided to the client **100**. The client **100** may construct a home network and receive a service over the home network.

**[0036]** Content transmitted in the above-described broadcasting system may be protected through conditional access or content protection. CableCard and Downloadable Conditional Access System (DCAS) are examples of conditional access or content protection.

**[0037]** The client **100** may also transmit content over a network. In this case, the client **100** serves as a CP and thus the CP **10** may receive content from the client **100**. Therefore, an interactive content service or data service can be provided.

**[0038]** FIG. **2** shows a broadcasting system including an image display apparatus according to another embodiment of the present disclosure. Referring to FIG. **2**, the image display apparatus **100** may be connected to a broadcast network and the Internet. The image display apparatus **100** may be, for example, a network TV, a smart TV, an HbbTV, or another appropriate multifunctional display device. The image display apparatus **100** may include, for example, a broadcast interface **101**, a section filter **102**, an Application Information Table (AIT) filter **103**, an application data processor **104**, a broadcast data processor **111**, a media player **106**, an IP processor **107**, an Internet interface **108**, and a runtime module **109**. The image display apparatus **100** may receive AIT data, real-time broadcast content, application data, and stream events through the broadcast interface **101**. The real-time broadcast content may be referred to as a linear Audio/Video (A/V) content.

**[0039]** The section filter **102** may perform section filtering on the four types of data received through the broadcast interface **101**. The section filter **102** may output the AIT data to the AIT filter **103**, the linear A/V content to the broadcast data processor **111**, and the stream events and application data to the application data processor **104**.

**[0040]** Meanwhile, the image display apparatus **100** may receive non-linear A/V content and application data through the Internet interface **108**. The non-linear A/V content may be, for example, a Content On Demand (CoD) application. The non-linear A/V content and the application data may be transmitted to the media player **106** and the runtime module **109**, respectively. The runtime module **109** may include, for example, an application manager and a browser as illustrated in FIG. **2**. The application manager controls the life cycle of an interactive application using the AIT data, for example. The browser displays and processes the interactive application.

**[0041]** FIG. **3** illustrates an operation for connecting to an SP and receiving channel information from the SP in the image display apparatus of FIG. **1** or **2**. Referring to FIG. **3**, an SP may perform an SP Discovery operation (S**301**) and the image display apparatus may transmit a Service Provider Attachment Request signal to the SP (S**302**). Upon completion of attachment to the SP, the image display apparatus may receive provisioning information from the SP (S**303**). Further, the image display apparatus may receive Master System Information (SI) Tables, Virtual Channel Map Tables, Virtual Channel Description Tables, and Source Tables from the SP (S**304** to S**307**). More specifically, SP Discovery is a process by which SPs that provide IPTV services may search for Service Discovery (SD) servers having information about the offerings of the SPs.

**[0042]** In order to receive information about the SD servers, an SD server address list can be detected, for example, using three methods. Specifically, the SD server address list may be obtained by an address preset in the image display apparatus or an address manually set by a user, Dynamic Host Configuration Protocol (DHCP)-based SP Discovery, and Domain Name System Service (DNS SRV)-based SP Discovery. The image display apparatus accesses a specific SD server using the SD server address list obtained through one of the above three methods and receives a SP Discovery record from the specific SD server. The Service Provider Discovery record may include information needed to perform Service Discovery on an SP basis. The image display apparatus may then start a Service Discovery operation using the SP Discovery record. These operations can be performed in a push mode or a pull mode.

**[0043]** The image display apparatus may access an SP attachment server specified by an SP attachment locator included in the SP Discovery record and performs a registration procedure (or a service attachment procedure). Further, after accessing an authentication service server of an SP specified by an SP authentication locator and performing an authentication procedure, the image display apparatus may perform a service authentication procedure. After service attachment is successfully performed, a server may transmit data in the form of a provision information table to the image display apparatus.

**[0044]** During service attachment, the image display apparatus may include an Identifier (ID) and location information thereof in data, and transmit the data to the service attachment server. Thus, the service attachment server may specify a service that the image display apparatus has subscribed to based on the ID and location information. In addition, the service attachment server may provide, in the form of a provisioning information table, address information from which the image display apparatus can obtain Service Information (SI). The address information may correspond to access information about a Master SI Table. This method facilitates provisioning of a customized service to each subscriber.

**[0045]** The SI may be divided into a Master SI Table record for managing access information and version information about a Virtual Channel Map, a Virtual Channel Map Table for providing a list of services in the form of a package, a Virtual Channel Description Table that contains details of each channel, and a Source Table that contains access information about actual services.

**[0046]** FIG. **4** illustrates an example of data used in the signal flow illustrated in FIG. **3**, and a relationship among data in the SI. Referring to FIG. **4**, a Master SI Table may contain information about the location and version of each Virtual Channel MAP. Each Virtual Channel MAP is identified by its Virtual Channel MAP identifier. VirtualChannelMAPVersion specifies the version number of the Virtual Channel MAP. If any of the tables connected to the Master SI Table in the arrowed direction is modified, the versions of the modified table and overlying tables thereof (up to the Master SI Table) are incremented. Accordingly, a change in any of the SI tables can be readily identified by monitoring the Master SI Table.

**[0047]** For example, when the Source Table is changed, the version of the Source Table is incremented and the version of

the Virtual Channel Description Table that references the Source Table is also incremented. Hence, a change in any lower table may lead to a change in its higher tables and, eventually, a change in the Master SI Table.

**[0048]** One Master SI Table may exist for each SP. However, in the case where service configurations differ for regions or subscribers (or subscriber groups), an SP may have a plurality of Master SI Tables in order to provide a customized service on a region, subscriber or subscriber group basis. Thus, it is possible to provide a customized service to a subscriber according to a region in which the subscriber is located and subscriber information regarding the subscriber.

**[0049]** A Virtual Channel Map Table may contain a list of one or more virtual channels. A Virtual Channel Map includes not details of the channels but information about the locations of the details of the channels. In the Virtual Channel Map Table, VirtualChannelDescriptionLocation specifies the location of a Virtual Channel Description Table that provides virtual channel descriptions.

**[0050]** The Virtual Channel Description Table contains the details of the virtual channels. The Virtual Channel Description Table can be accessed using VirtualChannelDescriptionLocation of the Virtual Channel Map Table.

**[0051]** A Source Table provides information necessary to access actual services (e.g. IP addresses, ports, AV Codecs, transmission protocols, etc.) on a service basis.

**[0052]** The above-described Master SI Table, the Virtual Channel Map Table, the Virtual Channel Description Table and the Source Table may be delivered in four logically separate flows, in a push mode or a pull mode. For version management, the Master SI Table may be multicast, and thus, a version change may be monitored by receiving a multicast stream of the Master SI Table.

**[0053]** FIG. **5** is a detailed block diagram of the image display apparatus of FIG. **1** or **2** according to an embodiment of the present disclosure. Referring to FIG. **5**, an image display apparatus **700** may includes a network interface **701**, a Transmission Control Protocol/Internet Protocol (TCP/IP) manager **702**, a service delivery manager **703**, a Demultiplexer (DEMUX) **705**, a Program Specific Information (PSI) & (Program and System Information Protocol (PSIP) and/or SI) decoder **704**, a display A/V and On Screen Display (OSD) module **708**, a service control manager **709**, a service discovery manager **710**, a metadata manager **712**, an SI & metadata DataBase (DB) **711**, a User Interface (UI) manager **714**, a service manager **713**, or another appropriate component based on the application of the display apparatus.

**[0054]** The network interface **701** may transmit packets to and receives packets from a network. Specifically, the network interface **701** may receive services and content from an SP over the network.

**[0055]** The TCP/IP manager **702** is involved in packet reception and transmission of the image display apparatus **700**, that is, packet delivery from a source to a destination. The TCP/IP manager **702** may classify received packets according to appropriate protocols and may output the classified packets to the service delivery manager **705**, the service discovery manager **710**, the service control manager **709**, and/or the metadata manager **712**.

**[0056]** The service delivery manager **703** may control received service data. For example, when controlling real-time streaming data, the service delivery manager **703** may use the Real-time Transport Protocol/Real-time Transport Control Protocol (RTP/RTCP). If real-time streaming data is transmitted over RTP/RTCP, the service delivery manager **703** may parse the received real-time streaming data using RTP and output the parsed real-time streaming data to the DEMUX **705**. The service deliver manager **703** may also store the parsed real-time streaming data in the SI & metadata DB **711** under the control of the service manager **713**. In addition, the service delivery manager **703** may feed back network reception information to a server that provides the real-time streaming data service using RTCP.

**[0057]** The DEMUX **705** may demultiplex a received packet into audio data, video data, and PSI data and outputs the audio data, video data, and PSI data to the audio decoder **706**, the video decoder **707**, and the PSI & (PSIP and/or SI) decoder **704**, respectively.

**[0058]** The PSI & (PSIP and/or SI) decoder **704** may decode SI such as PSI. More specifically, the PSI & (PSIP and/or SI) decoder **704** may decode PSI sections, PSIP sections, or SI sections received from the DEMUX **705**. The PSI & (PSIP and/or SI) decoder **704** may construct an SI DB by decoding the received sections and may store the SI DB in the SI & metadata DB **711**.

**[0059]** The audio decoder **706** and the video decoder **707** may decode the audio data and the video data received from the DEMUX **705** and may output the decoded audio and video data through the display A/V and OSD module **708**.

**[0060]** The UI manager **714** and the service manager **713** may manage the overall state of the image display apparatus **700**, provide UIs, and manage other managers. The UI manager **714** may provide a Graphical User Interface (GUI) in the form of an OSD and may perform a reception operation corresponding to a key input received from the user. For example, upon receipt of a key input signal regarding channel selection from the user, the UI manager **714** may transmit the key input signal to the service manager **713**.

**[0061]** The service manager **713** may control managers associated with services, such as the service delivery manager **703**, the service discovery manager **710**, the service control manager **709**, and/or the metadata manager **712**. The service manager **713** may also make a channel map and may select a channel using the channel map according to the key input signal received from the UI manager **714**. The service manager **713** may set the audio/video Packet ID (PID) of the selected channel based on SI about the channel received from the PSI & (PSIP and/or SI) decoder **704**.

**[0062]** The service discovery manager **710** may provide information necessary to select an SP that provides a service. Upon receipt of a channel selection signal from the service manager **713**, the service discovery manager **710** may detect a service based on the channel selection signal.

**[0063]** The service control manager **709** may manage selection and control services. For example, if a user selects live broadcasting, such as a conventional broadcasting service, the service control manager may select and control the service using Internet Group Management Protocol (IGMP) or Real-Time Streaming Protocol (RTSP). If the user selects Video on Demand (VoD), the service control manager **709** may select and control the service. RTSP supports trick mode for real-time streaming. Further, the service control manager **709** may initialize and manage a session through an IP Multimedia Control (IMC) gateway using IP Multimedia Subsystem (IMS) and Session Initiation Protocol (SIP). The protocols disclosed herein are given by way of example, and other protocols may be applicable in other embodiments.

**[0064]** The metadata manager **712** may manage metadata related to services and store the metadata in the SI & metadata DB **711**. The SI & metadata DB **711** may store the SI decoded by the PSI & (PSIP and/or SI) decoder **704**, the metadata managed by the metadata manager **712**, and the information required to select an SP, received from the service discovery manager **710**. The SI & metadata DB **711** may store setup data for the system. The SI & metadata DB **711** may be constructed in a Non-Volatile RAM (NVRAM) or a flash memory. Moreover, an IMS gateway **705** is a gateway equipped with functions needed to access IMS-based IPTV services.

**[0065]** FIG. **6** is a block diagram of the image display apparatus of FIG. **1** or **2** according to another embodiment of the present disclosure. Referring to FIG. **6**, the image display apparatus **100** may include a broadcasting receiver **105**, an external device interface **135**, a memory **140**, a user input interface **150**, a controller **170**, a display **180**, an audio output circuit **185**, a power supply **190**, a camera module, or another appropriate component based on the application of the display apparatus **100**. The broadcasting receiver **105** may include a tuner **110**, a demodulator **120** and a network interface **130**. As needed, the broadcasting receiver **105** may be configured so as to include only the tuner **110** and the demodulator **120** or only the network interface **130**.

**[0066]** The tuner **110** selects a Radio Frequency (RF) broadcast signal corresponding to a channel selected by a user from among a plurality of RF broadcast signals received through an antenna. The tuner **110** may downconverts the selected RF broadcast signal into a digital Intermediate Frequency (IF) signal or an analog baseband A/V signal.

**[0067]** More specifically, if the selected RF broadcast signal is a digital broadcast signal, the tuner **110** downconverts the selected RF broadcast signal into a digital IF signal DIF. On the other hand, if the selected RF broadcast signal is an analog broadcast signal, the tuner **110** downconverts the selected RF broadcast signal into an analog baseband A/V signal, CVBS/SIF. That is, the tuner **110** may be a hybrid tuner capable of processing not only digital broadcast signals but also analog broadcast signals. The analog baseband A/V signal CVBS/SIF may be directly input to the controller **170**.

**[0068]** The tuner **110** may be capable of receiving RF broadcast signals from an Advanced Television Systems Committee (ATSC) single-carrier system or from a Digital Video Broadcasting (DVB) multi-carrier system.

**[0069]** The tuner **110** may sequentially select a number of RF broadcast signals corresponding to all broadcast channels previously stored in the image display apparatus **100** by a channel add function from a plurality of RF signals received through the antenna and may downconvert the selected RF broadcast signals into IF signals or baseband A/V signals.

**[0070]** The broadcast signal may be input through the external device interface **135** or network interface **130** in addition to the tuner **110**. In one embodiment, the image display apparatus may not include the tuner.

**[0071]** The demodulator **120** receives the digital IF signal DIF from the tuner **110** and demodulates the digital IF signal DIF. For example, if the digital IF signal DIF is an ATSC signal, the demodulator **120** may perform 8-Vestigal Side-Band (VSB) demodulation on the digital IF signal DIF. The demodulator **120** may also perform channel decoding. For channel decoding, the demodulator **120** may include a Trellis decoder (not shown), a de-interleaver (not shown) and a Reed-Solomon decoder (not shown) so as to perform Trellis decoding, de-interleaving and Reed-Solomon decoding.

