Impact Factor (SJIF): 5.301

International Journal of Advance Research in Engineering, Science & Technology

e-ISSN: 2393-9877, p-ISSN: 2394-2444

Volume 05, Issue 3, March-2018

MAZING SMARTPHONES FOR CATASTROPHE RESTORATION

Mrs.S.Venkata Lakshmi[1], P.Aishwarya[2], E.Anusha Sree[3], M.Divya[4]

[1] *M.Tech,(Ph.D),Assistant Professor, Dept. of Computer Science and Engineering, Panimalar Institute of Technology, Chennai, TN*

[2,3,4] *Students, Computer Science and Engineering, Panimalar Institute of Technology, Chennai, TN*

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ABSTRACT - *This project is based on communication between rescue-workers and trapped survivors using their smartphones. The communication is like a messaging system. Messaging system runs on rescue workers as-well-as trapped survivors mobile while self-rescue system runs on trapped survivors mobile. When the rescue fighters enter into the spot for recovery works they will provide a network continuously within certain distance and range. They broadcast message like "hello is anyone there". Simultaneously at the other end the trapped survivors invoke the self-rescue system .In the messaging system they organize a group and a head will be chosen based on the battery level .The head node collects all the necessary information about the nearby trapped survivors in their group .Once when the rescue fighter enters into disaster region the trapped survivors will receive the broadcasted message of rescue fighter and starts communicating their current situation and position .The rescue fighter forwards the information from the trapped survivors to the command center .The command center find the route between rescue fighters in disaster region using AODV routing protocol .After finding the path between each rescue worker nodes they establishes communication with adhoc network*

***Key Words*:** Team Phone, Ad-hoc network, Messaging System, Rescue Operation, Battery Level

I. INTRODUCTION

This paper is fully based on communication between rescue-workers and trapped survivors using TeamPhone application over smartphones . We have two main components namely Messaging system and Self-rescue system .Messaging system runs on rescue workers as-well-as trapped survivors mobile, while Self-rescue system runs on trapped survivors mobile .When the rescue workers enter into the spot for recovery works they will provide a network continuously within a certain distance and range.They broadcast message like "hello is anyone there" .Simultaneously at the other end the trapped survivors invoke the Self-rescue system. In this system they organize a group and a head will be chosen based on the battery level .The head node collects all the necessary information about the nearby trapped survivors in their group .Once when the rescue worker enters into the disaster region the trapped survivors will receive the broadcasted message of rescue worker and starts communicating their current situation and position .The rescue worker forwards the collected information of the trapped survivors to the command center.The command center finds the route between rescue workers in disaster region using AODV routing protocol .After finding the path between each rescue worker node they establishe communication with Ad-hoc network.

II. LITERATURE SURVEY

1. ENERGY EFFICIENT ROUTING IN AD HOC DISASTER RECOVERY NETWORKS

Author Name : Gil Zussman and Adrian Segall Department of Electrical Engineering Technion – Israel Institute of Technology

Abstract : The terrorist attacks on September 11, 2001 have drawn attention to the use of wireless technology in order to locate survivors of structural collapse. We propose to construct an ad hoc network of wireless smart badges in order to acquire information from trapped survivors. We investigate the energy efficient routing problem that arises in such a network and show that since smart badges have very limited power sources and very low data rates, which may be inadequate in an emergency situation, the solution of the routing problem requires new protocols. The problem is formulated as an anycast routing problem in which the objective is to maximize the time until the first battery drains-out. We present iterative algorithms for obtaining the optimal solution of the problem. Then, we derive an upper bound on the network lifetime for specific topologies. Finally, a polynomial algorithm for obtaining the optimal solution in such topologies is described.

2. GPSFREE NODE LOCALIZATION IN MOBILE WIRELESS SENSOR NETWORKS

Author Name : H¨useyin Akcan , CIS Department , Polytechnic University. hakcan01@cis.poly.edu

Abstract : An important problem in mobile ad-hoc wireless sensor networks is the localization of individual nodes, i.e., each node's awareness of its position relative to the network. In this paper, we introduce a variant of this problem (directional localization) where each node must be aware of both its position and orientation relative to the network. This variant is especially relevant for the applications in which mobile nodes in a sensor network are required to move in a collaborative manner. Using global positioning systems for localization in large scale sensor networks is not cost effective and may be impractical in enclosed spaces. On the other hand, a set of pre-existing anchors with globally known positions may not always be available. To address these issues, in this work we propose an algorithm for directional node localization based on relative motion of neighboring nodes in an ad-hoc sensor network without an infrastructure of global positioning systems (GPS), anchor points, or even mobile seeds with known locations. Through simulation studies, we demonstrate that our algorithm scales well for large numbers of nodes and provides convergent localization over time, even with errors introduced by motion actuators and distance measurements.

