



## **“JauntBee as an Emergency Reporter – Encountering the Future Emergency Management Challenges with Technology”**

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### **Introduction**

Emergency never comes with prior intimation and in real world scenarios, detecting such emergencies & reporting them is real challenge. Disaster management organizations, may its government or private one, have their own agenda in place to work-out on the plan and rescue the person who is in emergency. But many of such rescue teams/organizations complaints as they won't get “right information in right time”. That is disaster management teams will not able to get the right information of the emergency in right time, so more the delay in reaching information of emergency to rescue team leads less chances of rescue. Countries like US, where most of the old age citizens stay alone; separate from their children. Medical emergency is most important factor for such citizens. Even considering other personal emergencies like fire at home due to some unfortunate conditions and being alone, sleeping at home leads to major injuries; sometimes death.

As per Indian governments ministry of road transport and highways departments report during the calendar year 2010, there were close to 5 lakh road accidents in India, which resulted in more than 1.3 lakh deaths and inflicted injuries on 5.2 lakh persons. These numbers translate into one road accident every minute, and one road accident death every 4 minutes. Unfortunately more than half the victims are in the economically active age group of 25-65 years. The loss of main bread winner can be catastrophic. (Source: Government of India, Ministry of road transport and highways, transport research wing, New Delhi) In all such situations person who is in emergency will not be in position to inform disaster management team, and that is the worst situation where needy needs help but not able to seek it. So by any means if emergency is detected and reported automatically to disaster management team, then these teams will be in position to rescue person in emergency, even before he/she knows about such emergency. To do so we would take help of all emerging technologies and available hardware sensors.

## **The Development of the Emergency preparedness**

Wireless Sensor Networks (WSN) is an emerging era in Embedded Systems. WSN majorly works on the short distance/range protocol. Whereas another wireless communication system which is backbone of our mobile communication uses the long range protocol to communicate between the devices. We are developing the hybrid system in wireless technology which can make best use of short-range protocol as well as long range protocol to design the world class application. Now a day's Mobile device (cell phones) are integral and inseparable parts of common man for contacting each other via call or text. Moreover Personal Digital Assistants (PDA's) facilitated with other good options like send or receive files, checking emails and it's become gaming device now to play joyful games. Smartphone's are used in many different sectors such as business, healthcare, social networks, environmental monitoring, safety and transport. For enabling related application to consider different domains, a set of embedded sensors such as accelerometer, compass, gyroscope, GPS, microphone and camera are directly included to Smartphone's[1]. Smartphone's are also capable to record useful data like location & other environment details and continuously upload it to particular server. Based on such location traces and also tagging the activities, (such as walking, biking, driving, etc.) one can have complete information about user [2]. Although mobile phones are in market as a platform for its sensing capability and such research has been carried out for a number of years now, in both industrial [3] and research communities [4], there has been little or no advancement in the field until recently. Numbers of technologies are introduced in recent year which have major changes of embedded systems. Along with sensing industry Data Exchange is also one of the key factors of today's advanced smart phones. One such widely accepted and mostly used open wireless technology to exchange data is Bluetooth. To replace cables used to connect devices new technology used worldwide is Bluetooth. Robustness, low power, and low cost are the main key features of Bluetooth technology. It works in the ISM band from 2400-2480 MHz on short wavelength radio transmission link, with creation of personal area networks (PANs). Bluetooth has Special Interest Group (SIG), which consists of different companies working in these electronic and software related services as working member and contributor for this future research and releases. Currently latest version of Bluetooth 4.0 is available in market and widely used by electronic industry. This latest version has features like low cost, multi-vendor interoperability and ability to run for years on standard coin-cell batteries [5]. Proposed system will be using this data transfer technology for its short distance data communication. We are proposing the Emergency reporting system which will record and report emergency in real time. Deployed electronic sensors with microcontroller will trigger in emergency and transmits the data over Bluetooth communication(short range protocol), where as the Smartphone which is in range of sensor (10 to 100 meters depends upon Bluetooth class) will work as receiver of this data and responsible to record it, this software on smart phone is also responsible for uploading that data along with other information like current location tracked via GPS , mobile number, and incident time over internet( long range protocol) to concern department website.

### **Why JauntBee?**

Person in emergency will not be in position to inform rescue team on fly and wait for their help; perhaps he/she try to escape if they are conscious and know about emergency. More dangerous situations occur when person is unconscious or not able to take action against emergency for example physically handicapped person or old age citizen who can't step down immediately from emergency place. Considering other situation like person is not aware about emergency at all and he/she continues their work in hand; in such situation, detecting any

emergency with help of sensors and reporting them to outside world, so that concern disaster team takes appropriate action to rescue the needy. "Right information at right time" will lead to rescue lives.

JauntBee is an application to fight the above clauses.

## **Looking Forward**

Mobile phone, geographic information systems (GIS), Twitter and other technologies are increasingly being used to warn communities of potential crises and inform them how to prepare, and to help governments and aid agencies predict how emergencies may unfold[6].

Team JauntBee looks at some of the ways these innovations are transforming early warning and preparedness.

### **a) Market monitoring**

Aid agencies are increasingly using mobile phones to monitor and analyse market data in remote areas. Buyers, traders or other informants communicate information about food availability, the functioning of local markets, and food prices to agencies like the World Food Programme (WFP) using SMS. These programmes are used all over the world, including in Kenya, northern Mali, Niger, Somalia and Tanzania. Agencies then use this data to inform programming - cash vouchers may be provided in markets with high availability and high prices, for instance, and food assistance may be provided in areas of low availability.

