

EMERGENCY NAVIGATION USING GREEDY PERIMETER STATELESS ROUTING IN WIRELESS SENSOR NETWORKS

M.Ponrajakumari,
Assistant Professor – I,

Dept of Electronics and Communication Engineering,
Velammal Engineering College,
Chennai, India.

V.Arvind Karthik, P.Jai Prakash, M.V.Rahul Bandhu,
A.Rishab Kumar,
Student,

Dept of Electronics and Communication Engineering,
Velammal Engineering College,
Chennai, India.

Abstract— One of the Major applications of Wireless Sensor Network (WSNs) is the navigation service for emergency evacuation. It is widely used in various domains such as military application, industries and environment. The navigation application was interaction between sensor and user. CANS is the first WSN assisted emergency navigation algorithm achieving both mild congestion and small stretch using level set method to track the evolution of the exit and the boundary of the hazardous area, while people distant from the danger avoid unnecessary detours. CANS does not require location information, and CANS Algorithm contains level set of methods. The first method is Establishing the Potential map, second method is Building the Hazard level map and final method is Planning a safe path for each user (Potential map and Hazard level map combine Compound level map). In CANS algorithm many people use one way to exit in particular time which is impossible. User doesn't have different path so heavy congestion occur. So we propose a fine-grained approach, localizability-aided localization (LAL).LAL triggers a single round adjustment, after which some popular localization methods are successfully carried out using Greedy Perimeter Stateless Routing Protocol (GPSR) and Greedy Forwarding which provides multiple exit paths and avoids congestion.

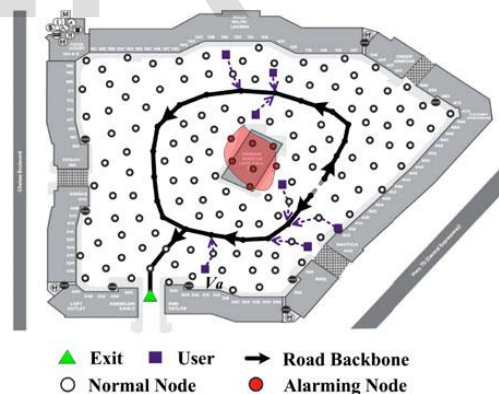
Keywords— Emergency navigation, WSN-assisted.

I. INTRODUCTION

Recent advances in wireless sensor network (WSN) technologies provide us the ability of pervasive usage of sensors widely deployed over the fields of interest. One important application of such in-situ interactions is WSN assisted emergency navigation [6], [7], where the WSN infrastructure is utilized as a cyber-physical system. In this mobile environment, the internal users are equipped with PDAs or smart phones that can talk with the sensors [4], [8]. When emergency occurs, the WSN explores the emergent field and provides necessary guidance information to users, so that users can be guided to move out of a hazardous region through ubiquitous interactions with sensors. Firstly, the navigation of human beings seeks for a safe-critical path, other than packet loss or energy efficiency which is the first priority as in packet

routing. Note that here the safety of a path not only means to be far away from a hazardous area, but also refers to mild congestion, less detour as well as fast reaction to an emergency. Secondly, human navigation consumes much more time than traditional packet routing process, due to the limited movement speed of people. . Earlier approaches [6], [8], [9], [10] rely on either exhaustive network-wide flooding or the availability of location information on each sensor/user. However, these methods neglect the underlying congestion and detour problems [3], which are critical for a fast evacuation, as they mainly focus on finding the shortest/safest path for each person, while other sub-optimal (yet safe) paths are left unused throughout most of the evacuation process.

II. EXISTING SYSTEM



Let us take one of the typical location-free emergency navigation approaches, the road map based method [4], [11], for instance. In this scheme, a distributed road map is embedded across the sensor network as a common facility for providing guidance information for internal inquirers. Specifically, the road map is built by connecting the medial axis of the network, with a tail route concatenating the exit and the directions assigned for each road segment. To explore the safe path, each user is first led to the road backbone, then

moves along the preset directional roads, and finally follows the directional tail route to evacuate from hazardous areas. Though the obtained navigation path for each user is safety guaranteed (in the sense that it is the most distant away from the dangerous areas), the number of people is more likely to exceed the safety capacity of the road map (especially the tail route), thus leading to congestions or even stampedes, as different users are guided through the same single-lane road map.

