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Tower-Less Emergency Communication Service for Smartphones

Dr.S.Srinivasan[1], Abiraami TV[2], Akila L[3], Divya S[4]
Professor[1], B.E Student[2, 3, 4]
Computer Science Engineering, R.M.D Engineering College, R.S.M. nagar, Kavaraipettai-601 206.
Affiliated to Anna University, Tamil Nadu, India

Abstract:
The possibilities of connecting people in emergency occurrences through cellular networks are quite difficult. The dissemination of emergency messages to the rescue authorities or to an individual is a challenging operation since the base stations get collapsed in the disaster happenings. In this paper we propose the dissemination of rescue messages through integration of the efficient use of RF transmitter and receiver using PIC microcontroller which mainly increases the communication range, victim localization and evacuate route planning. Our experiment results are the implementation of data i.e message transmission of smartphones even in the absence of cellular network. Our main aim is Broadcasting emergency messages to nearby people is considered to provide more instant help than distant rescue units. Since, the popularity of smart phones has been unprecedentedly increased. Thus increases the possibilities of successful receiving and recognizing SOS messages. The objective is to realize a one-way communication in case of an emergency between a source smartphone and a destination in absence of operational base stations inside an emergency region. To achieve this goal, our idea is to take advantage of wireless communication of smartphones to establish and broadcast and forward the message from the source to rescue unit. In this case, to re-establish communication between victims and outside world, sending the emergency messages through wireless technology. These features match the concept of opportunistic networking.

Keywords: PIC microntroller, wireless technology RF transceiver, smartphone.

I. INTRODUCTION

We are getting affected by large scale disasters by natural calamities like building destruction by earthquakes, tsunami and even manmade social collapses. At the time of disaster people get trapped under life saving circumstances where they will be in the need of a help of rescurer. There are rescue authorities located as they meant to rescue and make victim survive. For example, in earthquake, Chungwa Telecom, the largest telecommunication operation Tiwan, the entire mobile communication systems have taken 15 days to restore. Another example is at Japan were all carrier halted communication service operations of upto 29,000 base station. As a result, people are made to suffer a lot as they were unable to communicate anyone, thus it was difficult to locate them. Hence it is crucial to timely disseminate the emergency messages to rescue authorities.

The procedure for helping the victims are handled by the base stations the encounters that the disaster that had happened and with the cooperation of rescue units the entire recovery operation is carried out. But in case this is achievable with the acknowledgement of satellite link, LTE pico base station, single carrier GSM system. If in the scenario where your network doesn't support much there isn't the occurrence of communication in a proper way.

To overcome these limitations, we propose a towerless emergency communication services through the integration RF transmitter and receiver using PIC microcontroller. RF transmitter and receiver have various advantages such as increasing the longer propagation of communication range and less susceptible to obstacles.

We propose a first RF based emergency communication service by designing the dissemination of emergency messages through the integration RF transmitter and receiver using PIC microcontroller.

- Experimental results are based on the smartphone implementation of message transmission shows that the propose towerless emergency communication service is cost effective and energy efficient with relatively large communication range, victim localization and evacuating route planning.

II. BACKGROUND AND RELATED WORK

A. MCSOS-FM:

In the period of disaster the mobile communication networks which is fixed or mobile gets almost affected, which causes the SOS messages dissemination difficult. Therefore, the MCSOS-FM service was brought in practice in the disastrous area cut off from conventional services that can help users to send SOS messages. The smartphones with the implementation of MCSOS-FM can directly communicate with each other. Fig 1. illustrates the implantation of MCSOS-FM.in smartphones. Here the victim who got trapped in a collapsed building is assumed to seek for help by following two circumstances.

The system will switch to rescue mode automatically, if there is no base station found. In this scenario, victims can send FM radio signal to find viable propagators who are civilians passing nearby. When the FM radio signal finds there is a propagator, victims can transmit an SOS messages including the international mobile equipment identity number (IMEI number) of his/her smartphone, the events they encounter and their location by Morse code to the propagator. The propagators are the civilians passing by the area . The SOS messages are scanned periodically by the radio receiver on the smartphone. They can relay the SOS messages which they receive from victims to police/medical cloud,if the base station signal is available. If there is no base station signal, the SOS messages will get broadcasted. The messages are received by the smartphones the SOS messages will get broadcasted serially which are able to relay the messages to police/medical cloud. In this system, the MOC are regarded as the police/medical cloud. Once receiving SOS messages, the police/medical cloud can go to rescue victims.