3. DYNAMIC BEACONING CONTROL IN ENERGY-CONSTRAINED DELAY TOLERANT NETWORKS

Author Name : En Wang Department of Computer Science and Technology,
Jilin University, China.

Abstract : Due to the uncertainty of network topology and intermittent connectivity among nodes in Delay Tolerant Networks (DTNs), beaconing is used to detect probabilistic contacts. However, it causes the following new problem: beaconing frequency not only influences the probability of message transmission, but also affects the consumption rate of energy. Thus, putting forward a beaconing control strategy in energy-constrained DTNs becomes the key point. In this paper, we propose an efficient and dynamic beaconing control method DBCEC in energyconstrained DTNs based on the time-continuous Markov Model. A linear decline strategy (i.e. DBCEC-L) and exponential decay strategy (i.e. DBCEC-E) are respectively applied to control the beaconing frequency. Simulations based on the synthetic mobility model and real mobility traces are conducted in ONE, and results show that DBCEC-E achieves a better delivery rate without influencing average delay and the overhead ratio, compared with other beaconing control strategies.

4. A PARTITION-TOLERANT MANYCAST ALGORITHM FOR DISASTER AREA NETWORK

Author Name : Mikael Asplund, Simin Nadjm-Tehrani Department of
Computer and Information Science, Link¨oping University

Abstract : Information dissemination in disaster scenarios requires timely and energy-efficient communication in intermittently connected networks. When the existing infrastructure is damaged or overloaded, we suggest the use of a manycast algorithm that runs over a wireless mobile ad hoc network, and overcomes partitions using a store-and-forward mechanism. This paper presents a random walk gossip protocol that uses an efficient data structure to keep track of already informed nodes with minimal signalling. Avoiding unnecessary transmissions also makes it less prone to overloads. Experimental evaluation shows higher delivery ratio, lower latency, and lower overhead compared to a recently published algorithm

5. COVERAGE PROBLEM IN WIRELESS SENSOR NETWORK

Author Name : GaoJun Fan and ShiYao Jin National Lab of Parallel and Distributed Processing, National University of Defense Technology, ChangSha, China

Abstract : Wireless sensor networks constitute the platform of a broad range of applications related to national security, surveillance, military, health care, and environmental monitoring. The coverage of WSN has answered the questions about quality of service (surveillance) which can be provided by WSN. Therefore, maximizing coverage using the resource constrained nodes is a non-trivial problem. The coverage problem for wireless sensor network (WSN) has been studied extensively in recent years, especially when combined with connectivity and energy efficiency. In this paper we present a survey of coverage problem. And besides some basic design considerations in coverage of WSN we describe two challenges, namely, maximizing network lifetime and network connectivity.
We also provide a brief summary and comparison of existing coverage schemes.

6. MODELLING AND ASSESSING AD HOC NETWORKS IN DISASTER SCENARIOS

Author Name : D. G. Reina, S. L. Toral, F. Barrero Electronic Engineering Department University of Seville Seville, Spain , N. Bessis, E. Asimakopoulou School of Computing & Maths University of Derby Derby, UK.

Abstract : Ad hoc networks have been proved to be suitable for disaster scenarios since any infrastructure needs to be deployed in order to establish a wireless network. Routing protocols play an important role in the performance of mobile ad hoc networks. Routing protocols are responsible for deciding how the information is going to move through the network. Although one paramount parameter of ad hoc networks is the mobility of nodes, little effort has been made to evaluate the performance of mobile ad hoc networks under mobility models where the movements of rescue teams during evacuating operations are modelled. The objective of this paper is to evaluate real case disaster scenarios in terms of performance using several well-known routing protocols metrics.

7. COMMUNITY DETECTION IN WEIGHTED NETWORKS: ALGORITHMS AND APPLICATIONS

Author Name : Zongqing Lu*, Yonggang Wen* and Guohong Cao* Nanyan Technological University, The Pennsylvania State University.

Abstract : Community detection is an important issue due to its wide use in designing network protocols such as data forwarding in Delay Tolerant Networks (DTN) and worm containment in Online Social Networks (OSN). However, most of the existing community detection algorithms focus on binary networks. Since most networks are weighted such as social networks, DTN or OSN, in this paper, we address the problems of community detection in weighted networks and exploit community for data forwarding in DTN and worm containment in OSN. We propose a novel community detection algorithm, and then introduce two metrics called intra-centrality and inter-centrality, to characterize nodes in communities. Based on these metrics, we propose an efficient data forwarding algorithm for DTN and an efficient worm containment strategy for OSN. Extensive trace-driven simulation results show that the data forwarding algorithm and the worm containment strategy significantly outperform existing works.

