International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 05 | May-2018 www.irjet.net p-ISSN: 2395-0072

FISHERMEN WELFARE AND SECURITY WITH UNMANNED FLOATING STATION USING RSSI AND IOT

S.Shri Vidya[1], G.Sriranjani[2], B.Sruthi[3], V.Vidhyadevi[4], Mr.P.Navaseelan[5]

[1,2,3,4] Electronics and Instrumentation, Easwari Engineering college, Ramapuram,Chennai-89
[5]Associate Professor, Electronics and Instrumentation, Easwari Engineering college, Ramapuram,Chennai-89

Abstract--*India has a coast line on three sides open to the sea. Due the vast area of coast line India is more prone to security threats. Safety, security, law, Maritime boundary violation and intrusion by fishing boats has been a huge concern in coastal countries. Hence, keeping the above problems in mind, this paper proposes a Standalone floating station which would safe guard the fishermen from the potential dangers they might face by giving them pre-warning in case of trespassing the maritime boundary. In particular, we are using voice messages to make warning. The standalone device is self powered by making use of solar cells and micro turbine. The different ranging are identified through high power RSSI technique by comparing the distance between the boats by trilateration method. Besides these issues, fishermen's also face economical challenges where the profit and loss cannot be determined. To avoid this issue, the system is designed in such a way that it helps the fishermen to predict the profit and loss and act accordingly. Thus the system also helps the fisherman to meets his economical needs and enhance his trade methodology using newer technology.*

Keywords **– load cell, RS232, IOT, RF module, ultra capcitor, screen leap ,floating station.**

1. INTRODUCTION

The prevention of fisherman from going outside the border by placing a floating module in the respective sea border, and also enhancing their trade and economy through new technology. The floating module consists of hybrid power generation section and receiver section. Hybrid Section uses both solar and wind sources for power generation. The transmitter is placed in respective boats. Each boat is having Different Frequencies i.e. Modulation Frequency. The transmitter encodes the modulation signal to the carrier signal (433.92MHz) in the receiver side. In this System when the boat is nearing the border, the module alerts the boat by a voice message. This activity is monitored by the coast guard . In the floating station weighing system (load cell) and input panel is inserted through which the fishermen can pass the information about the variety of fishes collected and their respective weights to the offshore, so the exporters can book them in advance. Thus enhance fishermen's marketing strategies from inside the sea by fixing a price and demand.

2. EXISTING SYSTEM

Presently, few systems exist to remedy this situation wherein a GPS (Global positioning System) or Radar tracking system helps in tracking the location of the boats with a human operator monitoring at a central control room and viewing them on an electronic map. This methodology helps in controlling the fishermen by monitoring their movement from the central control room. This system is fast and accurate as is the case with most GPS systems and it even determines the speed and the direction in which the boat is heading. Some methods are there for automatically control boat direction. However the problem of the GPS system is power consumption. It easily drains the battery within 12 hours. GPS may also get affected by buildings and dense of trees. The accuracy of GPS also based on multipath communication. Apart from GPS localization, there will be a lot of positioning system. Among them, RSSI is mostly used for indoor and outdoor localization because of its easy targeting and measurement. The existing method of RSSI Localization with low power is radio frequency signal. This method has less power consumption, does not get easily affected by buildings. But the problem of this method is accuracy; it has little lower accuracy than GPS. Most of the existing method only focus on localization of boat. Another existing method is the alarm system which is ineffective to determine the accurate boundary. A major drawback in the existing method is the signal tower installation in the off shore region. In the case of energy storage, there is no effective energy storage technology is employed in the existing method.

3. PROPOSED SYSTEM

This project is designed to cater the needs of marine and ship control system and fishermen welfare. The most commercial ships contains conventional, electromechanical, electromagnetic indicating control system. We would like to implement a new methodology on ship data acquiring system and control along with positioning system using RSSI. This system consist of some buttons for announcing their emergencies and it's also encourages the legal trading in the mid-sea. The new type of data acquiring system consists of one computer, PIC micro controller and

necessary with sensors and transducers. The state of art Embedded micro controller PIC 16F877A will be employed in our project to reduce electronics complicity PIC 16F877A is a versatile embedded chip prepared by Microchip Corporation. Output of the embedded controller will be fed to a RS232 connecter chip, RS232 output will be connected to a computer. Set points, graphics, animation, annunciation voice output and database, control output to turbines and other important logic algorithm will be performed by computer using visual studio software.