**[0072]** For example, if the digital IF signal DIF is a DVB signal, the demodulator **120** performs Coded Orthogonal Frequency Division Multiple Access (COFDMA) demodulation upon the digital IF signal DIF. The demodulator **120** may also perform channel decoding. For channel decoding, the demodulator **120** may include a convolution decoder, a de-interleaver, and/or a Reed-Solomon decoder so as to perform convolution decoding, de-interleaving, and/or Reed-Solomon decoding, respectively.

**[0073]** The demodulator **120** may perform demodulation and channel decoding on the digital IF signal DIF, thereby obtaining a stream signal TS. The stream signal TS may be a signal in which a video signal, an audio signal and a data signal are multiplexed. For example, the stream signal TS may be an MPEG-2 TS in which an MPEG-2 video signal and a Dolby AC-3 audio signal are multiplexed. An MPEG-2 TS may include a 4-byte header and a 184-byte payload. In order to properly handle not only ATSC signals but also DVB signals, the demodulator **120** may include an ATSC demodulator and a DVB demodulator.

**[0074]** The stream signal TS may be input to the controller **170** and thus subjected to demultiplexing and A/V signal processing. The processed video and audio signals are output to the display **180** and the audio output circuit **185**, respectively.

**[0075]** The external device interface **135** may serve as an interface between an external device and the image display apparatus **100**. For interfacing, the external device interface **135** may include an A/V Input/Output (I/O) interface and/or a wireless communication module.

**[0076]** The external device interface **135** may be connected to an external device such as a Digital Versatile Disk (DVD) player, a Blu-ray player, a game console, a camera, a camcorder, or a computer (e.g., a laptop computer), wirelessly or by wire. Then, the external device interface **135** externally receives video, audio, and/or data signals from the external device and transmits the received input signals to the controller **170**. In addition, the external device interface **135** may output video, audio, and data signals processed by the controller **179** to the external device. In order to receive or transmit audio, video, and data signals from or to the external device, the external device interface **135** may includes the A/V I/O interface and/or the wireless communication module.

**[0077]** The A/V I/O interface of the external device interface **135** may include a Universal Serial Bus (USB) port, a Composite Video Banking Sync (CVBS) port, a Component port, a Super-video (S-video) (analog) port, a Digital Visual Interface (DVI) port, a High-Definition Multimedia Interface (HDMI) port, a Red-Green-Blue (RGB) port, a D-sub port, or another appropriate port for connecting to an external device.

**[0078]** The wireless communication module of the external device interface **135** may perform short-range wireless communication with other electronic devices. For short-range wireless communication, the wireless communication module may use Bluetooth, Radio-Frequency IDentification (RFID), Infrared Data Association (IrDA), Ultra WideBand (UWB), ZigBee, and Digital Living Network Alliance (DLNA).

**[0079]** The external device interface **135** may be connected to various set-top boxes through at least one of the above-described ports, and thus, may receive data from or transmit

data to the various set-top boxes. The external device interface **135** may receive applications or an application list from an adjacent external device and provide the applications or the application list to the controller **170** or the memory **140**.

**[0080]** The network interface **130** may serve as an interface between the image display apparatus **100** and a wired/wireless network such as the Internet. The network interface **130** may include an Ethernet port for connection to a wired network. The wireless communication module of the external signal I/O circuit **128** may wirelessly access the Internet. For connection to wireless networks, the network interface **130** may use Wireless Local Area Network (WLAN) (i.e., Wi-Fi), Wireless Broadband (WiBro), World Interoperability for Microwave Access (WiMax), High Speed Downlink Packet Access (HSDPA), or another wireless communication protocol.

**[0081]** The network interface **130** may transmit data to or receive data from another user or electronic device over a connected network or another network linked to the connected network. For example, the network interface **130** may transmit data stored in the image display apparatus **100** to a user or electronic device selected from among users or electronic devices pre-registered with the image display apparatus **100**.

**[0082]** The network interface **130** may access a specific Web page over a connected network or another network linked to the connected network. That is, the network interface **130** may access a specific Web page over a network and transmit or receive data to or from a server. Additionally, the network interface **130** may receive content or data from a CP or an NP. Specifically, the network interface **130** may receive content such as movies, advertisements, games, VoD files, broadcast signals as well as information related to the content from a CP or an NP. Also, the network interface **130** may receive update information about firmware and update files of the firmware from the NP. The network interface **130** may transmit data over the Internet or to the CP or the NP. The network interface **130** may selectively receive a desired application among open applications over a network.

**[0083]** In an embodiment of the present disclosure, when a game application is executed in the image display apparatus **100**, the network interface **130** may transmit data to or receive data from a user terminal connected to the image display apparatus **100** through a network. In addition, the network interface **130** may transmit specific data to or receive specific data from a server that records game scores.

**[0084]** The memory **140** may store various programs necessary for the controller **170** to process and control signals, and may also store processed video, audio and data signals. The memory **140** may temporarily store a video, audio and/or data signal received from the external device interface **135** or the network interface **130**. The memory **140** may store information about broadcast channels by the channel-add function. The memory **140** may store applications or a list of applications received from the external device interface **135** or the network interface **130**. The memory **140** may also store a variety of platforms. In one embodiment, when the image display apparatus **100** executes a game application, the memory **140** may store user-specific information and game play information about a user terminal used as a game controller.

**[0085]** The memory **140** may include, for example, at least one of a flash memory-type storage medium, a hard disk-type storage medium, a multimedia card micro-type storage medium, a card-type memory (e.g. a Secure Digital (SD) or eXtreme Digital (XD) memory), a Random Access Memory (RAM), a Read-Only Memory (ROM) such as an Electrically Erasable and Programmable Read Only Memory, or another appropriate type of storage device. The image display apparatus **100** may reproduce content stored in the memory **140** (e.g. video files, still image files, music files, text files, or application files). While the memory **140** is shown in FIG. **6** as being configured to be separate from the controller **170**, the present disclosure is not limited thereto. For example, the memory **140** may be incorporated into the controller **170**.

**[0086]** The user input interface **150** transmits a signal received from the user to the controller **170** or transmits a signal received from the controller **170** to the user. For example, the user input interface **150** may receive various user input signals such as a power-on/off signal, a channel selection signal, and a screen setting signal from a remote controller **200** or may transmit a signal received from the controller **170** to the remote controller **200**, according to various communication schemes, for example, RF communication and IR communication.

**[0087]** For example, the user input interface **150** may provide the controller **170** with user input signals or control signals received from local keys, such as inputs of a power key, a channel key, and a volume key, and setting values. Also, the user input interface **150** may transmit a control signal received from a sensor that senses a user gesture to the controller **170** or transmit a signal received from the controller **170** to the sensor. The sensor may include a touch sensor, a voice sensor, a position sensor, a motion sensor, or another appropriate type of sensor.

**[0088]** The controller **170** may demultiplex the stream signal TS received from the tuner **110**, the demodulator **120**, or the external device interface **135** into a number of signals and process the demultiplexed signals into audio and video data. The video signal processed by the controller **170** may be displayed as an image on the display **180**. The video signal processed by the controller **170** may also be transmitted to an external output device through the external device interface **135**. The audio signal processed by the controller **170** may be output to the audio output device **185**. Also, the audio signal processed by the controller **170** may be transmitted to the external output device through the external device interface **135**.

**[0089]** The controller **170** may include a DEMUX and a video processor. In addition, the controller **170** may provide overall control to the image display apparatus **100**. For example, the controller **170** may control the tuner **110** to select an RF broadcast signal corresponding to a user-selected channel or a pre-stored channel.

**[0090]** The controller **170** may control the image display apparatus **100** according to a user command received through the user input interface **150** or according to an internal program. The controller **170** may also access a network and download an application or application list selected by the user to the image display apparatus **100** over the network. For example, the controller **170** may control the tuner **110** to receive a channel selected according to a specific channel selection command received through the user input interface **150** and process a video, audio and/or data signal of the selected channel. The controller **170** may output the processed video or audio signal along with information about the user-selected channel to the display **180** or the audio output device **185**.

**[0091]** The controller **170** may also output a video or audio signal received from an external device such as a camera or a camcorder through the external device interface **135** to the display **180** or the audio output device **185** according to an external device video playback command received through the external device interface **150**.

**[0092]** The controller **170** may control the display **180** to display images. For instance, the controller **170** may control the display **180** to display a broadcast image received from the tuner **110**, an external input image received through the external device interface **135**, an image received through the network interface **130**, or an image stored in the memory **140**. The image displayed on the display **180** may be a Two-Dimensional (2D) or Three-Dimensional (3D) still image or moving picture.

**[0093]** The controller **170** may control content playback. The content may include any content stored in the image display apparatus **100**, received broadcast content, and external input content. The content includes at least one of a broadcast image, an external input image, an audio file, a still image, a Web page, or a text file.

**[0094]** In one embodiment, upon receipt of a go-to-home screen input, the controller **170** may control display of the home screen on the display **180**. The home screen may include a plurality of card objects classified according to content sources. The card objects may include at least one card object representing a thumbnail list of broadcast channels, a card object representing a broadcast program guide, a card object representing a program reservation list or a program recording list, or a card object representing a media list of a device connected to the image display apparatus **100**. The card objects may further include at least one of a card object representing a list of connected external devices or a card object representing a call-associated list. The home screen may further include an application menu with at least one application that can be executed.

**[0095]** The image display apparatus according to the embodiment of the present disclosure may include a card object generator that generates and displays the card object. In one embodiment, the card object generator may be an OSD generator **340** or a functional part included in the controller or another component.

**[0096]** Upon receipt of a card object move input, the controller **170** may control movement of a card object corresponding to the card object move input on the display **180**, or if the card object is not displayed on the display **180**, the controller **170** may control the display to show the card object on the display **180**. When a card object is selected from among the card objects on the home screen, the controller **170** may control display of an image corresponding to the selected card object on the display **180**. Examples of a display apparatus and method for displaying, moving or scrolling objects on the same are disclosed in U.S. patent application Nos. _____ and _____ (Attorney Docket Nos. PBC-0248.1 and PBC-0256, respectively), which are hereby incorporated by reference in their entirety.

**[0097]** The controller **170** may control display of an input broadcast image and an object representing information about the broadcast image in a card object representing broadcast images. The broadcast image may be fixed in size through a lock setting. The controller **170** may also control a display of a set-up object for at least one of image setting, audio setting, screen setting, reservation setting, setting of a pointer controlled by the remote controller, or network setting on the home screen.

**[0098]** The controller **170** may control display of a login object, a help object, or an exit object on a part of the home screen. The controller **170** may also control display of an object representing the total number of available card objects or the number of card objects displayed on the display **180** among all card objects, on a part of the home screen. Moreover, if one of the card objects displayed on the display **180** is selected, the controller **170** may display the selected card object as a full screen image to cover the entirety of the display **180**.

**[0099]** Upon receipt of an incoming call at a connected external device or the image display apparatus **100**, the controller **170** may control the display to focus-on or shift a call-related card object among the plurality of card objects. Furthermore, if an application view menu item is selected, the controller **170** may control display of applications or a list of applications that are available in the image display apparatus or downloadable from an external network.

**[0100]** The controller **170** may control installation and execution of an application downloaded from the external network along with various UIs. Also, the controller **170** may control display of an image related to the executed application on the display **180**, upon user selection.

**[0101]** In an embodiment of the present disclosure, when the image display apparatus **100** provides a game application, the controller **170** may control assignment of player IDs to specific user terminals, creation of game play information by executing the game application, transmission of the game play information to the user terminals through the network interface **130**, and reception of the game play information at the user terminals.

**[0102]** The controller **170** may control detection of user terminals connected to the image display apparatus **100** over a network through the network interface **130**, display of a list of the detected user terminals on the display **180**, and reception of a selection signal indicating a user terminal selected for use as a user controller from among the listed user terminals through the user input interface **150**.

**[0103]** The controller **170** may control output of a game play screen of the game application, inclusive of player information about each user terminal and game play information, through the display **180**. The controller **170** may determine the specific signal received from a user terminal through the network interface **130** as game play information, and thus, control the game play information to be reflected in the game application in progress. Moreover, the controller **170** may control transmission of the game play information about the game application to a specific server connected to the image display apparatus **100** over a network through the network interface **130**. In one embodiment, upon receipt of information about a change in the game play information from the server through the network interface **130**, the controller **179** may control output of a notification message in a predetermined area of the display **180**.

**[0104]** The image display apparatus **100** may further include a channel browsing processor configured to generate thumbnail images corresponding to channel signals or external input signals. The channel browsing processor may extract some of the video frames of each of stream signals TS received from the demodulator **120** or stream signals received from the external device interface **135** and display the

extracted video frames on the display **180** as thumbnail images. The thumbnail images may be directly output to the controller **170** or may be output after being encoded.

**[0105]** Also, it is possible to encode the thumbnail images into a stream and output the stream to the controller **170**. The controller **170** may display a thumbnail list including a plurality of received thumbnail images on the display **180**. The thumbnail images may be updated sequentially or simultaneously in the thumbnail list. Therefore, the user can readily identify the content of broadcast programs received through a plurality of channels.

**[0106]** Examples of thumbnails and methods of using the same are disclosed in application Ser. No. 12/651,730 (Attorney Docket No. HI-0447), which is hereby incorporated by reference.

**[0107]** The display **180** may convert a processed video signal, a processed data signal, and an OSD signal received from the controller **170** or a video signal and a data signal received from the external device interface **135** into RGB signals to generate drive signals. The display **180** may be various types of displays such as a Plasma Display Panel (PDP), a Liquid Crystal Display (LCD), an Organic Light-Emitting Diode (OLED) display, a flexible display, a 3D display, or another appropriate type of display. The display **180** may also be a touch screen that can be used not only as an output device but also as an input device.

**[0108]** The audio output device **185** may receive a processed audio signal (e.g., a stereo signal, a 3.1-channel signal or a 5.1-channel signal) from the controller **170** and output the received audio signal as sound. The audio output device **185** may employ various speaker configurations.

**[0109]** To sense a user gesture, the image display apparatus **100** may further include a sensor circuit that has at least one of a touch sensor, a voice sensor, a position sensor, and a motion sensor, as stated before. A signal sensed by the sensor may be output to the controller **170** through the user input interface **150**.

**[0110]** The image display apparatus **100** may further include the camera for capturing images of a user. Image information captured by the camera may be input to the controller **170**. The controller **170** may sense a user gesture from an image captured by the camera or a signal sensed by the sensor. The controller **170** may also combine the captured image and the sensed signal to generate an input signal.

