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SMART CITY GREEN CORRIDOR FOR TIME CRITICAL APPLICATIONS USING WIRELESS SENSOR NETWORK AND IOT

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ABSTRACT

Reliability and flexibility of wireless communication networks (WCNs) is effectively accomplished by mobility of the sink, which also contributes for increase in life time of a network. Proposed project provides a comprehensive integration of different strategies in deployment of wireless sensor networks involving sink mobility. The practical feasibility of WSN in real world motivates development of various smart applications.

Traffic congestion is a major problem in all major cities all over the world. To overcome this problem conventional systems has many limitations. In our project, we worked with two major goals, that is to provide green corridor (signal free path) for emergency vehicles also provide zero waiting time to emergency vehicles at a junction.

Keywords: *Mobile sink, Cluster head, Time critical, Internet of Things, Wireless sensor network (WSN), Cloud, Base station.*

I. INTRODUCTION

Wireless sensors are used to collect the required data from environment and transfer or route the collected a processing node, also called as sink. The sink has more processing and controlling capacity than any other sensors. In WSNs energy efficiency plays a key role. However, the energy sources for sensors junctions are minimal, hence difficult to replace. The nodes present near base station requires more energy when compared with the nodes present at other locations, this is because that, the node transfers the data collected from other sensor nodes present at distant locations to the base station. When the sensor near the base station (sink) cease to work properly or break down, than the data collected from the distant node which should be delivered to the sink gets halted. This leads to the failure of entire system, even though other nodes have plenty of energy still present in them. Hence, to increase the network operating lifetime, reduction of energy consumed by sensor nodes becomes a key challenge in WSNs.

Various approaches have been proposed in accordance with the prolonging of lifetime of WSNs. Several papers proposed using cross–layer optimized geographic node-disjoint multipath routing algorithm. But as per recent work using mobile nodes can be helpful in lifetime of WSNs to a big extent. When the comparison of the static and mobile nodes is done, it was found that mobile nodes has comparatively good energy and high powerful capabilities. Initially, mobile node is mounted on a moving vehicle, which follows the given path and collects the data from the static nodes present at different locations. Data collection from the static node can be done using either one-hop or multi-hop way.

II. RELATED WORK

Different papers have [1] resourceful information about different protocols in wireless sensor networks(WSNs) in concern with energy optimization, a shortest path routing algorithmic program is been projected for motion of mobile sink in presence of any blockers in the moving path, the same is stimulated and evaluated for results which shows it's an energy efficient approach to gather sensed data from senor deployed in site. [2] proposed an intelligent

traffic control system with the use of RFID and ZigBee module and other associated components at emergency vehicle to communicate with traffic signal for turning ON green signal of traffic signal. [3]Establishment of green corridor is done by allotting time slot as travel time for emergence vehicle with the help of Bluetooth device enabled in android application device. IR sensor and photodiodes. Microcontroller is used to control the whole system where all Bluetooth and other sensors are interfaced. [4]

Amis to monitor the speed of emergency vehicle to travel with a proper speed, and also proposes development of signal free roads for emergency vehicle by use of Destination sequenced and Ad hoc on demand distance vector protocol i.e. DSDV and AODV. [5]Deals with resolving the problem of energy efficiency in sensor networks by proposing a new interaction methodologies for grouping and data acquisition. Also this system results in establishment of effective protocol. [6] Use of algorithmic programs like TSCA and TSTMA is projected which enables dynamic and lively changes in traffic signal-flow. Evaluation of the system at its best is done by designing a reality test demo. [7]Different cluster routing methodologies is been discussed and tested for results. Results of each methods is compared in terms of power efficiency vs number of rounds which is graphically projected on graphs. [8] Proposes a new algorithmic program referred as Flame Leach which performs as same as leach, this results to be more constructive when compared with typical LEACH protocol. In [9], a ITCS with GPS tracking in ambulance unit and also uses WSN for control of traffic signals. [10] Explains flow control in establishment of green corridor through flowcharts.

III. METHODOLOGY

We have a mobile sink which can be an emergency vehicle or VIP vehicle. The current location and the destination location is transmitted from mobile sink to base station, then base station verifies if it's a valid mobile sink, and then sends the shortest path to reach the destination to mobile sink. As mobile sink starts moving closer to RFID sensors, these sensor responds to cluster member i.e. traffic signals present ahead. In response to these signals the traffic signal turns green. Hence makes easy signal free path for vehicle to the reach destination.

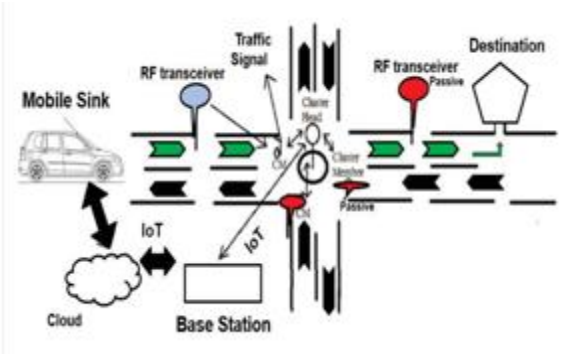

Figure 1: Proposed System.