4. PROCESS DESCRIPTION

The functional block diagram consists of 3-units:

- Power supply unit
- Transmission unit
- Input output unit

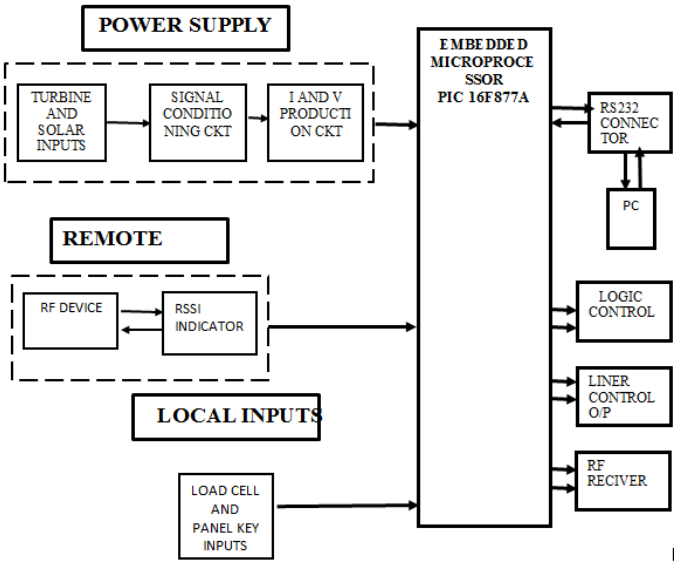

Figure 41 the functional block diagram

Power Supply Unit

Power for the floating station is generated autonomously through solar panel and wind turbine. The power from these two module is added together in hybrid slot and can be stored in ultra power capacitor for future use.

Transmission Unit

This **RF module** comprises of an **RF Transmitter** and an **RF Receiver**. The transmitter/receiver (Tx/Rx) pair operates at a frequency of **434 MHz** An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps - 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter. Using RSSI (RECEIVED SIGNAL STRENGTH INDICATOR) the strength of the received RF signal is determined.

Input/ Output unit

The input unit consists of four buttons, where each button indicates the type of issue/problem for the boat or for the fisherman. And a load cell on which the sea creature is kept and weight is measured. This arrangement is also consist of consist of four buttons each button indicates the type of creature caught in the net. The output unit is designed with the help of visual basic where the outputs are obtained virtually by interfacing the kit to the computer

5. METHODOLOGY

The whole process is explained below.

Program initialization-In this step, the input and output ports of the PIC controller are assigned.

Synchronisation of embedded system-The embedded module is synchronized with the PC by using Visual Basic software in order to provide visual output. The values that are collected may be Analog and Wireless values.

Digitising -The values that are collected is converted into digitized values by using Analog to digital convertor.

Serial conversion -The digitized values are converted into signal voltage levels by generating serial data and decoding the serial data.

RS232 conversion -It is a serial interface for communicating data by the way of transmission. RS232 is a standard communication protocol for linking computer and its peripheral devices to allow serial data exchange.

PC interface -The project model is interfaced along with PC. The changes that has to be made is done again in program initialization stage.