**[0111]** The power supply **190** supplies power to the image display apparatus **100**. Particularly, the power supply **190** may supply power to the controller **170**, the display **180**, and the audio output device **185**, which may be implemented as a System On Chip (SOC). The power supply **190** may include a converter for converting Alternating Current (AC) into Direct Current (DC). If the display **180** is configured with, for example, a liquid crystal panel having a plurality of backlight lamps, the power supply **190** may further include an inverter capable of performing Pulse Width Modulation (PWM) to control the luminance or dimming.

**[0112]** The remote controller **200** may transmit a user input to the user input interface **150**. For transmission of user input, the remote controller **200** may use various communication techniques such as Bluetooth, RF communication, IR communication, UWB, ZigBee, or another appropriate communication protocol.

**[0113]** In addition, the remote controller **200** may receive a video signal, an audio signal or a data signal from the user input interface **150** and output the received signals visually, audibly, or as vibrations.

**[0114]** The above-described image display apparatus **100** may be a fixed digital broadcast receiver capable of receiving at least one of ATSC (8-VSB) broadcast programs, DVB-T (COFDM) broadcast programs, and/or ISDB-T (BST-OFDM) broadcast programs.

**[0115]** The block diagram of the image display apparatus **100** illustrated in FIG. **6** is purely exemplary. Depending upon the specifications of the image display apparatus **100** in actual implementation, the components of the image display apparatus **100** may be combined or omitted or new components may be added. That is, two or more components are incorporated into one component or one component may be configured as separate components, as needed.

**[0116]** Unlike the configuration illustrated in FIG. **6**, the image display apparatus **100** may be configured so as to receive and playback video content through the network interface **130** or the external device interface **135**, without the tuner **100** and the demodulator **120**.

**[0117]** The image display apparatus **100** is an example of image signal processing apparatus that processes a stored image or an input image. Other examples of the image signal processing apparatus include a set-top box without the display **180** and the audio output device **185**, a DVD player, a Blu-ray player, a game console, a computer, or another appropriate device that processes image singals. The set-top box is described in further detail hereinbelow with reference to FIGS. **7** and **8**.

**[0118]** FIGS. **7** and **8** are block diagrams showing the image display apparatus configured separately as a set-top box and a display device. Referring to FIG. **7**, a set-top box **250** and a display device **300** may transmit or receive data wirelessly or by wire. The set-top box **250** may include a network interface **255**, a memory **258**, a signal processor **260**, a user input interface **263**, and an external device interface **265**.

**[0119]** The network interface **255** serves as an interface between the set-top box **250** and a wired/wireless network such as the Internet. The network interface **255** may transmit data to or receive data from another user or another electronic device over a connected network or over another network linked to the connected network.

**[0120]** The memory **258** may store programs necessary for the signal processor **260** to process and control signals and temporarily store a video, audio and/or data signal received from the external device interface **265** or the network interface **255**. The memory **258** may also store platforms, described in further detail with reference to FIGS. **11** and **12** hereinafter.

**[0121]** The signal processor **260** processes an input signal. For example, the signal processor **260** may demultiplex or decode an input video or audio signal. For signal processing, the signal processor **260** may include a video decoder or an audio decoder. The processed video or audio signal may be transmitted to the display device **300** through the external device interface **265**.

**[0122]** The user input interface **263** may transmit a signal received from the user to the signal processor **260** or a signal received from the signal processor **260** to the user. For example, the user input interface **263** may receive various control signals such as a power on/off signal, an operation

input signal, or a setting input signal through activation of a local key or the remote controller **200**, and may output the control signals to the signal processor **260**.

**[0123]** The external device interface **265** may serve as an interface between the set-top box **250** and an external device that is connected wirelessly or by wire, particularly the display device **300**, for signal transmission or reception. The external device interface **265** may also interface with an external device such as a game console, a camera, a camcorder, a computer (e.g. a laptop computer), or another appropriate external device, for data transmission or reception.

**[0124]** The set-top box **250** may further include a media input device for media playback. The media input device may be a Blu-ray input device, for example. That is, the set-top box **250** may include a Blu-ray player. After signal processing such as demultiplexing or decoding in the signal processor **260**, a media signal from a Blu-ray disk may be transmitted to the display device **300** through the external device interface **265** so as to be displayed on the display device **300**.

**[0125]** The display device **300** may include a tuner **270**, an external device interface **273**, a demodulator **275**, a memory **278**, a controller **280**, a user input interface **283**, a display **290**, and an audio output device **295**. The tuner **270**, the demodulator **275**, the memory **278**, the controller **280**, the user input interface **283**, the display **290**, and the audio output device **295** are identical respectively to the tuner **110**, the demodulator **120**, the memory **140**, the controller **170**, the user input interface **150**, the display **180**, and the audio output device **185** as described in reference to FIG. **6**, and thus, a description thereof is not repeated hereinbelow.

**[0126]** The external device interface **273** serves as an interface between the display device **300** and a wireless or wired external device, particularly the set-top box **250**, for data transmission or reception. Hence, a video signal or an audio signal received through the set-top box **250** may be output through the display **290** or the audio output unit **295** through the controller **280**.

**[0127]** Referring to FIG. **8**, the configuration of the set-top box **250** and the display device **300** illustrated in FIG. **8** is similar to that of the set-top box **250** and the display device **300** as described with reference to FIG. **7**, except that the tuner **270** and the demodulator **275** are provided in the set-top box **250**, not in the display device **300**. Here, the signal processor **260** may process a broadcast signal received through the tuner **270** and the demodulator **275**. The user input interface **263** may receive a channel selection input, a channel store input, etc.

**[0128]** FIG. **9** illustrates an operation for communicating with third devices in the previously disclosed embodiments of the image display apparatus according to an embodiment. Referring to FIG. **9**, the image display apparatus **100** may communicate with a broadcasting station **210**, a network server **220**, or an external device **230**.

**[0129]** The image display apparatus **100** may receive a broadcast signal including a video signal from the broadcasting station **210**. The image display apparatus **100** may process the audio and video signals embedded in the broadcast signal or the data signal of the broadcast signal, for example, into a format suitable for transmission from the image display apparatus **100**. The image display apparatus **100** may output images or sound based on the processed video or audio signal.

**[0130]** Meanwhile, the image display apparatus **100** may communicate with the network server **220**. The network server **200** is capable of transmitting signals to and receiving signals from the image display apparatus **100** over a network. For example, the network server **220** may be a portable terminal that can be connected to the image display apparatus **100** through a wired or wireless base station. In addition, the network server **200** may provide content to the image display apparatus **100** over the Internet. A CP may provide content to the image display apparatus **100** through the network server **220**.

**[0131]** The image display apparatus **100** may communicate with the external device **230**. The external device **230** can transmit and receive signals directly to and from the image display apparatus **100** wirelessly or by wire. For instance, the external device **230** may be a media memory device or a multimedia player. That is, the external device **230** may be any of a camera, a DVD player, a Blu-ray player, a PC, or another appropriate device based on the required functionality.

**[0132]** The broadcasting station **210**, the network server **220** or the external device **230** may transmit a signal including a video signal to the image display apparatus **100**. The image display apparatus **100** may display an image based on the video signal included in the received signal. Also, the image display apparatus **100** may transmit a signal received from the broadcasting station **210** or the network server **220** to the external device **230**, and may transmit a signal received from the external device **230** to the broadcasting station **210** or the network server **220**. That is, the image display apparatus **100** may transmit content included in signals received from the broadcasting station **210**, the network server **220**, and the external device **230**, as well as playback the content immediately.

**[0133]** FIG. **10** is a block diagram of the controller of FIG. **6**. Referring to FIG. **10**, the controller **170** may include a DEMUX **310**, a video processor **320**, an OSD generator **340**, a mixer **350**, a Frame Rate Converter (FRC) **355**, and a formatter **360**. The controller **170** may further include an audio processor and a data processor.

**[0134]** The DEMUX **310** may demultiplex an input stream. For example, the DEMUX **310** may demultiplex an MPEG-2 TS into a video signal, an audio signal, or a data signal. The input stream signal may be received from the tuner **110**, the demodulator **120**, or the external device interface **135**.

**[0135]** The video processor **320** may process the demultiplexed video signal. For video signal processing, the video processor **320** may include a video decoder **325** and a scaler **335**. The video decoder **325** decodes the demultiplexed video signal and the scaler **335** scales the resolution of the decoded video signal so that the video signal can be displayed on the display **180**.

**[0136]** The video decoder **325** may be provided with decoders that operate based on various standards. If the demultiplexed video signal is, for example, an MPEC-2 encoded video signal, the video signal may be decoded by an MPEC-2 decoder. On the other hand, if the video signal is an H.264-encoded DMB or DVB-handheld (DVB-H) signal, the video signal may be decoded by an H.264 decoder. The video signal decoded by the video processor **320** may be provided to the mixer **350**.

**[0137]** The OSD generator **340** may generate an OSD signal autonomously or based on to user input. For example, the OSD generator **340** may generate signals by which a variety of information is displayed as images or text on the display **180**, according to control signals received from the user input interface **150**. The OSD signal may include various data such

as a UI, a variety of menu screens, widgets, icons, etc. For example, the OSD generator **340** may generate a signal by which subtitles are displayed with a broadcast image or Electronic Program Guide (EPG)-based broadcasting information.

**[0138]** The mixer **350** may mix the decoded video signal with the OSD signal and output the mixed signal to the formatter **360**. As the decoded broadcast video signal or the external input signal is mixed with the OSD signal, an OSD may be overlaid on the broadcast image or the external input image.

**[0139]** The FRC **355** may change the frame rate of an input image. For example, a frame rate of 60 Hz may be converted into a frame rate of 120 or 240 Hz. When the frame rate is to be changed from 60 Hz to 120 Hz, a first frame may be inserted between the first frame and a second frame, or a predicted third frame may be inserted between the first and second frames. If the frame rate is to be changed from 60 Hz to 240 Hz, three identical frames or three predicted frames may be inserted between the first and second frames. It is also possible to maintain the frame rate of the input image without frame rate conversion.

**[0140]** The formatter **360** changes the format of the signal received from the FRC **355** to be suitable for the display **180**. For example, the formatter **360** may convert a received signal into an RGB data signal. The RGB signal may be output in the form of a Low Voltage Differential Signal (LVDS) or mini-LVDS.

**[0141]** The audio processor of the controller **170** may process a demultiplexed audio signal. For audio signal processing, the audio processor may have a plurality of decoders. If the demultiplexed audio signal is a coded audio signal, the audio processor of the controller **170** may decode the audio signal. For example, the demultiplexed audio signal may be decoded by an MPEG-2 decoder, an MPEG-4 decoder, an Advanced Audio Coding (AAC) decoder, an AC-3 decoder, or another type of decoder based on the format of the audio signal. The audio processor of the controller **170** may also adjust the bass, treble or volume of the audio signal.

**[0142]** The data processor of the controller **170** may process the data signal obtained by demultiplexing the input stream signal. For example, if the data signal is an encoded signal such as an EPG which includes broadcasting information specifying the start time, end time, etc. of scheduled broadcast TV or radio programs, the controller **170** may decode the data signal. Examples of an EPG include ATSC-Program and System Information Protocol (PSIP) information and DVB-Service Information (SI). ATSC-PSIP information or DVB-SI may be included in the header of a TS, i.e., a 4-byte header of an MPEG-2 TS.

**[0143]** The controller **170** as embodied and broadly described herein is not limited to the configuration as illustrated in the block diagram of FIG. **10**. Depending upon the specifications of the controller **170**, the components of the controller **170** may be combined, omitted, or additional components may be added to the controller **170**.

**[0144]** FIG. **11** illustrates a platform architecture implemented in the image display apparatus according to one embodiment, and FIG. **12** illustrates another platform architecture implemented in the image display apparatus according to another embodiment.

**[0145]** A platform for the image display apparatus may have OS-based software to implement the above-described operations. Referring to FIG. **11**, a platform for the image display apparatus may be a separate type. For example, the platform may be designed separately as a legacy system platform **400** and a smart system platform **405**. An OS kernel **410** may be shared between the legacy system platform **400** and the smart system platform **405**.

**[0146]** The legacy system platform **400** may include a stack including a driver **420**, middleware **430**, and an application layer **450** on the OS kernel **410**. On the other hand, the smart system platform **405** may have a stack including a library **435**, a framework **440**, and an application layer **455** on the OS kernel **410**.

**[0147]** The OS kernel **410** is the core of an operating system. When the image display apparatus is driven, the OS kernel **410** may be responsible for the operation of at least one of hardware drivers, security protection for hardware and processors in the image display apparatus, efficient management of system resources, memory management, hardware interfacing by hardware abstraction, multi-processing, or scheduling associated with the multi-processing. Meanwhile, the OS kernel **410** may further perform power management operations.

**[0148]** The hardware drivers of the OS kernel **410** may include, for example, at least one of a display driver, a Wi-Fi driver, a Bluetooth driver, a USB driver, an audio driver, a power manager, a binder driver, or a memory driver. Moreover, the hardware drivers of the OS kernel **410** may also include drivers for hardware devices within the OS kernel **410**. The hardware drivers may include a character device driver, a block device driver, and/or a network device driver. The block device driver may need a buffer to buffer data on a block basis as data may be transmitted on a block basis. The character device driver may not need a buffer since data may be transmitted on a basic data unit basis, that is, on a character basis. The OS kernel **410** may be implemented based on any of various OSs such as Unix (Linux), Windows, etc. The OS kernel **410** may be a general-purpose open OS kernel which can be implemented in other electronic devices.

**[0149]** The driver **420** may be interposed between the OS kernel **410** and the middleware **430**. Along with the middleware **430**, the driver **420** may drive devices for operations of the application layer **450**. For example, the driver **420** may include a driver(s) for a microcomputer, a display module, a Graphic Processing Unit (GPU), the FRC, a General-Purpose Input/Output (GPIO) pin, a High-Definition Multimedia Interface (HDMI), a System Decoder (SDEC) or DEMUX, a Video Decoder (VDEC), an Audio Decoder (ADEC), a Personal Video Recorder (PVR), and/or an Inter-Integrated Circuit (**12**C). These drivers may operate in conjunction with the hardware drivers of the OS kernel **410**.

**[0150]** In addition, the driver **420** may further include a driver for the remote controller **200**, especially a pointing device as described below. The remote controller driver may reside in the OS kernel **410** or the middleware **430**, instead of the driver **420**.

