A Novel Approach to Surface Refraction Effects on GPS Radio Occultation Refractivity in Marine Boundary Layer

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Abstract: - GPS radio occultation has proved to be a powerful tool for remotely sensing the Earth's neutral atmosphere and ionosphere. In this letter, we propose a novel approach to retrieving marine troposphere profiles based on single ground-based GPS occultation observations. A new retrieval method uses the data from a ground based receiver while the GPS satellites rise or set at the local horizon in the direction of the ocean. The GPS L1 amplitude signals with negative elevation angles are used to retrieve the atmospheric refractivity by artificial neutral networks. The subsequent experiment was carried out on the coast of the Yellow Sea from August 2010 to July 2011. It is shown that the inversion profiles are very consistent with the radiosonde observations. The new method outperforms the Hopfield model, particularly at 0.5–5-km altitude. These results validate the feasibility of retrieving the lower marine atmospheric refractivity from GPS data collected by a single ground-based receiver near the sea surface.

Keywords- GPS, Neutral Network, Occultation, Refractivity

I. INTRODUCTION

The main aim of our project is to identify the zone. Here we are using the Zigbee technology for controlling. By this project we can able to maintain the zone level. . By using ultrasonic sensor we detect the iceberg in the sea while travelling in boat or ship. As well as, to find the prediction of tsunami here we are using vibration sensor. If he cross the limitation of border its gives voice message, even though if they tried to move forward then automatically motor of the ship/boat will stop .In the problematic time, from the control room they can trace out the ship/boat which one is cross the border & in dangerous for the rescue, and also there is one emergency switch available on the boat side that will inform about the route to home.

A Zigbee transmitter is used to transmit these data from the transmitter side. The Zigbee receiver receives the transmitted parameters and monitored through display unit. In this transmitter is Master and it will be in constant place. While the receiver enters into particular limit it automatically receives the data from transmitter and displayed [1].

In this project a portable device will be made, which uses GPS for real time location detection and uses Zigbee for wireless communication. The device also has a small LCD display and a button which acts as a multipurpose signaling switch. Each of the fishing boats is provided with this portable device. Using the Zigbee transceivers on each of the units, all the boats can form an AD Hoc network within themselves [2].

Once this AD Hoc network is established, then the following applications will become possible
.

- Lack of communication between shipping boat.
- Inability to identify the border.
- Fishermen suffering in emergency cases.
- Could not carry heavy antenna in small fishing boat.

In this work, we propose a wireless network, which provides an efficient positioning service and restores the lost sea-to-land link from small fishing boats to central base stations. The proposed networks combine global positioning system (GPS) and wireless sensor network communication system. The proposed concept approach provides continuous reporting and monitoring of all boats and its exact locations for search and rescue process during emergency situation [3].

II. EXISTING SYSTEM

At present, there are few existing systems which help to identify the current position of the boats/ships using GPS system and view them in an electronic map. GPS provides the fastest and most accurate method for mariners to navigate, measure speed, and determine location. This enables increased levels of safety and efficiency for mariners worldwide and accurate position, speed and heading are needed to ensure the vessel reach its destination safely. The accurate position information becomes even more critical as the vessel departs from or arrives in port.

III. PROPOSED SYSTEM

The proposed system is used to detect the maritime boundary of the country where the long time dispute between Sri Lanka and India still exists. This mainly happens when fisherman crosses maritime border of neighboring country as he is not aware of the limits in sea. The proposed system uses a GPS receiver which receives signals from the satellite and gives the current position of the boat. With already known details of the latitude and longitude of the maritime boundary, the microcontroller calculates the current position and stored boundary positions and indicates the fisherman that he has crossed the boundary by an alarm system. It also uses a message transmitter to send message to the base station which monitors the boats in the sea. Our system provides an indication to both fisherman and to coastal guard. Thus the system saves the lives of the fisherman or reduces the damages caused to them by Lankan coast guards.