8. SKELETON CONSTRUCTION IN MOBILE SOCIAL NETWORKS: ALGORITHMS AND APPLICATIONS

Author Name : Zongqing Lu*, Xiao Sun†, Yonggang Wen* and Guohong Cao* The Pennsylvania State University, Nanyang Technological University.

Abstract : Mobile social networks have emerged as a new frontier in the mobile computing research society, and the commonly used social structure (i.e., community) has been exploited to facilitate the design of network protocols and applications, such as data forwarding and worm containment. However, community based approaches may not be accurate when applied for predicting node contacts and may separate two frequently contacted nodes into different communities. In this paper, to address these problems, we propose skeleton, a tree structure specially designed for organizing network nodes, as the underlying structure in mobile social networks. We address the challenges on how to uncover skeleton from network, how to adapt skeleton with dynamic network and how to

leverage skeleton for network protocol designs. Skeleton is constructed based on best friendship and skeleton construction is simple and efficient (e.g., less computational complexity than community detection). Algorithms are also designed to adapt skeleton construction to dynamic network. Moreover, a data forwarding algorithm and a worm containment strategy are designed based on skeleton. Trace-driven simulation results show that the skeleton based data forwarding algorithm and worm containment strategy outperform existing schemes based on community.

9. WIFI-OPP: AD-HOC-LESS OPPORTUNISTIC NETWORKING

Author Name : Sacha Trifunovic, Bernhard Distl, Dominik Schatzmann, Franck Legendre Communication Systems Group ETH Zurich, Switzerland.

Abstract : Opportunistic networking offers many appealing application perspectives from local social-networking applications to supporting communications in remote areas or in disaster and emergency situations. Yet, despite the increasing penetration of smartphones, opportunistic networking is not feasible with most popular mobile devices. There is still no support for WiFi Ad-Hoc and protocols such as Bluetooth have severe limitations (short range, pairing). We believe that WiFi Ad-Hoc communication will not be supported by most popular mobile OSes (i.e., iOS and Android) and that WiFi Direct will not bring the desired features. Instead, we propose WiFi-Opp, a realistic opportunistic setup relying on (i) open stationary APs and (ii) spontaneous mobile APs (i.e., smartphones in AP or tethering mode), a feature used to share Internet access, which we use to enable opportunistic communications. We compare WiFi-Opp to WiFi Ad-Hoc by replaying realworld contact traces and evaluate their performance in terms of capacity for content dissemination as well as energy consumption. While achieving comparable throughput, WiFi-Opp is up to 10 times more energy efficient than its Ad-Hoc counterpart. Eventually, a proof of concept demonstrates the feasibility of WiFi-Opp, which opens new perspectives for opportunistic networking.