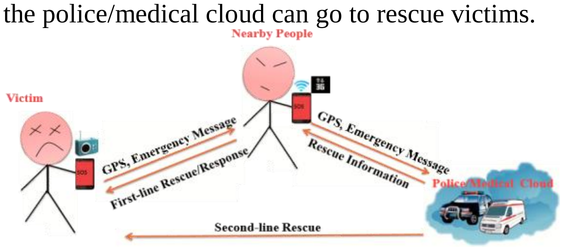

Fig1.overview if MCSOS-FM

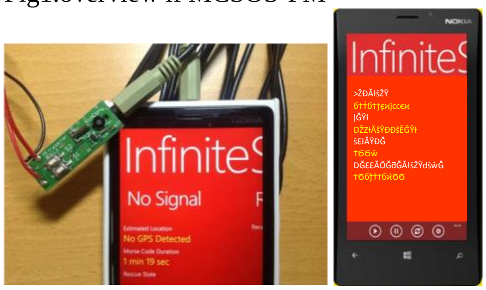

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Fig2. The FM transmitter and user interface of MCSOS-FM.

1) Information Coding Process: The SOS information that a victim fills in is digital data. In order to send digital data through radio system and share in an easy way, we integrate a Morse code encoder in MCSOS-FM to encode the SOS information into Morse code. The FM receiver of propagator receives the analog signal of Morse code and send the signal to Morse code decoder to translate to digital data. Fig. 2(b) shows the user interface of a propagator. The digital information that contains estimated location, event information, estimated distance and message creation time will show to propagator.

2) Radio Broadcasting Process: In order to improve communication range and evacuation route planning, we propose a radio broadcasting process to relay the SOS message. The radio broadcasting process checks whether the receiver has base station signal. If the receiver has no base station signal to relay the SOS message, the radio broadcasting process will broadcast the SOS message to other nearby users until the SOS message can be forwarded to police/medical cloud.

3) Location Estimation Mechanism: Following the above processes, SOS messages will be relayed via propagators until these messages reach the police/medical cloud. The police/medical cloud needs to know the victim's location to rescue victims. However, victims may trap in the place without GPS signal. We propose a location estimation mechanism includes three methods to estimate a victim's location. The first method to estimate location is based on the received signal strengths from FM radio stations [23]. The FM receiver can receive the signal from nearby radio stations which are commercial radio.

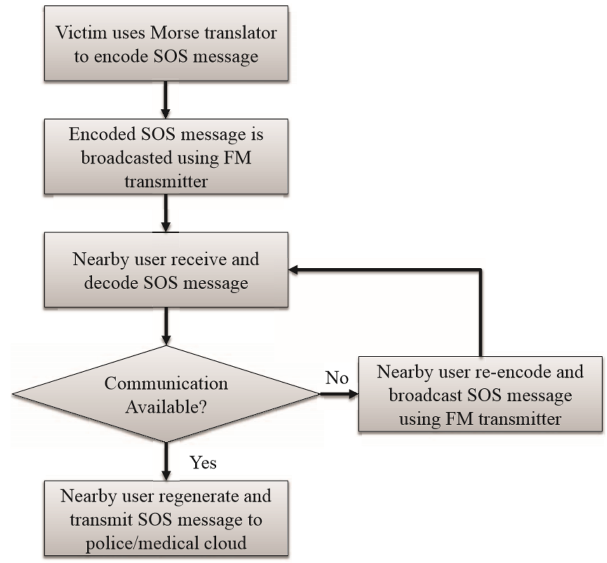


Fig3.System flow of MCSOS-FM.

stations or deployed by rescue authorities. After a victim sends SOS messages, SOS messages may be received by many propagators. Thus, the second method to estimate a victim's location is based on the GPS location of nearby propagators. Once receiving the SOS message from the victim, the propagators find out that there is no location information in the SOS message. The propagator who has GPS location winll send his/her GPS location back to the victim. The victim can use the GPS location from propagators to estimate his/her location. Finally, the third method uses victim's IMEI to find the latest base station which was communicated by the victim, which may indicate the nearly area of the victim. Combining the result of the three methods, MCSOS-FM can estimate victim's location more accurately.

1) System Flow: Fig. 4 summarizes the flow of MCSOSFM. First, the victim uses Morse code translator to encode SOS message, and the SOS message is broadcasted by FM transmitter. Then, nearby propagators receive and decode SOS message. If propagators have available base station signal, they can regenerate and transmit the SOS message to police/medical cloud. If propagators do not have base station signal, they re-encode the SOS message and broadcast to other nearby propagators.

