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Reporting mechanism in fisherman boat tracking system using combinational approach

Dr. A Sivasangari[1], Pavan Kalyan M[2]
[1] Assistant Professor, Department of ECE, GMR Institute of Technology, Rajam, Andhra Pradesh, India
[2] UG Scholar, Department of ECE, GMR Institute of Technology, Rajam, Andhra Pradesh, India

Abstract
The proposed work intend a communication and localisation system referred to RFID and GPS technology. The system permits launching communication and localisation means for location finding, meteorological info by means of sending SMS between the boats and the land for searching operation. The location of boats are detected by global positioning system receiver. RFID is one of the most advanced tools that revolutionise the functioning performance by improving effectiveness and refining productivity. This pioneering technology has greater opportunities in distinct serial numbers for each item and the possibilities to read at a distance of several meters. They are analogous to position than wire cables and these networks will be enabled to provide improved understanding of process and surroundings through constant observing by a set of parameters.

Keywords: RFID, GPS, position tracking, GPS receiver, RFID tags, individual serial numbers

1. Introduction

Our Indian fishery is deeply depend on private industries, which use small and medium-sized fishing boats. There are many small and medium sized fishing boats have not been yet furnished with communication maneuvers. It means that the security circumstance of the boats does not meet simple standard, typically due to the deficient communication set-up between the boats and the rescuing and monitoring authority in the land. That's why rescue task meets a huge problems and it is the prime cause of harms affected by natural calamities. It is essential to generate communication and localization system along the coastal side dedicated to the fishing boat rescue operation. The method has to meet the condition of the propagation condition on the marine with a long expanse. The communication equipment on the fishing boat have a low-cost that is appropriate to fishermen's revenue. This paper propose a solution for communication and localization of small and medium-sized fishing boats. The solution is a combination of GPS and RFID technology which is a practical and cost-effective solution that will provide a communication means for position tracking, weather information services as well as other short message services between the fishing boats and the mainland.

2. Overview

RFID Structure

RFID is the method of identifying a given object/person by storing and remotely retrieving information from small transducers, referred as RFID tags. RFID provides the interface for communication between the user and databases and information management systems. These tags have an associate antenna created into them that permit for the transmission and associated reception of radio to waves from an RFID transmitter to receiver (Fig. 1).

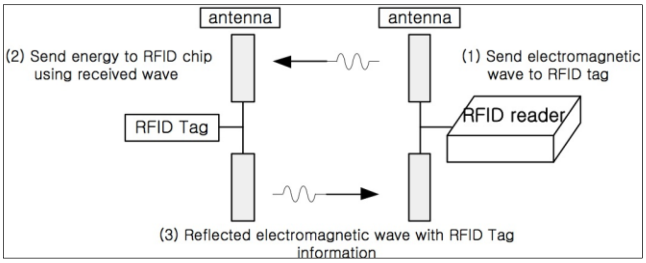

Fig 1: RFID block diagram

There are two kind of RFID tags available: active and passive. Passive tags required no power source, whereas Active tags need of power source to function. This paper presents the fisher boat activity tracking with Radio Frequency Identification (RFID) tag technology that helps in tracking the location. RFID tags are inexpensive, barcode sized stickers that contain an antenna and a microchip that can be sensed wirelessly by an RFID reader. The Radio Frequency Identification (RFID) system is a form of sensor network that used for identify physical objects. The RFID system composed of readers and tags. All readers are use radio signals to communicate with tags, while tags may be passive (powered by the reader's signals) or active (battery powered). Readers communicate with tags using radio frequency signaling for obtaining the identifier and other data elements stored in the tags. All readers are cantered in a finite area within which they can communicate with tags. This area is referred to as the reader's interrogation zone. Readers with overlapping interrogation zones will interfere with each

Other, usually to the purpose wherever neither reader will communicate with any tags located within their respective interrogation zones. Readers may additionally interfere with the operations of alternative readers, even if their interrogation zones don't overlap.

