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Boarder Analysis with Ensora and Doa Using Wireless Sensor Networks

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ABSTRACT
Network lifetime maximization and the target detection is the most important issue in wireless sensor network. The WSN motivated hundreds of applications in many domains, such as healthcare, emergency responses, traffic control, and military applications. The capability is to sense the environment and respond properly in automated manner. Many studies in the literature have addressed the problem of evaluating the performance of sensor network based on detection probability. It is difficult to detect the target in sensor networking since it is dependent on the topology of the sensor deployment and the location of the target. There has been a great interest to utilize WSN for military applications and especially in border protection. Focus on minimizing energy consumption and maximizing network lifetime for data relay in one-dimensional (1-D) queue network. The sensors on the devices extract physical information from the environment, such as temperature through a temperature sensor, pressure through a barometer, noise through a microphone, and even an image through a camera or thermal camera. Specifically, an Energy Saving via Opportunistic Routing (ENS_OR) algorithm is designed to ensure minimum power cost during data relay and protect the nodes with relatively low residual energy.

I. INTRODUCTION

Wireless Sensor Network (WSN) offers a wide range of applications in areas such as traffic monitoring, medical care, inhospitable terrain, robotic exploration, and agriculture surveillance. The advent of efficient wireless communications and advancement in electronics has enabled the development of low-power, low-cost, and multifunctional wireless sensor nodes that are characterized by miniaturization and integration. In WSNs, thousands of physically embedded sensor nodes are distributed in possibly harsh terrain and in most applications, it is impossible to replenish energy via replacing batteries.

In order to cooperatively monitor physical or environmental conditions, the main task of sensor nodes is to collect and transmit data. It is well known that transmitting data consumes much more energy than collecting data. To improve the energy efficiency for transmitting data, most of the existing energy-efficient routing protocols attempt to find the minimum energy path between a source and a sink to achieve optimal energy consumption [10]. However, the task of

designing an energy-efficient routing protocol, in case of sensor networks, is Multifoods, since it involves not only find the minimum energy path from a single sensor node to destination, but also balancing the distribution of residual energy of the whole network [13].

Scope

The idea of seeing vehicles as elements of a telecommunication network dates back to the first smart navigation tests carried out in the seventies, In the same years, independently, research on ad hoc networks begun with the purpose of enhancing military communications. The ideas and technologies thought for adhoc networks and designed for the battlefield have been ported to the vehicular space. Although, solutions are found for small to medium scale networks with pedestrian mobility hardly map to large scale networks with challenging mobility patterns. Vehicular networks introduce new challenges compared to Mobile Ad-hoc Network (MANETs) technologies, mainly because of their highly dynamic mobility patterns. The application scenarios are also very different. MANETs are designed to interconnect swarms of soldiers, tanks and aircrafts and therefore require, for example, robust and reliable multicast protocols to enable the interaction and coordination. The most favorable target is the more useful, efficient and safer roads will built through vehicular networks by informing to basic authorities and drivers in time in the future. Another target is to discover the advancement of Vehicular Ad-hoc Networking (VANET) wireless technologies. Next goal to create high-presentation, extremely measurable and secured technologies of VANET shows an unusual challenge to the investigate community of wireless.

VANETs are constructed on-the fly and do not require any investment besides the wireless network interfaces that will be a standard feature in the next generation of vehicles. Furthermore, VANETs enable new class of applications that require time-critical responses (less than 50 ms) or very high data transfer rates (6-54 Mbps). VANETs have unique characteristics as very high mobility, theoretically infinite extension, absence of a centralized control, and intermittent connectivity through the sparse infrastructure since vehicles can directly communicate with an entirely new type for vehicle based applications can be created. The main applications such as safety and non-safety applications can greatly enhance road and vehicle efficiency. New challenges are faced by high vehicle speeds and highly changing operating environments of the vehicles. Again, new requirements, necessitated by these new applications, include new expectations for high packet delivery rates and low packet loss. Usually this data is self-contained within a single vehicle. But With a VANET, the 'the necessity for creating awareness of other vehicles' for the vehicle or driver drastically increases. In VANET, the communication can be either done directly between vehicles at the next hop, or vehicles can be made to continuously retransmit messages, thereby enabling the vehicle to act as a router. With the increasing traffic conditions there is also an equal increase in the amount of traffic and accidents that occur on the road. The VANET applications mainly aims to be a solution for such hazards that may occur on the road by promptly alerting the drivers of the traffic conditions and the accidents which could have occurred on the path ahead. But the main difference in VANET from other mobile networks is its ability to work without any infrastructure. VANET can work without any access points of base station of infestation. Therefore complexities arrive when either vehicles travel in a high traffic area or into area with very low vehicular density where a vehicle may not have any connection with any other vehicles. Therefore proper scheduling of data that is transferred among vehicles and a methodology to regulate the flow is various traffic conditions are required for this emerging network.