As mobile sink passes the traffic signal, the sensor on the traffic signal senses the maximum frequency radiated by the mobile sink and sends a confirmation signal (or location of the traffic signal) again to the mobile and switches back to its normal operation. These type of data is collected at every sensor nodes on the destination path. Once the mobile sink reaches the destination the collected data is uploaded to cloud. Base station collects these data from cloud. Mobile sink path is predetermined. Hence it is a time critical and deterministic.

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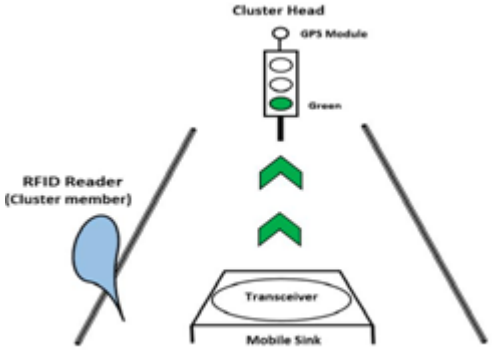

Figure 2: Signal Switching.

IV. ALOGORITHM

- destination node a cluster head

v cluster member

D(a) shortest path

i. Initialization
ii. D = X

iii. for all node a

iv. If a adjacent to X

v. Then D (a) = c (X, a)

vi. Else D (a) = ’
vii. Loop
viii. Find b not in D such that D (b) is a minimum

ix. Add b to D

x. Update D (a) for all a adjacent to w and not in D;

xi. D (a) = min (D (a), D (b) + c (b, a))

V. BLOCK DIAGRAM

Initially the cloud will have all the data of mobile sink, traffic signals, nodes and the shortest path. When the vehicle i.e. an emergency vehicle needs to reach soon base station sends a message to mobile sink through cloud. Raspberry pi (base station) checks if it is a registered vehicle. When the mobile sink moves close to RF Transceiver, it detects the emergency vehicle and sends the message to traffic signal. All other signals are made red the particular lane where the mobile sink is moving, that lane is made green. Once the mobile sink passes the signal, the info of passing is sent to vehicle.

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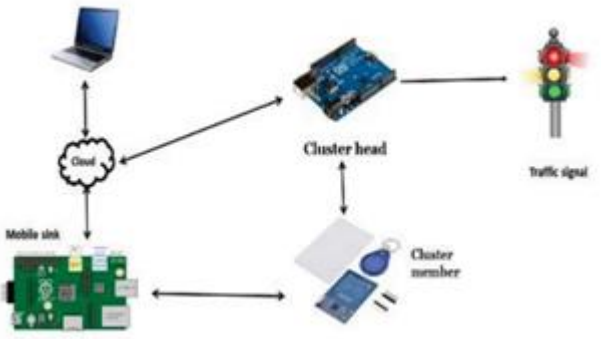
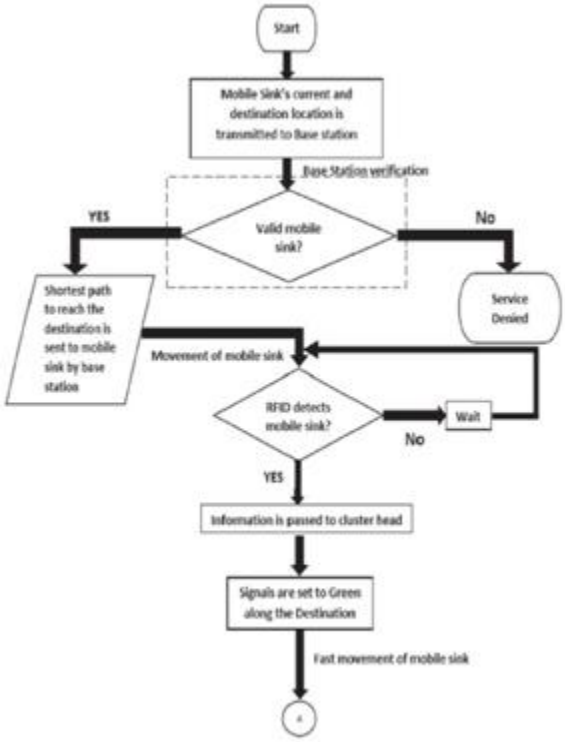


Figure 3: Block Diagram

VI. FLOWCHART



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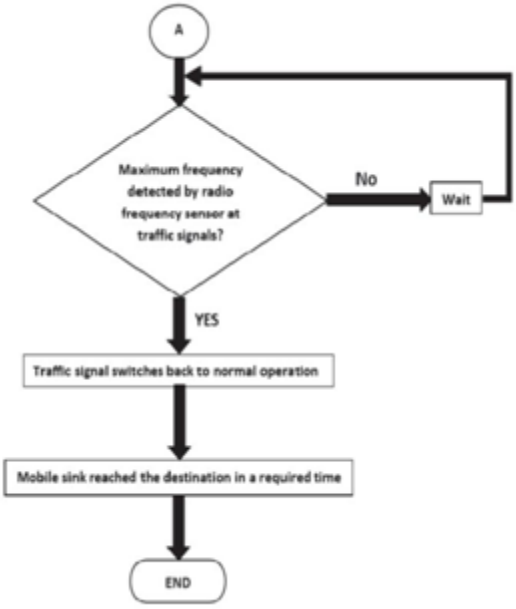