To the best of our knowledge, CANS is the first WSN assisted emergency navigation algorithm achieving both mild congestion and small stretch, where all operations are in-situ carried out by cyber-physical interactions among users and sensor nodes. It is distributed and scalable to the size of the network without reliance on user/sensor's location information. It also considers the situation in the event of emergency dynamics, and designs an updating scheme that locally updates the hazard level map when the hazardous areas vary in time.

III. PROPOSED METHOD

We propose a fine-grained approach, localizability-aided localization (LAL), which basically consists of three phases: node localizability testing, structure analysis, and network adjustment. LAL triggers a single round adjustment, after which some popular localization methods can be successfully carried out.

A. Node Localizability Testing

We analyse the limitation of previous works and propose a novel concept of node localizability. By deriving the necessary and sufficient conditions for node localizability, for the first time, it is possible to analyse how many nodes one can expect to locate in sparsely or moderately connected networks. To validate this design, we implement our solution on a real-world system and the experimental results show that node localizability provides useful guidelines for network deployment and other location-based services. In recent years, several approaches have been proposed for in-network localization, in which some special nodes (called beacons or seeds) know their global locations and the rest determine their locations by measuring the Euclidean distances to their neighbours. The first major challenge for studying node localizability is to identify uniquely localizable nodes. Following the results for network localizability, an obvious solution is to find a localizable sub graph from the distance graph, and identify all the nodes in the sub graph localizable. Unfortunately, such a straightforward attempt misses some localizable nodes and wrongly identifies them as non-localizable. In the novel concept of node localizability. By deriving the necessary and sufficient conditions for node localizability, we can answer the fundamental questions on localization: which node is indeed localizable in a network. Our designs not only excel previous ones theoretically, but also achieve a decent performance for practical uses.

B. Structure Analysis:

Networks have also been studied extensively in the social sciences. Typical network studies in sociology involve the circulation of questionnaires, asking respondents to detail their interactions with others. One can then use the responses to reconstruct a network in which vertices represent individuals and edges the interactions between them. Typical social network studies address issues of centrality (which individuals are best connected to others or have most influence) and connectivity (whether and how individuals are connected to one another through the network). In the aims to create models of networks that can help us to understand the meaning of these properties—how they came to be as they are, and how they interact with one another. Third, it aims to predict what the behaviour of networked systems will be on the basis of measured structural properties and the local rules governing individual vertices. How for example will network structure affect traffic on the Internet, or the performance of a Web search engine, or the dynamics of social or biological systems? As we will see, the scientific community has, by drawing on ideas from a broad variety of disciplines, made an excellent start on the first two of these aims, the characterization and modelling of network structure.

C. Network Adjustment:

As the proliferation of wireless and mobile devices continues, a wide range of context-aware application sare deployed, including smart space, modern logistics and so on. In these applications, location information is the basis of other services, such as geographic routing, boundary detection, and network coverage control. In some other applications, such as military surveillance and environment monitoring, sensed data without location information are almost useless. Localization in wireless ad hoc and sensor networks is the problem in which every node determines its own location. In this work, we focus on 2D in-network localization in which some special nodes (called beacons or anchors) know their global locations and the rest determine their euclidean coordinates by measuring the euclidean distances to their neighbors. Due to hardware or deployment constraints, a network can be partially localizable given distance measurements and locations of beacons, that is to say, some nodes have unique locations while others do not. To locate nonlocalizable nodes, the existing solutions mainly focus on how to tune network settings. The first attempt is to deploy additional nodes or beacons in application fields. Such incremental deployment increases node density and creates abundant internode distance constraints, thus, enhancing localizability. However, the attempt lacks feasibility, since the additional nodes should be placed in the vicinity of non-localizable nodes, whose locations are just unknown. Using mobile nodes (e.g., beacons) is another choice. The controlled motion of beacons provides thorough information for localization, but also incurs adjustment delay and controlling overheads.

