Secured Maritime Alert System Based on RSSI Localization Scheme

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Abstract - The technology proliferation of RSSI is used to provide localization based positioning, exact location and time details in all climatic conditions, even anywhere any time. Though it comprises two units namely Transmitter and receiver units is used for time, sensitive tracking, localization and many more security applications. The marine security systems and devices became a revolutionizing tool for fisherman boat maritime border issues. The proposed system coins low cost alert system for maritime issues. It is a continuous monitoring scheme that tracks, alerts and controls the activities of fishermen from the control unit located in the shore.

Keywords— *Localization, maritime, RSSI, security, zigbee.*

I. INTRODUCTION

In countries that are separated by maritime borders like India and Srilanka, the people's livelihood depends mostly on fishing occupation. Crossing the border is serious offence especially in the region of Tamil nadu nearly 30,000 boats performs fishing in the sea. Due their carelessness the crosses the boundary limit and they arrested or killed by the relevant navy and they will be abducted and they boats are capture by the coastal guards of the other countries [1]. This causes more difficult to live hood of the fisher man. This issue leads to loss both the lives of fisherman and economic incomes. As far this fishing activity is not smooth and peace in many areas since they are crossing the borders.

The technology proliferation will be very apt for resolving the border crossing issue. RSSI Localization scheme and wireless sensor networks are the best choice for this issue. The proposed system is used to devise a low cost system for the fisherman that gives an alert when the boat or a ship crossed beyond other country borders and this will help the fisherman no to go far from their country borders. If fisherman violate the border agreement and indication of an alarm at the control unit indicating that he violated and crossed the border and in addition it send voice alert to the boat from the control unit .Thus the guard in the shore can assist and provides an additional help to the fisher man if they needed. Keeping in mind about lives of Indian fisherman, this device has been created not to cross the border of the other countries.

II. RELATED WORK

At earlier the wireless sensor networks are utilized by many application and systems where their location of their nodes in the network is to be tracked. So many security systems and sensitive applications are used. The systems like MANET which is used for addressing the issues uses an algorithm called cooperative localization which has multiple hops and nodes cannot be localized by an single hop localization algorithms.

To help Gujarati Fishermen to alert when they cross the border and alert in their regional language this application also works in GPS enable mobile device and specific GPS instrument.[3]

The concept is to safeguard the uneducated fisher men crossing the border and guides them to go in a right path and save their life. It a helps in locating the Fishing boat using GPS system. This information is transmitted using wireless mode to the control system. Then by detecting the latitude and longitudinal location of the Fishing boat, the control system detects the present area of the Fishing boat and send command signal to the Fishing boat using wireless mode to guide the vehicle if the boat is out from the border. The GPS system is the technology which helps us in identifying the Fishing boat either inside or outside the border. The ZIGBEE technology also helps us to communicate from both the ends [2],[4].

The technology using is Global Positioning system (GPS) to track and identify the position of boats and ships by means of satellite communication. These systems use the electronic maps that provides for the navigation and localization methods by the user. Since these system locates through GPS[5], there are many drawbacks which are position information becomes even more critical in GPS, Complexity, Turn-by-turn directions are not available on every type of GPS device, No accuracy, no longer lifetime.

III. PROPOSED WORK

The proposed work is allow low cost maritime security system which is mainly focused on the small scale fisherman who live just near to the poverty line. This security alert system comprises with Transmitting unit which consist of all information and connect with alert system and wireless sensors and the Processing unit which estimate exact position of the vessel by using the

localization algorithm and Receive unit monitors the whole process of transmitter and control through PC. The Proposed system's detailed work is discussed by following sections. Fig.1 represents the block diagram of our project.