IV. BLOCK DIAGRAM

1. Transmitter Section:

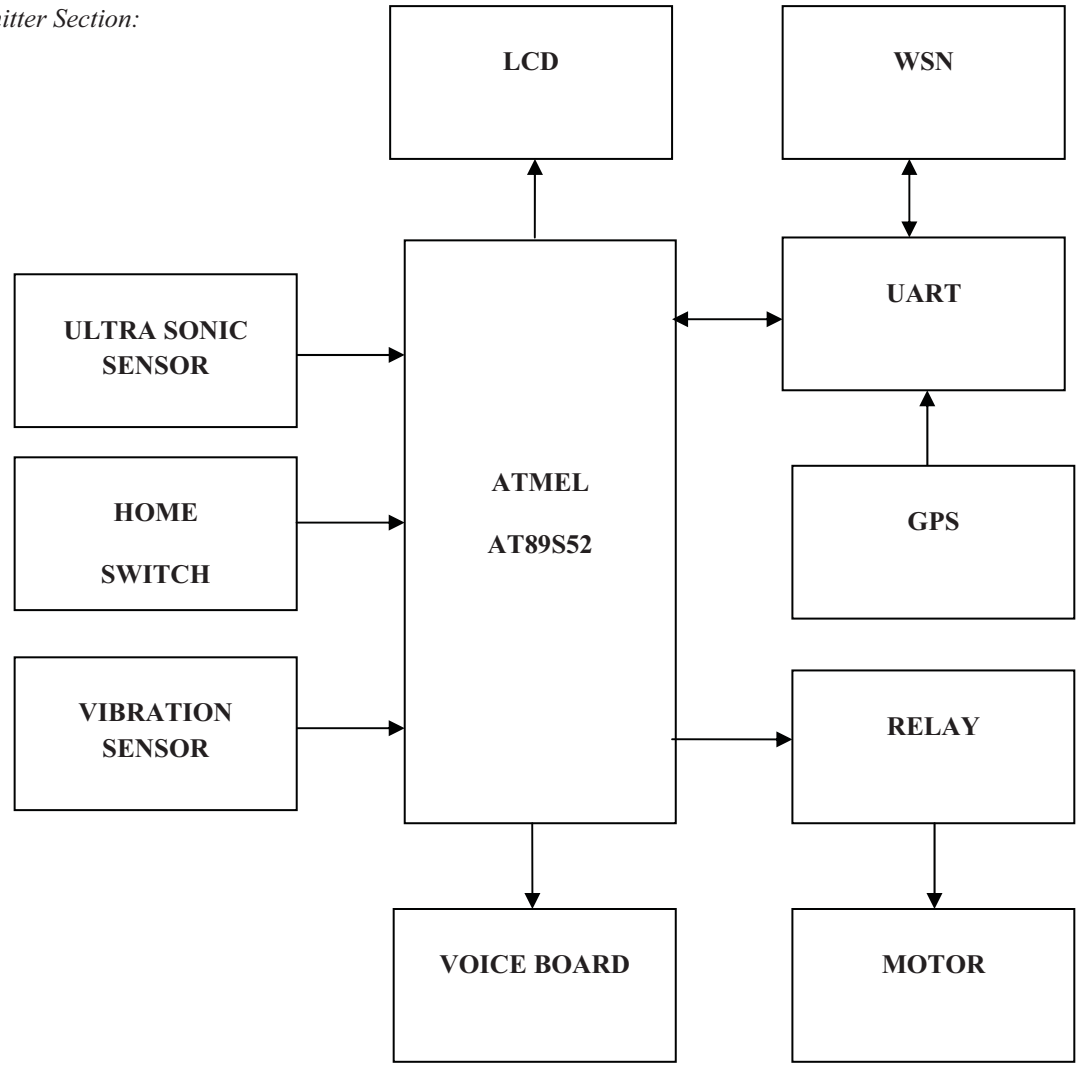

Fig.1 Block Diagram of Transmitter Section

2. Receiver Section:

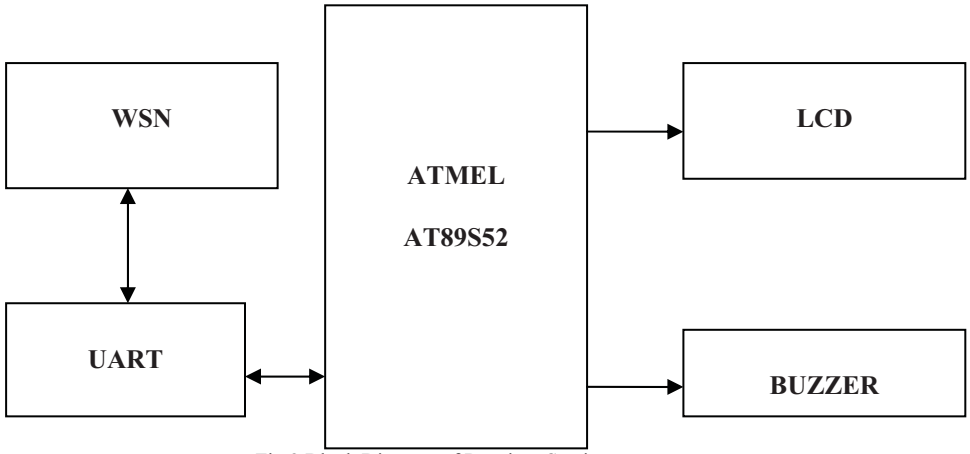

Fig.2 Block Diagram of Receiver Section

A. Vibration Sensor:

A piezoelectric sensor is a device that uses the piezoelectric effect to measure pressure, acceleration, strain or force by converting them to an electrical signal. It has been successfully used in various applications, such as in medical, aerospace, nuclear instrumentation, and as a pressure sensor in the touch pads of mobile phones. In the automotive industry, piezoelectric elements are used to monitor combustion when developing internal combustion engines.

Fig 3: Vibration Sensor

B. Ultrasonic Sensor:

Ultrasonic sensors (also known as transceivers when they both send and receive) work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. This technology can be used for measuring wind speed and direction (anemometer), fullness of a tank and speed through air or water. For measuring speed or direction a device uses multiple detectors and calculates the speed from the relative distances to particulates in the air or water. To measure the amount of liquid in a tank, the sensor measures the distance to the surface of the fluid. Further applications include: humidifiers, sonar, medical ultrasonography, burglar alarms and non-destructive testing.

Fig 4: Ultrasonic Sensor

C. GPS:

The **Global Positioning System** (GPS) is a U.S. space-based global navigation satellite system. It provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth. A GPS receiver calculates its position by precisely timing the signals sent by the GPS satellites high above the Earth. Each satellite continually transmits messages which include [4].