D. Greedy Perimeter Stateless Routing Protocol (GPSR):

We present Greedy Perimeter Stateless Routing (GPSR), a novel routing protocol for wireless datagram networks that uses the positions of routers and a packet's destination to make packet forwarding decisions. GPSR makes greedy forwarding decisions using only information about a router's immediate neighbours in the network topology. When a packet reaches a region where greedy forwarding is impossible, the algorithm recovers by routing around the perimeter of the region. By keeping state only about the local topology, GPSR scales better in per-router state than shortest-path and ad-hoc routing protocols as the number of network destinations increases. A community of ad hoc network researchers has proposed, implemented, and measured a variety of routing algorithms for such networks. The observation that topology changes more rapidly on a mobile, wireless network than on wired networks, where the use of Distance Vector(DV), Link State (LS), and Path Vector routing algorithms is well established, motivates this body of work. The two dominant factors in the scaling of a routing algorithm are: • The rate of change of the topology. • The number of routers in the routing domain. Both factors affect the message complexity of DV and LS routing algorithms: intuitively, pushing current state globally costs packets proportional to the product of the rate of state change and number of destinations for the updated state

E. Greedy Forwarding

As alluded to in the introduction, under GPSR, packets are marked by their originator with their destinations' locations. As a result, a forwarding node can make a locally optimal, greedy choice in choosing a packet's next hop. Specifically, if a node knows its radio neighbour's positions, the locally optimal choice of next hop is the neighbour geographically closest to the packet's destination. Forwarding in this regime follows successively closer geographic hops, until the destination is reached. To support fine-grained manipulation, we decompose a distance graph into two-connected components. These components are organized in a tree structure and the one containing beacons is the root. Adjustments are conducted along tree edges from the root to leaves. Through vertex augmentation, LAL converts all non-localizable in one round. Assume that packet sources can determine the locations of packet destinations, to mark packets they originate with their destination's location. Thus, we assume a location registration and lookup service that maps node addresses to locations. In the following sections, we describe the algorithms that comprise GPSR, measure and analyse GPSR's performance and behaviour in simulated mobile networks.

III. MODULE SPECIFICATIONS

1. Navigation Management:

The admin should have the prior knowledge about the environment. The admin will per-process the whole environment for the complete navigation for the users by

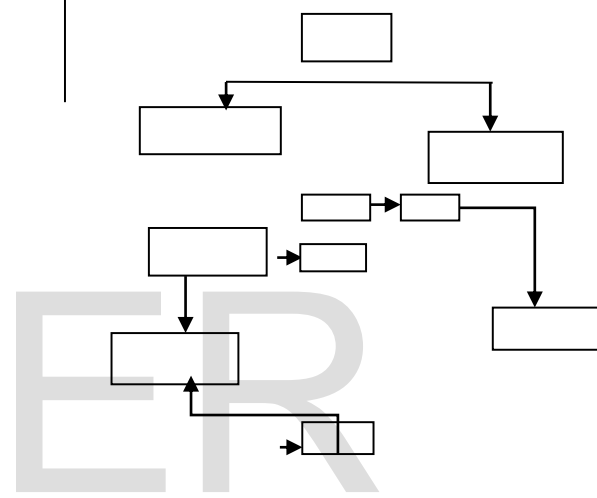
adding the block details (Peter England, theater, etc...) and the exit, the brief description about the block and exit. And admin navigate the user by preprocessing the path for source to the destination that the user request.

2. Destination Navigation:

Node has to detect path, which node wants to send source to destination should be finding the navigation path in this particular place. In wireless network coding systems, user can exit in multiple paths. one user give the route request and to get the path and route information .

3. Emergency Navigation:

When Emergency trigger to pass information from nearest sensor, to neighbor sensor and under the user neighbor also, and receive the mobile user then each and every user should find the available path to finally provide shortest path for user. the user can use the safest path to exit will occur only mild congestion and small stretch also.



ARCHITECTURE DIAGRAM

IV. SOFTWARE REQUIREMENTS

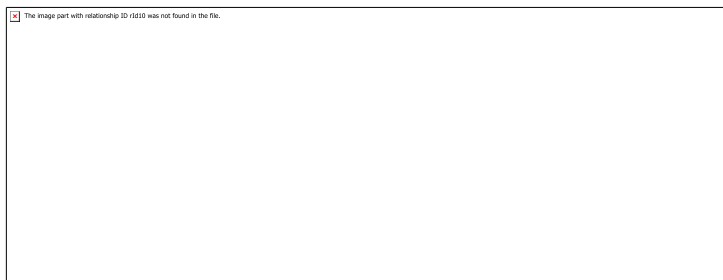
I. Network Simulator

NS (version 2) is an object-oriented, discrete event driven network simulator developed at UC Berkely written in C++ and OTcl.

