

Disasters unfold 'intelligently' on phone screens

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(PhysOrg.com) -- For the first time, a computer scientist has developed a method of making smart phones able to show a disaster unfolding in real-time on phone screens.

The application has a complete functioning prototype and allows for a wide range of uses, from <u>health care workers</u> monitoring heart patients' ECGs, to police central control being able to see where each <u>police</u> <u>officer</u> is in an emergency, to helping deploy the right staff to the right places in a natural disaster.

Dr. Mohamed Gaber, of the University of Portsmouth's School of Computing, along with a group of researchers from Monash University, have published their research in the <u>Proceedings of the IEEE 22nd</u> International Conference on Tools with <u>Artificial Intelligence</u>, with an invitation for an extended version to be published in the *Journal of Computer and System Sciences*.

The application could be used in a natural disaster, for example, so those co-ordinating rescue efforts can use an electronic map on their phone screens with clusters showing which areas are worst affected. Because such information would constantly update as the disaster unfolds, the clusters would adjust automatically in size and scale as new clusters formed to stop the phone screen becoming over-crowded with information.

Dr. Gaber said: "This is the first time anyone has managed to develop a



clutter-aware visualisation for <u>mobile data</u> mining that automatically considers the amount of information presented on screen and dynamically adjusts the way this information is presented to avoid confusion and enhance ease of understanding.

"A lot of work has gone into making the application useable and interactive so it can be adjusted to people's abilities to manage visual information - some people can cope with a lot more than others, but this development means the application is truly universal, by being adaptive in real-time to the user's needs.

"Reducing clutter on screen is key to improving perception and understanding of the information presented. The higher the number of clusters, the less understandable the situation becomes, leading to confusion for those trying to manage a rapidly evolving situation.

"The need for an application that knows when information overload is a threat is very important."

No existing method allows for such rapid real-time adjustments to what shows on a phone's screen while also being "aware" of how cluttered the screen is becoming. This means a screen can quickly become covered in clusters of information, for example, in a major city riot where protestors are sparking incidents across a wide area.

Clutter on a phone screen is measured in two ways – the percentage of the screen occupied by clusters; and the percentage of clusters that overlap.

Dr. Gaber said: "We want to give people the choice of what degree of clutter is tolerable in any given situation and to give them the power to adapt their screen images dynamically as a situation or location unfolds, depending on their preferences.



"The user can decide the amount of clusters they can visually manage on their phone screen and when a situation becomes more complex, the phone image is automatically scaled down; or if that is still too much information for the user, then the clusters change color so black dots represents a lot of activity or data, grey represents a fair amount, and white represents very little, for example.

"Because both refreshing a screen and the screen's backlight are big eaters of a phone's battery, we have developed an energy control system which allows the phone to adjust dynamically, depending on battery usage and life, how often to refresh the screen and how brightly to light the screen."

And because people managing a complex rapidly unfolding crisis or situation sometimes cannot look at their phone screens continuously, for instance, when they are driving, Dr. Gaber and colleagues have made the application capable of being switched to sound only, so an alert sounds every time a new <u>cluster</u> forms or an existing one grows.

He said: "The main aim of data visualisation is to help users make decisions, so we have enabled the system to allow people to tap a cluster to find out more and incorporated an audio aspect so they can hear more information about a cluster without further cluttering up the screen. This is especially useful to people in situations where they can't look at their phone screen continuously, for example. Audio feedback also allows for the screen to be turned off entirely if battery levels are low and audio can then be used to sound an alert or an alarm if a cluster grows beyond a certain size."

The application has the potential to enable an entire new class of intelligent analysis applications for supporting mobile users, he said, and the implications of that are significant. "The development of visualisation techniques is the natural next step to enable large-scale



deployment of mobile real-time analysis."

Clustering of information could be used in the field of disaster management; by emergency services in the event of a complex disaster; by a taxi controller needing to know drivers' locations and the drivers' needing to know where they are in relation to the drop-off and next pickup; and for analysing heart rates to detect when they are outside the norm.

The researchers started developing the application in response to the phenomenal growth of mobile devices coupled with their ever-increasing computational capacity.

Dr. Gaber said: "Much research has focused on developing ways of analyzing data in real-time but to date nobody has developed visualisation techniques for small screens. The problem of cluttered screens is well known and has long been studied but everything developed so far has not found a way around making a phone aware of the extent of cluttering on the screen. It is an emerging challenge but it's vital we allow mobile phone users a way of seeing the information they need in a way they can understand and use. It is only now that such a development is becoming possible."

Provided by University of Portsmouth

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