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Coastal Monitoring with Self Helping System for Fishermen

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Abstract— In the present context, fishing is one of the professional activities most prone to labour accidents. Averages of 24000 fishermen lose their life every year. But by taking precautions, this can be made easy for the fishermen, depending on the navigation and on weather conditions. Thus by monitoring the atmospheric conditions in the fishing area, providing the required information about the obstacles that the boat tends to collide with and guiding the fishermen to row the boat in the actual path of fishing, this project is expected to achieve its objective of protecting the lives of the fishermen.

Keywords—Collision sensor; Global Positioning System; RADAR;Tracking;

I. Introduction

Fishing has existed as a means of obtaining food from the Mesolithic period. During the time of the Ancient Egyptians, fishermen provided the majority of food for Egyptians. Fishing had become a major means of survival as well as a business venture. This project is to safeguard the lives of the fishermen when they are in sea area.
Wind speed is affected by many factors and situations, operating on scales that vary from micro to macro units. These include the pressure gradient, Rossby waves, jet streams and other local weather conditions. There are links to be found between wind speed and wind direction, notably with the pressure gradient and surfaces over which the air is found. These wind speeds cause high damage to the boats which can cause harm to the fishermen.
Waves are generated by forces that cause disturbances in the body of water. They can result from a wide range of forces such as the gravitational pull of the sun and the moon, underwater earthquakes and landslides. In the outer atmosphere of the ocean, air molecules push against the water and this leads to a friction between the air and water. This friction between the air, water and tries to push the ridges or ripples up, on the ocean surface. As a result of this the pressure on the sea increases, which eventually grows into waves that may reach many meters in height.
Boat wrecking is the event that causes the wreck, such as the striking of something that causes the boat to sink, the stranding of the boats on rocks, land or shoal, poor maintenance, or the destruction of the boat at sea by violent weather. Boats navigation errors and other human errors lead to collisions with rocks. Bad weather and powerful or large waves often leads to capsizing, which is also referred to as foundering.

Figure1: Boat capsized due to bad weather conditions.

Boats are usually considered to be lost and assumed wrecked after a period of disappearance. Without any evidences or survivors, mysteries surrounding the fate of missing boats have inspired many nautical lores and creation of paranormal zones such as the Bermuda Triangle. In many cases a very common cause has been deduced, like a known storm or warfare, but it could not be confirmed without evidences or sufficient documentation. Many such disappearances occurred before wireless telegraphy was available in navigation applications, which would have allowed the crew to send a distress call. Sudden disasters such as collision, rogue waves or piracy also prevent a crew from sending a distress call and reporting a location. Advancements in radar technology and global positioning system make it more likely that a distresses boat can be located.

II. Existing System

The current technology provides a discrete combination of systems that serve to measure the atmospheric conditions in the fishing area of the sea and to keep a track of the boats in order to make sure they do not lose their path of fishing.

M.Surekha *et al.* proposed a novel concept to safeguard the uneducated fishermen crossing the border and to guide them to

safety. PS system is used for tracking. The latitudes and longitudes of the boat is observed and if it is detected that the boat is crossing border, information is transmitted using wireless mode to control system. Zigbee technology is used for communication between control system and fishing boat. Microcontroller displays the latitude and longitude position received by GPS receiver on LCD display.
Lacks accuracy in terms of range since a short range communication mode such as Zigbee technology is used. No notification given for under water obstacles and for high level tides. No alternative is provided if the system fails to correspond in real time.[1]

Ansari *et al*. presented a novel simple algorithm based on ultrasonic sensors and simple calculations for real-time obstacle detection and avoidance. It is designed to implement in air and this can be adapted to underwater environments where deep sea maintenance and reconnaissance tasks are applications using Sonar. The designed robot is called Autonomous Sonar based vehicle (ASVR).Ultrasonic transducer is used to gather information about surroundings. It is interfaced with microcontroller for logic reasoning. A novel iterative algorithm was developed in C language to determine the position of obstacles in real time and Robot's mobility will convey as to how it will go about avoiding the obstruction. For mobility purpose of the Robot gear headed Dc motor and Stepper motor are used. ASVR can efficiently avoid obstacles which comes in its path using trigger signals to detect their presence. The Robot is capable of finding the optimum path through the gap between obstacles.[2]

Chintan Kaur *et al*. developed a GPS module based RF Transceiver for fishermen boats. The system operates at 433 MHz with high gain microstrip antenna and low power transceiver IC from Texas Instruments to achieve a larger range. The transceiver can communicate successfully up to 50m on quick testing which can further be increased upto few kilometres with the help of power amplifier. Improvement needed in terms of range and also to reduce much more noise within control room although it uses LNA at the receiver end.[3]