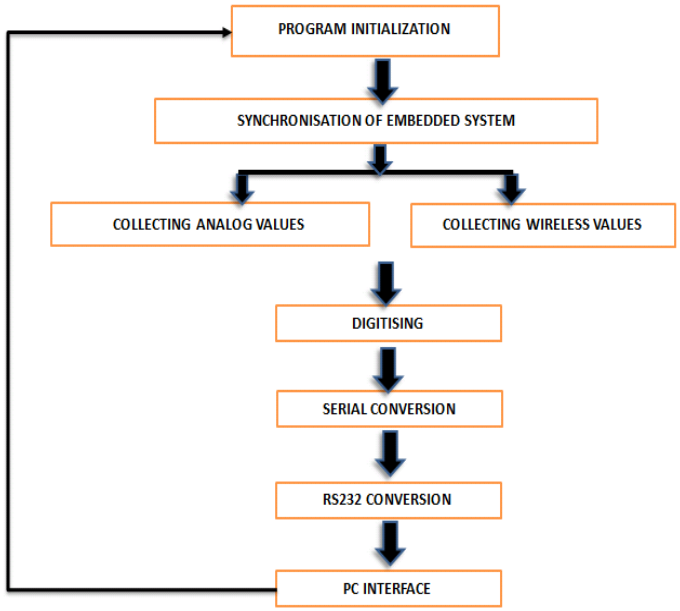

Figure 5.1 Methodology flowchart

6. HARDWARE DESCRIPTION

The hardware description is used to describe the behavior and the structure of electronic circuits. It includes the models or prototype which is used in the project. The following are the components which describes the hardware description part.

6.1 Transformers

Instrument transformers are used in the measurement and control of alternating current circuits. Direct measurement of high voltage or heavy currents involves large and expensive instruments, relays and other circuit components of many designs. The use of instrument transformers, however, makes it possible to use relatively small and inexpensive instruments and control devices of standardized designs. Instrument transformers also protect the operator, the measuring devices and the control equipment from the dangers of high voltage the use of instrument transformers results in increased safety, accuracy and convenience. There are two distinct classes of instrument transformers:

1. Potential transformer

2. Current transformer

6.2 Solar Panel

Bank of solar cell is known as solar panel. Solar panel works by allowing photons, or particles of light, to knock electrons free from atoms, generating a flow of electricity. Solar panels actually comprise many, smaller units called photovoltaic cells. (photovoltaic simply means they convert sunlight into electricity.) Many cells linked together make up a solar panel. Each photovoltaic cell is basically a sandwich made up of two slices of semi-conducting material, usually silicon — the same stuff used in microelectronics.

6.3 Turbine

Synchronous motors is called so because the speed of the rotor of this motor is same as the rotating magnetic field. It is a fixed speed motor because it has only one speed, which is synchronous speed, or in other words, it is in synchronism

with the supply frequency. Synchronous speed is given by

$$N_s = \frac{120f}{p}$$

Where,

f= supply frequency and p = no. of poles.

Usually, its construction is almost similar to that of a 3 phase induction motor, except the fact that here we supply DC to the rotor, the reason of which we shall explain later. Now, let us first go through the basic construction of this type of motor. From the above picture, it is clear that how do we design this type of machine. We apply three phase supply to the stator and DC supply to the rotor.

6.4 Load Cell

A load cell is a sensor or a transducer that converts a load or force acting on it into an electronic signal. This electronic signal can be a voltage change, current change or frequency change depending on the type of load cell and circuitry used. There are many different kinds of load cells. We offer resistive load cells and capacitive load cells.

6.5 Ultra capacitors

Ultracapacitors are some of the best devices around for delivering a quick surge of power. Because an ultracapacitor stores energy in an electric field, rather than in a chemical reaction, it can survive hundreds of thousands more charge and discharge cycles than a battery can. Ultra capacitors have two metal plates, but they are coated with a sponge-like, porous material known as activated carbon. And they're immersed in an electrolyte made of positive and negative ions dissolved in a solvent. One carbon-coated plate, or electrode, is positive, and the other is negative. During charging, ions from the electrolyte accumulate on the surface of each carbon-coated plate.

6.6 RF Devices

This **RF module** comprises of an **RF Transmitter** and an **RF Receiver**. The transmitter/receiver (Tx/Rx) pair operates at a frequency of **434 MHz** An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps - 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter. The RF module is often used along with a pair of encoder/decoder. The encoder is used for encoding parallel data for transmission feed while reception is decoded by a decoder. HT12E-HT12D, HT640-HT648, etc. are some commonly used encoder/decoder pair ICs.

