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A Survey on Mobile Networks for Disaster Management

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Abstract: *Teamphone is designed in order to provide communication capabilities, via bonding the gaps between different kinds of wireless networks. Teamphone comprises of two parts: The messaging system and the self-rescue system. The messaging system is the combination of cellular networking, ad-hoc networking and opportunistic networking seamlessly. This system enables better communication between the rescuers. The self-rescue system sorts, plans and position the survivors. Such a class of smart phones with this facility can ascend and pass out messages in case of exigency with the region and spot details so that it is helpful the rescue operation. The teamphone is setup and deployed as a preliminary application on the android platform on the smartphones. The experimental solutions proved that the implementation of the teamphone attained the requirements of communication and aids assistance in rescue operation of disaster recovery.*

Keywords: *Smartphone, disaster recovery, messaging system, self-rescue system, routing.*

I. INTRODUCTION

In the last few years the communication technologies are implemented and used in order to make improvements in the field of rescue of survivors in disaster. For communication, smartphones which are equipped with cellular network and short range radios are used e.g., Bluetooth and Wifi. The short range radios provide communication even when there is no cellular towers. The teamphone supports data communication within the rescue workers in infrastructure and infrastructure-less scenarios. The survivors can also discover the rescue workers and send the emergency message and this emergency message contains the location and position details. The location details are obtained from their last known location of their smartphone. The teamphone comprising of messaging and self-rescue system aids rescue operation with different type of message transmission by bonding the three types of network. The self-rescue system is designed to satisfy the following three functions (i)Self-rescue grouping (ii)Wake-up scheduling and(iii) Positioning. The three types of networks used in teamphone are cellular network, wireless sensor network and opportunistic seamless network.

II. TEAMPHONE

The team phone is being setup as a preliminary application on the smartphone in case of exigency to rescue the trapped survivors. This preliminary application forms a group within the nearby trapped survivors, it fetches the details of the position and location. Specification of the system is a must by the user. User can send messages from their smartphones in the messaging system. The smartphones act as relays for the routing and gateway for cellular connections. Automatic configuration happens in the self-rescue system. The self-rescue system schedules to wake-up. Once it receives a hello message from the messaging node it automatically generates an emergency message and sends it to the messaging node and from there it is sent to the command center. In the implementation part C and C++ is used in the configuration of network interface and routing. The implementation of teamphone requires root privilege.

III. LITERATURE SURVEY

The process of climate adaptation the PetaJakarta.org focuses understanding and improving the capacity of recovering from the difficulty [1]. PetaJakarta.org is a discoverer tackle the social media to collect, categorize and exhibit the data about flooding to the Jakarta inhabitants. The circumstantial information is collected and circulated through the members of the organization with the help of the GPS enabled mobile devices, it is shared with the exigency response organization. The PetaJakarta.org annexes the people, mobile and independent sensors in network of information. The exigency in Japan caused a drastic change in the society[2], due to this the survivors were not able to use their communication devices to clarify whether their family and friends are safe. Here D2D plays a very important role, since it has infrastructure-less multihop communication. Users can send messages if they are trapped by the first generation prototype of relay. The results of this idea shows gradual advancement in the user-driven network.