3. Principle of Operation

Usage of RFID in fisher Boat Tracking System

Fisher boat tracking is different from GPS tracking system on land. GPS tracking system is working well at sea, because the reason is that there are no (urban) canyons, nor trees that break the weak signals from the satellites to GPS device. But unfortunately, there are no cell- towers at sea. So, to communicate the output of a GPS receiver to a base station on land, it can't use telephone networks signals. Once a ship is 8 miles to 10 miles far away, any cellular phone not works. Passive RFID systems will be used for very little-ranges where the objects to be tracked pass through a small number of known narrow points that can be automatically watched – such as a containers or pallets of fisher goods passing through a door in a warehouse. Passive RFID systems are only capable of saving and recording the movement of objects at those specific choke points and loose visibility and readability outside of those points. Active RFID provides superior work where real-time or live tracking is required throughout a larger or maximum more complex area, such like as within a hospital, industrial or office building with many corridors, doors and rooms. Active RFID systems with battery power have very large signal range and the active readers are actually cheaper than passive RFID readers, thus making deployment more cost effective overall. An active RFID system is better where the objects to be tracked are large amount of value, mission critical, have a consequential impact if not fast located, or there is an additional security for privacy, regulatory or health and safety required for such information

RFID Principle

An RFID tag consists of three parts: an antenna, a semiconductor chip attached to the antenna and some form of encapsulation. The tag antenna captures energy and transfers the tag's ID (the tag's chip coordinates this process). Two fundamentally different RFID design approaches exist for transferring power from the reader to the tag:1. Magnetic induction, 2. Electromagnetic wave (EM) capture. These two designs take advantage of the EM properties associated with an RF antenna—the near field and the far field. Both can transfer enough power to a remote tag to sustain its operation—typically between 10 µW to 1 mW

Near field RFID

Faraday's principle of magnetic induction is the basis of near-field coupling between a reader and tag. A reader passes a large alternating current through a reading coil, resulting in an alternating magnetic field in its locality. If you place a tag That incorporates a smaller coil in this field, an alternating voltage will appear across it. If this voltage is rectified and coupled to a capacitor, a reservoir of charge accumulates, which you can then use to power the tag chip Tags that use near-field coupling send data back to the reader using load modulation. Because any current drawn from the tag coil will give rise to its own small magnetic field—which will oppose the reader's field—the reader coil can detect this as a small increase in current flowing through it. This current is proportional to the load applied to the tag's coil the tag's electronics applies a load to its own antenna coil and varies it over time, a signal can be encoded as tiny variations in the magnetic field strength representing the tag's ID. The reader can then recover this signal by monitoring the change in current through the reader coil. A variety of modulation encodings are possible depending on the number of ID bits required, the data transfer rate, and additional redundancy bits placed in the code to remove errors resulting from noise in the communication channel.

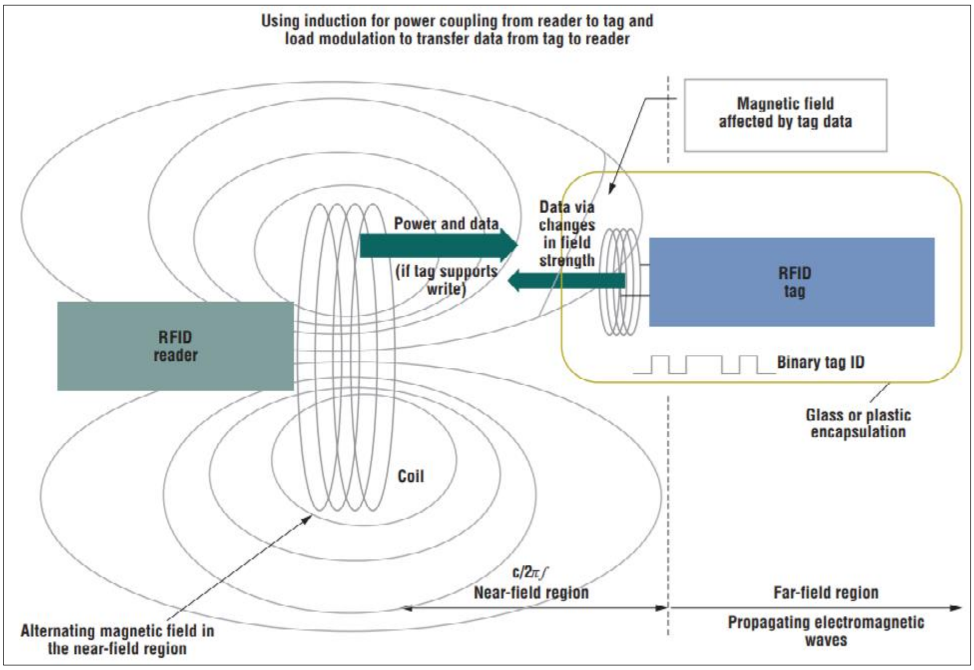

Fig 2: Near-field power/communication mechanism for RFID tags operating at less than 100 MHz