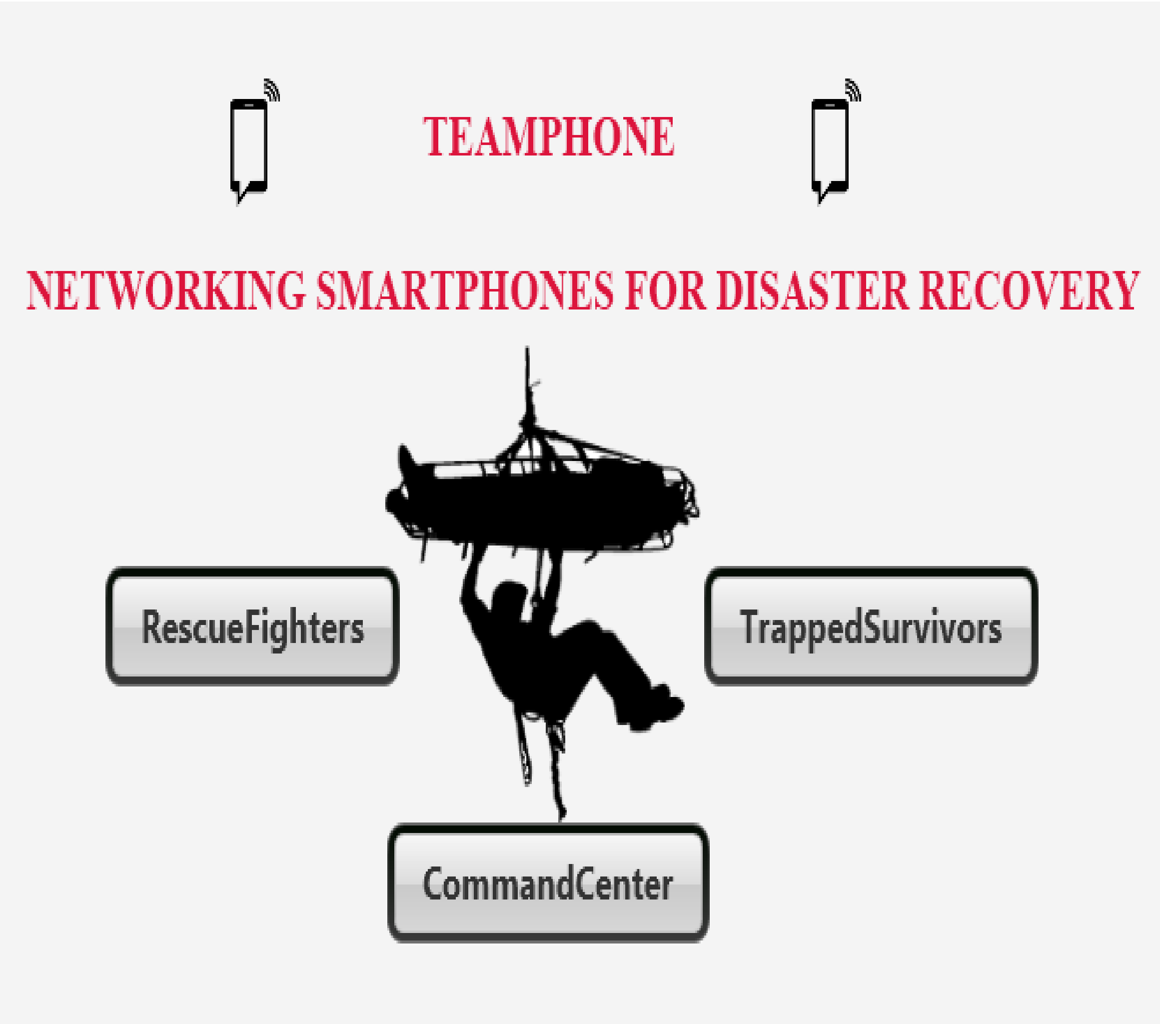
10. NETWORKING SMARTPHONES FOR DISASTER RECOVERY

Author Name : Zongqing Lu, Guohong Cao and Thomas La Porta The
Pennsylvania State University.

Abstract : To network smartphones for providing communications in disaster recovery. By bridging the gaps among different kinds of wireless networks, we have designed and implemented a system called TeamPhone, which provides smartphones the capabilities of communications in disaster recovery. Specifically, TeamPhone consists of two components: a messaging system and a self-rescue system. The messaging system integrates cellular networking, ad-hoc networking and opportunistic networking seamlessly, and enables communications among rescue workers. The self-rescue system energyefficiently groups the smartphones of trapped survivor and sends out emergency messages so as to assist rescue operations. We have implemented TeamPhone as a prototype application on the Android platform and deployed it on off-the shelf smartphones. Experiment results show that TeamPhone can properly fulfill communication requirements and greatly facilitate rescue operations in disaster recovery.

III. PROPOSED SYSTEM

In this paper, we propose clustering the smart-phones, a platform for communication in disaster recovery, where smartphones are teamed up and work together to provide data communications. By exploiting Wi-fi and cellular modules of smartphones. Team phone seamlessly integrates cellular networking, in infrastructure-constrained and infrastructure-less scenarios. Team phone also enables energy-efficient methods for trapped survivors to discover rescue fighters and send out emergency messages, by carefully addressing the wake-up scheduling of smartphones. The emergency message includes the coarsegrained location and position information of trapped survivors, which is derived from the last known locations of their smartphones and the network formed by these smartphones. We implement Team phone as an app on the Android platform and deploy it on off-the-shelf smartphones. Experimental results demonstrate that Team phone can properly fulfill the communication requirements and greatly facilitate rescue operations.



NETWORK FORMATION

Firstly, a network node is created by providing the distance and range of the node. We assume that the communication range of the node is finite. This node in the network would contain a unique name and a port number to communicate with other node. A node needs to find their nearby neighbor before starting any communication. Neighbor is calculated based on the coverage of each node . When the node comes within the coverage range of the other node, then these two node will considered as neighbors.

