Abstract: A system for displaying information on multiple mobile devices whereby the information displayed for each device is determined by the device’s physical location in relation to other devices’ physical locations. The information may be graphic, text, numerical, or audible.
SMART PHONE CROWD ENHANCEMENT

We Verdict Communications Ltd, 21 Rostfevor Street, Hamilton 3204 a New Zealand company do hereby declare this invention to be described in the following statement:
FIELD OF INVENTION

The present invention relates generally to mobile device display screens and more specifically to the relationships between information displayed on multiple mobile devices display screens which may be in motion, when utilized in conjunction with one another over a geographic area at a given time.

BACKGROUND OF THE INVENTION

Typically when a gathered crowd of people sends a message, they do so by shouting in unison or with movement such as a hand wave. These movements may also involve objects. For example, at a baseball game, fans may stomp their shoes or wave their baseball caps. Furthermore, a crowd may work together to create a synchronized motion.

A common example of a synchronized crowd motion is a stadium wave which is achieved in a packed area when successive groups of spectators briefly stand and raise their arms. Each spectator rises at the same time as those straight in front and behind, and slightly after the person immediately to either the right (for a clockwise wave) or the left (for a counterclockwise wave). Immediately upon stretching to full height, the spectator returns to the usual seated position.

Another common example of a synchronized crowd motion is when concert spectators raise their lighters in hand and sway in unison to the tempo of live music.
These methods however are limited in that the objects used in conjunction with physical movements can not be dynamically updated to transmit different information without being manipulated by the user. That is, a crowd might decide to sway at a different tempo, but it's the user that has to change their own movement speeds.

Another example would be: A group of users raise their mobile phones in the air at a music concert. They all have a blank white screen showing on the phone. If they are prompted to change the screen to green, each user would have to execute the request manually.

The present device seeks to augment crowd capability by utilizing mobile devices in conjunction with one another to present synchronized group messages that can be dynamically updated and retain their cohesiveness while the crowd is moving.

For example, a crowd carrying mobile devices such as Apple's iPhone can all raise their phones with an orientation allowing onlookers to see the displays.

Subsequently, the individual iPhone screens can be used in conjunction to form in aggregate, a larger image to onlookers. As the members of the crowd move, the individual images on the iPhone screens are updated using an algorithm so that the aggregate image remains intact.

It is also known that mobile devices have accelerometers, magnetometers, cameras, Bluetooth communications, wireless data systems and other mechanisms for input. The invention will incorporate one or more of these inputs to relate information about
the user's state in order to communicate the information effectively throughout the group of mobile devices. It can also use these inputs to modify the information displayed on the mobile devices.

The present device will work in large and small groups. Furthermore, it may incorporate various communications protocols such as those of Mobile ad hoc (MANET) and Mesh networking. As described by Wikipedia, Mesh networking is a way to route data, voice and instructions between nodes. It allows for continuous connections and reconfiguration around broken or blocked paths by "hopping" from node to node until the destination is reached. A mesh network whose nodes are all connected to each other is a fully connected network. MANET can also deal with the problems introduced by the mobility of the nodes. Mesh networks are self-healing: the network can still operate when one node breaks down or a connection goes bad.

DISCUSSION OF RELATED ART

In U.S. Patent 5361078 "Multiple screen graphics display" Caine, Lester S. shows a display system comprised of a wall of video screens each driven by a video driver. Information to be displayed is supplied from a host computer. Each screen displays a portion of an image or the whole image.

This invention is limited by the necessity of a dedicated host computer. It is also limited because the displays are in a static configuration and are not wireless or mobile.
In U.S. Patent 5,606,336, "Display control apparatus" Yuki, Osamu, specifies a system whereby a group of display screens are synchronized with a single computer. As LCD horizontal scan times vary with temperature this device uses LCD temperature as a feedback mechanism to synchronize the displays correctly. This device uses screens in fixed positions. The current invention's screen updating is not dependent on temperature of the individual LCD screens.

In U.S. Patent 7091926 "Computer display system using multiple screens" Charles Kulas describes a complex arrangement of arbitrarily placed screens. While the positioning of the screens in his invention is arbitrary, the individual screens are physically mounted so that viewers can see the information presented on the screens. The information for each screen is determined by its position and the screens are not intended to be moved while the invention is being used.

ADVANTAGES

The present invention may have one or more of the following advantages:

The information displayed on the individual devices is determined by its position relative to the other displays in the display group. Thus when one device is removed or rearranged, the system compensates to maintain the integrity of the overall image, message or information being displayed.
Each individual display is a component of an individual mobile device; any of which can be utilized as a host device. Other systems utilizing multiple display devices rely on a dedicated host.