Ken Teo *et al*. designed an obstacle detection, obstacle avoidance and anti-collision system using a commercial off-the-shelf (COTS) multi-beam forward looking sonar. The system is an underwater vehicle that can navigate around obstacles that arise in its programmed path. From the sonar image, the potential obstacles are correctly picked up. To confirm the presence of obstacles a real time multi frame filter is used. The system effectively performs real time path planning. However ability to identify unknown obstacles and noise is a serious concern and is extremely challenging. To address this challenge, image processing technique is used in which the confirmed obstacles are put in a 2D grid map which serves as workspace.[4]

Mustafa Yilmaz *et al*. has developed a system that uses Broadband Vibrating Quartz Pressure Sensors for Tsunameter and other Oceanographic applications. But the most prominent one which is relating to public safety is tsunami detection network developed and installed by NOAA's Pacific Marine Environmental Laboratory. The bottom pressure recorder includes a Dig quartz Depth sensor, a computer and an acoustic transducer to communicate with the surface buoy. This constitutes the main sensing element which monitors pressure continuously and if the pressure reading changes above a set threshold, then the Tsunameter automatically transmits data to a surface buoy and this buoy makes a satellite connection to warning centres which can further issue tsunami warning. The performance and quality of these sensors are vital for this system to see continuous success of Tsunameter network.[5]

Michael Armatys *et al*. came up with a new approach named GPS-based wind retrieval to determination of wind direction as well as wind speed, based on measurements from two or more reflected GPS signals. Estimates of wind speed and direction of ocean surface are compared to Quick SCAT wind fields. These fields provide highly accurate measurements and provides clear picture of ocean surface conditions. For retrieval of wind, backscatter measurements at Ku-band are sensitive abrupt changes in the surface conditions. Slope statistics are first determined in the model which best ft the data then the wind vectors from the GPS observations are executed. In the second step direction estimate from the slopes and retrieval of wind speed are done using an ocean model. Two satellites with high elevation angles are used for this purpose to insure that the angle dependent slop statistics are nearly the same for both satellites. For contributing to our understanding of global ocean surface conditions, the use of GPS for wind retrievals is an emerging technology.[6]

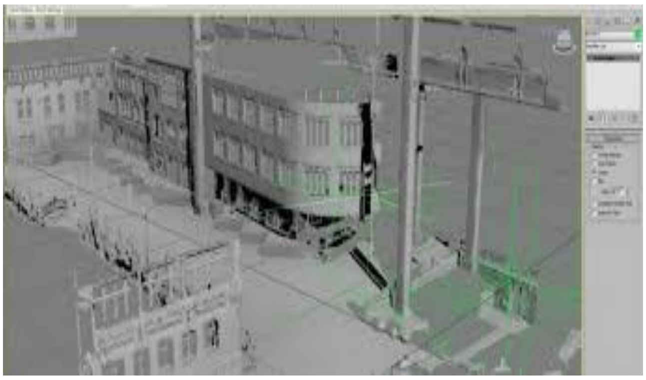

Figure3: Lidar Image

A new maritime navigation system based on a laser range-finder scanner for obstacle avoidance and precise maneuvering operations. The main novelty of this work is the adaptation and implementation of known technology for laser range finding and algorithms for target tracking into a system that operates in real time and has been tested in different natural sea and inland navigation scenarios. The principal components of this system, namely, 1) the laser range finder, 2) the scanning unit, and 3) the data processing and displaying unit. Lidar sensors are used in this real time system, which gives a Lidar image and robust Kalman filtering techniques for continuous tracking of each detected observation as shown in Fig(3) and fig(4). Bridge height estimation is precise.

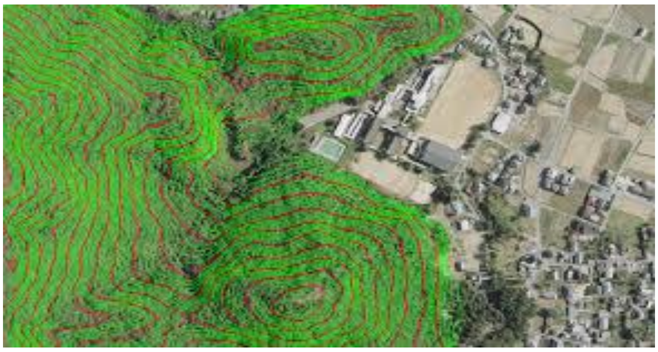

Figure4: Kalman filtered Image

III. Proposed System

This integrated system creates a new revolution in tracking and locating lost boats. It monitors the weather and provides accurate measurements on the speed of wind and the pressure of the tides intimating fishermen to reach the base, when it is dangerous. It also indicates the obstacles inside the sea such as icebergs that may lead to disastrous events.