II. ROUTING PROTOCOL

A formula used by routers to determine the appropriate path onto which data should be forwarded. The routing protocol also specifies how routers report changes and share information with the other routers in the network that they can reach. A routing protocol allows the network to dynamically adjustto changing conditions, otherwise all routing decisions have to be predetermined and remain static.

AODV Routing Protocol

It is a reactive routing protocol, meaning that it establishes a route to a destination only on demand. In contrast, the most common routing protocols of the Internet are proactive, meaning they find routing paths independently of the usage of the paths. AODV is, as the name indicates, a distance-vector routing protocol. AODV avoids the counting-to-infinity problem of other distance-vector protocols by using sequence numbers on route updates, a technique pioneered by DSDV. AODV is capable of both unicast and multicast routing.

III. EXISTING SYSTEM

Border patrol has extensively been based on human involvement. However, the relative cost for the increasing number of personnel as well as the diminishing accuracy through human-only surveillance has required the involvement of high-tech devices in border patrol. Among these, Unmanned Aerial Vehicles (UAVs) for aerial surveillance have recently been used to automatically detect and track illegal border crossing [7,8, 16]. Due to the large coverage and high mobility of the UAVs, the intensive human involvement in low-level surveillance activities can be reduced. It allows valuable human resources to be allocated to decision management activities based on information from these devices.

However, similar to the conventional border patrol systems, UAVs alone cannot cover the whole border at any time. There may exist times when certain sections of the border are not being monitored. Moreover, the

UAVs have significantly high costs and accident rates than those of manned aircrafts and require large human footprint to control their activities. In addition, inclement weather conditions can also impinge on the surveillance capability of UAVs.

To complement the UAV activities, recently, Fiber Optic Sensors (FOSs) are introduced. Seismic sensors are equipped with FOSs so that they can measure pressure waves in the earth caused by intruders. However, FOS communication depends on a single wire along the border. As a consequence, any single point-of-failure can affect very long distances.

Due to the harsh environmental conditions along a border, wired sensor systems are not robust.

Moreover, deployment costs of wired sensors surpass existing costs in long borders limiting their practical application. Compared to the wired sensors, Unattended Ground Sensors (UGSs) [5, 6, and 20] provide higher system robustness. UGSs have been intensively used for military Intelligence Surveillance and Reconnaissance (ISR) applications. UGSs can detect vibration/seismic activity or magnetic anomaly, which indicate that people or vehicles are crossing the border. Moreover, UGSs can pick up moving heavy vehicles (such as tanks) from a distance of 500 m and walking humans from 50 m [6]. However, the information provided by the UGSs can be limited and inaccurate.

Therefore, based on the limited information acquired by current ground sensors, it is difficult to distinguish actual intrusion alarms from false positives, i.e., nuisance warnings caused by environment elements (insects, weather, animals, etc). According to the US department of homeland security, 90% of the alerts are caused by animals or environment impacts instead of illegal immigrants and these results in a significant amount of wasted time for the deployment of agents to check on the provided information [18]. In addition, it has been reported that the existing sensors are often damaged by insects or moisture and hence, are not robust to external impacts [18].

While scalar sensors such as vibration sensors are important to detect an intrusion, these sensors provide limited information to classify the intruder. To this end, surveillance towers equipped with video monitors and night vision scopes provide high accuracy in human detection and keep false alarms to a minimum [17]. The monitoring range is also much larger than the ground sensors. These systems, however, typically require human interaction to determine the type of intrusion. Moreover, the video monitors require the target within the line of sight. If the monitoring area consists of obstacles such as rocks, brushwood, or trees, the miss rate increases. The existing techniques for border patrol, which include surveillance towers, ground sensors, or unmanned aerial vehicles, are deployed completely aboveground. In certain areas, aboveground components are vulnerable to the effects of the environment, vehicles or large animals.