Far field RFID

RFID tags based on far-field emissions capture EM waves propagating from a dipole antenna attached to the reader. A smaller dipole antenna in the tag receives this energy as an alternating potential difference that appears across the arms of the dipole. A diode can rectify this potential and link it to a capacitor, which will result in an accumulation of energy in order to power its electronics. Unlike the inductive designs, the tags are beyond the range of the reader's near field, and information can't be transmitted back to the reader using load modulation. If an impedance mismatch occurs at this Frequency, the antenna will reflect back some of the energy (as tiny waves) toward the reader, which can then detect the energy using a sensitive radio receiver. By changing the antenna's impedance over time, the tag can reflect back more or less of the incoming signal in a pattern that encodes the tag's ID. tags that use far-field principles operate at greater than 100 MHz typically in the ultrahigh-frequency (UHF) band (such as 2.45 GHz);

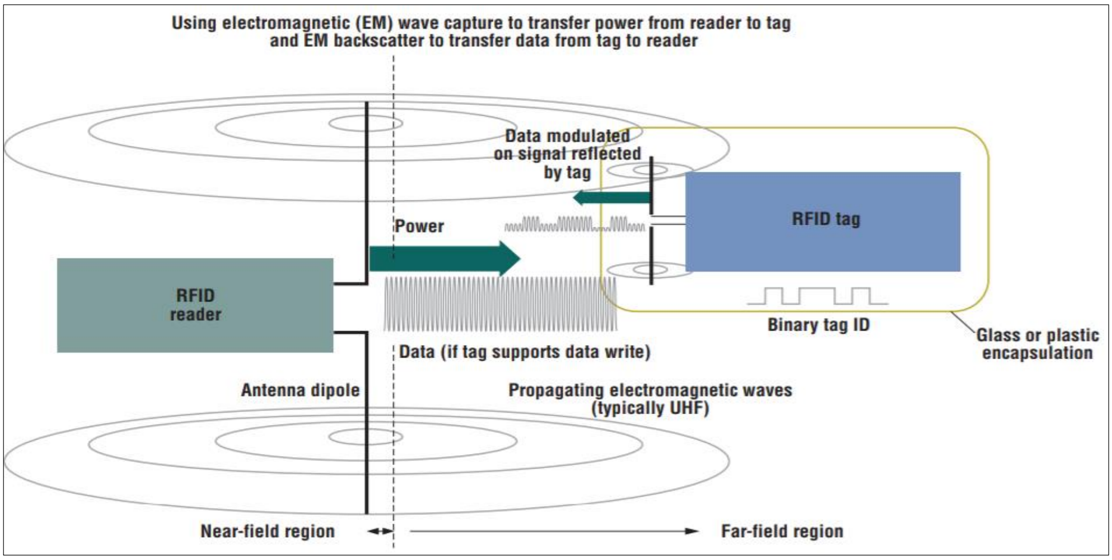

Fig 3: Far-field power/communication mechanism for RFID tags operating at greater than 100 MHz

4. Procedure

Initialization of RFID reader

The program flow chart is shown in Fig.3 according to the communication protocol of RFID module, the main work of initialization RFID reader is to set the baud rate, which means the command of SYS_SET_BAUDRATE is sent to the reader through a serial port. After receiving this command, the reader returns a response frame, which can be used to determine whether the initialization is successful. If it fails, the reader will initialize again.

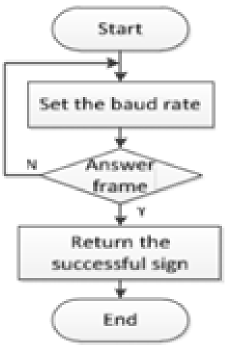

Fig 4: Initialization of RFID reader

Reading the tag data

The program flow chart is shown in Fig.4 by using the function of reading on recurring, namely, reading the tag data in circulation within the current scope of radio frequency Antenna, when read a different ID but with the same dangerous goods, the tag number plus one. The essence of this function is to execute single reading data operation in circulation. According to the actual data quantity, only the first 8 bytes of data are read to be stored. In practice operation, after reading commands of ISO_LIST_DATA, the reader will return a data frame including the information of tag number. In order to avoid missing the tag data, the tag number is put into a variable named Tag Counts, and then read out all the storage data on a reduction circle until the Tag Counts reduced to 0. Data in the buffer are sent to MCU through a serial port, and then posted to CDMA communication module in the form of message mailbox