III. EFFICIENT USE OF RF TRANSMITTER AND RECEIVER USING PIC MICROCONTROLLER.

A.OVERVIEW OF MESSAGE TRANSMISSION:

The transmission of rescue messages to the individuals who are nearby ot the rescue authorities can be executed only when the smartphones are implemented with the rescue application developed. When the victim gets trapped under any collapsed building he /she tries to seek help rom someone. This happens when the smartphone is completely out of network services. the efficient use of RF transmitter and receiver enable the message transmission from the smartphone which is out of network services to the smartphones which lies in the same situation i.e there is no network service. The smartphone is enabled with the location and hence the longitudinal and latitudinal information gets transformed along. The application gets implied with their corresponding user and password details and it is specified with aathar card number. The victim can log into the session and sends the help seeking messages along with the details of their location and aathar card number. The RF transmitter will receive the messages using PIC microcontroller and the RF receiver on the receiver session will receive the rescue message and thus the victim gets localised.

B: PROPOSED SYSTEM:
We explore a potential application of smart phones in the case that natural disasters or other emergencies occur, which becomes frequent all around the world. A rescue system using the Android Technology is proposed. However, disasters often come along with the destruction of the local telecommunication infrastructure causing severe problems for rescue team. In this case, to re-establish communication between victims and outside world, sending the emergency messages through wireless networks would be favorable. In our application, no assumption is made with regard to the existence of a complete path between two nodes wishing to communicate. Any possible node can opportunistically be used as a next hop, provided brings the message closer to the final destination. These features match the concept of opportunistic networking. There are three roles for smart phones in the described. The message source could belong to victims trapped in a building/ruin or injured people in need of rescue. They are usually unable to move, therefore are static sources. The source smart phone can also belong to witnesses or reporters sending the real-time information out. Such node can be considered as dynamic sources. The final destination could be either an emergency center (police, red cross etc.) or a mobile user (the source's family or friend). From technical point of view, here we consider a nearby operational base station outside the disaster region as the destination. These are smart phones within the disaster region that participate in the message dissemination by virtue of their wireless capabilities.

C.EXISTING SYSTEM:
In this system, an emergency message dissemination system by taking advantage of epidemic routing algorithm, as well as Bluetooth and WiFi technologies present in modern smartphones. For the purpose of verifying our research, we have simulated the system with two tools: Epidemic Routing Simulator with graphical user interface, and a simulation script. We tested the influence of various parameters (disaster area, number of devices, range of devices, node movement speed, chance of a node to drop a connection, message priority) on the success rate of the message delivery function. A successful message transmission out of the disaster area is the Node Density, WiFi Devices' Range, Message Priority and Probability of Node Leaving the Network. Regarding the wireless technologies, the result shows that WiFi makes much greater contribution than Bluetooth on message dissemination. Furthermore, a trade-off should be made between success rate and average time/energy cost. The simulated results also provide a useful baseline for practical parameter setting in performance-cost optimization.

DISADVANTAGES**:**

- Short range communication up to 10 meters.
- Simulated results only can be done.
- Bluetooth and wi-fi networks are works under cellular networks.

IV.EXPERIMENTAL RESULT:
The transmission of emergency and broadcasting it to the individuals and the rescue authorities is made possible by the wireless technology.