6.7 RS232

RS - 232 Converter is used for PC application. The serial port converts the output of PC, which is in parallel form into serial data for transmission. The external converter Quadruples the incoming 5V (from PIC) and gives 20 V output. i.e -10V to +10V. Similarly the incoming 20 V from (from PC) is reduced as 5V by the converter.

RS-232 Communication System Types

There are three ways that the data can be sent in Serial Communication System. They are

1. Simplex
2. Half duplex
3. Full duplex

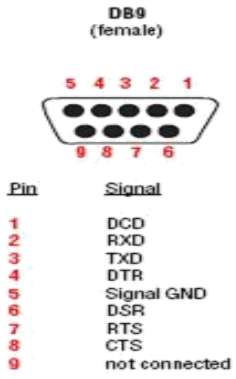

Figure 6.1 RS232 PIN OUT

7. PIC Controller

Peripheral Interface Controller (PIC) is enhanced version of microcontrollers. It is an embedded controller. PIC microcontroller contains several families. They are classified as three categories.

1. Low End Family: It has 33 instructions. For example, PIC 12XXX.
2. Mid Range Family: It has 35 instructions. For example, PIC 16XXX .
3. High End Family: It has 77 instructions. For example, PIC 17XXX and PIC 18XXX.

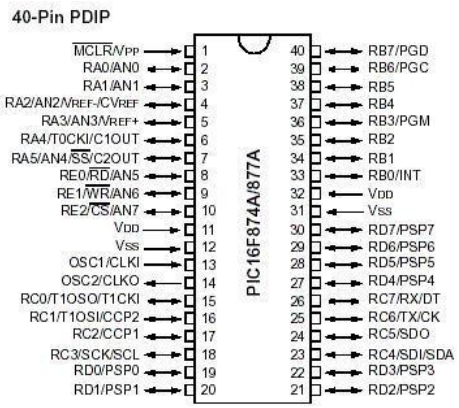

Figure 6. pin diagram of PIC16F877

Figure 6.2 Hardware Module

8. SOFTWARE DESCRIPTION

Each project is verified by the output. In this project the output is verified based on the software which is been used. The software which is used in this project is Visual basic. By using this visual basic software the output can be visually demonstrated.

Visual Basic

Visual Basic (VB) is a programming environment from Microsoft in which a programmer uses a graphical user interface (GUI) to choose and modify preselected sections of code written in the BASIC programming language

A. IOT (Internet Of Things)

Internet of Things (IoT) is an ecosystem of connected physical objects that are accessible through the internet. The 'thing' in IoT could be a person with a heart monitor or an automobile with built-in-sensors, i.e. objects that have been assigned an IP address and have the ability to collect and transfer data over a network without manual assistance or intervention. The embedded technology in the objects helps them to interact with internal states or the external environment, which in turn affects the decisions taken.

B. Screenleap

Screen leap is a screen sharing tool that allows you to quickly share your screen in seconds .Screen leap is the easiest way to share your screen with anyone. A unique share code is created each time you start sharing your screen. A user with the share code will be able to view your screen by either a) going to the Screen leap site or entering the share code or b) by clicking on a link containing the share code.

9. RESULTS AND OUTCOMES

The tracking of the boat near the maritime boundary using RSSI value is shown in the Table 8.1.The local inputs such as type and weight of the aquatic creature got by the fishermen and alert message from fishermen is shown in Table 8.2 . The power generation obtained from solar panel and hydro turbine is shown Table 8.3.