Visible devices may also be easily found, damaged, or avoided by intruders. For instance, for a system with surveillance towers, the intruders will look for areas and times not properly covered by adjacent towers. In addition to these major challenges, the existing solutions for border patrol systems lack a coherent system that coordinate various technologies to improve the system accuracy.

Disadvantages of Existing System

- Data delivery not ensured..
- Not suitable for low vehicle density network.
- Special data delivery schemes not available.
- Location based relaying compromises the location information of the relaying vehicle.
- Distance of coverage was below 30 nautical mile.
- Energy loss due to data transmission.

IV. PROPOSED SYSTEM

The application of border surveillance is widely used on ground wireless sensor networks. It can be applied in marine surveillance and marine border protection. The above existing system there is more disadvantages are set to be held. The main disadvantage was energy minimizing; it is the most important issue in wireless sensor network in proposed system to implement the Energy-efficient routing algorithm for 1-D queue network in this way to improve the energy of the wireless sensors. Routing algorithm will be extended to sleep mode and therefore a longer network lifetime can be achieved. Then the Degree of Aggregation algorithm DOA means the minimum number of reports about an event that a leader of a group waits to receive from its group members, before reporting the ship location to the base station. DOA increases the sensing report and decrease the false alarm. In this way, it is easy to detect the ship by using the nodes which is connected to the sensors.

Advantages of Proposed System

- No packet loss.
- Distance of coverage is 30-40 nautical mile.
- Less energy conception.
- ENS_OR adopts a new concept called energy equivalent node (EEN).
- Energy-efficient routing algorithm for 1-D queue network.

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SYSTEM ARCHITECTURE

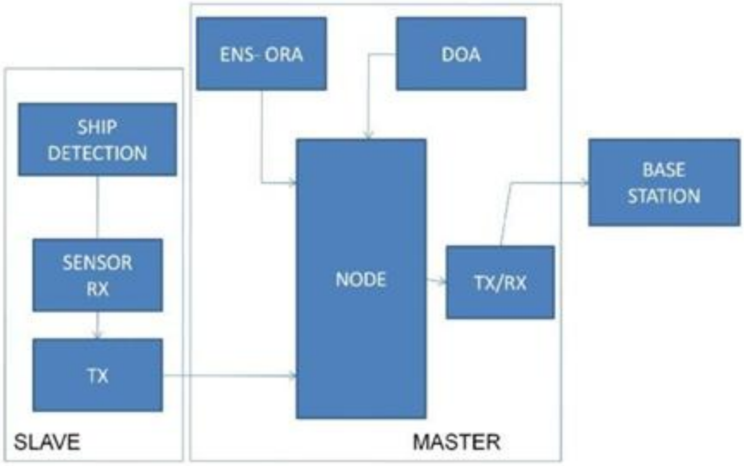

Fig 4.1 System Architecture

Fig 4.1 illustrates the system architecture; the sensor node was connecting to the transistor. The ship was crossed in the node the sensor will processing to sense the ship by using the acknowledgement transfer to the ship of receiver. In that communication the data will transfer to the controlled of the node, the controller is convert the data in analog to digital form by using the ADC converter and it can be transmit the data to the base station by the help of relay/repeater. The relay can be used for to convert the signal to the neighbor node then the signal can be send to the base station. In this way, it is easy to detect the ship departure and arriving in the border. The ENS-ORA algorithm is used for to consuming the power of the node and the DOA is used to transfer the data to the head of the node without the data loss.

1Network Design

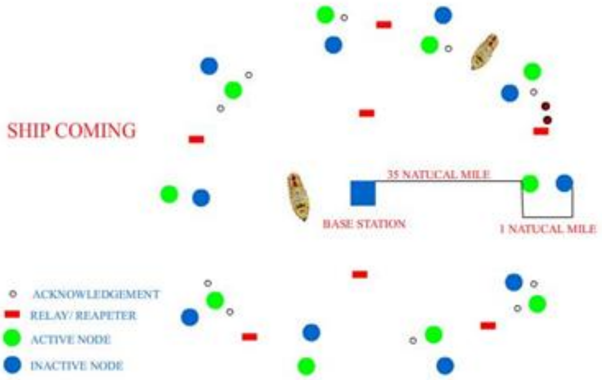

Fig 5.1 Ad-Hoc with Seven Junctions

The network consists of 20 nodes around the boarder at both the left and right pane. It consists of some junctions at various ends and there are nodes connecting the junctions. Each node has two lanes named right and left. The ship move across these nodes randomly with Ad- Hoc communication established between each other. This enables the vehicles to communicate with each other and also perform other actions on the network such as data relaying. The vehicles in the network also broadcast their location information about its current location. Vehicles in the network communicate wirelessly causing for the requirement of a proper scheduling or managing scheme which controls the order and the priority for the data being transferred across the network. Fig 5.1 .The network design using ns2 allows tracing both the movement of the vehicle and the data transmission made by the vehicle which helps out in performing research and analyzing the performance.