- The time the message was sent
- Precise orbital information (the ephemeris)
- The general system health and rough orbits of all GPS satellites (the almanac).

The receiver measures the transit time of each message and computes the distance to each satellite. Geometric trilateration is used to combine these distances with the satellites' locations to obtain the position of the receiver. This position is then displayed, perhaps with a moving map display or latitude and longitude; elevation information may be included. Many GPS units also show derived information such as direction and speed, calculated from position changes [5].

D. Voice Board:

The APR9600 experimental board is an assembled PCB board consisting of an APR9600 IC, an electrets microphone, support components and necessary switches to allow users to explore all functions of the APR9600 chip. The oscillation resistor is chosen so that the total recording period is 60 seconds with a sampling rate of 4.2 kHz. Single-chip, high-quality voice recording & playback solution. No external ICs required, Minimum external components, Non-volatile Flash memory technology, No battery backup required,.

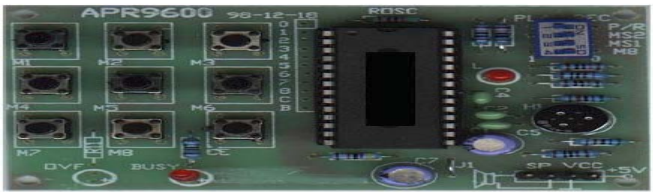

Fig 5: Voice Board

Features:

- Single-chip, high-quality voice recording & playback solution
  - No external ICs required
  - Minimum external components
- Non-volatile Flash memory technology
  - No battery backup required
- User-Selectable messaging options
  - Random access of multiple fixed-duration messages
- Low power consumption
  - Operating current: 25 mA typical
  - Standby current: 1 uA typical
  - Automatic power-down
- Chip Enable pin for simple message expansion.