Reliability and flexibility are the two factors required for exigency communication [3]. A network architecture is designed to deliver large data under exigency scenario. Network coding is used to increase the delivery portability. The decoding probability is successful at both source and intermediate node. The effectiveness of the architecture is tested in terms of delivery ratio. It is a context monitoring platform [4]. It develops and deploys the context aware application. Sensors are integrated in smartphones. The deployment was slow in more number of previous applications because of heavy resource and battery usage. To solve these issues Mobicon was implemented overcoming the problem of complexity of the context and heavy resource. The ability to respond effectively and efficiently for the safety and security of the people is developed through the large scale crises [5]. The way of crises response is way developed after the adoption of mobile. Analyzation is done on the crisis event to know about the awareness of social media in people safety and security. Social media information is converted into actionable intelligence through a set of critical success indicators. Thus the conversion saves time, lives and money is saved. N This paper provides the layout of the ad-hoc patterns that can be applied in disaster relief operations [6]. The major work in the documentation of the ad-hoc in catastrophe is reviewed. The open challenges and future research requirements are also provided. In [7], Coverage problem in the sensor network reflects the tracking or monitoring by the sensors. The coverage problem is considered as decision problem and the goal is to find that the points in the sensor network are covered by k-sensors. Sensing ranges may in unit disks or non-unit disks. The polynomial time algorithms were studied in terms of no. of sensors. It can be converted into distributed protocols. Barrier coverage guarantees to detect any intruder attempting to cross the barrier of sensor networks [8]. In the majority of studies on barrier coverage using wireless sensor networks, sensors are assumed to have an isotropic sensing model. However, in certain applications like monitoring a region using video cameras, the sensors have directional sensing model. The nature of directional sensor networks demands novel algorithms and solutions. In directional sensor networks, the work presented started from the concept and characteristics of a directional sensing model, and then summarized the sensing properties and behaviors of directional sensors. In particular, we classify the existing research results into different categories, such as strong barrier and weak barrier, 1-barrier and k-barrier, worst and best-case coverage and exposure path coverage, any-view coverage, full view coverage, and overview each category in terms of problem definition, assumption, usage, solution, and performance. Finally, the open research problems to be solved and future work were also discussed. The survey based on the recent researches and the efforts of the issue by utilizing the multi objective optimization [9]. Initially the objectives of the MOO, then the methods that is to be used for MOO, such as programming based scalarization, optimization algorithm. Finally the recent studies of MOO that gives useful assistance to the researchers to understand and the open problems which were to be tackled was also discussed. The sensor network comprises of resource limited and autonomous devices [10]. One or more physical phenomena in the area of interest is monitored by the devices. Sensor network requires robust and adaptive methods for low maintenance cost and service time. Many applications of Markov Decision Process was studied. Many solutions were discussed and compared which provide assistance for the usage of markov decision process in sensor network. Routing, load balancing, coverage, energy hole, hotspot are the problems faced by the sensor network [11]. The performance of the network is degraded by the effect of lifetime of the network, energy consumption and deployment time., etc. Different kind of soft computing paradigms was studied. In robust time complicated problems were solved using the soft computing technique. Some of the soft computing techniques are fuzzy logic, neural network, reinforcement learning, swarm intelligence. Using these algorithms performance is increased. The direction and speed of nodes is used to construct stable localized network [12]. If the nodes move in same direction with same speed then the network topology remains constant. Compared to the local reference group the network co-ordinate system is consistent and the selection was based on the relative speed of the nodes. In [13], the wireless mesh networks do not have much consideration in comparison with the mobile ad-hoc network and wireless local area network. The important element is localization, it must be accurate for user mobility support. The distance measurement method "Ring Overlapping Algorithm" was proposed based on the subtle partial range aware. Localization was reduced within 3 meters using the new algorithms than the existing system. If cellular network breakdown occurs an alternate network for communication was setup via mesh network using wifi interface [14]. Consequent tests were carried out on the android devices. A series of tests on Android devices and computers are applied by creating mesh network with a software using OLSR (Optimized Link State Routing) routing protocol. As a result of the tests, communication among devices succeeded. There is no fixed infrastructure and single physical administration in MANET [15]. Since there is no central authority mobile ad-hoc network is less secured than the wired network. In DoS attack the route request (RREQ) is sent continuously to the victim, so that it doesn't receive any other RREQ. The packet delivery ration checks the number of request per minute to check whether it is malicious or not. If it finds a node to be malicious it informs to all other nodes in the transmission range.

Reliable network can be formed in short period of time for natural disaster where there is no communication infrastructure [16]. The route request message is employed by the AODV routing protocol to find destination in route discovery stage. The flooding scheme leads to performance degradation. The status of the underlying network is dynamically probed by Dynamic Connectivity Factor, while reducing the route request overhead. The output obtained normalizes routing overhead, packet delivery ratio and MAC collision. Mobile nodes (UAV- Unmanned Aerial Vehicle) of a delay tolerant network was used to overcome the communication problem between survivor and rescuer [17]. The performance of the delay tolerant network is tested with real traces of UAV based on heavy rains and landslides. The results show that verification of routing protocols and the relationship between UAV and DTN. The crowd sourcing uses sensor enabled smartphones, it opens up more opportunities for many crowd-centric application systems [18]. The crowd sourcing technology collects data about coverage, location and connectivity of wireless network. The two challenges are (i) No self-contained bootstrapping data (ii) device-dependent data processing. The first problem is solved building opportunistic sensing system. The second issue was solved using data aggregation algorithm with verification of computation complexity based on crowd source data. The spatial and temporal variations were studied by the implementation of network monitoring infrastructure. Novel multi copy routing protocol to minimize the energy used in communication [19]. This is a exigency response application. Energy plays a vital role to confirm whether there is any way to communicate to the trapped victim. The number of message copies are reduced by exploiting mobility and contact pattern when disconnection occurs. Inter contact routing is established to find reliable route and route delays. It also controls replication of message. Augmentation of another message delivery service to function in low energy scenario. The resource overhead is reduced per message with increase in latency. Wifi tethering technology is used on wireless devices to setup an ad-hoc network for information gathering and in exigency scenarios [20]. Novel mechanism is designed to help in independent creation of ad-hoc network, sort the data captured within devices, data is collected with minimum delay. The sorted coalition game is designed and implemented in purpose to sort the data capturing task among wireless devices based on their capabilities.

IV. CONCLUSION

The teamphone is designed to mesh the smartphones for disaster recovery. The messaging the system provides communication to transfer data. The self-rescue system clubs the smartphones of the victims, through which the messaging nodes are discovered and emergency message is sent which consist of the location and the position data. Using the cellular and wifi interface the teamphone is implemented as a preliminary application to provide communication. Reasonable power consumption and delay with reduced energy consumption is accomplished after the deployment providing various transmission of message, by using wake-up scheduling and grouping.

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