**[0151]** The middleware **430** may reside between the OS kernel **410** and the application layer **450**. The middleware **430** may mediate between different hardware devices or different software programs for data transmission and reception between the hardware devices or the software programs. Therefore, the middleware **430** can provide standard interfaces, support various environments, and enable interaction between tasks conforming to heterogeneous communication protocols. Examples of the middleware **430** in the legacy system platform **400** may include Multimedia and Hyperme-

dia information coding Experts Group (MHEG) and Advanced Common Application Platform (ACAP) as data broadcasting-related middleware, PSIP or SI middleware as broadcasting information-related middleware, or DLNA middleware as peripheral device communication-related middleware.

**[0152]** The application layer **450** that runs atop the middleware **430** in the legacy system platform **400** may include, for example, UI applications associated with various menus in the image display apparatus. The application layer **450** may allow editing and updating over a network by user selection. With use of the application layer **450**, the user may enter a desired menu among various UIs by manipulating the remote controller **210** while viewing a broadcast program. The application layer **450** may further include at least one of a TV guide application, a Bluetooth application, a reservation application, a Digital Video Recorder (DVR) application, and a hotkey application.

**[0153]** In the smart system platform **405**, the library **435** may be positioned between the OS kernel **410** and the framework **440**, and may form the basis of the framework **440**. For example, the library **435** may include Secure Socket Layer (SSL) being a security-related library, WebKit being a Web engine-related library, C library (libc), and Media Framework being a media-related library that specifies, for example, a video format and an audio format. The library **435** may be written in C or C++. Also, the library **435** may be exposed to a developer through the framework **440**.

**[0154]** The library **435** may include a runtime **437** with a core Java library and a Virtual Machine (VM). The runtime **437** and the library **435** may form the basis of the framework **440**.

**[0155]** The VM may be a virtual machine that enables concurrent execution of a plurality of instances, that is, multitasking. For each application of the application layer **455**, a VM may be allocated and executed. For scheduling or interconnection between instances, the binder driver of the OS kernel **410** may operate. The binder driver and the runtime **437** may connect Java applications to C-based libraries. The library **435** and the runtime **437** may correspond to the middleware **430** of the legacy system platform **400**.

**[0156]** In the smart system platform **405**, the framework **440** may include programs on which applications of the application layer **455** are based. The framework **440** may be compatible with any application and may allow component reuse, movement, or exchange. The framework **440** may include supporting programs and programs for interconnecting different software components. For example, the framework **440** may include an activity manager related to activities of applications, a notification manager, and/or a CP for abstracting common information between applications. This framework **440** may be written in Java.

**[0157]** The application layer **455** on top of the framework **440** may include a variety of programs that are executed and displayed in the image display apparatus. The application layer **455** may include, for example, a core application suite having at least one of an e-mail, Short Message Service (SMS), calendar, map, browser, or another appropriate application based on the desired functionality. The application layer **455** may be written in Java.

**[0158]** In the application layer **455**, applications may be categorized into user-undeletable applications **465** or user-installed/deletable applications **475**. User-undeletable applications **465** may be applications stored in the image display apparatus **100** that cannot be modified. User-installable or user-deletable applications **475** may include application which may be downloaded from an external device or a network and stored in the image display apparatus.

**[0159]** With the applications of the application layer **455**, a variety of functions such as Internet telephony, VoD, Web album, Social Networking Service (SNS), Location-Based Service (LBS), map service, Web browsing, and application search may be performed through network access. In addition, other functions such as gaming and schedule management may be performed by the applications.

**[0160]** Referring to FIG. **12**, a platform for the image display apparatus according to another embodiment may be an integrated type. The integrated platform may include an OS kernel **510**, a driver **520**, middleware **530**, a framework **540**, and an application layer **550**. Compared to the separate-type platform, as illustrated in FIG. **11**, the integrated-type platform is characterized by the absence of the library **435**. Moreover, in this embodiment, the application layer **550** may be an integrated layer. The driver **520** and the framework **540** correspond to the driver **420** and the framework **440** of FIG. **5**, respectively.

**[0161]** The library **435** of FIG. **11** may be incorporated into the middleware **530**. That is, the middleware **530** may include both the legacy system middleware and the image display system middleware. As previously described, the legacy system middleware may include MHEG or ACAP as data broadcasting-related middleware, PSIP or SI middleware as broadcasting information-related middleware, and DLNA middleware as peripheral device communication-related middleware, whereas the image display system middleware may include SSL as a security-related library, WebKit as a Web engine-related library, libc, and Media Framework as a media-related library. The middleware **530** may further include the runtime as previously described.

**[0162]** The application layer **550** may include a menu-related application, a TV guide application, a reservation application, etc. as legacy system applications. The application layer **550** may also include an e-mail, SMS, a calendar, a map, and/or a browser as image display system applications.

**[0163]** In the application layer **550**, applications may be categorized into user-undeletable applications **565** that are stored in the image display apparatus and user-installable or user-deletable applications **575** that are downloaded from an external device or a network and stored in the image display apparatus.

**[0164]** Based on the afore-described platforms illustrated in FIGS. **11** and **12**, a variety of Application Programming Interfaces (APIs) and Software Development Kits (SDKs) necessary to develop applications may be opened. APIs may implement functions that provide connectivity to specific sub-routines for execution of the functions within a program. APIs may also be implemented as programs.

**[0165]** For example, sources related to hardware drivers of the OS kernel **410**, such as a display driver, a WiFi driver, a Bluetooth driver, a USB driver or an audio driver, may be opened. Related sources within the driver **420** such as a driver for a microcomputer, a display module, a GPU, an FRC, an SDEC, a VDEC, an ADEC or a pointing device may be opened. In addition, sources related to PSIP or SI middleware as broadcasting information-related middleware or sources related to DLNA middleware may be opened. The various open APIs may allow developers to create applications executable in the image display apparatus **100** or applications

required to control operations of the image display apparatus **100** based on the platforms as illustrated in FIGS. **11** and **12**.

**[0166]** The platforms of FIGS. **11** and **12** may be general-purpose platforms that can be implemented in many other electronic devices as well as in the image display apparatus as disclosed herein. The platforms may be stored or loaded in the memory **140**, the controller **170**, or any other processor. To execute applications, an additional application processor may be further provided.

**[0167]** FIG. **13** illustrates a method for controlling the image display apparatus using a remote controller according to an embodiment of the present disclosure. Referring to FIG. **13**(*a*), a pointer **205** representing movement of the remote controller **200** may be displayed on the display **180**. The remote controller **210** may be a motion sensing remote controller that senses a movement of the remote controller **210**. The user may move or rotate the remote controller **200** up and down, side to side (FIG. **13**(*b*)), and back and forth (FIG. **13**(*c*)). Since the pointer **205** moves in accordance with the movement of the remote controller **200**, the remote controller **200** may be referred to as a pointing device.

**[0168]** Referring to FIG. **13**(*b*), if the user moves the remote controller **200** to the left, the pointer **205** may move to the left on the display **180** in response thereto. A sensor provided on the remote controller **200** may detect the movement of the remote controller **200** and transmit corresponding motion information to the image display apparatus. Then, the image display apparatus may determine the movement of the remote controller **200** based on the motion information received from the remote controller **200**. The controller may then calculate the coordinates of a target location to which the pointer **205** should be shifted in accordance with the movement of the remote controller **200**. The image display apparatus may then display the pointer **205** at the calculated coordinates.

**[0169]** Referring to FIG. **13**(*c*), the remote controller **200** may be moved away from the display **180** while a predetermined button on the remote controller **200** is depressed. Then, a selected area corresponding to the pointer **205** may be zoomed in to enlarge a image on the display **180**. On the contrary, if the user moves the remote controller **200** toward the display **180**, the area corresponding to the pointer **205** may be zoomed out, and thus, reducing the size of the image on the display **180**. The opposite may also be possible. That is, when the remote controller **200** moves away from the display **180**, the selection area may be zoomed out and when the remote controller **200** approaches the display **180**, the selection area may be zoomed in.

**[0170]** With the predetermined button pressed on the remote controller **200**, an up, down, left or right movements of the remote controller **200** may be ignored. That is, when the remote controller **200** moves away from or approaches the display **180**, only the back and forth movements (e.g., the distance from the display **180**) of the remote controller **200** are sensed, while the up, down, left and right movements of the remote controller **200** are ignored. When the predetermined button is not selected at the remote controller **200**, the pointer **205** may move in accordance with the up, down, left or right movement of the remote controller **200**. Moreover, the speed and direction of the pointer **205** on the display **180** may correspond to the speed and direction of the remote controller **200**. The sensitivity of the pointer **205** relative to the movement of the remote controller **200** may be adjusted.

**[0171]** The pointer **205** is an object displayed on the display **180** in correspondence with the movement of the remote controller **200**. Therefore, the pointer **205** may have various shapes other than the arrow illustrated in FIG. **13**. For example, the pointer **205** may be a dot, a cursor, a prompt, a thick outline, etc. The pointer **205** may be displayed across a plurality of points, such as a line and a surface as well as at a single point on a horizontal and vertical axes.

**[0172]** FIG. **14** is a block diagram of the remote controller in the image display apparatus according to an embodiment of the present disclosure. Referring to FIG. **14**, the remote controller **200** may include a wireless communication module **225**, a user input device **235**, a sensor **240**, an output device **250**, a power supply **260**, a memory **270**, a controller **280**, or another appropriate component based on the application or desired functionality of the display device.

**[0173]** The wireless communication module **225** may transmit signals to and/or receives signals from the image display apparatus **100** as disclosed herein. The wireless communication module **225** may include an RF module **221** for transmitting RF signals to and/or receiving RF signals from the image display apparatus **100** according to an RF communication standard. The wireless communication module **225** may also include an IR module **223** for transmitting IR signals to and/or receiving IR signals from the image display apparatus **100** according to an IR communication standard.

**[0174]** In this embodiment, the remote controller **200** may transmit motion information that represents a movement of the remote controller **200** to the image display apparatus **100** through the RF module **221**. The remote controller **200** may also receive signals from the image display apparatus **100** through the RF module **221**. As needed, the remote controller **200** may transmit commands such as a power on/off command, a channel switch command, or a volume change command to the image display apparatus **100** through the IR module **223**. In certain embodiments, the command signals may also be transmitted through the RF module **221**.

**[0175]** The user input device **235** may include a keypad, a plurality of buttons, a touchpad and/or a touch screen. The user may enter commands to the image display apparatus **100** by manipulating the user input circuit **235**. If the user input circuit **235** includes a plurality of hard buttons, the user may input various commands to the image display apparatus **100** by activating the hard buttons. Moreover, if the user input circuit **235** includes a touch screen displaying a plurality of soft keys, the user may input various commands to the image display apparatus **100** by touching the soft keys on the display **180**. The user input device **235** may also include various input tools other than those set forth herein, such as a scroll key, a jog wheel, or another appropriate user input device.

**[0176]** The sensor **240** may include a gyro sensor **241** and/or an acceleration sensor **243**. The gyro sensor **241** may sense a movement of the remote controller **200**, for example, along the X-, Y-, and Z-axis, and the acceleration sensor **243** may sense the acceleration and speed of the remote controller **200**. The sensor **240** may further include a distance sensor (proximity sensor) to sense the distance between the remote controller **200** and the display **180**.

**[0177]** The output device **250** may output a video and/or audio signal corresponding to manipulation of the user input device **235** or corresponding to a signal received from the image display apparatus **100**. The user may easily identify whether the user input device **235** has been manipulated or whether the image display apparatus **100** has been controlled, based on the video and/or audio signal output by the output device **250**.

**[0178]** The output device **250** may include a Light Emitting Diode (LED) module **351** which may be activated whenever the user input circuit **235** is manipulated or whenever a signal is received from or transmitted to the image display apparatus **100** through the wireless communication module **225**, a vibration module **253** which generates vibrations, an audio output module **255** which outputs audio data, and/or a display module **257** which outputs video data.

**[0179]** The power supply **260** supplies power to the remote controller **200**. If the remote controller **200** is kept stationary for a predetermined time or longer, the power supply **260** may, for example, reduce or shut off supply of power to the motion sensing remote controller **200** in order to save power. The power supply **260** may again supply power if a predetermined key on the motion sensing remote controller **200** is manipulated.

**[0180]** The memory **270** may store various types of programs and application data necessary to control or drive the remote controller **200**. The motion sensing remote controller **200** may wirelessly transmit signals to and/or receive signals from the image display apparatus **100** over a predetermined frequency band with the aid of the RF module **221**. The controller **280** of the remote controller **200** may store the frequency band information associated with the paired image display apparatus **100** in the memory **270** for subsequent use.

**[0181]** The controller **280** may provide overall control of the remote controller **200**. The controller **280** may transmit a signal corresponding to a key manipulation detected from the user input device **235** or a signal corresponding to a motion of the motion sensing remote controller **200**, as sensed by the sensor **240**, to the image display apparatus **100**.

**[0182]** FIGS. **15** to **18** illustrate various types of UIs in an image display apparatus according to embodiments of the present disclosure. Referring to FIG. **15**, an application list of applications available over a network may be displayed on the display **180**. A user may access a CP or an NP directly, search for various applications, or download the applications from the CP or the NP.

**[0183]** Specifically, FIG. **15**(*a*) illustrates the display **180** which displays an application list **610** of applications which may be available on a server connected to the display apparatus. The application list **610** may include an icon for each application as well as a brief description of the application. Because the image display apparatus as disclosed herein may have full browser functionality, the icons or the descriptions may be enlarged on the display **180** of the image display apparatus. Accordingly, the user may readily identify the desired applications, as described in further detail hereinafter. FIG. **15**(*b*) illustrates a selection of one application **620** from the application list **610** using a pointer **205**. The pointer **205** may be controlled by a movement of the remote controller **200**. Thus, the selected application **620** may be easily selected, downloaded, or remotely executed over the network.

**[0184]** FIG. **16** illustrates an application list displayed on the display **180** according to another embodiment. Referring to FIG. **16**(*a*), when an application list view menu is selected by manipulating the remote controller **200**, a list of applications **660** stored in the image display apparatus may be displayed on the display **180**. The icons may include identifying information related to the corresponding application to facilitate identification of the application. Moreover, while only icons representing the applications are shown in FIG. **16**, the application list **660** may also include brief descriptions of the applications, as in the application list **610** of FIG. **15**. Therefore, the user may access additional information to readily identify the applications if desired. FIG. **16**(*b*) illustrates a selection of one application icon **670** from the application list **660** using the pointer **205**. The pointer **205** may be controlled by moving the remote controller **200**. Accordingly, the selected application **670** may be easily selected and executed.