In the current invention the devices are not hard wired together.

The system is designed so that one or more the screens in the group can be in motion during its use. Other systems for dynamically updating multiple screens rely on the screens being in fixed positions for the duration of their use.

The invention is designed to dynamically update the information sent to the individual mobile devices based on the position of the target phone.

The invention is designed to anticipate crowd movements and dynamically update the information sent to the individual screens based on the projected physical attributes of the devices over time.

It is not necessary for the user to view the information on the screen in order to interact with the invention.
SUMMARY OF THE INVENTION

The present invention consists of a group of mobile devices with display screens.

First it is determined how many devices will consist of a Group. The Group may be comprised of one or more mobile devices of various manufacture.

One or more mobile devices are selected out of the Group to be the Root device. The position and orientation of the other mobile device display screens is then determined in relation to the location of the Root device or devices.

A message is created by a Control User which may or may not be the Root device. Using an algorithm, the Control User device determines the optimal way to display the message on the Group devices based on the physical attributes of the individual mobile devices including but not limited to their number, screen size, orientation and position in three dimensional space.

The message is then divided, replicated, or manipulated to be presented on the Group's mobile devices.

As the physical attributes including position of the individual mobile devices changes, the invention compensates for the physical attribute changes to retain the integrity of the message to the extent possible under a given situation.
The Control device is capable of dynamically updating the information sent to one or more of the Group devices.

It is also contemplated that the Control device is capable of anticipating the movements of the individual Group devices. Furthermore, the Control device is capable of sending information to the Group devices based on the anticipated physical attributes of the Group devices.

It is further contemplated that the Control device is capable of anticipating aggregate crowd movements and determining what information is sent to the Group devices before the movements occur.

It is contemplated that the algorithm used to determine the position of the Group devices is based on the relative strength of a wireless communications signal such as Bluetooth.

DRAWINGS- FIGURES

FIG. 1 is a diagram illustrating a group of mobile devices in a defined area.

FIG. 2 is a diagram illustrating a group of mobile devices in a defined area displaying information.
FIG. 3 is a diagram illustrating a group of named mobile devices in a defined area.

FIG. 4 is a diagram illustrating a group of named mobile devices in a defined area displaying information.

FIG. 5 is a diagram illustrating a group of named mobile devices in a defined area displaying information where the positions of the mobile devices change.

FIG. 6 is a diagram illustrating a group of mobile devices in a defined area where the mobile devices are moving and the information being displayed is changing.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The following is presently contemplated for this embodiment, but other values, dimensions, can be used.

Turning now to FIG. 1 An area 10 is defined whereby mobile devices 12 within the physical boundaries 10 become part of the group. The physical boundaries for the group can be modified along any dimension in real time. For example, the groups' boundaries may set to the three dimensional area within a football stadium. Furthermore any devices 14 outside the area 10 entering the area 10 become part of the group 12 and any mobile devices 16 leaving the area 10 exit the group.
Turning to FIG. 2. The group of mobile devices 22 are in a given area 20 and are cued to display certain information which creates a visual pattern.

Turning to FIG 3. The group of mobile devices 32 are in a given area 30 and their physical positions in relation to one another are determined and recorded. This can be accomplished using a number of methods including the relative strength of a communication signal, such as Bluetooth or wireless TCP/IP. It is also contemplated that the users position can be determined using a GPS signal. It is also contemplated that this can be accomplished using another wireless signal.

Each mobile device is assigned a name.

Turning to FIG 4. The group of mobile devices 42 are in a given area 40 and their physical positions in relation to one another have been determined by an algorithm and recorded; each mobile device is assigned a name or identification. Certain devices within the group 42 are cued to display certain information which creates a visual pattern. As positions of the individual mobile devices within the group of devices change 46, the information presented on each mobile device changes based on the new positions of the mobile devices. Thus the overall visual pattern on the mobile device group 40 and 41 remains the same over time as the positions of the mobile devices shift.
Turning to FIG. 5 a group of people are holding mobile devices 52 of different makes and models that may have different physical attributes such as screen size and display technology and are connected to various communication networks. The physical locations of the mobile devices 52 are determined in relation to one another within the area 50.

