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Survey on network smartphone on disaster recovery

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ABSTRACT

In the time of disaster, the information exchange between rescue helpers and survivors is difficult and the wired connection and cellular network are also collapsed during a disaster and it also not possible to reconstruct the network to communicate with the helpers and survivors. In this paper, we discussed various technologies to help trapped survivors to reach the resue workers in the wireless network even in the absence of cellular network using the wireless ad-hoc network, opportunistic network and using smart phones which uses wifi interface to reach survivors and rescue workers. One is using directional antenna for ad-hoc networks using inter-vehicular communication for quick reconstruction of network, and the other is opportunistic network using ad-hoc communication presents HELPME a self levelling opnet application deployed in smart phones which uses ad-hoc network for communication over wifi in the time of disaster and it forms a dynamic matching of its neighboring nodes to transmit the information with the help of ad-hoc network. And the third one is using the telephone a network application for disaster recovery. Team phone consists of two components the messaging system between rescue worker and trapped survivors integrates cellular networking, ad-hoc networking, and opportunistic networking, and enables proper communication. And the self-rescue system that groups the smartphones of trapped survivors together, energy-efficiently discovers nearby messaging nodes and sends out emergency messages including location and position information.

Keywords: *Disaster, Adhoc, Wi-Fi, Smart Devices, Node.*

1. INTRODUCTION

The world has become a home for various disasters where huge destructions happen almost daily. Either it is caused by natural calamities or manmade disasters, which causes thousands or lakhs of people become sufferers. Victims find them-selves imprison without any hope of reaching for help with no electricity nor communications. In natural disasters like floods, earthquakes, hurricanes or human-caused events like large-scale terrorist attacks or nuclear disasters, basic communication systems can be totally destroyed making the rescue operations extremely difficult. More fear situations occur as people do not know whether their near ones are affected.

The wireless network communication system [2] is very helpful for disaster information network because of its mobility, quick construction in particularly for the disaster-affected areas to enhance the communication of a network area. Adhoc network communication is used to establish the communication between survivor and the rescue helper. Smart phones have recently been considered for disaster recovery to locate survivors using Bluetooth and to provide communication in multihop. However, Bluetooth has a limited range of few meters.

2. MOTIVATION AND CHALLENGES

A disaster such as earthquakes can cause thousands of people to die and cause hundreds of people to buried under rubble. In order to communicate with the trapped survivors so that they can send emergency messages to rescue helpers and it will fasten the rescue work. The smartphones can be used for various applications including health monitoring, computing communication and more over users heavily depend on smartphones in their daily routine. However, in the time of disasters, the cellular network may not work in that time the short range radios like WIFI can be used to identify trapped survivors.

Due to the mobility of survivors and rescue helpers, it is difficult to identify the network topology. Sometimes they form adhoc network

and sometimes opportunistic network so it is a challenge to provide network communication among cellular, adhoc and opportunistic routing. It is also difficult to find out the exact location of the survivors in order to do the rescue operation.

3. APPROACHES

A. DIRECTIONAL ANTENNA BASED NETWORK

In this method a distant communication can be perceived using the position of information is with relay vertex obtained from the GPS receiver and by accurate which controls the direction of the antenna. Using high-end channel the information of the location can be share with opposite node. The antenna can be controlled by conforming automatically by Noticing the electric power density of the opposite electric power density and field intensity.This framework can be carried and moved by a vehicle so as to quickly deploy in an affected area. In most of the cases there are less chances of power supply then power supply can be obtained easily from a vehicle to help for providing communication facilities in the disaster area.

A vehicle can carry each base station, a directional antenna [3] which is mounted with the accurate, wireless LAN access point and GPS Receiver as shown in the figure.

We selected 802.11b/g as the data channel for this network communication because the licence is not necessary and any one can introduce immediately with low price. Mobile stations are structured in an affected area so that anyone can communicate with anyone without any approval from authorized access. Care should be taken to face directional antenna exactly opposite to other directional antenna when both communication stations are moving otherwise the communication range should be limited. This can be control by taking GPS data, electric power density, packet loss and time delay.