**[0185]** Moreover, in certain embodiments, the application lists **610** or **660** may display icons representing both applications available over the network as well as applications available locally. In this embodiment, the icons or the descriptions may include additional indicia to differentiate the remote and local applications. For example, the description may include a network address for the corresponding application.

**[0186]** Furthermore, in certain embodiments, the icons may be thumbnails. While icons may include images which are related to the corresponding content (e.g., name or logo of a content server, an image representing a category, etc.), thumbnails may include a representation of the corresponding content (e.g., an image of the content). For example, if the thumbnail corresponds to a still image, a reduced sized version of the still image may be displayed on the thumbnail. Moreover, if the corresponding content is a video image (e.g., a broadcast content), a version of the video image may be played on the thumbnail.

**[0187]** While FIGS. **15** and **16** show that a desired application may be selected by moving the pointer **205** using the remote controller **200**, the application may be selected in many other ways. For example, the user may select a specific application by moving a cursor around the display **180** using dedicated keys (e.g., arrow keys and an OK key) on the remote controller **200**. In another example, if the remote controller **200** equipped with a touch pad, the pointer **205** may be controlled using the touch pad. Accordingly, the user may select a specific item using the pointer **205** and various types of input devices.

**[0188]** FIG. **17** illustrates a Web page displayed on the display **180**. Specifically, FIG. **17**(*a*) illustrates a Web page **710** with a search window **720** displayed on the display **180**. A keyword or search string may be input to the search window **720** using a keypad displayed on the display **180**, local keys provided on the display apparatus, or character keys provided on the remote controller **200**.

**[0189]** FIG. **17**(*b*) illustrates a search result page **730** which may display a search result matching the keyword entered in the search window **720**. Since the image display apparatus may have browser functionalities, the user may access a Web page from the search result on the image display apparatus.

**[0190]** FIG. **18** illustrates another Web page displayed on the display **180**. Specifically, FIG. **18**(*a*) illustrates a mail service page **810**, including an ID input window **820** and a password input window **825**, displayed on the display **180**. The user may enter an alphanumeric user ID and password into the ID input window **820** and the password input window **825**. The user ID and password may be inputted using a keypad displayed on the mail service page **810**, character keys provided as local keys, or character keys provided on the remote controller **200**. Hence, the user may login to an online mail service using the image display apparatus.

**[0191]** FIG. **18**(*b*) illustrates a mail page **830** which may be displayed on the display **180** after logging-in to the mail service. The mail page **830** may contains items "read mail," "write mail," "sent box," "received box," "recycle bin," or another appropriate mail related items. Moreover, in the

"received box" item, mail may be sorted according to sender or by title. The image display apparatus may be configured to have full browser functionality when displaying the mail service page. Therefore, the user may conveniently access the mail service through the image display apparatus.

**[0192]** FIG. **19** shows an exemplary home screen displayed on the display **180**. The configuration of the home screen as shown in FIG. **19** may be a default home screen configuration for a smart TV. The home screen may be set as an initial screen that may be displayed when the image display apparatus **100** is powered on or wakes up from a standby mode. Moreover, the home screen may be a default screen which may be displayed when a local key on the display apparatus **100** or a home key on the remote controller **200** is selected.

**[0193]** Referring to FIG. **19**, a card object area may be defined in a home screen **1300**. The card object area may include a plurality of card objects **1310**, **1320** and **1330** which may be classified based on the source or a type of content. The image display apparatus may include a card object generator which generates and displays the card object. In certain embodiments, the card object generator may be an OSD generator **340** or a functional module included in the controller or another component of the display apparatus **100**.

**[0194]** The card object may be a window having a predetermined configuration (e.g., size, shape, color, style, etc.) for display on the display apparatus **100**. The configuration of the card objects may be predetermined such that the positioning and arrangement of the card objects on the display may be uniform among the plurality of card objects. For example, each of the card objects be the same size and displayed in areas predefined on the home screen **1300** designated for displaying a card object. In this manner, the arrangement of the home screen **1300** may be maintained while the displayed content on the home screen **1300** may be updated or changed.

**[0195]** Referring again to FIG. **19**, the card object **1310** may be named BROADCAST and may display a broadcast image. The card object **1320** may be named NETCAST and may provide a list of CPs, e.g., a list of CPs available through NetCast. The card object **1330**, which may be named APP STORE, may provide a list of applications.

**[0196]** Other card objects may be arranged in a hidden area **1301**. The card objects in the hidden area **1301** may be hidden from view on the display **180**. These hidden card objects may be shifted or scrolled onto the display **180** to replace the displayed card objects. The hidden card objects, as shown in FIG. **19**, may include a CHANNEL BROWSER card object **1340** which may provide a thumbnail list of broadcast channels, a TV GUIDE card object **1350** which may provide a program list, a RESERVATION/REC card object **1360** which may provide a reserved or recorded program list, a MY MEDIA card object **1370** which may provide a list of multimedia files which are available on the image display apparatus **100** or on a device connected to the image display apparatus **100**, an EXTERNAL DEVICE card object **1380** which may provide a list of external devices which may be connected to the image display apparatus **100**, and a PHONE card object **1390** which may provide a list of call-related items.

**[0197]** The BROADCAST card object **1310** may display a broadcast image **1315** received through the tuner **110** or the network interface **130**, an information object **1321** that displays information about the broadcast image **1315**, a device object **1317** representing an external device, and a setup object **1318**. Moreover, the BROADCAST card object **1310** may be fixed in size by a lock function such that the broadcast image **1315** may be viewed while the other displayed card objects **1320**, **1330** may be scrolled.

**[0198]** Moreover, the broadcast image **1315** may be scaled or resized. For instance, a size of the broadcast image **1315** may be enlarged or reduced by dragging the broadcast image **1315** with the pointer **205** of the remote controller **200**. As the broadcast image **1315** is scaled up or down, the number of the displayed card objects may be changed accordingly. For example, the number of card objects displayed on the display **180** may be changed from three to either four or two card objects. Furthermore, when the broadcast image **1315** in the card object **1310** is selected, the broadcast image **1315** may be displayed as a full screen image on the display **180**.

**[0199]** The information object **1321** that displays information related to the broadcast image **1315** may include a channel number (DTV7-1), a channel name (YBC HD), the title of a broadcast program ("Oh! Lady"), and an airtime (8:00-8:50 PM) for the broadcast program. Therefore, the user may readily obtain information regarding the displayed broadcast image **1315** through the information object **1321**. Moreover, if the user selects the information object **1321**, related EPG information may be displayed on the display **180**.

**[0200]** A current time object **1302** that includes a date (03.24), a day (THU), and a current time (8:13 PM) may be displayed above the card object **1310**. Thus, the user may readily identify current time information through the current time object **1302**. The device object **1317** may represent an external device connected to the image display apparatus **100**. For example, if the object **1317** is selected, a list of external devices connected to the image display apparatus **100** may be displayed. The setup object **1318** may be used to set various settings of the image display apparatus **100**, such as video settings, audio settings, screen settings, reservation settings, setting of the pointer **205** of the remote controller **200**, network settings, or another appropriate setting for the image display apparatus **100**.

**[0201]** The card object **1320** may contain a card object name **1322** (NETCAST) and a CP list **1325** that displays a list of CPs. While Yakoo, Metflix, weather.com, Picason, and MyTube are listed as available CPs in the CP list **1325**, as shown in FIG. **19**, it should be appreciated that many other CPs may be listed in the CP list **1325**. Upon selection of the card object name **1322**, the card object **1320** may be displayed as a full screen image on the display **180**. The same may apply to the other card objects **1330**, **1340**, **1350**, **1360**, **1370**, **1380**, **1390**. Moreover, if a specific CP is selected from the CP list **1325**, a list of content available from the selected CP may be displayed on the display **180**.

**[0202]** The card object **1330** may include a card object name **1332** (APP STORE) and an application list **1335**. The application list **1335** may display a plurality of icons representing applications available on a server, for example, for download or purchase from the display apparatus **100**. Application icons may be sorted into predetermined categories in the application list **1335**. As shown in FIG. **19**, applications may be sorted by popularity (HOT), by time (NEW), and/or another appropriate category group. Upon selection of an application icon from the application list **1335**, information related to the selected application may be displayed on the display **180**.

**[0203]** A Login menu item **1327**, a Help menu item **1328**, and an Exit menu item **1329** may be displayed above the card objects **1320** and **1330**. The user may login to the APP STORE or a network connected to the image display appara-

tus **100** using the Login menu item **1327**. The Help menu item **1328** may provide guidance regarding operation of the image display apparatus **100**. The Exit menu item **1329** may be used to exit the home screen **1300**. When the Exit menu item **1329** is selected, a full screen image of the received broadcast image may be displayed on the display **180**.

**[0204]** An indicator object **1337** may be displayed under the card objects **1320** and **1330** to indicate the total number of available card objects. The indicator object **1337** may also indicate the number of card objects which are displayed on the display **180**. For example, the total number of dots may represent the total number of available card objects. The displayed card objects may be represented by corresponding highlighted dots which may be differentiated by a different color (e.g., white). Moreover, the position of the highlighted dots among the plurality of dots may correspond to a position of the displayed card objects among the plurality of available card objects. As shown in FIG. **19**, the first two white dots of the eight total dots may represent the first two card objects (NETCAST and APP STORE card objects) among the eight available card objects, in their relative positions.

**[0205]** The card object **1340** may represent a list of broadcast channels. This card object **1340** may include a card object name **1342** (CHANNEL BROWSER) and a thumbnail list of broadcast channels **1345**. A plurality of broadcast channels may be represented as thumbnail images, as shown in FIG. **19**. The thumbnail images may include still images or moving pictures. The thumbnail list **1345** may include information related to the channels as well as the thumbnail images for the channels such that the broadcast programs of the channels may be readily identified.

**[0206]** Moreover, the thumbnail images may correspond to pre-stored user channels (e.g., favorite list) or to channel numbers relative to the channel being displayed in the card object **1310** (e.g., channels which are numbered higher or lower than the displayed channel). Although eight channel thumbnail images are displayed in FIG. **9**, many other configurations may be possible. The arrangement and selection of the displayed thumbnail images may be updated in the thumbnail list **1345**. Upon selection of a thumbnail image from the thumbnail list **1345**, a broadcast program from the selected channel may be displayed on the display **180**.

**[0207]** The card object **1350** which represents a program list may contain a card object name **1352** (TV GUIDE) and a program list **1355**. The program list **1355** may list broadcast programs for the currently displayed channel or broadcast programs for one or more different channels. If a program is selected from the program list **1355**, a broadcast image of the selected program (e.g., currently being broadcast) or broadcasting information related to the selected program (e.g., future broadcasts) may be displayed on the display **180**.

**[0208]** The card object **1360** which represents a reserved (e.g., a scheduled recording) or recorded program list may include a card object name **1362** (RESERVATION/REC) and a scheduled or recorded program list **1365**. The scheduled or recorded program list **1365** may include scheduled recordings or scheduled programs which have been recorded. Moreover, while a thumbnail image is displayed for each program as shown in FIG. **19**, the present disclosure is not limited thereto and the program listing may be displayed in various formats. For example, the scheduled/recorded program list **1365** may include a text listing, a grid, thumbnail images only, or another appropriate format to list the scheduled recordings/recorded programs. Upon selection of a scheduled recording or a recorded program from the scheduled or recorded program list **1365**, broadcast information related to the scheduled recording or the recorded broadcast program may be displayed on the display **180**. Alternatively, if recorded, the recorded program may be displayed on the display **180**.

**[0209]** The card object **1370** display a list of multimedia files and may include a card object name **1372** (MY MEDIA) and a media list **1375**. The media list **1375** may list multimedia files available on the image display apparatus **100** or a device connected to the image display apparatus **100**. While the multimedia files are shown as moving pictures, still images, and audio in FIG. **19**, many other types of media (e.g., text, e-books, etc.) may be listed in the card object **1370**. Upon selection of a file from the media list **1375**, the selected file may be opened and a window (e.g., audio/video player or picture viewer window) that corresponds to the selected file may be displayed on the display **180**.

**[0210]** The card object **1380** may display a list of connected external devices and may contain a card object name **1382** (EXTERNAL DEVICE) and a device list **1385** of external devices connected to the image display apparatus **100**. The external device list **1385** may include a gaming box, a DVD player, a computer, or another appropriate device. Upon selection of the card object name **1382**, the card object **1380** may be displayed as a full screen image on the display **180**. Moreover, upon selection of a specific external device from the external device list **1385**, a menu related to the selected external device may be displayed. For example, content may be played back from the external device and a window (e.g., device control menu window) that corresponds to the reproduced content may be displayed on the display **180**.

**[0211]** The card object **1390** may display call-related information and may include a card object name **1392** (PHONE) and a call-related list **1395**. The call-related list **1395** may be a listing related to calls placed or received from a portable phone, a computer, or the image display apparatus **100** capable of placing calls. For instance, the call-related list **1395** may include a message item, a phone book item, or a setting item. Upon receipt of an incoming call at the portable phone, the computer, or the image display apparatus **100**, the call-related card object **1390** may be automatically displayed in the card object area of the display **180**. If the card object **1390** is already displayed on the display **180**, it may be highlighted or otherwise distinguished from the other card objects.

**[0212]** Therefore, the user may readily identify incoming calls received on a nearby portable phone, a computer, or the image display apparatus **100**. This is an interactive function among the portable phone, the computer, and the image display apparatus, and may be referred to as a 3-screen function. Moreover, upon selection of the card object name **1392**, the card object **1390** may be displayed as a full screen image on the display **180**. Upon selection of a specific item from the call-related list **1395**, a window that corresponds to the selected item may be displayed on the display **180**.

**[0213]** The controller or the card object generator may store and manage (e.g., sort and arrange a display order of the card objects), and display the card objects. The controller or the card object generator may set a virtual hidden area on one side of the screen so as to manage a sort and display order of the card objects. The controller or the card object generator may also control scrolling of the card objects, for example, to shift a displayed card objects to be hidden and to shift a hidden card object to be displayed on the display apparatus **100**.