IV. System Overview

i. The base station unit

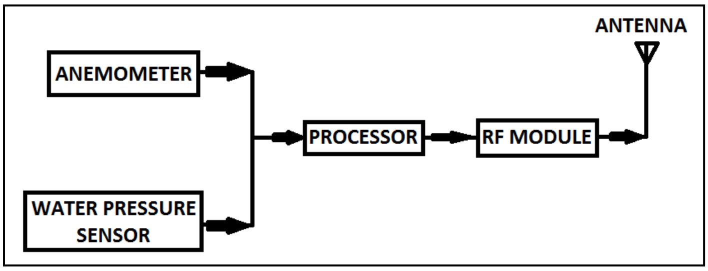

Figure5: Sea Unit Block Diagram

The base station monitors the movement of the boat and is also responsible for guiding the boat, back on the right path. Once it detects that the path is lost, it immediately alerts the fishermen on `GSM, keypad, RF module and display unit.

ii. The Sea unit

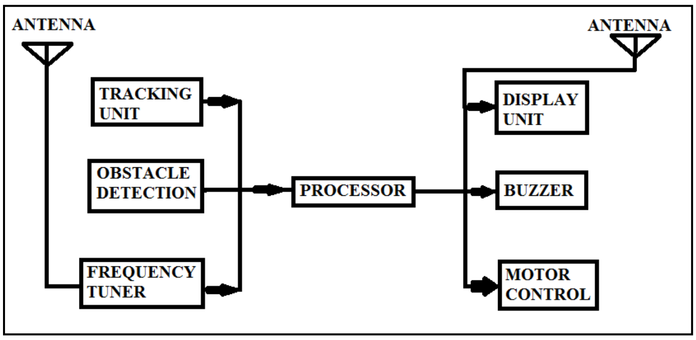

Figure6: Boat Unit Block Diagram

This unit consists of an activator which activates the circuit on detecting a collision. It activates the RF module which in turn sends out random RF signals in all directions. This unit forms the major part, as accuracy is in great demand for operations to happen without errors.

iii. The Boat unit

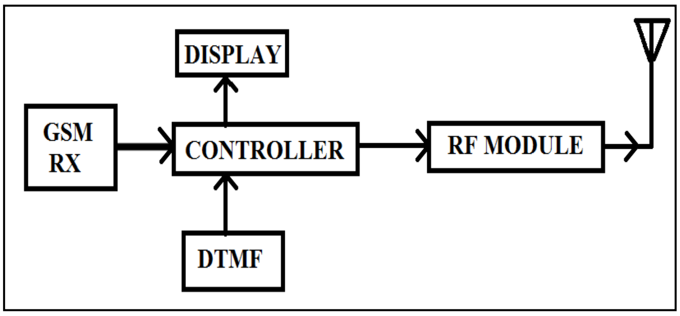

Figure7: Base Station Unit Block Diagram

The Boat unit receives alert information from both base station as well as sea unit. It consists of all the indication units such as LCD, LED and buzzers which helps fishermen to follow safe routes for fishing where the sea bed is friendly. This unit also includes an obstacle detector to detect obstacles under the sea.

V. Working Of The System

[i] In the sea unit, the anemometer measures the speed of the wind in that locality and the water pressure sensor measures the pressure of the tides.

[ii] These measured information is then passed on to the processor, which, when reaches the threshold value sends a caution signal, that is to be broadcasted through the RF transmitter.

[iii] In the boat unit, the frequency tuner is set to a particular frequency, so as to receive the signal broadcasted by the floating unit.

[iv] The boat unit consists of the tracking unit, which locates the boat, based on its latitude and longitude. Also, this unit consists of an obstacle detector, which inspects the abstract under the sea.

[v] The tracked information is sent to the processing unit, for it to be processed and for further transmission. The signal from obstacle detector is also sent to the processing unit, whose output intimates the boatmen if there are any obstacles under sea that can cause damage to the boat.

[vi] Based on the signal from obstacle detector, the processor sends signals that deviates the boat automatically to a location in sea, which is safe from obstacles, using the automated motor control.

[vii] In the base station unit, the GSM receives the signal from the boat unit that gives the tracked information about the location of the boat.

[viii] Based on the tracked information the display unit displays the exact location of the boat. By continuously monitoring the location of the boat, immediate commands can be given to the boatmen to change their route of travel, if they are in a path that is prone to danger and this signal is again broadcasted for the boat unit to receive.

VI. Results

The concepts discussed in the paper were successfully implemented and developed into a working prototype.
The sea unit measures the atmospheric conditions and informs to the boat unit which has protection against the obstacles. The boat is continuously monitored and intimations are successfully provided to the boatmen id deviated from the actual path.

VII. Conclusion

We conclude that we were able to successfully implement the proposed system. The results were meeting the expectations. The traditional discrete units for tracking lost ships, detecting objects and to monitor weather, can be replaced by this new integrated system which would have an edge over the former system in terms of accuracy and speed. It also provides overall information about boat safety simultaneously to the fishermen. The integrated system can perform in real time and no delays or glitches would hinder the performance. Thus implementation of this system would be a great help to save lives of fishermen.

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