Fig.1 Block diagram of proposed system

This system is used to detect the locations and boundaries of three stages in seashores with help of RSSI and also intimate to coastal guard. The 2 level borders B1, B2 area details are stored in the controlling unit. If a vessel crosses B1, the controlling unit will provide an alert. If a vessel crosses B2, motor of the boat will be stop.fig 2 and fig 3 shows the transmitter block and the receiver block this is used to transmit the information from the coastal guard room and the vessel at the sea.
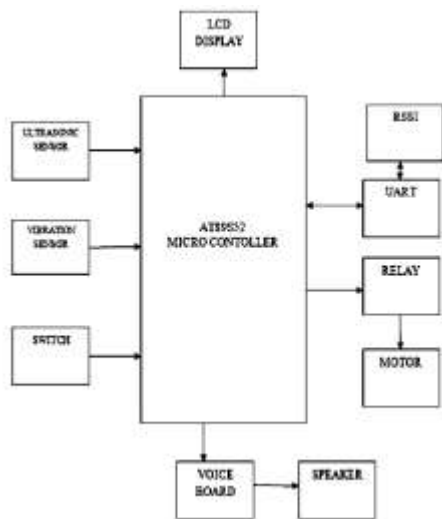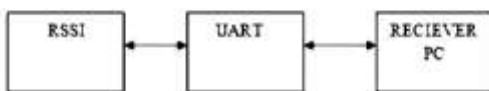

Fig 2. Transmitter block diagram

Fig 3.Receiver block diagram

The alert system of the proposed work is consists of 3 levels which are first level is at sea level which indicates the normal condition by and green at the coastal guard room and the next level is at border 1 which indicates by the yellow signal which is provides an voice alert to the vessel from the coastal room and next level is near to the border 2 which is indicated by an red colour in the coastal room which will automatically boat is stopped. Fig 4 represents the alert system of the proposed work.
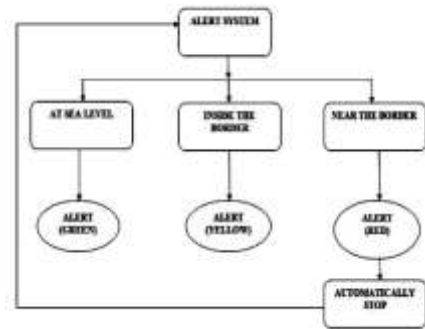

Fig 4. Alert system

IV.LOCALIZATION SCHEMES

Localization is the process of discovering the position of all sensor nodes within a sensor network. The link between sensed value and the location of the source data is necessarily fundamental and important motivation for localization. Localization scheme is generally categorized into two parts are: Range-based localization scheme and Range-free localization scheme. Fig 5 represents the Localization Scheme
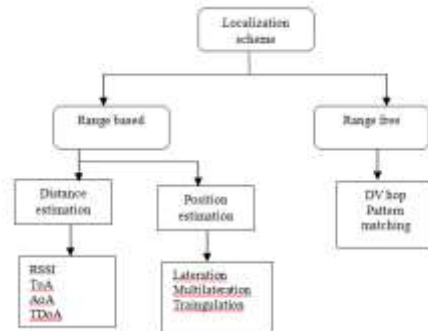

Fig 5 Localization scheme

Range-based localization scheme is used to compute the distance and angle between anchor and unknown nodes with in a fixed area whereas Range-free localization scheme is used to calculate the distance or position between various unknown nodes. Range-based localization scheme can estimate the distance between the unknown and reference node whereas range-free localization scheme can estimate the location of unknown node without even determining the distance. It has no prior knowledge about the node. Range-based scheme is further divided into two distance estimation RSSI, ToA, AoA, TDoA techniques are used. Whereas, in position estimation Lateration, Trilateration and Multilateration techniques are used [6] [7]. For the range-free scheme there is DV-Hop and pattern matching method are used such as fingerprinting [10] [8]. Localization is very important in many real time applications. Various techniques of Range based localization are as follows:

1. Received Signal Strength Identifier (RSSI)

   RSSI is a Radio- Frequency term which is mainly used for distance measurement between transmitter and receiver. It is most popular technique for indoor and outdoor environment for improve accuracy. It is most suitable for WSN due to low cost, low power consumption, simple hardware, etc. RSSI achieves high accuracy in short distance.

2. Time of Arrival (ToA)

   It is used to measure the distance between anchor node and target node and also proportional to the propagation time of signal. It requires high precision timing and synchronization.

3. Time Difference of Arrival (TDoA)

   The implementation of technique depends on the measurement of time of arrival (ToA). It measures the transmitter's signal at a number of receivers.

