LABVIEW BASED SHIP INTRUSION DETECTION METHOD.

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Abstract - Vigilance is a serious problem for harbor protection, border control or the security of commercial facilities. The effective protection of vast near-coast sea surfaces and busy harbor areas from intrusions of unauthorized marine vessels, such as pirates, smugglers, illegal fishermen is particularly challenging. The main aim is to detect the ship, which cross over the border or secured industries using ultrasonic sensor ,axis sensor and halleffect sensor. These sensors are placed on grid for every 20km apart when the intrusion is passed away the sensor, it senses the obstacle and measures the intruder angle,distance and magnitude of ships. This will be displayed in the form of graphical representation in LabVIEW (Laboratory Virtual Instrumentation Engineers Workbench). An alert message will be sending to control room using GSM (Global System for Mobile communication).

Keywords-Wireless Sensor Networks (WSN), ultrasonic sensor,accelerometer sensor,halleffect sensor, LabVIEW, PIC Microcontroller, Global System for Mobile communication (GSM),zigbee etc.

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Introduction Surveillance is a critical problem for harbour protection, border control or the security of commercial facilities. The effective protection of vast near-coast sea surfaces and busy harbour areas from intrusions of unauthorized marine vessels, such as pirates, smugglers, illegal fishermen is particularly challenging. The main aim is to detect the ship, which cross over the border or secured industries using ultrasonic sensor and axis sensor, hall effect sensor. These sensors are placed on grid for every 20km apart when the intrusion is passed away the sensor , it senses the obstacle and measures the intruder angle and distance and magnitude of ship. This will be displayed in the form of graphical representation in LabVIEW (Laboratory Virtual Instrumentation Engineers Workbench). An alert message will be sending to control room using GSM (Global System for Mobile communication).

Equipped with ultrasonic sensors,accelerometer sensor,hall effect sensor are deploy an experimental WSN (Wireless Sensor Networks) on the sea's surface to detect ships. This will be intimated to the microcontroller by emitting digital signal from the sensors. . These digital signals will be formed as a packet consisting of date, time and node id will be sent to the server node using Zigbee. The server will receive this signal using Zigbee in the receiving side and it will be displayed in LabVIEW software. An alert message will be sent to control room using GSM. The conducted evaluations with real data collected in our initial experiments, and provide quantitative analysis of the detection system, such as the successful detection ratio, detection latency, and an estimation of an intruding vessel's velocity

Literature Survey:

R.M. Madhumathi and Dr. A.Jagadeesan,

One of the most common active sensors for imaging operation is SAR (Synthetic Aperture Radar).The high-resolution SAR images are widely used both in military and civilian applications.Because SAR images are less influenced by the time and weather conditions than the optical images, they are more suitable for ship detection. Systems using this technique can efficiently perform the monitoring and surveillance mission of the sea surface. There are two fundamentally different means of detecting ships in SAR image, detection of the ship target itself and detection of the ship wake.First of all, the reflected signal from the ship as a feature is more useful and less dependent on the sea state and higher than the surrounding sea clutter. Moreover,

the ship wakes are often invisible for some special angles of radar and the detection of ship wakes needs heavy computational processing.Due to the corner reflection from the ship structure or between the ship body and ocean surface, ship targets are usually clear in SAR images. When the ocean surface is relatively calm (e.g., when the wind speed is lower than two meters per second), the reflection of the ocean surface to the radar wave is specular reflection and the echo signal is very faint.

Hanjing Luo and Kaisun Wu

Wireless sensor networks (WSNs) are developed for terrestrial intrusion detection recently. These networks deploy sensors, such as magnetometers, thermal sensors, and acoustic sensors, in the monitored area to detect intruders. Though such networks may work well on the land, it is challenging to deploy these sensors on the sea surface for ship detection. The main challenge is that when sensors are deployed on the sea surface, they are not static and tossed by ocean waves.

which make the sensors move around randomly. These movements make most sensors, (e.g., magnetometers and thermal sensors), difficult to detect the intrusion. Due to the high cost and stability requirement, using the camera sensors is not a general solution in such scenarios. For the same reason mentioned earlier, the detection results can also be easily affected by the random movement of the cameras.

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when a ship moves through the water, it generates V shaped waves. Though the studying of the ship-generated waves has been an old research topic which mainly focused on the harm of the sea waves,such as reducing wave resistance for ship hull design, or preventing damage of coastal or marine floating structures, the investigation of the characteristics of ship waves propagated to large distances from a ship has not been the focus area in most of the research projects. we leverage the characteristics of ship generated waves for ship detection. We have conducted experiments to detect ship-generated waves. To the best of our knowledge, this is the first detailed, systematic experimental study of ship intrusion detection with WSNs. the proposed novel approach for ship detection by taking advantage of the characteristics of ship-generated waves with WSNs.