SCREEN SHOTS

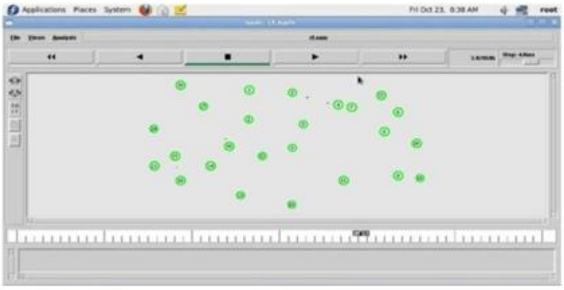

Fig 6.1 Node Initialization

First the nodes are created in Fig. 6.1 there are totally 26 nodes in the network. All the mobile nodes originate from the same point on the NAM window whose X value is 18.054050937049496 and Y value is 123.9459490629505. The mobile nodes which are communicating with one another node is done by sending acknowledgement.

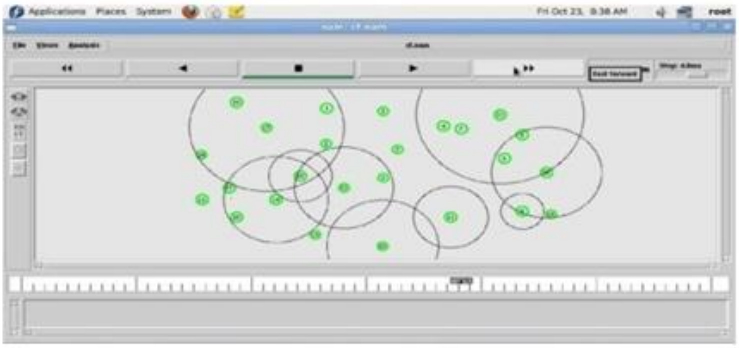

Fig 6.2 Nodes Broadcasting Location Information

The mobile nodes in VANET have the ability to either directly communicate or broadcast any kind of information. Fig. 6.2 shows the new originating nodes starting to transfer data by starting with the location information. This helps the other nodes to determine the presence of the other node and start the process of relaying or transferring. The data will receive from the ship and it can be transfer the data to the next node.

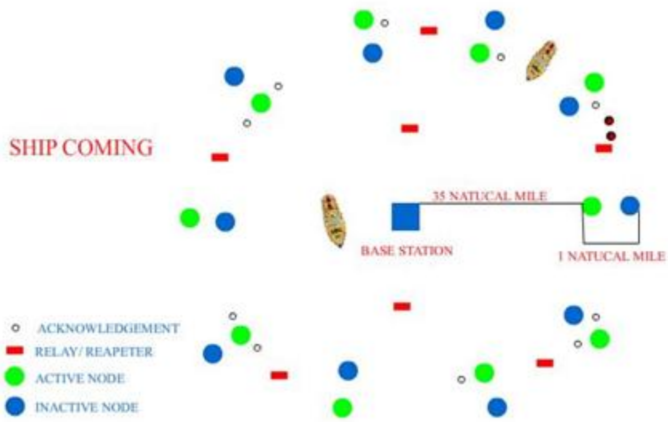

Fig 6.3 Ship Coming

Here all the nodes are performing 1-D queue operation because of the node energy conception. When the ship was interrupt between the nodes the ship transmitter sends the data to the receiver of the node illustrated in Fig 6.3. Automatically the node send the data to the nearest node or the relay/repeater after receiving the data will

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send to the base station by the help of repeaters.