Network Configuration

The System consists of two networks, To fix the direction of the directional antenna to exactly opposite to its partner instinctually the location of the partner station must be known. Therefore it is necessary to know the exact location of the partner node in another network channel. This can be done through GPS receiver which provides the exact location of the opposite station.Information required for adjusting the directional antenna opposite to opposite direction can be done through the control channel and the main traffic channel is formed.

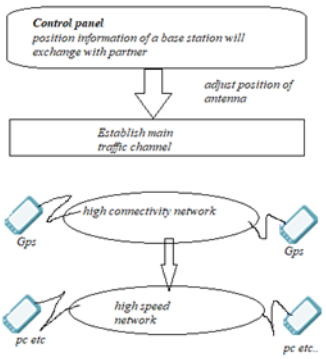


Fig 2: Network Configuration

4. SYSTEM ARCHITECTURE

This System can be explained by connecting a GPS receiver, an curator for a directional antenna, wireless LAN access point, and an executable application.

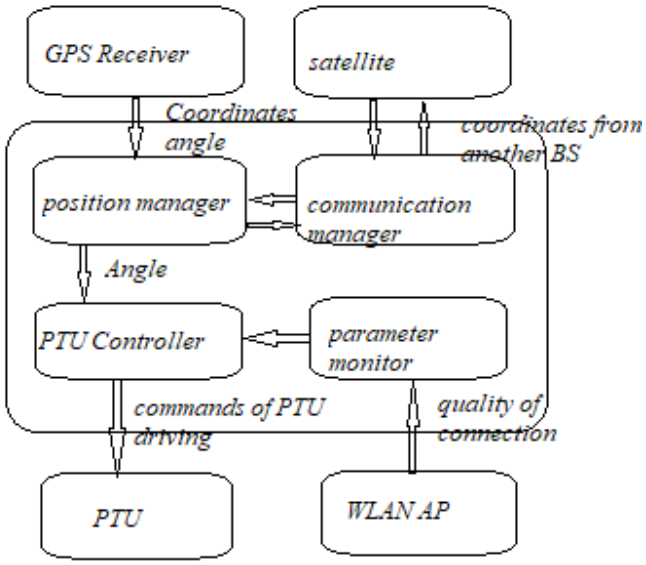


Fig 3.System Architecture

Position manager gets the location information from the GPS receiver and performs the conversion. Communication manager performs message transmission and direction information in which opposite station position angle using a control channel over an IP network. This transmission of control information must be done for every second.

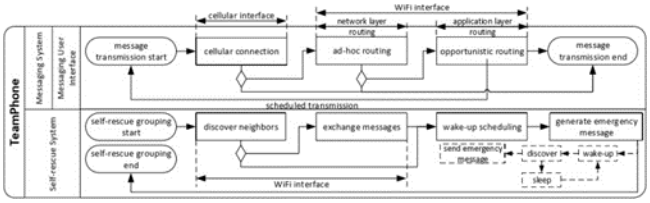
To control the actuator unit PTU controller generates a command and transmits to opposite side.system initialization and operation check can be done by this module for PTU.

After positioning the angle of antenna it is required to tune in optimal position adjustment using electric power density, Round trip time and packet loss rate.This can be realized by Parameter monitor which supervises the network quality. Electric power density can be obtained via SNMP in which wireless access point implements.

a. TEAM PHONE FOR DISASTER RECOVERY:

In the time of disaster recovery due to the frequent mobility of trapped survivors and rescue workers there is a change in the topology of network sometimes smartphones form an adhoc network and sometimes they can contact each other by opportunistic network or sometimes there is a chance of they are in cellular network range so there is a big headache in providing a communication among all the three (cellular, Adhoc and opportunistic) types of network. So we demonstrate a TeamPhone that provides communication where smartphones are grouped together and work together to provide communication.