3. SYSTEM DEVELOPMENT

.3.1 Proposed SYSTEM

It is used to detect the obstacle in the sea and measure the distance. Here by using step down transformer to convert 230V AC supply into 12V AC supply. Using the bridge rectifier, AC signal is converted to DC signal and to reduce the ripple, capacitor of 1000µf is used. IC 7805 voltage regulator is used for converting the 12V into 5V for the input. The input of the ultrasonic sensor,halleffect sensor and accelerometer sensor is given to the microcontroller. If the intruder is present, the distance of the obstacle and the measured angle is displayed in LCD. Power driver is used to convert low voltage into high voltage for indication. From the microcontroller the output signal is transmitted through Zigbee and this signal will be intimated to the microcontroller by emitting digital signal from the sensors. These digital signals will be formed as a packet consisting of date, time and node id will be sent to the server node using Zigbee. The server will receive this signal from Zigbee in the receiver side and it will be displayed by LabVIEW software. An alert message will be sent to control room using GSM and the database can be maintained in the personal computer.

WSN to detect ships by using ultrasonic sensors along with three-axis accelerometer sensor have been deployed on sea surface. The use of ultrasonic sensor will detect the intruder whenever they pass across and three axis accelerometer will detect the intruder whenever its axial position changes.The ultrasonic transmitter in the aerodrome will transmit the signals in all the four direction, these signals will reflect back to the

receiver when any object or person comes on transmitting line. At any time if there is any object or person entering in to the area, we are indicating by passing this information to the control room with Zigbee transmitter

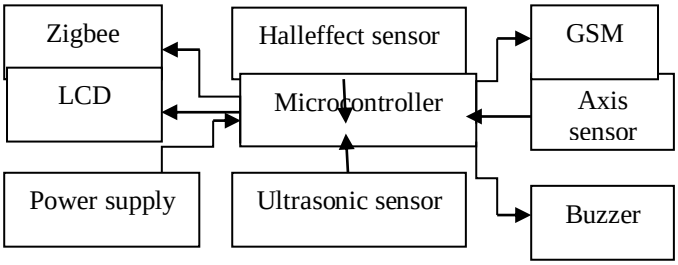

Fig.3.1.Block Diagram of Receiver node

The receiver node of the zigbee receives the signal from zigbee transmitter and displayed on the

LabVIEW. The signals from the zigbee are passed to SIM (Subscriber Identity Module) card so that an alert message is given to the coastal area control room officers. The data base is maintained in the computer for the references.

II] Transmitter node

In the Transmitter node the real time signals such as movements, sounds, and Temperature are given to microcontroller, it converts them as digital signal. The back corresponding voltage signals are transmitted through ground of SAR image is quite dark and the targets are ZigBee. An alert message is sent to mobile using GSM.

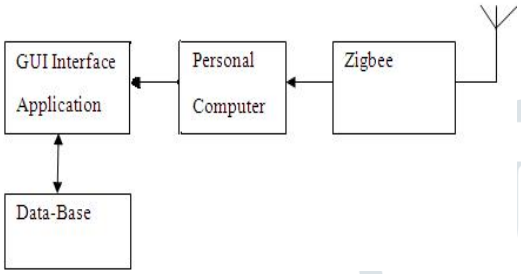

Fig.3.2. Block Diagram of Transmitter Node

The Server node components include, Zigbee, Personal computer with Graphical User Interface and RS232 cable for PC to Zigbee interface. In our project we are using LabVIEW software to show the alert in the surveillance system. The Zigbee at the receiving side continuously receives data from sensor node and stored in the database. Whenever it crosses the maximum limitations it will be will be displayed as message with priorities includes Medium and High, Which will be stored in database for future reference.

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. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object. 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. Ultrasonic sensor is a 4 pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that

Distance = Speed × Time

Fig. 3.3 Ultrasonic sensor

Accelerometer Sensor :

An accelerometer is a device that measures proper acceleration and the Proper acceleration,being the acceleration (or rate of change of velocity) of a body in its own instantaneous rest frame, is not the same as coordinate acceleration, being the acceleration in a fixed coordinate system. For example, an accelerometer at rest on the surface of the Earth will measure an acceleration due to Earth's gravity, straight upwards (by definition) of $g \approx 9.81\ m/s^2$. By contrast, accelerometers in free fall (falling toward the center of the Earth at a rate of about $9.81\ m/s^2$) will measure zero.

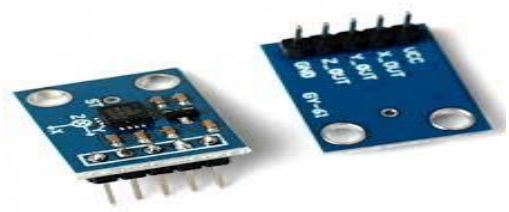

Fig.3.4 Accelerometer sensor

Hall Effect Sensor :

In a Hall Effect Sensor, a thin strip of metal has a current applied along it. In the presence of a magnetic field, the electrons in the metal strip are

deflected toward one edge, producing a voltage gradient across the short side of the strip (perpendicular to the feed current). Hall effect sensors have an advantage over inductive sensors in that, while inductive sensors respond to a changing magnetic field which induces current in a coil of wire and produces voltage at its output, Hall effect sensors can detect static (non-changing) magnetic fields. In its simplest form, the sensor operates as an analog transducer, directly returning a voltage. With a known magnetic field, its distance from the Hall plate can be determined.