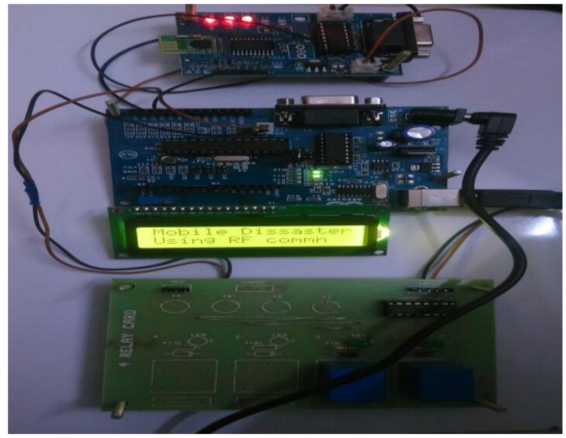


Fig4.RF transmitter

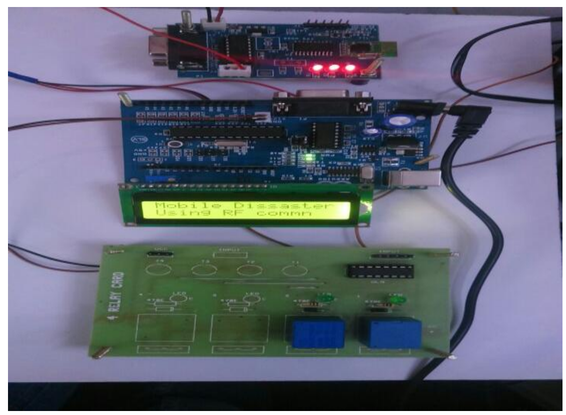


Fig5.RF receiver

A.DESIGN OF MOBILE APPLICATION:
The mobile is comprised of details that define the ultimate user login and password. Even in the absence of network service the communication between the victim and the individuals happens through the efficient use of wireless technology. Fig 7 demonstrates the android framework that implents the development of the mobile application.

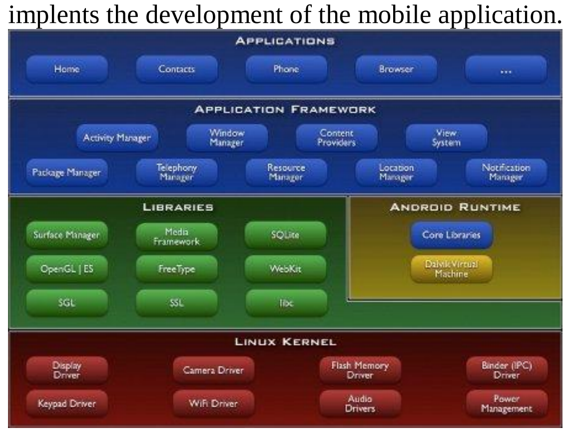
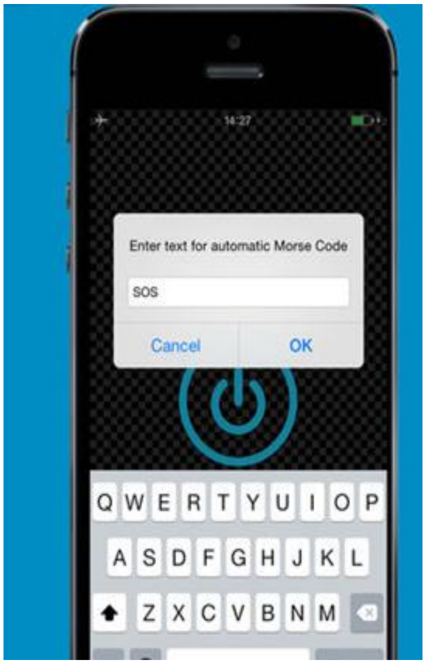


Fig 7 Application Framework
When the longitudinal and latitudinal information is transformed as the resuce emergency messages it is easy to locate the victim.



The message transmission from the victim to the rescue authorities gets broadcasted fig .6 to the mobile with the implantation of the application.

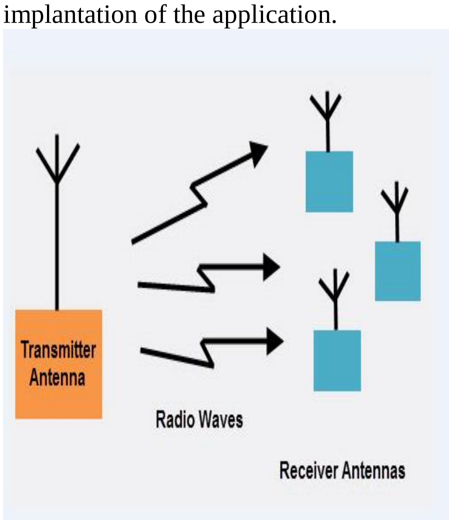


Fig 6. Message transmission

V.CONCLUSION

In this paper we explored the usage of smartphones as message disseminating nodes that do not depend on cellular infrastructures. Our application is useful during natural hazards, when base stations are destroyed, rendering the phone users unable to call or send a SMS to other users. Under such circumstance, we proposed a personal emergency message dissemination system by using wireless technology with 2.4 GHz frequency along with android application. We are able to broadcast messages around 30 to 40 meter. Our system is possible that somebody near the people in emergency can provide more instant help than distant rescue units. Thus, we broadcast the emergency message to nearby people. Furthermore, a prediction or evacuation of a disaster often needs to broadcast the emergency message to people in a local area. The implementation of multiple node transmission between victim and rescue unit. Further, the ability to broadcast messages around 1Km by using Zigbee and it is possible to portable our system by using rechargeable battery.

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