**[0214]** As shown in FIG. **19**, the card objects **1310**, **1320** and **1330** may be displayed in the card object area **1300**, and the card objects **1340** to **1390** may be hidden in the hidden area **1301**, by way of example. The card objects **1320** and **1330** displayed on the display **180** may be exchanged with the hidden card objects **1340** to **1390** according to a card object shift input. For example, at least one of the card objects **1320** and **1330** being displayed on the display **180** may be moved to the hidden area **1301** and in turn, at least one of the hidden objects **1340** to **1390** may be displayed on the display **180**.

**[0215]** An application menu **1305** may include a plurality of application menu items. The plurality of application menu items may include predetermined menu items **1306** to **1309** which may be selected from all application menu items available on the display **180**. Thus, the application menu **1305** may be referred to as an application compact-view menu. The application menu items **1306** to **1309** may be divided into mandatory application menu items **1306**, **1307**, and **1309** (Search, App Store, and '+') and optional application menu items **1308** (e.g., Music, Book, MAZON, and SNS).

**[0216]** The mandatory application menu items **1306**, **1307** and **1309** may be fixed such that the user is not allowed to edit these items. The Search application menu item **1306** may provide a search function based on an input search keyword. The App Store application menu item **1307** may allows direct to access an AppStore. The '+' (View More) application menu item **1309** may provide a full screen function wherein the application menu **1305** may be displayed as a full screen image.

**[0217]** In certain embodiments, an Internet application menu item and a mail application menu item may be added as mandatory application menu items in the application menu **1305**. The user-set application menu items **1308** may be changed to display applications menu items for applications which are frequently accessed. It should be appreciated that, while the application menu **1305** is disclosed herein as having a predetermined specific set of mandatory application menu items and user-set application menu items, the present disclosure is not limited thereto, and any number or types of application menu items may be designated as being mandatory or optional.

**[0218]** FIG. **20** is a flowchart of a method for operating an image display apparatus according to an embodiment of the present disclosure, and FIGS. **21**, **22** and **23** are exemplary home screens to illustrate the method of FIG. **20**. Referring to FIG. **20**, the method for operating an image display apparatus according to an embodiment of the present disclosure, may include displaying the home screen **1300**, in step S**1410**. The home screen **1300** may include a plurality of card objects, for example, a BROADCAST card object **1310**, a NETCAST card object **1320**, the APP STORE card object **1330**, and the application menu **1305** that includes at least one application menu item displayed on the display **180**, as illustrated in FIG. **21**.

**[0219]** The home screen **1300** may be displayed, in step S**1410**, when the image display apparatus is powered on, wakes up from standby mode, or receives a go-to-home input. Since the home screen **1300** was previously described with reference to FIG. **19**, a detailed description of the home screen **1300** is not repeated hereinbelow.

**[0220]** As described with reference to FIG. **19**, the plurality of card objects may include at least one of a card object that provides a thumbnail list of broadcast channels, a card object that provides a scheduled program list or a recorded program list, or a card object that provides a list of multimedia files available on the image display apparatus or in a device connected to the image display apparatus. Among the card objects, a card object that displays a broadcast image may include a received broadcast image and an object representing information related to the broadcast image.

**[0221]** The plurality of card objects may include the CHANNEL BROWSER card object **1340**. This card object may be partially displayed on the display **180**. Herein, a partially displayed card object such as the CHANNEL BROWSER card object **1340** is referred to as a first card object. That is, referring to FIG. **21**, the card objects **1320** and **1330** are fully displayed, while the card object **1340** is partially displayed on the display **180**.

**[0222]** Upon selection of the first card object **1340**, in step S**1420**, the first card object **1340** may be fully displayed, as illustrated in FIG. **22**. For example, at least one of the card objects displayed on the display **180** (**1320**, **1330**) may be moved to the hidden area **1301** and at least one of card objects hidden in the hidden area **1301** (**1340**, **1350**) may in turn be displayed on the display **180**, in step S**1430**.

**[0223]** A card object may be selected through manipulation of input device such as the pointer **205** which may be controlled by a movement of the remote controller **200**, a local key of the image display apparatus, a directional key on the remote controller, etc. Moreover, the number of card objects displayed on the home screen **1300** may be variable.

**[0224]** Specifically, upon selection of the first card object **1340**, the partially displayed first card object **1340** (CHANNEL BROWSER) representing a thumbnail list of broadcast channels and the TV GUIDE card object **1350** that displays a program list may be moved out of the hidden area **1301** to replace the NETCAST card object **1320** and the APP STORE card object **1330** in the card object area. Thus, the CHANNEL BROWSER card object **1340** may be fully displayed.

**[0225]** As the CHANNEL BROWSER card object **1340** and the TV Guide card object **1350** are displayed on the home screen **1300**, the RESERVATION/REC card object **1360** may now be partially displayed as a first card object, as shown in FIG. **22**. Among the displayed card objects, the first card object **1360** of FIG. **22** may be placed at the rightmost position. In other words, the first card object **1360** may now be the leftmost card object in the hidden area **1301**.

**[0226]** In certain embodiments, a selection of the partially displayed first card object may result in replacing only one displayed card object with a new card object, rather than replacing all displayed card objects with new hidden card objects. For example, referring to FIG. **21**, a selection of the partially displayed CHANNEL BROWSER card object **1340** may result in sliding this card object to an area on the display occupied by the APP STORE card object **1330**, and sliding the NETCAST card object **1320** off the screen to the hidden area.

**[0227]** Moreover, the NETCAST card object **1320**, which was replaced by the CHANNEL BROWSER card object **1340**, may be partially displayed at the left side of the APP STORE card object **1330** to indicate presence of available card objects. In this case, the partially displayed card object on the left side may be displayed between the BROADCAST card object and the leftmost card object. In other words, hidden card objects may be partially displayed on the left side as well as the right side of the displayed card objects to indicate presence of additional card objects on each respective side.

**[0228]** The partially displayed card objects may be further distinguished from the active card objects by distinguishing a color, tint, brightness, shading, fading, or another appropriate characteristic to further distinguish the partially displayed card objects. For example, the image of the partially displayed card objects may be faded such that the partially

displayed card objects are less noticeable. Other graphic effects may be provided, such as gradually fading the partially displayed card object towards the edge of the display, to further distinguish these card objects while minimizing their potential distraction to a user.

**[0229]** FIGS. **21** and **22** illustrate examples of a home screen **1300** which may include a partially displayed object at the right side of the display that indicates presence of an additional card object on the right side of the display. When additional information is present in the vertical direction, a similar environment may be provided to display the additional card objects.

**[0230]** Moreover, similar methods may be used to identify hidden objects (e.g., icons) within a card object. For example, the CHANNEL BROWSER card object **1340** as shown in FIG. **23** may include additional hidden objects **1341** and **1342** which may be partially displayed on the bottom of the card object **1340**. Accordingly, the user may readily recognize the presence of additional hidden thumbnail images **1341**, **1342** and view them by scrolling up the CHANNEL BROWSER card object **1340** using the remote controller **200**. Alternatively, the partially displayed object **1341** or **1342** may be selected to fully display the partially displayed object **1341** or **1342** as well as other hidden thumbnails without manually scrolling to view the hidden thumbnails.

**[0231]** For example, when the partially displayed object **1341** or **1342** is selected (e.g., using the remote controller **200**), all displayed thumbnails may be replaced with new thumbnails (e.g., hidden thumbnails). Here, a selection of the partially displayed objects **1341** or **1342** may be similar to a selection of a page up/down button. In certain embodiments, the selection of the partially displayed object **1341** or **1342** may cause the thumbnails to shift by one row. Here, the partially displayed objects **1341** or **1342** may be used similar to a scroll button. Moreover, when changing the displayed thumbnails, the displayed thumbnails may be scrolled to slide across the display or may be changed instantly without the graphic effects.

**[0232]** Indicator objects **1337** in this embodiment may also indicate which of the plurality of card objects are currently being displayed on the home screen **1300**. For example, in FIG. **23**, six card objects **1320**-**1370** may be available (excluding the BROADCAST card object **1310**). The six card objects may be represented by six corresponding dots of the indicator object **1337** positioned below the two displayed card objects **1340**, **1350**. The six dots of the indicator object **1337** may be displayed according to a relative order of the available card objects such that a relative position of the displayed card objects may be determined based on the dots.

**[0233]** For example, the first dot may corresponds to the first card object (NETCAST **1320**) and may be displayed at a far left position among the six dots. The third dot may correspond to the third card object (CHANNEL BROWSER **1340**) and may be displayed at the third position from the left among the six dots, etc. Because the dots which correspond to the displayed card objects (CHANNEL BROWSER card object **1340** and the TV GUIDE card object **1350**) may be highlighted (white dots), a relative position of the displayed card objects among the all available card objects may be determined through the indicator objects **1337** (e.g., CHANNEL BROWSER card object **1340** is the third card object).

**[0234]** FIG. **24** is a flowchart of a method for operating an image display apparatus according to another embodiment of the present disclosure, and FIGS. **25** to **32** are exemplary screen images to illustrate the method of FIG. **24**. Particularly, FIGS. **25** to **32** illustrate exemplary application market screens, for example, app store screens.

**[0235]** Referring to FIG. **24**, the method for operating an image display apparatus according to this embodiment may include receiving a go-to-app store input, in step S**1610**, in response to the go-to-app store input, displaying tabbed menus which may represent categories in which a plurality of applications may be classified in a first area of the display **180**, in step S**1620**, and upon a selection of a tabbed menu corresponding to a category, in step S**1630**, sorting icons that represent applications in the selected category according to sub-categories and displaying the sorted icons based on the sub-categories, in step S**1640**.

**[0236]** Referring to FIG. **25**, tabbed menus which may represent categories into which a plurality of applications are classified may be displayed in a first area **1800** of the display **180**. The large number of available application may make identification of newly added applications difficult. Accordingly, the applications may be classified into various categories (e.g., game, news, sport, etc.) based on the type of application, as illustrated in FIG. **25**, a user may search for a desired application more easily.

**[0237]** In step S**1620** as shown in FIG. **24**, the method for operating an image display apparatus may further include displaying a broadcast image **1711** in a second area **1710** of the display **180**. Thus, the broadcast image **1711** may be continually displayed while accessing the app store. Upon selection of a tabbed menu corresponding to a category, application icons that fall into the selected category may be sorted according to sub-categories and displayed in at least a part of the display **180**, preferably in the first area **1800**. That is, because the applications of the selected category are re-classified and displayed according to predetermined criteria, the user can identify the applications more easily.

**[0238]** FIG. **25** illustrates an example in which a category **1811** 'ALL' with all applications is selected. The selected category **1811** may be displayed differently from other categories **1812** and **1813** in color, size, etc. One of the tabbed menus may be selected based on pre-stored settings or by a user input. For example, the category **1811** 'All' may be set by default. In this case, when an app store (application market) is accessed, the application icons included in the category 'All' may be automatically sorted and displayed according to predetermined criteria, as illustrated in FIG. **25**. Accordingly, when the tabbed menus are displayed, the category 'All' may be selected by default according to an embodiment of the present disclosure.

**[0239]** The sub-categories may be based, for example, on a total popularity ranking **1820** (Weekly Hot), new application **1830** (New), free application ranking **1840** (Top FREE), or paid application ranking, for a predetermined time period. The predetermined time period may be, for example, a day, a week, a month, a quarter, a half year, a year, or a custom time period, and may be set to be different for each sub-category. For instance, a top ranking list which may list the download or installation rankings of applications may be ranked and displayed on a weekly basis, whereas the numbers of downloads or installations of free or paid applications may be accumulated for an indefinite period and tabulated as a top free application list or a top paid application list. A new application list including new applications released within a predetermined time may also be made based on a different statistical period from those of other sub-categories.

**[0240]** The application lists of the sub-categories may contain fully displayed icons and partially displayed icons. Referring to FIG. **25**, the Weekly Hot list **1820** may contain full icons **1821** and **1822** and a partial icon **1823**. The New list **1830** may also contain full icons **1831** and **1832** and a partial

icon **1833**. The Top FREE list **1840** may contain full icons **1841** and **1842** and a partial icon **1843**.

**[0241]** Simply for ease of discussion, the partially displayed icons may be referred to as first icons. The user may readily recognize the presence of additional icons hidden from the display **180** based on these first icons. Upon selection of a first icon, in step **S1650**, the display state of the first area may be changed, in step **S1660**. In step **S1660**, the first icon may be fully displayed. In an embodiment, hidden icons may be displayed along with the selected first icon in the application list containing the first icon.

**[0242]** Upon selection of the first icon **1823** which is partially displayed in the Weekly Hot list **1820** in FIG. **25**, the Weekly Hot list **1820** may be changed to display an icon **1851** which may be a fully displayed version of the first icon **1823**, followed by icons **1852**, **1853** and **1854** which were hidden, as shown in FIG. **26**. In this manner, the first icon **1823** may function to shift the application list forward or backward so that the application list displays previous or next icons which were not previously displayed.

**[0243]** The first icon **1851** (full version of partially displayed first icon **1823**) may be placed at the leftmost position of the application list. Moreover, if there are remaining hidden icons, not yet displayed in the Weekly Hot list **1820**, an icon **1856** may be partially displayed at the rightmost position, as shown in FIG. **26**, in order to indicate to the user of the existence of additional information.

**[0244]** Upon selection of the first icon **1823** in FIG. **25**, the fully displayed icon **1822** to the left of the first icon **1823** may be partially displayed as illustrated in FIG. **26** (shown in FIG. **26** as icon **1855**). In this case, the user may readily recognize that there is a previous icon which may be available in the Weekly Hot list **1820**. When the user clicks on the first icon **1822**, the Weekly Hot list **1820** may be shifted to display the previous icons.

**[0245]** In certain embodiments, when first icon **1823** as shown in FIG. **25** is selected, the displayed icons in the Weekly Hotlist **1820** may be shifted (e.g., scrolled) by one icon to display the first icon **1823** at a location where icon **1822** was originally displayed. In this case, only the left most icon may be scrolled off the screen to be hidden or partially displayed, while the other three previously displayed icons may still be displayed.

**[0246]** Meanwhile, a specific image, for example, an advertisement **1775** may be displayed in a third area **1770** of the display **180**. The advertisement **1775** may be received from a network or a connected external device. If a signal related to an advertisement is not received, any other image may be displayed. For instance, an advertisement for a manufacturer of the image display apparatus, which may be stored in the image display apparatus, may be displayed in the third area **1770**.