4. Angle of Arrival (AoA)

   In this technique each sensor allows to evaluate the relative angles between received radio signals. It required antenna and complex hardware.

   RSSI based technique is more suitable estimate position due to its nature and low cost, low power consumption. Other techniques required hardware and also complex. For position estimation multilateration technique is more required than other techniques because it performs the better result than other. Various techniques are used for position estimation are as follows:

1. Lateration

   Fig 6 shows the Lateration structure of our model. It consists of three collinear anchors for precise measurement. It determines the position of an object by measuring its distance from many reference points.
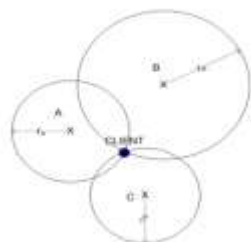

Fig 6 Lateration structure

2. Triangulation

   Technique is based on information about angles rather than distances. It is also called as Triangulation. It is used for position computation. Fig 7 shows the Triangulation scheme.
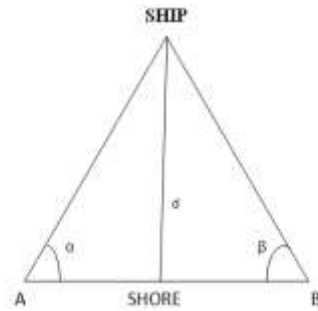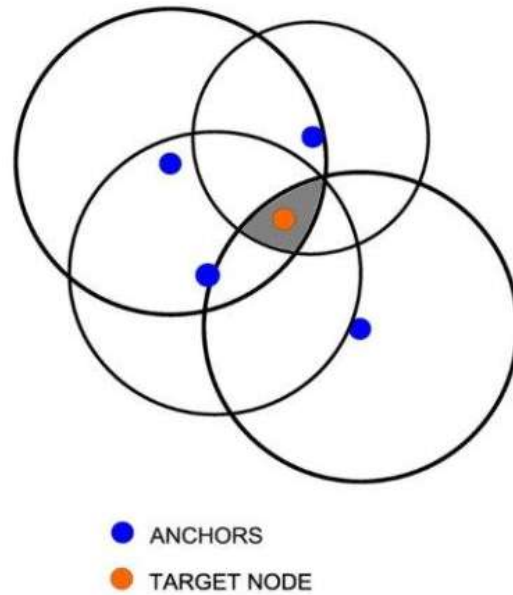

Fig 7 Triangulation structure

Fig 8 Multilateration structure

Table 1 shows the different distance measurement techniques.

Table 1 Different measurement techniques

Type of measurement		Accuracy	Overhead
Distance	RSSI	Low	Low
	ToA	High	Low
	TDoA	High	Low
	AoA	Low	Low

V. SIMULATION ENVIRONMENT

   The simulation of this project has been undergone with the help of PROTEUS software tool. PCB layout offers automation of both component level tracking as well as placement designing into the computer. This can often be the most time-

consuming element of the simulation. The results from the proposed work prove that RSSI algorithm has improved the location tracking of fisherman to a greater extent.

VI. CONCLUSION

In the conventional, the fishermen have to keep watch the maritime border, which cannot be easily separated as land region. If they crossed certain limit on the sea. They have to pay the penalty or got arrested by the naval guards of the neighbour country. The project generates alarm if they cross the border by mistake. With the simple circuitry and the use of sensors (low cost sensors) makes the project a low cost product, which can be purchased even by a poor fisherman. This project is best suited for places where the fishermen continuously monitor the boundary limit. This project also aims at solving relevant social problems with the appropriate use of satellite geographical location data for through wireless networking. Our goal is to confront wireless networking with a concrete problem of worldwide dimensions, the sustainability of fishermen community are taken care by the simulation experiments. The simulation result shows the circuit level work is outperformed well that can be extended to circuit fabrication in future. This paper will be used for advancement of coastal border averment. This also will give sufficient process to both ship and coastal guardians, if anyone crossing the border. The process of routing the fishermen will make more efficient. The process of increasing the accuracy will be achieved greater in future.

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