TeamPhone[1] consists of two types of system. 1. A messaging system 2. Self Rescue System. In a messaging system, the transmission of messages can be of different types by subtending cellular networks, opportunistic and ad-hoc networks. Self-rescue system can send out emergency messages automatically from trapped survivors including location and position information through self rescue grouping and wakeup scheduling.



Messaging System: The messaging system runs on rescue workers smartphones which transmit messages and self-rescue system runs on trapped survivor smartphones are automatically configured as part of self-rescue system which is activated by other applications in order to measure seismic waves such as **ishake[4] .**The self-rescue system group the survivors of nearby and automatically send out an emergency message to the messaging nodes.

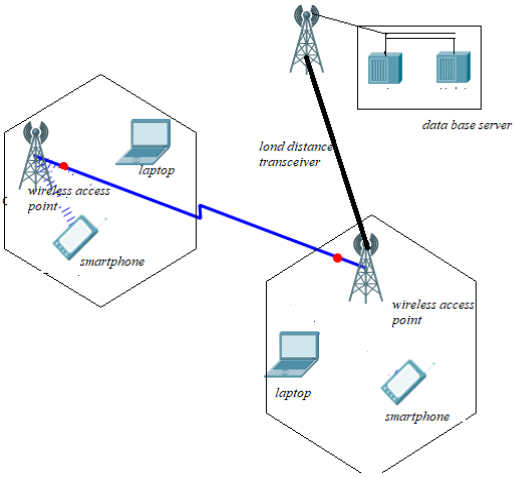
Self-Rescue System: The self-rescue system can automatically send messages to the messaging system of rescue workers including information of location and position information with the help of self-rescue grouping and wakeup scheduling protocol.

b. Wireless Adhoc Network for Disaster Relief.

In order to establish an emergency communication using wireless ad-hoc network, the core of the network is created using WiFi nodes.The wireless nodes can be installed at the place where the disaster occurred.These nodes can inter communicate while rescue workers and trapped survivors connect to these nodes using wifi devices. At least one of the node is in long distance transceiver in order to establish a communication with faraway datacenter and rescue worker.

System Architecture:

The proposed system consists of wireless nodes, network wifi smart devices, and long distance transfers. The wireless access nodes contain two types of equipment. One is used for inter-node communication and the other is used for communication between the end user and acts as an access point. Nodes can be deployed 100m radius in the operation area so that network can communicate.



The whole system is communicating to a data center by a long connection link .networks have a number of communication links.Nodes which are connected to long distance communication link where the exchange of disaster information happens can be called as Super Nodes.

The responsibility for smart devices of end users to provide a function for communication through WiFi.Applications involved in these devices enable services like message broadcasting, peer to peer communication.

Super Node: Super node is a node which directly links a wifi node to the datacenter.The long-distance transceiver works as a link to WAN (Wide Area Network) which connects a database server

Long Distance Link: long distance link communication can be provided using two technologies. One is communication-based on satellite which is scarce and costly and the other is ZigBee which is having low data rates and low cost. ZigBee will not take all the traffic instead it will take critical messages to the other end in the datacenter and get the important data from the connected access point.

c. Emergency Message Dissemination System (EMDS)

In this Application emergency dissemination using an opportunistic network which cannot have any complete path from source to destination.Any near node which comes near can be used as an opportunistic node to bring messages near to destination.

Message Format: The application which message is generated can be of the following format: time, phone number, location information, emergency message, message id and priority of the message.

Message Transmission: Message diffusion protocol is used to send a message from source to destination. The node which either gets a message from some other node or generated by its own called as infected node keep the message in its local buffer broadcasts message to all other nodes who are nearer. The node which is infected have the priority 0 broadcast the message once and drops the message and the infected node which have high priority floods the network n times until message reaches the destination and thus the message takes an infinite number of hops to reach the destination.

5. CONCLUSIONS

We explored many approaches in order to save the life of the human beings and successfully communicate with survivors that are buried under debris using the smartphones to know the information regarding the exact location without depending on only cellular network and varying network topology frequently at the time of disaster using alternatives like ad-hoc and opportunistic networks for detection of survivors and relief operation.

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