**[0247]** In addition, when the user selects or focuses on a specific application, an image that corresponds to the application may be displayed in the third area **1770**. If the user selects an icon, an image displayed on the third area **1770** may be replaced with information about the application corresponding to the selected icon. Moreover, when another icon is selected, or if a hidden first icon is selected, the displayed images in the corresponding list (Weekly Hot list **1820**, New list **1830**, or Top Free list **1840**) as well as the third area **1770** may be updated accordingly.

**[0248]** According to an embodiment of the present disclosure, upon selection of the first icon, the current screen may turn to a previous page or a next page in step **S1660**. FIGS. **27** and **28** are exemplary screen images to illustrate a change in a display screen upon a selection of a partially displayed icon (i.e. a first icon) according to this embodiment. Here, when one of a partially displayed first icon **1861**, **1862**, or **1863** is selected when under the category "All," a current page **1860** may be switched to a next page **1870**.

**[0249]** Referring to FIG. **28**, each of application lists on the page **1870** may include a plurality of icons. Among them, icons **1871**, **1872** and **1873** may be fully displayed, whereas first icons **1874** to **1879** may be partially displayed. The first icons **1874** to **1879** may be placed at the leftmost or rightmost positions in their respective application lists.

**[0250]** The user may recognize the presence of the previous page when the first icons **1874**, **1875** and **1876** are displayed at the leftmost positions in their respective application lists. Upon selection of the first icon **1874**, **1875** or **1876**, the current screen may turn to the previous page **1860** of FIG. **27**. Likewise, a presence the first icons **1877**, **1878** and **1879** at the rightmost positions in their respective application lists may indicate a presence of a next page. Upon selection of one of the first icons **1877**, **1878** or **1879**, the current screen **1870** may turn to a next page that includes the full version of the first icons **1877**, **1878**, **1879** as well as additional hidden icons if available.

**[0251]** FIGS. **29** and **30** illustrate displayed screen image switching according to an embodiment of the present disclosure. Here, a displayed image screen may be switched based on flicking when two pages are available. In FIGS. **29** and **30**, two large rectangles **1910**, **1920** may represent pages, wherein the bolded rectangle may represent a current page.

**[0252]** Referring to FIG. **29**, a first page **1910** may be displayed on a display screen. Unlike a conventional page, the first page **1910** may contain a portion of the next page **1920** to notify the user of the presence of the next page **1920**. Here, the first page **1910** may easily be turned to the next page **1920** through flicking. Referring to FIG. **30**, the second page **1920** may be displayed. Like the first page **1920**, the second page **1920** may contain a portion of the first page **1920**. The second page **1920** may be easily flicked to the previous page **1910**.

**[0253]** A flicking or a flick input may be, for example, a touch input similar to a touch-and-drag input. However, in this type of input, the movement to drag is a quick movement across the screen. Unlike the touch-and-drag input where the drag may span across the screen, the flicking motion may require a quicker motion that spans a smaller distance. The flick input may be generated through a touch screen input, a remote controller **200**, or another appropriate input device.

**[0254]** FIGS. **31** and **32** are exemplary display screen images of an application list that includes partially displayed icons (i.e. first icons) **1881** and **1882** positioned vertically, under fully displayed icons. That is, while the first icons, as illustrated in FIGS. **25** to **30**, were positioned horizontally at the leftmost or rightmost portions of the display, first icons **1881** and **1882** in this embodiment may be partially displayed at the bottom to indicate that there is still another page. Upon selection of the icon **1881** or **1882**, the next page may be displayed.

**[0255]** That is, if there are additional hidden application lists or icons available vertically at either the top or bottom of the display, an partial first icon **1881**, **1882** may be partially displayed on the top or bottom edge of the display area to indicate the presence of the additional information. Upon selection of the partially displayed icon **1881** or **1882**, as shown in FIG. **31**, the selected icon **1881** or **1882** may be fully displayed as an icon **1891** or **1892**, as illustrated in FIG. **32**. Along with the full icons **1891** and **1892**, other hidden application lists such as a Top PAID list, a Recommended list, etc. may be displayed to replace the Weekly Hot list, the New list, and the Top FREE list of FIG. **31**. Moreover, as shown in FIG.

**32**, additional partially displayed icons may be displayed on the top and bottom of the application list area to indicate the presence of additional information, if available (e.g., Time Attack).

**[0256]** As previously discussed, a broadcast image may be displayed on a portion of the display **180**. FIG. **33** is a flowchart of a method for operating an image display apparatus according to another embodiment of the present disclosure, and FIGS. **34**, **35** and **36** are exemplary display screen images to illustrate the method of FIG. **33**.

**[0257]** Referring to FIG. **33**, an input to display the application menu on a full screen may be received, in step S**2010**. The input to switch to a full screen view of the applications may be generated in various manners. For example, a full screen function may be invoked by selecting the view more (+) application menu item **1309** in the application menu **1305** of FIG. **19** using the pointer **205**. The pointer **205** may be controlled by a movement of the remote controller **200**. Moreover, the view more (+) application menu item **1309** may be selected through a selection of a directional key or both a directional key and an "OK" key on the remote controller **200**.

**[0258]** A full screen **2100** which includes a plurality of application items may be displayed on the display **180**, as illustrated in FIG. **34**, in step S**2020**. The full screen **2100** may include an application menu **2150**. To be specific, the full screen **2100** may include an application compact-view menu **2110** and an extended application menu **2150** with additional application items. Each application menu may include a plurality of application items.

**[0259]** The full screen may include an application menu which may include at least one object that represents movement to the home screen, an object that represents deletion of an application item, or an object that indicates a current page number with respect to the total number of pages.

**[0260]** The application compact-view menu **2110** is similar to the application menu **1305** illustrated in FIG. **19**, except that a compact-view application item (−) **2109** replaces the view more application item (+) **1309** as a mandatory application item. That is, upon selection of the compact-view application item (−) **2109**, the home screen as illustrated in FIG. **19** may be displayed. In other words, when the display apparatus enters the compact-view mode of the application menu, the application menu **1305** of the home screen may be displayed.

**[0261]** The extended application menu **2150** may include, among application items installed in the image display apparatus, application items that are not displayed in FIG. **19**. The extended application menu **2150** may further include an object **2120** which may represent deletion of an application item and an object **2130** that represents the current page number with respect to the total number of pages for the full screen **2100**.

**[0262]** Meanwhile, the extended application menu **2150** may include a plurality of fully displayed application items **2173** and **2174** as well as a plurality of partially displayed application items **2171** and **2172**. The partially displayed application items **2171** and **2172** may indicate the existence of a next page. Upon selection of the partially displayed application item **2171** or **2172**, the full screen **2100** may turn to the next page to display additional application items. Upon selection of a partially displayed application item, in step S**2030**, the displayed extended menu screen may be switched to display a previous or next screen, in step S**2040**.

**[0263]** FIGS. **34** and **35** show display exemplary display images to illustrate the method of FIG. **33**. Referring to FIGS. **34** and **35**, upon a selection of the partially application item **2171** or **2172** of FIG. **34**, the full screen **2100** may turn to the next page which may include a new extended application menu **2180**, as shown in FIG. **35**. Preferably, the application compact-view menu **2110** may still displayed. Accordingly, the user may readily identify added application items.

**[0264]** As the user turns to the next page, the partially displayed application items **2171** and **2172** of FIG. **34** may now be fully displayed as application items **2181** and **2182**, respectively, as shown in FIG. **35**. The application items **2173** and **2174** which were fully displayed in FIG. **34**, may now be partially displayed at the left side in FIG. **35**. Accordingly, the existence of a previous page may be indicated. Upon selection of the application item **2183** or **2184**, as shown in FIG. **35**, the previous page may be displayed. The partially displayed application items may be placed at the leftmost or rightmost positions among the plurality of displayed application items. Alternatively or additionally, the partially displayed application items may be placed at the top or bottom side among the plurality of displayed application items.

**[0265]** FIG. **36** illustrates exemplary display images that display partially displayed application items. The application items **2191** and **2192** may be partially displayed at the bottom of the extended application menu **2150** to indicate that the current page does not contain all of available application items. In this embodiment, the application items **2191** and **2192** may function to allow the displayed page to be switched from one page to another. For example, upon selection of the application item **2191** or **2192**, the extended application menu **2150** may be changed to a next page and a new extended application menu may be displayed. When changing the displayed page, the page may be scrolled to provide an effect of sliding the displayed application items across (or up) the screen. Alternatively, the display of the extended application menu **2150** may be instantly changed.

**[0266]** FIG. **37** is a flowchart of a method for operating an image display apparatus according to a further embodiment of the present disclosure. FIGS. **38** to **41** are images of the display screen to illustrate the method of FIG. **37**. Referring to FIG. **37**, upon receipt of a search input from the user, the controller **170** may control to the display apparatus to display a search window on at least a part of the display **180**, in step S**2210**. The search window may be displayed separately from a displayed image or overlaid on the displayed image.

**[0267]** Subsequently, a search may be performed based on a keyword entered in the search window, in step S**2220**. The search keyword may be entered using an external input device connected to the image display appartus **100** via the external device interface **135**. Moreover, the search keyword may be entered through a local key positioned on the display apparatus **100**, or through a character key provided on the remote controller **200**.

**[0268]** If a visual keyboard is displayed on the display **180**, each character of the keyword may be entered by using a local key or through manipulation of the remote controller **200**. If a touch screen display is provided, the keyword may be entered by touching the keys at the display. Moreover, a keyword may also be entered through voice recognition. In this case, the controller **170** may include a voice recognition algorithm. A voice signal may be received through a microphone connected to the image display apparatus **100**. Alternatively, a microphone may be provided on the remote controller **200** to provide the voice commands to the controller **170**. Then, the controller **170** may generate appropriate control signals by translating the received voice commands through the voice recognition algorithm in real time.

**[0269]** Then, a search result image that includes a plurality of objects **2310** and **2320** (as shown in FIG. **38**) which correspond to the search result may be displayed, in step S**2230**.

Specifically, the controller **170** may perform a search based on the keyword and may display the search results on the display **180**. When the Keyword List button **2391** is selected, the displayed search result may include content which includes the entered search keyword. Moreover, when the Similar List button **2392** is selected, the displayed search result may include content which is similar to contents which includes the entered search keyword. For example, if "Shutter Island" is entered as a search keyword, as shown in FIG. **38**, and the Similar List button **2392** is selected, similar content from the same genre (e.g., thriller) may be displayed as the search result.

**[0270]** Moreover, the search may be performed in the image display apparatus **100**, an external device connected to the image display apparatus **100**, or on a remote device connected through an external network through the network interface **135**. While the controller **170** may perform the search when the contents are located locally (e.g., on an external device connected locally at the display apparatus **100**), when the contents are located on a remote device, a search engine on an external network may be used instead of the controller **170**. Upon selection of the partially displayed object **2320**, in step S**2240**, the search results page may be changed to display the next page of search results, e.g., hidden objects, in step S**2250**.

**[0271]** As the next search result page is displayed, the partially displayed object **2320** of FIG. **38** may be fully displayed as an object **2340**, as shown in FIG. **39**. Then, the search result object **2310** may be scrolled to the left to be partially displayed as an object **2330**, as shown in FIG. **39**. Accordingly, the partially displayed object **2330** may indicate the presence of the previous search result page. Moreover, upon selection of the partially displayed object **2330**, the previous page may be displayed. A partially displayed object may be placed at the leftmost or rightmost position among a plurality of objects, or both sides, based on the presence of additional objects.

**[0272]** FIG. **40** illustrates a display screen image of a search result which may be included in multiple categories. Referring to FIG. **40**, the displayed objects **2360**, **2370** may fall into both categories "Similar List" (e.g., objects which represent similar content) and "Netcast" (e.g., objects which are available on service providers through Netcast). The objects **2360** and **2370** included in the search result may each include a word which is related to the search keyword. Moreover, if remote content is being searched, the search result may be provided for display at the display apparatus **100** by a service provider.

**[0273]** Referring again to FIG. **40**, the displayed search list includes content from the same genre, e.g., thriller. To display search results associated with a different genre, the up/down screen shift icons **2380** may be selected using a pointer **2350**. The pointer **2350** may be controlled by a directional key of the remote controller, or another appropriate input device. Moreover, to display content which includes the search keyword, the keyword list button **2392** may be selected.

**[0274]** A search result object **2320** may be partially displayed at the rightmost position to indicate the presence of additional search results of the same genre. Upon selection of the partially displayed search result object, the search results screen may be changed to display the next page of search result objects.

**[0275]** In certain embodiments, a partially displayed object may be positioned vertically, e.g., near the top or bottom side, among a plurality of objects. FIG. **41** illustrates a display screen image of a search result having partially displayed objects positioned near the top or bottom. In this embodiment, the partially displayed object **2390** may indicate presence of additional objects which may be hidden. Moreover, the hidden objects may be displayed without using the screen shift icons **2380** of FIG. **40**. Here, a search result object **2390** may be partially displayed at the bottom and may be used to change the displayed page to another page. For example, upon selection of the search result object **2390**, the search results page may be changed to display a new search result page. The displayed page may be configured to be scrolled (e.g. slide off the display) or may be changed instantly upon selection of the partially displayed object **2390**.

**[0276]** FIGS. **42**, **43** and **44** are exemplary display screen images to control a display of graphical objects according to an embodiment of the present disclosure. Hereinafter, the term "graphical object" may include objects as described with reference to FIGS. **42**, **43** and **44** as well as objects, items, and icons as described with reference to FIGS. **19** to **41**.

**[0277]** When a card object **1320** is selected that represents CPs on the home screen of FIG. **19** (e.g., the Netcast card object), additional CP objects may be displayed on the display **180**, as illustrated in FIG. **42**. The CP objects may be icons that include identifying information (e.g., logos, names, video clips, etc.). Thus, the plurality of displayed CPs may easily be identified. While a CP list is shown in FIG. **42** as listing **10** CPs objects (Yakoo, Metflix, Weather.com, Picason, My Tube, Gudu, Nulu, Witter, pacebook, and SBC), the number of CP objects listed on a single screen may be changed. For example, the size of the CP objects may be made smaller to display a greater number of CP objects on a single display.

**[0278]** Partially displayed objects **2413**, **2414** may be provided to indicate availability of additional CP objects. Upon selection of a partially displayed object **2413** or **2414**, the selected object may be fully displayed as an object **2417** or **2418**, as shown in FIG. **43**. Along with the object **2417** or **2418**, other previously hidden CP objects may be displayed on the display **180**.