WAKEUP SCHEDULING

Wakeup scheduling is we handle with the battery status of trapped survivors. The battery life of smart-phones must last as long as possible, since rescue operations may last for hours or even days. Therefore, the messaging system must be energy-efficient. Since trapped survivors are most likely difficult to discover, rescue crews may not infer the location of trapped survivors, even if they have received emergency messages from them. On concerning these problems, we use the concept of wakeup scheduling. Here we aggregate the trapped survivors by their disaster type and choose a head among the group based on high battery level. When the emergency button is triggered a group is formed within the trapped survivors and a head node will be selected based on the battery percentage. All the other nodes will be in sleeping state while the head node is in wakeup state will be looking for message transfer. The head node gathers all the necessary information such as position and counts of trapped survivors (nodes) within its group and form an emergency message which is to be sent to the nearby Rescue Fighter.

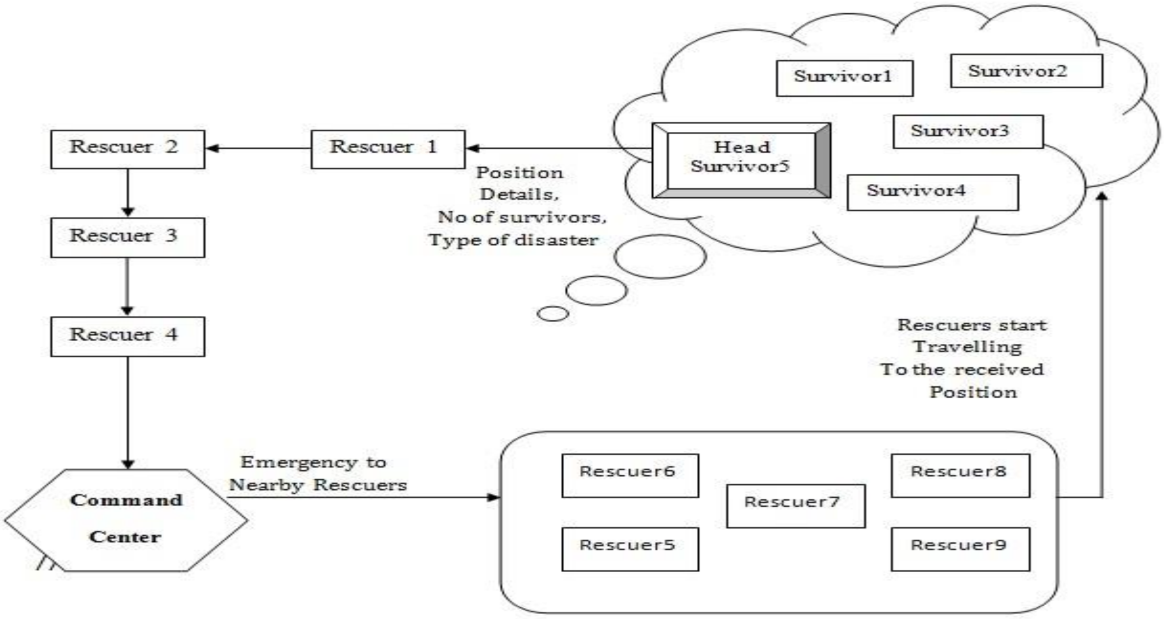
EMERGENCY ALERT

Here we look at how the messaging system satisfies the data communication within a routing path. The messaging system get invoked once when the emergency is triggered. A broadcast message is generated automatically in this messaging system. After Wakeup Scheduling the head node started broadcasting a message like “help me!”. When any rescuer node enters into the particular range of the head node, they will receive a broadcasted message. When the rescuer receives any broadcasted message, start scanning the trapped survivors by providing a Wi-Fi-hotspot. Thus, the chosen head will send an emergency message with location information to facilitate rescue operations

INITIATING RECOVERY

Once the rescue fighter receives the emergency message with the trapped survivor location and position information, the rescue fighter will forward the message to their nearby command centre via opportunistic network using opportunistic routing. The rescuer node search for nearby rescuer node within their range and forwards the information to them. This message transfer runs continuously until it reaches the nearby command centre. The command centre finds the route between rescue workers in disaster region using AODV routing protocol. After finding the path between rescue fighters, the command centre commands the respective rescue fighters to travel towards the position of trapped survivors. Thus, by using our Team-Phone framework in a mobile Ad-hoc network, many trapped survivors will be recovered soon and safely.

SYSTEM ARCHITECTURE



IV. CONCLUSIONS

In this paper, smartphones are networked for disaster recovery which mainly involves the communication between the trapped survivors and rescue fighters. Messaging system uses the Wi-Fi interface and the opportunistic network for data communication during the network failure.The group formation of smartphones of trapped survivors provide the energy consumption because the head node only participates in the communication. It can be accomplished in various message transmission with less power consumption and delay.

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