### **b) Health early warning messages**

Many organizations now use mobile phones to help prevent health emergencies. For instance, the International Federation of Red Cross and Red Crescent Societies (IFRC) in West Africa, Oxfam and other agencies say they send out periodic health information related to HIV/AIDS, malaria, reproductive health, hygiene and other issues to raise awareness among phone users. A recent survey of the impact of these health messages by IFRC in Sierra Leone found that 90 percent of people who received such messages changed their behaviours in a positive way.

In April 2013, to pre-empt a cholera outbreak in Sierra Leone during this year's rainy season (in 2012 the country suffered its worst cholera outbreak in 15 years), IFRC set up an SMS system called the Trilogy Emergency Relief Application (TERA), which can send vital information to more than 36,000 people in a single area in less than one hour.

### **c) Community early warning**

Advanced notice of an impending natural disaster can give people a valuable, and often life-saving, head start when it comes to reaching safety. In Malawi, communities living along the banks of the Katchisa-Linthipe River, a high-risk flood zone, worked with Italian NGO COOPI ('Cooperazione Internazionale'), with funding from the European Commission Humanitarian Aid Office's disaster preparedness programme (DIPECHO)[7], to monitor water levels. The measurements were sent to communities downstream via mobile phone. If water levels start to rise, people have time to prepare for possible flooding.

Catholic Relief Services (CRS), Save the Children and IFRC have also sent out “blast messages” to warn people of impending threats, such as high flood risk, imminent storms or disease outbreaks in Haiti, Kenya Madagascar, Niger, and other countries.

**d) Speeding up delivery**

According to the Office for the Coordination of Humanitarian Affairs (OCHA), a pilot programme of Action Aid and infosaid in Kenya last year showed that sending advance text messages to aid recipients about pending deliveries cut down distribution time from three hours to 30 minutes. Similarly, IFRC says they were able to reach more people in a shorter amount of time in Nigeria when distributing mosquito nets just by sending out text messages beforehand.

**e) Geo-hazard mapping**

WFP has partnered with NGOs, UN agencies and governments around the world to map vegetation, crop coverage, market locations and water sources in areas that are prone to natural disasters, using technologies such as satellite imagery, spatial analysis and GIS. Many governments have also begun creating geo-hazard maps, which identify areas that are prone to natural disasters, such as flash floods, soil erosion or landslides[8]. When a natural disaster occurs, these same technologies can be used to map out where roads have been destroyed or washed away, and to pinpoint the location of victims.

CRS first started using this system during the 2010 earthquake in Haiti to map out destroyed homes, track the construction of 10,500 transitional structures and calculate piles of rubble. It has since expanded the program to Madagascar, the Central Africa Republic and the Democratic Republic of Congo, and plans to reach 30 other emergency-prone countries over the next 18 months. In West Africa, IFRC, along with the Red Cross/Red Crescent Climate Change Centre, has been using weather forecasts from the African Centre of Meteorological Application for Development to create easy-to-read maps, which allow field offices in risk zones to preposition supplies and quickly deploy teams in the event of a disaster [9].

**f) Monitoring payments to indicate vulnerability**

Mobile cash transfers to vulnerable people are now routinely used by WFP and its partners, both in and before crises. By collecting data on recipients, these cash programmes can also be used to signal impending crises[10].

For instance, if many recipients are suddenly in need of more cash immediately after a transfer, or if many begin defaulting on micro-loans, aid organizations know to look for underlying causes.

**JauntBee as a Predictor of an Emergency**

JauntBee implemented a robust system to report the emergency. System implementation with one emergency type and their respective experiments shows the positive feedback on systems working model. JauntBee's Implemented system is real time system which reports emergency automatically and also records the sufficient data like person in emergency, location, time and type of emergency and communicate this message to outside world with help of wireless channels. This system is developed on Bluetooth as short range communication

channel. Future work can be carried out on the other options like Wi-Fi Direct or Infrared technologies. Same way applications can be implemented for other mobile OS like Windows, iOS or platforms like PhoneGap. Making most of it is always appreciated and suited for upcoming projects. This system worked with two components - Electronic sensor and a port application on Smartphone. Most excited work to study and implement the integration of these two separate components. i.e. Smartphone itself must have in-built sensors. This work will definitely breakthrough in embedded systems era. Current system works in two tier architecture. Another solution to report emergency is standalone system which can satisfy the given proposal of emergency reporting system with 3 tier system. That means first tier will have all sensor devices in place and second tier will be one device which should responsible to collect data from connected multiple sensors and then it will transfer the data to third tier device, noting but Smartphone.

## **Conclusions**

People's flair for using pervasive mobile technologies to share important information encourages researchers to find solutions based on them. Gathered information can be used for both long-term and short-term solutions. In the first case, the information is used to follow the evolution of a specific crisis and eventually to learn from it for future emergencies. An example is represented by the web application eStoryS [11] that creates and visualizes storyboards about an emergency with the goal to inform operators to manage future events. Short-term solutions exploit data coming from citizens to improve the current emergency response. The most common approach in this case is to establish a bidirectional channel between EM operators and citizens for receiving and sending information in real time through an Emergency Communication Systems [12]. Other solutions are based on a one-way channel that transmits emergency messages to a specific receiver or a group of people. Such systems are called Emergency Notification Systems [13] and they are the ones most widely used nowadays thanks to the diffusion of mobile technologies. As a demonstration of their spread, in the mobile market it is already possible to find a large number of such applications. In this paper, we focus on the short-term approach and in particular on applications used by citizens for notifying emergency organizations about an exceptional situation [14].

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