Once the locations of all the mobile devices 52 in the system are determined, one device is determined to be the Root device 54. Any device within the area 50 may be the Root device. The Root device determines the information being sent to other devices in the group 52 based on the mobile devices physical position, orientation and other physical attributes. For example, a user 51 in the area 50 with a Root device 54 may determine a picture of an "X" should be displayed as a mosaic across the group of mobile devices. Once the information is selected, that is the image of the "X", the Root device breaks down the information, in this case the picture, into pieces that will effectively display the image of the "X" across a number of mobile device screens within a Group 50. As the members of the Group move, the Root device updates the information being sent to the individual devices to retain the integrity of the image when viewed in aggregate. If the Root device 54 enters the group buffer zone 56 the Root device uses an algorithm to determine which other mobile device within the group will become the new Root device 58 and a communication of the change is sent to the new Root device 58 which may relay it to the other devices in the group.
It is further contemplated that the device can be used in a crowd setting to distract players, display advertisements, and enable a new level of crowd interaction. It is contemplated that an algorithm will be used to sync adjacent mobile device screens based on location to one large image based on certain criteria. Technologies contemplated are Bluetooth, WiFi, SMS, IP, infrared, image capture and zero connectivity versions.

It is further contemplated that the technology used to enable the invention will be developed for cross-platform deployment. That is, the device will work with multiple mobile device platforms and on different mobile device networks and use multiple communication protocols if necessary. For example users of various Smart Phones models (such as the iPhone, GI, Palm) will all be able to utilize the invention and it will work on different telecommunication networks such as 3G, AT&T, Verizon, Virgin.

The invention will be able to display branding visible to both the user on a personal scale and a wider audience on a macro scale. For example a user may see the outline of a dolphin on their individual phone, and when combined with other images presented on adjacent phones, see a larger dolphin.

It is further contemplated that the invention will incorporate audio synchronization between multiple mobile devices. For example by harnessing small audio outputs from multiple devices, users can create a louder sound.

It is further contemplated that a user voting system will be integrated into the invention whereby users 59 of individual mobile devices such as smart phones in the Group 52 can vote for the image they want displayed in the area 50.
It is further contemplated that the invention will enable a system whereby users can submit their own graphics to be displayed by the Group 50.

It is further contemplated that the visual macro image can be manipulated by real time audio. For example an image that changes when the audio sound of clapping or cheering is recognized.

Turning now to FIG. 6 The group 62 of mobile devices may vary in size from a small group to a large group and that they may be self organized. The area 60 of the group 62 may be defined in a three dimensional space. Information may be cued on the devices which forms three dimensional images. It is contemplated that the mobile devices 62 are in constant motion 66 and motion images are created by utilizing persistence of vision.

It may the be case that the group 62 is disconnected from a larger communications network 99 such as AT&T's 3G network of cell phone towers. Thus the invention can operate using Mobile ad hoc network MANET which enables the invention to operate without the need for connectivity to a network outside the area 60. The movements 67 of the mobile devices 62 may be random or synchronized.

It is contemplated that a user may raise their mobile device rapidly and the invention may detect this movement using one of the sensors on the mobile device such as with one or more accelerometers. Thus the invention may assume the user is participating in a "Mexican Wave" and the screen will light up and the device might emit a sound. The invention may also modify what information is displayed on the mobile device if
the user moves the device in a specific pattern. For example, if a user shakes their mobile device aggressively, the invention may determine the user would like to create a distraction and thus, the screen will flash rapidly between images and may emit a negative sound. It is also contemplated that the invention may cue the group by various methods such as a timer or audio cue to create a pattern such as a distraction.

It is further contemplated that users might wave their mobile device gently above their heads and the invention will assume a "Sway" mode, where the screen will modulate between soft colors in time with your wave. The user will be able to set palettes according to personal preferences or in order to reflect support for a team or organization.

It is also contemplated that the invention can provide feedback for to the individual users. For example, the device may calculate how synchronized the group is as a whole and how in synchronization an individual is in relation to the group. This information can be provided to the user in a number of forms including pictures.

Conclusion, Ramifications, and Scope

The reader will see that, according to one embodiment of the invention, the device has created a large image by utilizing a group of mobile device screens while the mobile device screens are in motion. While the above description contains many specificities, these should not be construed as limitations on the scope of any embodiment, but as exemplifications of the presently preferred embodiments thereof. Many other
ramifications and variations are possible within the teachings of the various embodiments. Thus the scope of the invention should be determined by the appended claims and their legal equivalents, and not by the examples given.

It should be emphasized that the above-described embodiments of the present invention, particularly, any "preferred" embodiments, are merely possible examples of implementations, merely set forth for a clear understanding of the principles of the invention. Many variations and modifications may be made to the above-described embodiment(s) of the invention without departing substantially from the spirit and principles of the invention. All such modifications and variations are intended to be included within the scope of the present invention.
CLAIMS

What is claimed is:

1. A method of displaying information on multiple mobile device view screens whereby the information displayed on each device is determined by the device's physical location or other physical attributes in relation to other mobile devices' physical locations or attributes.