Figure 4: Flowchart

As every process needs a sequential flow, the controlling of the proposed system is explained in the following flowchart. The intercommunication between hardware components is explained. Initially mobile sink's location is being sent to base station, if it's a valid mobile sink sends destination route. Later a security code is sent to mobile sink, this is detected by RFID detector. This enables the signal to be made green. Later with traffic free road, the vehicle reaches the destination.

VII. RESULTS

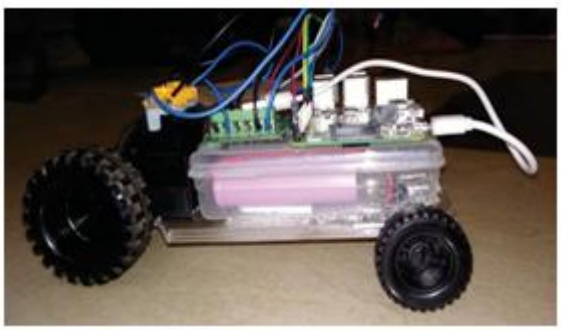

Figure 5: Mobile Sink

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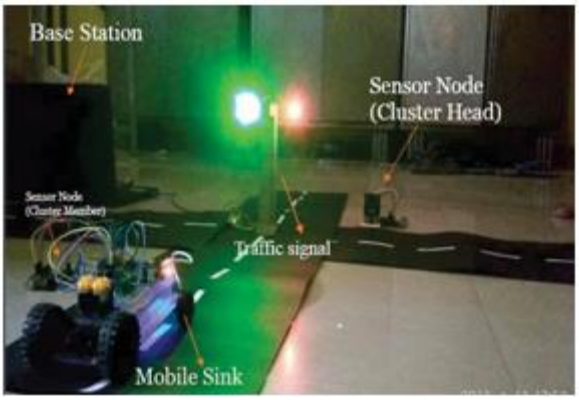

Figure 6: Overall model.

The mobile sink is developed using raspberry pi 3B model, which is connected to cloud through inbuilt Wi-Fi-module and predetermined shortest path is been pre-programmed. Hence, this enables us to control the mobility of mobile sink through internet from any part of the world. Cluster member consists of RF Transceiver and is controlled by Arduino. Traffic signal which is the cluster head is also controlled using Arduino.

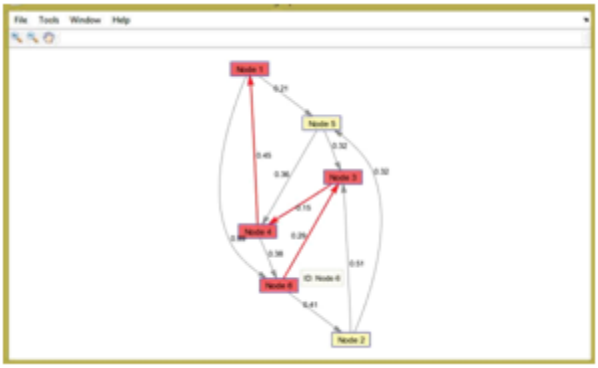

Figure 7: Simulation of destination path identification

Simulation for determining the shortest path between the initial node and final node is computed using MATHLAB code. The distance and orientation between nodes are pre-defined. The number of nodes can be varied, as it is user defined. Initially the source and destination nodes are fed as inputs, accordingly the shortest path between the nodes is obtained as output.

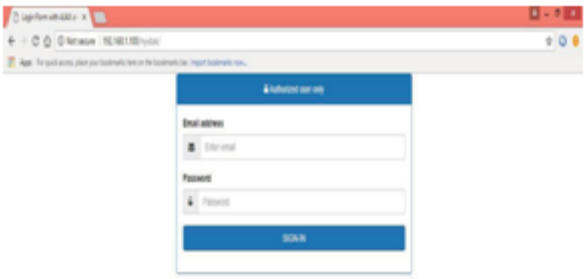

Figure 7: Login Page

Figure 8: Selection of destination page

Figure 9: Comfirmation page

In our system web applications are used as an interface between the base station and mobile sink (any emergency vehicle). A web page enables the user to access the service i.e. provision of "GREEN CORRIDOR" through simple registration and login page.

VIII. CONCLUSION

Our proposed project minimizes the manual switching of signals at the junctions. Hence, aims to minimize the human power, reduction of waiting time at junction. With effective integration of hardware and software, a powerful and secured system can be developed. Our project also demonstrates more efficient method for traffic control, when compared to traditional techniques. This system is a novel idea for controlling traffic signal in favor of emergency case vehicle like ambulance used transportation of organ transplant, also any cases as such, fire-engine, police cars, VIP vehicle, etc.

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