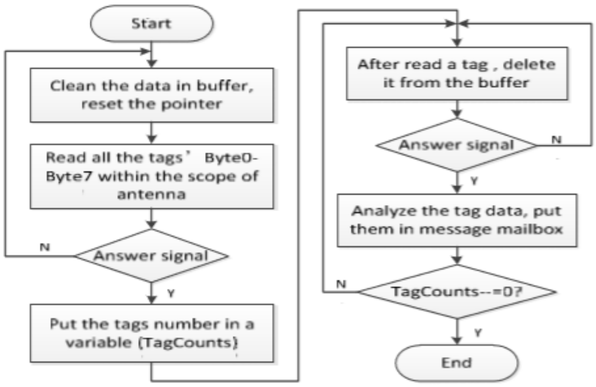

Fig 5: Reading the tag data

Extracting the location data by GPS

In this system, GPS receiver is used to positioning and tracking the fisher man boat. Considering the positioning accuracy, communication protocol, data interface and cost, the GR87 module of HOLUX Company is the perfect selection. It is a high performance, low power consumption, highly integrated GPS receiver. The format of output GPS data follows NMEA-0183 standard communication protocol set up by the NMEA (National Marine Electronics Association). This standard provides a variety format of statements. But in practical application, not all of the statements are needed. To reduce redundancy of program and data, it is necessary to simplify the positioning data. the most practical statements of $GPRMC and $GPGGA are chosen, which are consist of the vehicles dynamic coordinate location (latitude, longitude and altitude), time, speed, and other key information

Example:

$GPRMC,082643.000,A,2934.0962,N,10627.9820,E,0.00,100611,,,A*68

The module of MCU sets GPS receiver working in automatic output mode through serial port of RS232.

MCU creates a task named GPSTask to realize extraction of GPS data

The main steps are

1. Initialization GPS module through serial command;
2. Receiving the GPS data;
3. Judging format and validity of the data
4. Extraction useful information includes time, geographic information and movement data
5. Checking the data, storing necessary data in buffer

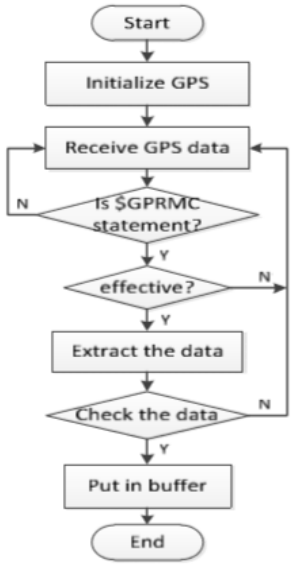

Fig 6: Extracting the location data by GPS

5. Block diagram

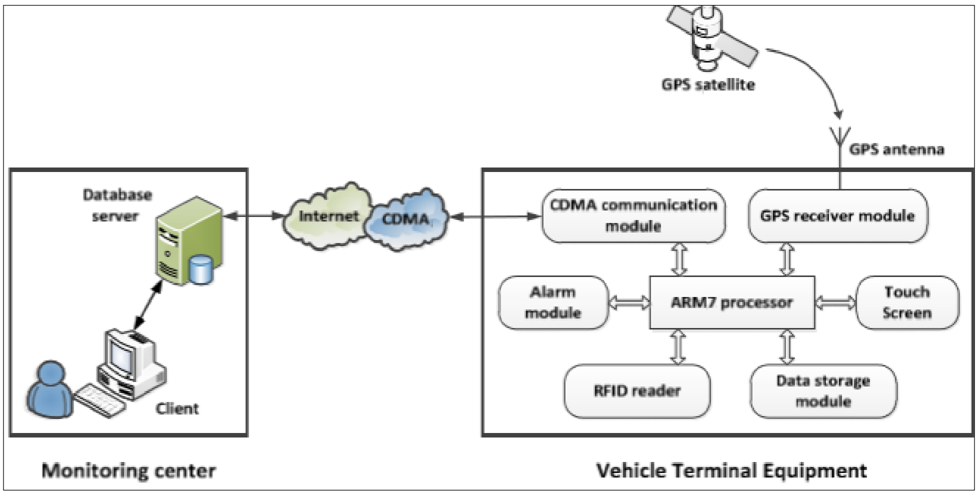

Fig 7: Block diagram of GPS tracking system

6. Conclusion

A dynamic well suited network devoted to both communication and localization of fisher boats is proposed. This solution also combines the advanced technologies as GPS technology, GIS one and it permits to extend communication range between fishing boats and the mainland. In addition, the proposed solution not only has a low implementation and recurring cost thanks to software defined radio, but also decreases interferences. However, this solution requires fishing boats in a group. More ever, in order to validate the performance of all system, routing and networking should be investigated. The combine approach of GPS and RFID has been motivated by the fact that some advanced technologies as software defined radio, GPS and GIS technologies are well known with a suitable implementation cost and it may be an opened way for fishermen choices.

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