**[0279]** CP objects **2411** and **2412** which are fully displayed in FIG. **42** may be partially displayed as CP objects **2415** and **2416** at the leftmost positions in FIG. **43**. Hence, the presence of additional CP objects which are not displayed may be indicated by the display of CP objects **2415** and **2416**. Upon selection of the CP object **2415** or **2416**, the previous page may be displayed. Moreover, a partially displayed object may be placed at the top or bottom of the object display area to indicate presence of additional objects at the top or bottom of the CP list, respectively.

**[0280]** Referring to FIG. **44**, in addition to the partially displayed CP objects **2413**, **2414** positioned horizontally, a partially displayed CP object **2419** may be positioned adjacent to the bottom row of the displayed CP objects. This CP object **2419** may indicate to a user that additional CP objects are available near the bottom of the displayed list. Upon selection of the CP object **2419**, the displayed CP list may be scrolled up or changed to display another page of CP objects.

**[0281]** For example, the displayed CP list may be scrolled, for example, using a remote controller **200**. Once the partially displayed CP object **2419** is selected, the displayed CP objects may be replaced with CP object **2419** and additional new CP objects. Because all the CP objects are replaced (e.g., the entire page of CP objects is scrolled to display the next page), it may not be necessary for the user repeatedly scroll down the list. However, it should be appreciated that a selection of the partially displayed object **2419** may scroll the displayed image by one row of CP objects (e.g., object **2419**

may be fully displayed as well as the row including object **2412**, while the row including object **2411** may now be hidden).

**[0282]** The image display apparatus and the method of controlling the same, as embodied and broadly described herein, may increase user convenience and overall effectiveness of the user interface (UI) by providing a more intuitive graphical interface. The image display apparatus may be a multifunctional display device. The image display apparatus may be equipped to provide multimedia content received over a network as well as broadcast content received from a broadcast provider. Thus, the image display apparatus may be provided with various types of user-friendly input devices such as a handwriting input device, a touch screen, a pointing device, or another appropriate type of input device. Furthermore, because the image display apparatus may be connected to the Internet, it may be configured to provide various functions including e-mail, web browsing, online banking, gaming, or another appropriate type of online activity by connecting directly to the Internet or a computer having Internet access. Moreover, to implement these functions, the image display apparatus may operate based on a standard general-purpose Operating System (OS).

**[0283]** Various applications may be freely added to or deleted from, for example, a general-purpose OS kernel in the image display apparatus. Hence, the image display apparatus may be configured as a network TV, a Hybrid broadcast broadband TV (HbbTV), a smart TV, or another appropriate type of networked display device. Moreover, the image display apparatus may be implemented on a smart phone, as needed.

**[0284]** The image display apparatus may display various types of content including still or video images as well as multimedia content. The image display apparatus may also display broadcast programs which may be selected from among a plurality of broadcast programs transmitted from broadcasting stations. The broadcast programs may be digital content.

**[0285]** Digital broadcasting may offer many advantages over analog broadcasting. For example, digital broadcasting may provide improved noise cancelation, reduced data loss, improved error correction as well as the ability to provide higher resolution images, such as high-definition content. Moreover, digital broadcasting may allow for interactive viewer services to be provided to the end user.

**[0286]** In an embodiment, the image display apparatus may provide a user interface that includes a plurality of icons and card objects representing a plurality of content which may be accessed, for example, over the Internet. At least one of the plurality of icons may be partially displayed to indicate to the user that additional icons or card objects are available. A selection of the partially displayed icons or card objects may scroll the displayed objects to display the additional icons or card objects.

**[0287]** In accordance with an aspect of the present disclosure, a method for operating an image display apparatus may include displaying a home screen on a display, the home screen having a plurality of card objects and an application menu with at least one application item, and upon selection of a first card object which is partially displayed on the display from among the plurality of card objects, fully displaying the selected first card object, moving at least one of the card objects displayed on the display to a hidden area, and displaying at least one of card objects hidden in the hidden area on the display.

**[0288]** In accordance with another aspect of the present disclosure, a method for operating an image display apparatus may include using a partially displayed graphic object as a page switching or screen switching menu, among a plurality of graphic objects displayed on various screens. In accordance with a further aspect of the present disclosure, an image display apparatus may include a user input interface which may receive an input related to a plurality of graphic objects, and a controller which may, upon selection of a partially displayed graphic object from among the plurality of graphic objects, control a display of a hidden graphic object.

**[0289]** A method of controlling a display on a multifunctional display device, as embodied and broadly described herein, may include displaying a first card object in a first area of the display, the first card object configured to display a video image; displaying a second card object in a second area of the display, the second card object having at least one link for connecting to a content provider or to a storage device; displaying a third card object in a third area of the display such that the third card object is partially displayed on the display; receiving a request to change the displayed card objects; and displaying, in response to the request, the third card object in the second area of the display and partially displaying a fourth card object in the third area of the display.

**[0290]** In this embodiment, a width of the partially displayed portion of the third or fourth card object may be less than a width of a hidden portion of the third or fourth card object. The third area of the display may be positioned at an outside edge of the display such that the partially displayed portion of the third or fourth card object is displayed at the outside edge of the display. The second area of the display may be positioned adjacent to the first area of the display, and the third area may be positioned adjacent to the second area opposite the first area.

**[0291]** Moreover, the displaying the third card object in the second area of the display may include partially displaying the second card object in a fourth area of the display, the fourth area positioned between the first area and the second area, wherein a selection of the second card object displayed in the fourth area of the display causes the second card object to be displayed in the second area of the display and the third card object to be partially displayed in the third area of the display. Moreover, displaying the third card object in the second area of the display may include scrolling the third card object across the display from the third area to the second area and scrolling the second card object across the display from the second area to the fourth area.

**[0292]** The at least one link may include a URL configured to retrieve a multimedia content stored on the content server. The at least one link corresponds to a channel in a broadcast signal, and wherein a selection the at least one link tunes a tuner in the multifunctional display device to the channel. The at least one link is an icon.

**[0293]** In this embodiment, the third card object may include at least one thumbnail corresponding to at least one of a broadcast content, content stored on the content server, or content stored on the storage device, wherein the at least one thumbnail includes a still image or a video image representative of the corresponding content. A selection of the at least one thumbnail may cause the at least one of a broadcast content, content stored on the content server, or content stored on the storage device to be retrieved for display on the display. Moreover, the displayed content is displayed as a full screen image on the display. Alternatively, if the thumbnail corresponds to a video content, the video content may be displayed in the first card object.

**[0294]** The video image displayed in the first card object may also be at least one of a broadcast video received at a tuner provided in the multifunctional display device, a

streaming video received at a network interface provided in the multifunctional display device, or a video stored on a storage device provided in the multifunctional display device. Furthermore, the receiving the request to change the displayed card objects may include detecting a selection of the third card object displayed in the third area of the display, the third card object being selected using a cursor on the display that is controlled by a motion sensing remote controller.

**[0295]** In one embodiment, a multifunctional display apparatus may include a tuner configured to tune to a channel of a broadcast signal; a network interface configured to receive data packets; a display module; a wireless input interface to receive signals from a remote controller; a storage device to store data; a processor to control the display module based on a signal from the remote controller. Here, a first area of the display module may display a first card object configured to display a video received through a channel of the broadcast signal tuned by the tuner, a second area of the display module may display a second card object having at least one link configured to access a content server or a local storage device, and a third area of the display module may partially displays a third card object, and wherein the signal from the remote controller causes the processor to control the display module to display the third card object in the second area of the display module and partially display a fourth card object in the third area of the display module.

**[0296]** In another embodiment, a method of controlling a display on a multifunctional display device may include displaying at least one first icon in a first area of the display; displaying at least one second icon in a second area of the display such that the second icon is partially displayed on the display, wherein the at least one first and second icons include at least one link for connecting to a server or to a storage device; receiving a selection of the at least one second icon; scrolling, in response to the selection, the at least one first icon out of the first area and scrolling the at least one second icon into the first area of the display, and partially displaying at least one third icon in the second area of the display.

**[0297]** In this method, selecting an icon displayed in the first area may cause the multifunctional display device to retrieve a corresponding content for display on the display, and selecting an icon displayed in the second area may cause the multifunctional display device to replace a displayed icon with a hidden icon.

**[0298]** Embodiments of the present disclosure are described in detail with reference to the attached drawings, but it should be understood that they are merely illustrative of the present disclosure and should not be interpreted as limiting the scope of the present disclosure. The terms "module" and "unit" used to refer to components are used herein to help in the understanding of the components, and thus, they should not be considered as having specific meanings or roles. Accordingly, the terms "module" and "unit" may be used interchangeably. In addition, although the terms used in the present disclosure are selected from generally known and used terms, some of the terms mentioned in the description of the present disclosure, the detailed meanings of which are described in relevant parts of the description herein, have been selected by the applicant at his or her discretion. Furthermore, the present disclosure must be understood, not simply by the actual terms used, but by the meanings of each term lying within.

**[0299]** The method for operating an image display apparatus according to the foregoing exemplary embodiments may be implemented as code that is written on a computer-readable recording medium and, can thus, be read by a processor. The computer-readable recording medium may be any type of recording device in which data is stored in a computer-readable manner. Examples of the computer-readable recording medium may include a ROM, a RAM, a CD-ROM, a magnetic tape, a floppy disc, an optical data storage, and a carrier wave (e.g., data transmission through the Internet). The computer-readable recording medium may be distributed over a plurality of computer systems connected to a network so that computer-readable code is written thereto and executed therefrom in a decentralized manner. Functional programs, code, and code segments needed to realize the embodiments herein may be construed by one of ordinary skill in the art.

**[0300]** Any reference in this specification to "one embodiment," "an embodiment," "example embodiment," etc., means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the disclosure. The appearances of such phrases in various places in the specification are not necessarily all referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with any embodiment, it is submitted that it is within the purview of one skilled in the art to effect such feature, structure, or characteristic in connection with other ones of the embodiments.

**[0301]** Although embodiments have been described with reference to a number of illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements of the subject combination arrangement within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

What is claimed is:

**1**. A method of controlling a display on a multifunctional display device, comprising:

displaying a first card object in a first area of the display, the first card object configured to display a video image;

displaying a second card object in a second area of the display, the second card object having at least one link for connecting to a content provider or to a storage device;

displaying a third card object in a third area of the display such that the third card object is partially displayed on the display;

receiving a request to change the displayed card objects; and

displaying, in response to the request, the third card object in the second area of the display and partially displaying a fourth card object in the third area of the display.

**2**. The method of claim **1**, wherein a width of the partially displayed portion of the third or fourth card object is less than a width of a hidden portion of the third or fourth card object.

**3**. The method of claim **1**, wherein the third area of the display is positioned at an outside edge of the display such that the partially displayed portion of the third or fourth card object is displayed at the outside edge of the display.

**4**. The method of claim **1**, wherein the second area of the display is positioned adjacent to the first area of the display, and the third area is positioned adjacent to the second area opposite the first area.

**5**. The method of claim **1**, wherein the displaying the third card object in the second area of the display includes partially

displaying the second card object in a fourth area of the display, the fourth area positioned between the first area and the second area.

**6**. The method of claim **5**, wherein a selection of the second card object displayed in the fourth area of the display causes the second card object to be displayed in the second area of the display and the third card object to be partially displayed in the third area of the display.

**7**. The method of claim **5**, wherein displaying the third card object in the second area of the display includes scrolling the third card object across the display from the third area to the second area and scrolling the second card object across the display from the second area to the fourth area.

**8**. The method of claim **1**, wherein the at least one link includes a URL configured to retrieve a multimedia content stored on the content server.

**9**. The method of claim **1**, wherein the at least one link corresponds to a channel in a broadcast signal, and wherein a selection the at least one link tunes a tuner in the multifunctional display device to the channel.

**10**. The method of claim **1**, wherein the at least one link is an icon.

**11**. The method of claim **1**, wherein the third card object includes at least one thumbnail corresponding to at least one of a broadcast content, content stored on the content server, or content stored on the storage device.

**12**. The method of claim **11**, wherein the at least one thumbnail includes a still image or a video image representative of the corresponding content.

**13**. The method of claim **11**, wherein a selection of the at least one thumbnail causes the at least one of a broadcast content, content stored on the content server, or content stored on the storage device to be retrieved for display on the display.

**14**. The method of claim **13**, wherein the displayed content is displayed as a full screen image on the display.

**15**. The method of claim **13**, wherein, if the thumbnail corresponds to a video content, the video content is displayed in the first card object.

**16**. The method of claim **1**, wherein the video image displayed in the first card object is at least one of a broadcast video received at a tuner provided in the multifunctional display device, a streaming video received at a network interface provided in the multifunctional display device, or a video stored on a storage device provided in the multifunctional display device.

**17**. The method of claim **1**, wherein

the receiving the request to change the displayed card objects includes detecting a selection of the third card object displayed in the third area of the display,

the third card object being selected using a cursor on the display that is controlled by a motion sensing remote controller.

**18**. A multifunctional display apparatus, comprising:

a tuner configured to tune to a channel of a broadcast signal;

a network interface configured to receive data packets;

a display module;

a wireless input interface to receive signals from a remote controller;

a storage device to store data; and

a processor to control the display module based on a signal from the remote controller, wherein:

a first area of the display module displays a first card object configured to display a video received through a channel of the broadcast signal tuned by the tuner,

a second area of the display module displays a second card object having at least one link configured to access a content server or a local storage device, and

a third area of the display module partially displays a third card object, and wherein

the signal from the remote controller causes the processor to control the display module to display the third card object in the second area of the display module and partially display a fourth card object in the third area of the display module.

**19**. A method of controlling a display on a multifunctional display device, comprising:

displaying at least one first icon in a first area of the display;

displaying at least one second icon in a second area of the display such that the second icon is partially displayed on the display, wherein the at least one first and second icons include at least one link for connecting to a server or to a storage device;

receiving a selection of the at least one second icon;

scrolling, in response to the selection, the at least one first icon out of the first area and scrolling the at least one second icon into the first area of the display; and

partially displaying at least one third icon in the second area of the display.

**20**. The method of claim **19**, wherein

selecting an icon displayed in the first area causes the multifunctional display device to retrieve a corresponding content for display on the display, and

selecting an icon displayed in the second area causes the multifunctional display device to replace a displayed icon with a hidden icon.

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