2. A method of broadcasting audio on multiple mobile devices whereby the audio information for each device is determined by the device's physical location in relation to other devices' physical locations.

3. A method of grouping mobile devices in a given area and the timed cueing one or more devices to display information which creates a visual mosaic across all mobile device screens within the group.

4. A method of grouping of mobile devices in a given area and cueing more than one device to display information which augments crowd interaction.

5. A method as described in claim 1 whereby the mobile devices are moving.

6. A method as described in claim 2 whereby the mobile devices are moving.

7. A method as described in claim 3 whereby the mobile devices are moving.
8. A method as described in claim 4 whereby the mobile devices are moving.

9. A method as described in claim 5 further comprising a system where crowd movements are anticipated.

10. A method as described in claim 6 further comprising a system where crowd movements are anticipated.

11. A method as described in claim 7 further comprising a system where crowd movements are anticipated.

12. A method as described in claim 8 further comprising a system where crowd movements are anticipated.
FIGURE 3
### A. CLASSIFICATION OF SUBJECT MATTER

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

### B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Electronic database consulted during the international search (name of data base and, where practicable, search terms used):

TXTEN, GOOGLE SCHOLAR AND PATENTS with Crowd, Pattern, Display, Multiple, Mobile, Screen, Mosaic, Visual, Audio, Stadium and similar keywords

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<th>Category</th>
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| X        | US 2005/022 1841 A1 (PICCIONELLI et al.) 6 OCTOBER 2005  
Fig 1a - 1c, Fig 5b and corresponding explanations, Para [0066], Para [0071] |
|          |                                                                                      | 2, 6, 10 |
Fig 2 and corresponding explanations, Para [0012], Para [0016] |
|          |                                                                                      | 4, 8, 12 |
| X        | US 6 965 785 B2 (MAGER et al.) 15 NOVEMBER 2005  
Fig 1a, Fig 4a - Fig 4c and corresponding explanations, Col 3 Line 60 - Col 4 Line 4, Col 8 Lines 29 - 48. |
|          |                                                                                      | 1, 3, 5, 7, 9, 11 |

Further documents are listed in the continuation of Box C

X See patent family annex

Date of actual completion of the international search: 07 March 2011

Date of mailing of the international search report: 10 MAR 2011

Name and mailing address of the ISA/AU

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Form PCT/ISA/210 (second sheet) (July 2009)
This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. 
   - **Claims Nos.:**
     - because they relate to subject matter not required to be searched by this Authority, namely:

2. 
   - **Claims Nos.:**
     - because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. 
   - **Claims Nos.:**
     - because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

This International Searching Authority found multiple inventions in this international application, as follows:

**SEE SUPPLEMENTAL BOX - 1**

1. 
   - **As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.**

2. 
   - **X As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.**

3. 
   - **As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:**

4. 
   - **No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:**

**Remark on Protest**

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.
Continuation of Box No: III

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

In assessing whether there is more than one invention claimed, I have given consideration to those features which can be considered to potentially distinguish the claimed combination of features from the prior art.

This International Searching Authority has found that there are four different inventions as follows:

- Claims 1, 5, 9: These claims define a method of displaying information on multiple mobile device screens whereby the information displayed on each device is determined by the device’s physical location or physical attributes in relation to other mobile device’s physical location or physical attributes. It is considered that this group of claims define a first invention.

- Claims 2, 6, 10: These claims define a method of broadcasting audio information on multiple mobile devices whereby audio information for each device is determined by the device’s physical location in relation to the other device’s physical location. It is considered that this group of claims define a second invention.

- Claims 3, 7, 11: These claims define a method of grouping mobile devices in a given area and the timed cueing one or more devices to display information which creates a visual mosaic across all mobile devices within the group. It is considered that this group of claims define a third invention.

- Claims 4, 8, 12: These claims define a method of grouping of mobile devices in a given area and cueing more than one device to display information which augments crowd interaction. It is considered that this group of claims define a fourth invention.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

None of the abovementioned groups of claims share any special technical feature. Because there is no common special technical feature it follows that there is no technical relationship between the identified inventions. Therefore the claims do not satisfy the requirement of unity of invention a priori.

The International Searching Authority believes that a search and examination for the other three inventions will not involve more than negligible additional search and examination effort over that for the first invention and so no additional search fee was invited in order to search and examine that invention.
This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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Form PCT/ISA/2 10 (patent family annex) (July 2009)
# INTERNATIONAL SEARCH REPORT

Information on patent family members

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Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX