WEBCON 4 Proposal

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Title of the web material: Ubiquitous Crowdsourcing for Emergency Response

- **Design concept and purpose**

  Natural hazard and disasters have always threatened peoples' life and property. It is important to collect geospatial information before and after a disaster for emergency response. However, the capacity (or manpower) of government is very limited when the disaster is happening. **Volunteered Geographic Information (VGI)** is a different way to collect pre- and post-disaster information effectively. VGI is a kind of **crowdsourcing** to collect geospatial data. It is the process of obtaining needed services, ideas, or content by soliciting contributions from a large group of people, and especially from an online community (Wikipedia, 2014). The concept of 'crowdsourcing' changes the way of geospatial data collection for emergency response. Volunteers can spend their time and efforts for emergency mapping via different platforms. For example, DigitalGlobe has provided high resolution satellite images on Tomnod website in finding the Malaysia Airlines Flight 370; Humanitarian OpenStreetMap Team (HOT) has provided a platform for mappers to digitize base maps for needed areas (e.g. West Africa Ebola epidemic); and last but not least, the MapGive project to connect the image providers and the Crowd mapping tasks.

  Currently, interface of the crowd mapping tasks are mostly in the form of web pages, and volunteers have to use their computers for mapping. As the development of mobile devices, volunteers may now use their mobile devices in emergency responses anytime and anywhere. The aim of this study is to create a simple crowd mapping APP to determine types of the damage areas (e.g. road, building, land) for emergency responses.

- **Objectives**

  This study is to design a mobile device application (App) to determine the damaged buildings, broken roads/bridges by satellite images in disaster areas. We use web map tile service to segment a large image into many map tiles which are suitable to fit a smartphone's screen. Volunteers simply determine the damage areas using map-tile and

send the results to database through internet. Then, the web server calculates the classified map tiles on database to produce a disaster map for emergency response.

- **Outline of the web material:**

  The major work includes two parts (see Fig 1): server and client. The first part is the back-end server for dealing with the related matters of images. The main functions include storing the segmented images, sending them to clients, receiving the classified results, and data analysis. The second part is the APP for volunteers to determine whether the images have affected area or not. We develop the APP based on Android system for mobile devices. Therefore, volunteers can be a part of crowd mapping anytime and anywhere.
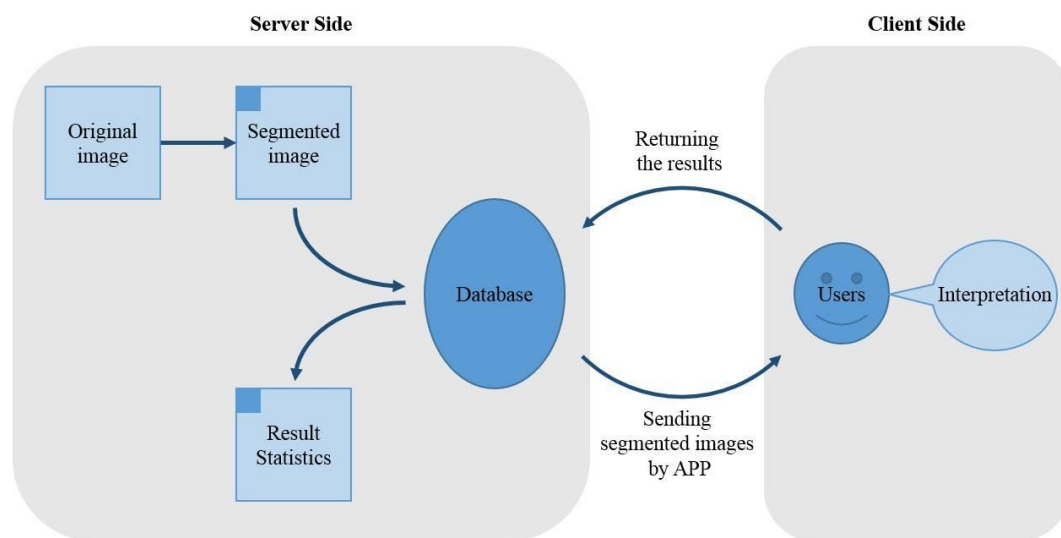

Fig. 1 The work flow of the study

- **Steps:**

  This APP includes three major interfaces and steps:

  1. Choose the missions:

     As shown in Fig. 2(a), it is the **main interface** of the APP. There are four buttons: the "Bridge" button performs the "Damaged Bridge Mission", while the "Building" button performs the "Damaged Building Mission". The user can press either one to start the mission.

  2. Choose the image:

     As shown in Fig. 2(b), it is the interface to **choose the task images**. Green color indicates the area without any interpretation; yellow indicates the area needs more interpretation; and the red color indicates the damage type that has been confirmed.

  3. Interpretation:

     As shown in Fig. 2(c), it is the interface to determine if there is an affected area. Once the volunteer found an affected area, he or she can just simply **double click** the image

and the attribute of this map-tile will be recorded; or else, just **slip** the screen for the next map tile. The result will automatically send to the server.
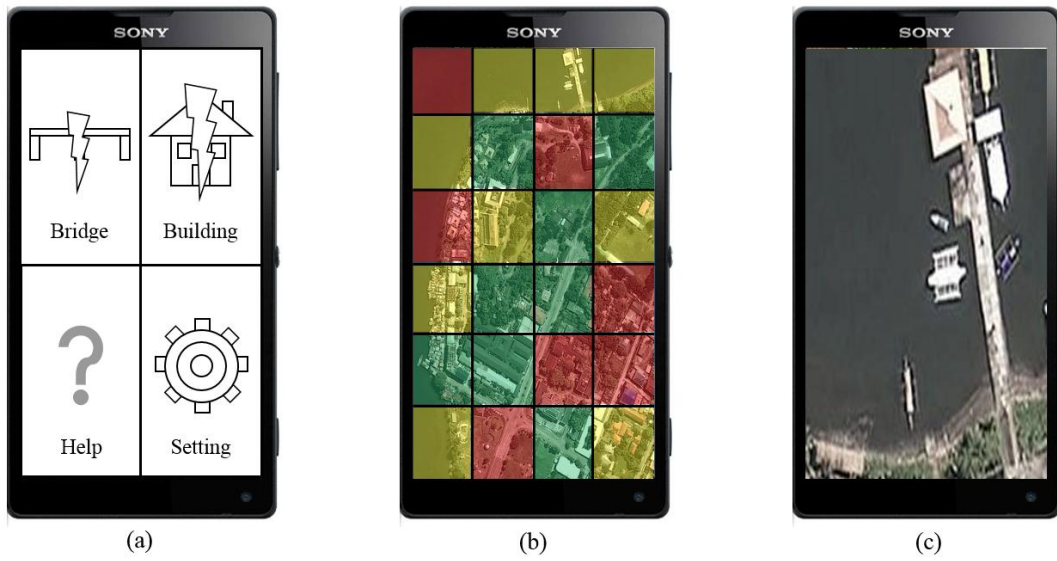

(a)　　　　　　　　(b)　　　　　　　　(c)

Fig. 2 The interface of the APP