REGION	RSSI(dbm)	MESSAGE
1(far from the border)	1023 to 900	no alert
2(close to the border)	900to -700	nearing danger (voice)
3(in the border)	700 to -500	Danger (both voice and visual)
4(crossed the border)	<500	continuous alert

Table 9.1 Tracking output

1	**SWITCHES**	1. health hazard	2. emergency	3. vessel hazard	4. tracking
2	**WEIGHT**	9 kg	5 kg	2 kg	7 kg
3	**TYPE OF FISH**	prawn	Fish	crab	Lobster

Table 9.2 Local inputs

Table 9.3 Power sources outputs

1	**SOLAR VOLTAGE**	23 V
2	**WIND VOLTAGE**	15 V
3	**CURRENT SIGNAL**	94 mA
4	**NET VOLTAGE**	38 V
5	**TOTAL POWER**	35.2 Wh

9.1 Virtual display

figure 9.1 The type and weight of the aquatic creature got by the fishermen data is passed to the base station

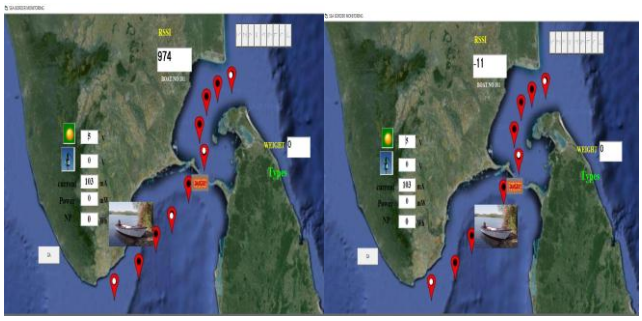

Figure 9.2 The tracking of the boat near the maritime boundary using RSSI value and voice note

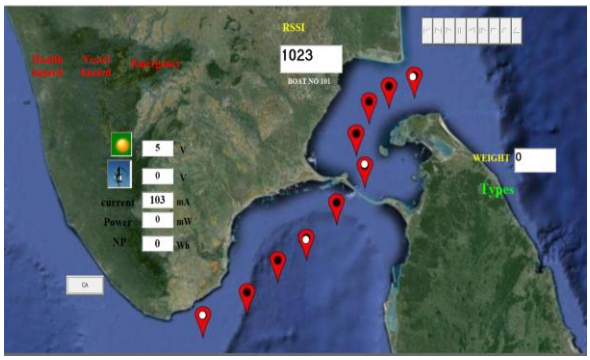

Figure 9.3 The alert messages and voice note

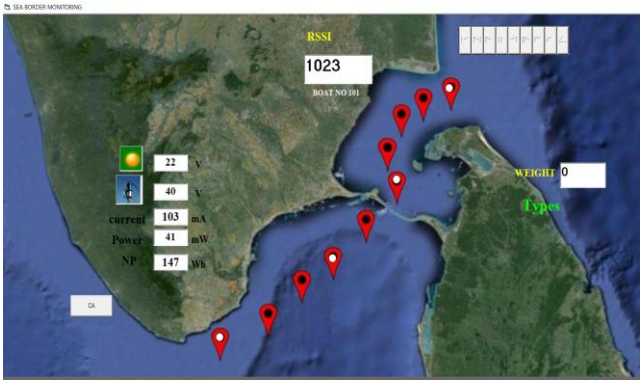

Figure 9.4 The energy and total power obtained from solar panel and hydro turbine

10. CONCLUSION

The project aims to save the lives of fisherman who sometimes cross the borderline without consent and also improve the overall coastal boundary security of the country. It incorporates the module for effective communication of the location to the coastguard by the means of an unmanned floating station which generates autonomously. The station is also provided with a self-powered device which provides constant power supply to the floating station. The module also proposes to improve the fishing marketing strategy from sea itself.

11. FUTURE WORK

Firstly, in order to provide basic support to the floating station, Nitrogen mates will be installed, above which the floating station will be mounted. In case of power failure, ie. Both the solar power and the wind power is lower, ultra capacitors can be used by connecting them in series which gives constant power storage. The standards for fire and water proofs can be implemented for the transmitters which are attached in the boat in case of emergency situations because tracking can be done using a separate carrier frequency through which the base station can identify the exact location of the boat.

An advanced image processing technique can be implemented through which the exporters can collect the exact information of the fishes that they have collected. Simply, the exporters may get a visual proof of their collection. For demonstration purpose, we have used load cell for measuring the quantity of fishes. But in real time, a volumetric analyzers can be implemented for weighing the quantity of fishes in larger amount.

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