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the Indus-try-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52

is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM con-tents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

The main purpose of using the microcontroller in our project is because high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

Serial communication in this program, the various special function registers of the microcontroller are set such that they can send and receive data from the PC. This program uses the serial library to communicate with the port.

V. RESULTS AND DISCUSSIONS

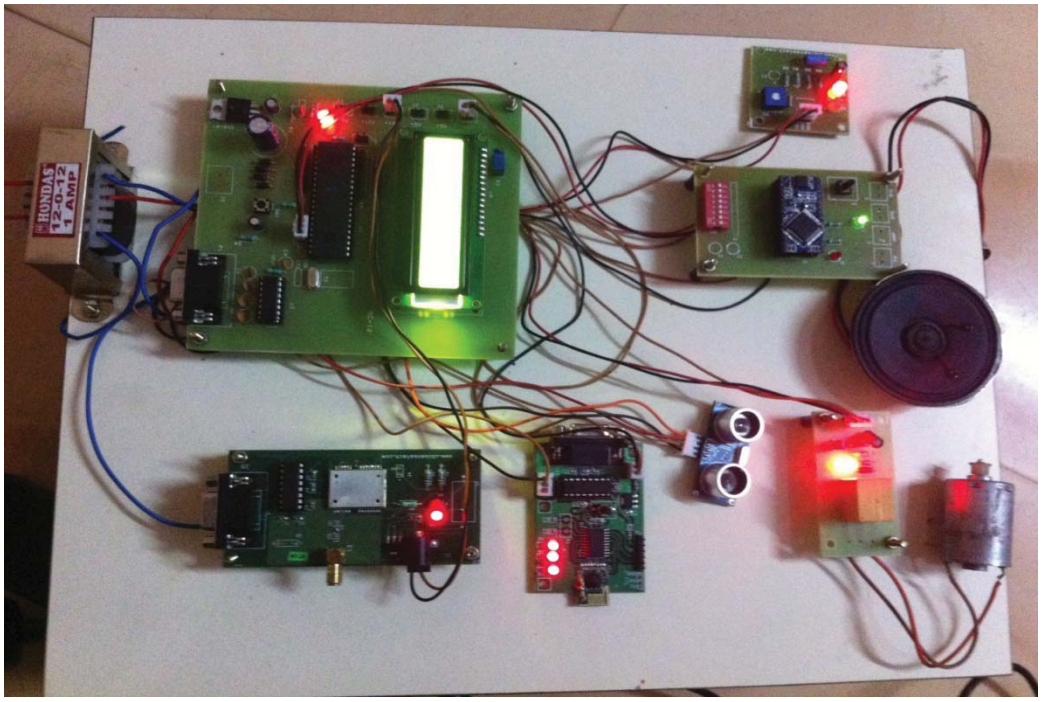

Fig 6: Kit Output of Transmitter Section

Fig 7: Display of Obstacle Detection

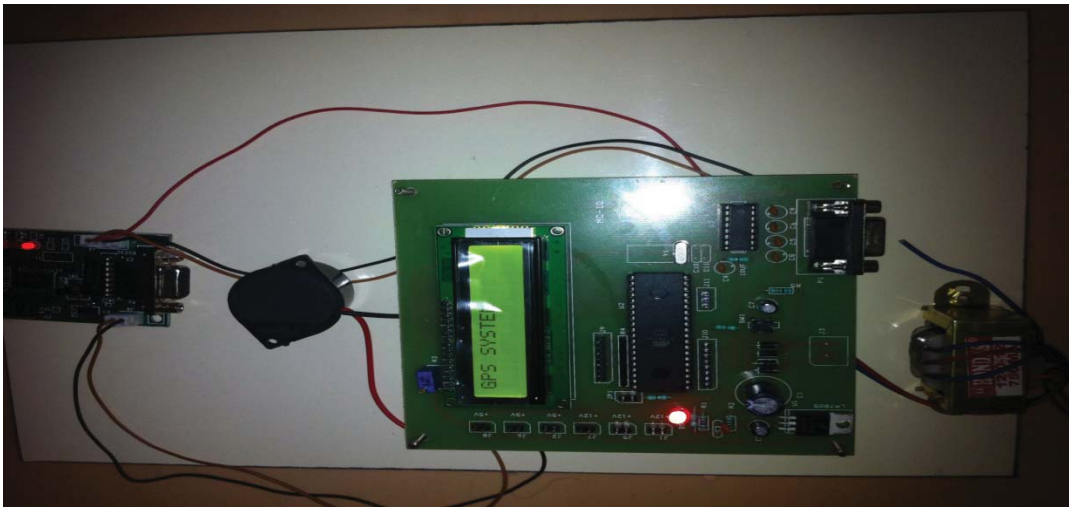

Fig 8: Kit Output of Receiver Section

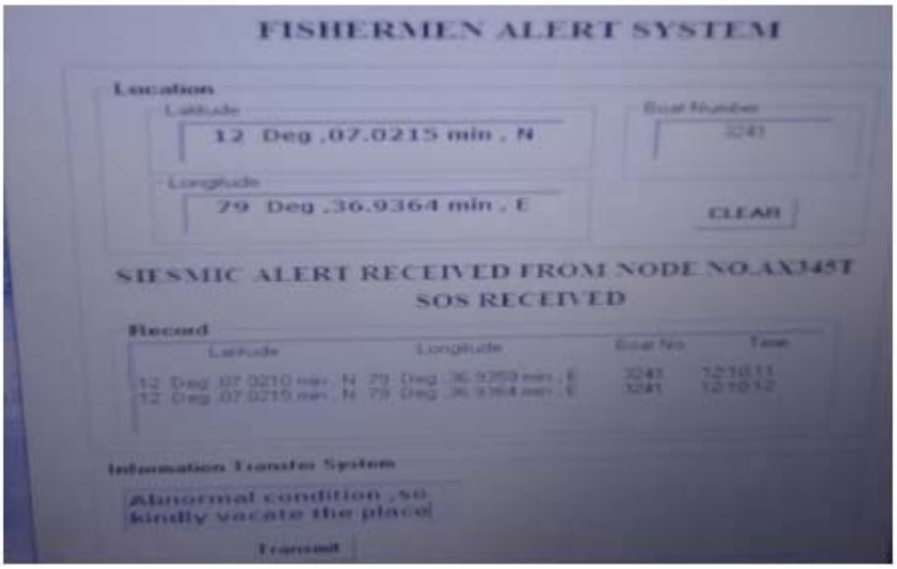

Fig 9: Output of Seismic Sensor or Vibration Sensor

As shown in fig.6, 7 gives the information about Ultrasonic sensor helps to detect boat while crossing the boundary. This mainly happens when fisherman crosses maritime border of neighboring country as he is not aware of the limits in sea. The system uses a GPS receiver which receives signals from the satellite and gives the current position of the boat. With already known details of the latitude and longitude of the maritime boundary, the microcontroller calculates the current position and stored boundary positions and indicates the fisherman that he has crossed the boundary by an alarm system. It also uses a message transmitter to send message to the base station which monitors the boats in the sea. Once the boat crossed first line border the message will receive as not to cross the limit. If there crossed the second line using relay we can stop the motor of the boat. Our system provides an indication to both fisherman and to coastal guard.

Whereas in fig.9 gives the information about vibration sensor help to detect boat location and boat number and also help to give alert system for fishermen in versatile navigational aid, Weather updates, Emergency reporting on a boat.

VI. CONCLUSION

Using this project we protect the fishermen from daily facing problem. In future we have plan to adopt fish tracking system by fixing RFID active tag in to the fish for identify maximum fish location so that the fishermen get benefited.

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