Fig.3.5 Halleffect sensor

4.RESULT

When the ship is not arriving,during the normal condition does detect object and identify that whether it is ship or not.it shows how lond the object is present and accelerometer sensor detect the oscillation of the sea waves whether it is normal or not.when ship is not arriving the led will not glow and ship alert will not show.

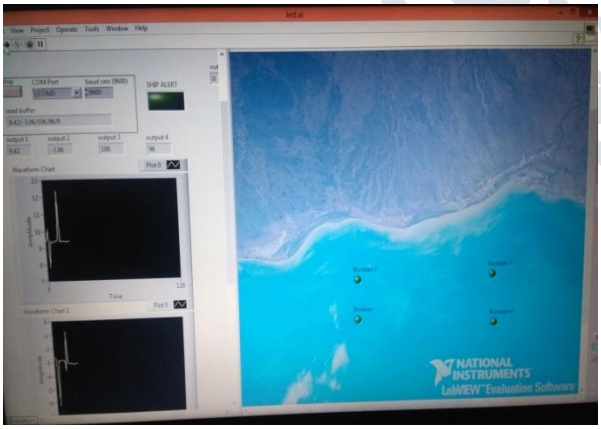

Fig. 4.1.shows when ship is not arriving

Fig.4.2 shows value of accelerometer

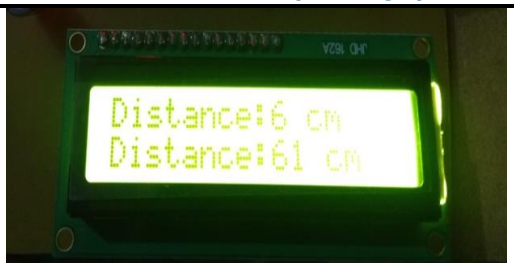

Fig.4.3 shows value of ultrasonic sensor

When the ship arrives, when the sensor senses the value above the set value alert levels is indicated. There are two alert levels. The first level indication is accelerometer sensor, with this input we cannot able to predict the intruder.with the ultrasonic sensor as second level indication able to decide that there is an intruder present in the border and with third level indication that is hall effect sensor we definitely identified that its ship intruder or any other intruder. The graphs visually shows the variations of ultrasonic and accelerometer sensors. According to the sensor values the alert level gets automatically active and buzzers are used to indicate the presences of intruder in the sea.

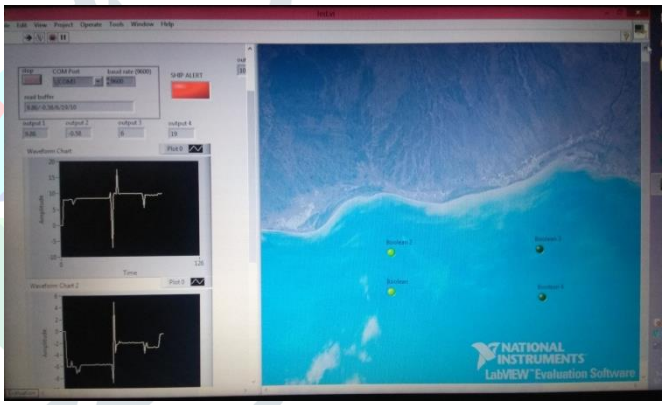

Fig.4.5Snapshot of LabVIEW when ship Arrives

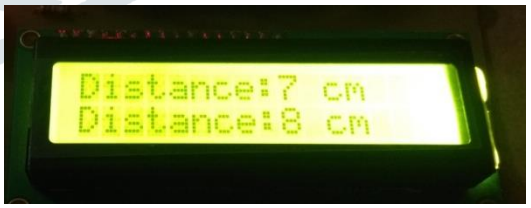

Fig. 4.6 shows value of ultrasonic sensor

Fig.4.7 shows value of accelerometer sensor

Fig. 4.8.shown on screen when ship is detected.

6. CONCLUSION

This project gives the innovative solution for the people who cross over the border and saves more lives. The input is given to the microcontroller and it is transmitted through Zigbee. The transmitted signal from the Zigbee is received by the receiver node of the Zigbee and the output is displayed as graphical representation in LabVIEW. An alert message is send through mobile to the coastal areas using GSM and database can be maintained in the personal computer. The overall accuracy of the system is good comparedas compaired to RADAR method. The main limitation of our scheme is that it requires a relatively dense network (cost more because the nodes are expensive now), especially to achieve a high detection ratio with small boats because of the high noise on the sea. This can be further extended by measuring the weight of the ship based on the height of sea waves. We can further modified this system on real time base. We can add camera on board which capture the image of ship or the logo of ship and by using digital image processing the image can check ad it is helpful to detect the ship . Power management is another important thing in this project; we are going to try using solar panels to get power instead of using batteries. This we left for our future work.

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