A. Overview of NS2

NS is an event driven network simulator developed at UC Berkeley that simulates variety of IP networks. It implements network protocols such as TCP and UPD, traffic source behavior such as FTP, Telnet, Web, CBR and VBR, router queue management mechanism such as Drop Tail, RED and CBQ, routing algorithms such as Dijkstra, and more. NS also implements multicasting and some of the MAC layer protocols for LAN simulations. The NS project is now a part of the VINT project that develops tools for simulation results display, analysis and converters that convert network topologies generated by

well-known generators to NS formats. Currently, NS (version 2) written in C++ and OTcl (Tcl script language with Object-oriented extensions developed at MIT) is



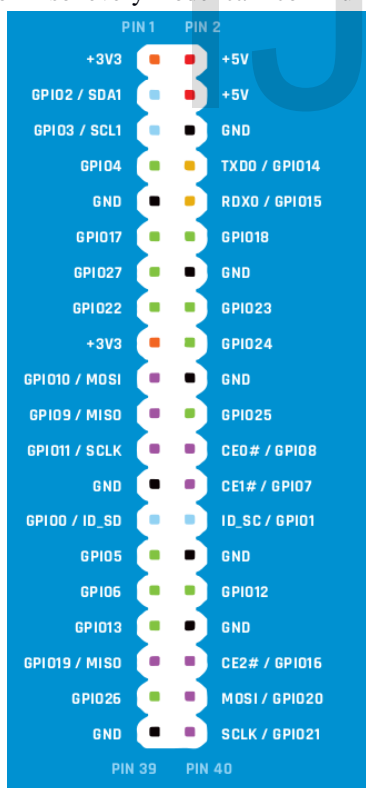
available.

SIMPLIFIED VIEW OF NETWORK SIMULATOR

B. HARDWARE REQUIREMENTS

1. Raspberry Pi

Here we use Raspberry pi in order to collect the data from the sensors like the temperature sensor or the vibration sensor and thus process them to be sending them to the appropriate receiver. In turn the mobile users receive the data that is been sent by Raspberry Pi. This data may be in the form of a position indicating map or even may be a plain text. Network communication with Raspberry Pi is possible through an Sim card that is been fixed and installed with the Pi. Sensors in the networks are connected in a ad-hoc fashion so every node can communicate with each other with in



or even directly the Backbone this case the Raspberry Pi.

2. Temperature Sensor

Temperature Sensor being used in various real life scenarios, also plays a vital role in our project too. The sensor senses the environment continuously and updates this information to the backbone. All the sensors over here are connected in an ad-hoc fashion. Sensing those values and then comparing them with the ideal values tells us whether the situation is abnormal or else.

V. DESCRIPTION

In this Mobile Environment, the users are equipped with PDAs or smart phones that can talk with the Sensors easily. When emergency occurs, the WSN provides necessary information to users, So that guided to move out of a hazardous area through interaction with sensors. Wireless network sensor combined with a navigation algorithm could help safely guide people to a building exit while helping them avoid hazardous area. We propose a plain navigation algorithm for emergency situation. CANS leverages the idea of level set method to track the evolution of the exit and the boundary of the hazardous area, so that people nearby the hazardous area achieve a mild congestion at the cost of a slight detour, while people distant from the danger avoid unnecessary detours. Firstly, the navigation of human beings seeks for a safe-critical path, other than packet loss or energy efficiency which is the first priority as in packet routing. Secondly, human navigation consumes much more time than traditional packet routing process, due to the limited movement speed of people. And which are critical for a fast evacuation, as they mainly focus on finding the shortest/safest path for each person, while other sub-optimal (yet safe) paths are left unused throughout most of the evacuation process.

1. Enhancement

- Dynamic Short path.
- Map level implementation for navigation (from one place to another place) path.
- Datasets are highly dynamic.

VI. CONCLUSION

LAL, a novel distributed algorithm towards congestion-adaptive and small stretch emergency navigation with WSNs is used in the emergency navigation system. CANS does not require in advance knowledge of location or distance information, nor the reliance on any particular communication model. It is also scalable since the time and message complexities of our algorithm are linear to the network size. Both small scale experiments and extensive simulations

demonstrate the efficiency and effectiveness of the proposed algorithm.

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