Comparison Graph

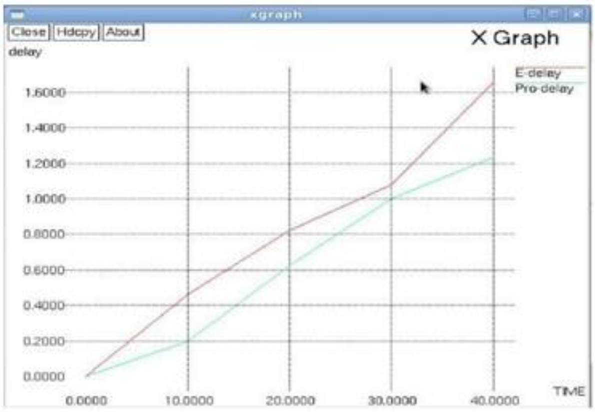

Fig 6.4 Time Delay

Fig 6.4 shows the average time of data sending and receiving between the nodes. The red color is mentioned for existing system, and the green color is also mentioned for proposed system of the project. In the existing system that can take the more sec /min of data transferring time, in the proposed system it over come that minimum time to transfer the data to the base station.

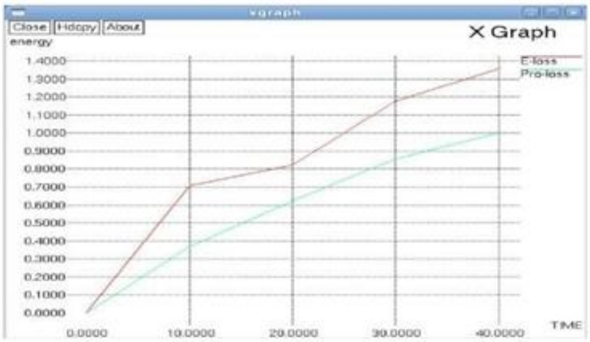

Fig 6.5 Energy Loss

Fig 6.5 shows the average voltage measured on router nodes with varying time. The initial average voltage is 3 V. At the end of the experiment, the initial average voltage of ENS_OR is 2. 847 V, which is the highest value compared with others. Existing is following behind ENS_OR as 2. 774 V, and proposed has the lowest value 2. 758 V. So far, it has evidences to conclude that ENS_OR can improve the energy efficiency of individual node or the whole network.

V. CONCLUSION AND FUTURE ENHANCEMENT

WSN has been widely used for monitoring and control applications in daily life due to its promising features, such as low cost, low power, easy implementation, and easy maintenance. However, most of sensor nodes are equipped with the limited non-rechargeable battery power. Energy savings optimization, therefore, becomes one of major concerns in the WSN routing protocol design. The implementation on opportunistic routing theory to virtually realize the relay node when actual relay nodes are predetermined which cannot be moved to the place according to the optimal transmission distance. This will prolong the lifetime of the network. Hence, the objective is to design an energy-efficient opportunistic routing strategy that ensures minimum power is cost and protects the nodes with relatively low residual energy. Numerous simulation results and real test bed results show that the proposed solution ENS_OR makes significant improvements in energy saving and network partition as compared with other existing routing algorithms.

Compared with traditional ship detection methods which can monitor a large area (e.g., radars or satellites) but cost a lot, these methods can be cheaper. Moreover, the satellites cannot perform real-time monitoring. With radar, it need some place to set up the equipment, and it is difficult to detect small boats. The schemes with WSNs are cheaper and can be deployed almost everywhere. More importantly, it can perform situ real-time monitoring, and provide more information of the monitored targets. The main limitation of scheme is that it requires a relatively dense network (cost more because the nodes are expensive now), especially to achieve a high detection ratio with small boats because of the high noise on the sea. Deploying a monitoring belt may decrease the total number of deployed nodes. Combining with other sensors, such as acoustic sensors, may also help decrease the deployment density because sound travels far in the water. The algorithm is based on a grid deployed network, and it is better to deploy the sensor networks randomly in a real deployed system, like dropping buoys from a plane. However, it is more difficult than the grid network, and leaves it as future work. Meanwhile, the further research will be on power management. In sink level detection, it deals with ships which are trying to penetrate the invasion detection area using varying course, and traveling at different speeds to evade detection. The ship speed estimation also needs to be improved with intrusion vessels traveling at varying speeds and courses in the detection zone. Though the algorithm can detect multiple ships traveling along distances in different geographical areas, the further research is on multiple ships crossing the sensor region in close proximity to each other. The current design cannot support online intrusion detection, and leaves it as future work.

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