

**DESIGN OF SHIP ROUTE TRACKING AND ALERT SYSTEM BY USING  
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**Abstract—** The ships may sometimes cross their route beyond the limit without their knowledge. This causes a lot of problems. This paper is developed for the ship users to find out their route in the sea area. The main modules are GPS, RF transducer, Microcontroller, Satellite phone, Mapping system, ship engine, LCD display and Buzzer. When the boat reaches the particular area the RF signals are received by the receiver and given to the microcontroller unit. The Microcontroller analyses the signal and calculates the location and sends corresponding message to the LCD display. If it is ship cross its decided route microcontroller operates then displays an warning zone then buzzer sound will gives alerts and ship engine will make 50% slower and if ships cross its restricted limit then it displays an restricted zone then engine will gets in off automatically and working people may understand the situation and GPS information also sends to the coastal authorities through mapping system. so, they identify the current situation in ship and they make call through satellite phone to alert the ship controller such that (ship is in wrong route). ship controller will make a correct action to perform a ship in decided route (normal zone). The Microcontroller program is written in Embedded C language and Microcontroller used in LPC 2148.

**Keywords:** GPS, RF transducer, Microcontroller, Satellite phone, Mapping system, ship engine, LCD display and Buzzer

**I. INTRODUCTION**

Maritime transport is used to transport many goods and passengers from one count to another by water. Freight transport had make an wide record history throughout sea. Although the main usage of sea travel for goods has decreased due to aviation, it is effective for short trips and pleasure cruises. it can be realized over any distance by boat, ship, sailboat or barge, over oceans and lakes, through sea. it has an problem of exact location identification of ship moving in sea due to less accuracy of GPS, marine traffic and weather problem due to this problem more number of accidents occurred, to overcome monitoring exact location of ship monitoring. a global positioning system (GPS) is needed for identify and monitor a ship's position, location, distance, time and any other detail that might be important in measuring and stabilizing a ship's route and course. in today's highly revolutionized world of marine travel, a vessel tracking system (GPS) plays a very important role by analyzing about long range connectivity not only between ships and coast guards of nations but also among ships as well it also, since the pioneering of the internet, many vessel tracking systems have managed to incorporate internet connection as a part of there core objective thus providing a better service. the most common among the wide array of vessel tracking system is the GPS. The GPS is a vessel tracking system that has managed to attract and hold the attention of the widespread consumer market.

In contrary, the existing systems available are not much portable, short distance coverage because of using GSM in sea area because there is no tower in sea area also it has an less accuracy. In the previous the system designed by using an GPS and its performance is send through the GSM but it cover only shorter distance and less accuracy. The device consists of a processing section which takes input, processes it and provides output. this system requires base station should near to the system. to overcome the less accuracy and shorter distance coverage area the proposed system is needed. Here GPS (global positioning system) is increasingly being used for a wide range of applications. it provides reliable positioning, navigation, and timing services to world wide users on a continuous basis in all weather, day and night, anywhere on or near the earth.

In this paper an embedded system is designed with ARM microcontroller smart tracking system helps to alert an workers under working in ships by using GPS. The hardware which interfaces with microcontroller are GPS, internet, RF transducer, microcontroller, satellite phone, mapping system, ship engine, LCD display and buzzer and GPS receiver. The performance of the GPS is represented in mapping for route analyzing and it is monitoring in both ship and coastal guards. so, both place have an mapping system for measuring longitude and latitude of the ship location because of using mapping system in ship the performance of the system is displayed in LCD. There are three zones to display such as normal zone, warning zone and restricted zone. Initially the ship is moves on normal zone LCD displayed normal zone. Due to improper connectivity and weather conditions ships will moves to the undesired routes. if it is ship cross from its desired routes microcontroller operates

then displays an warning zone then buzzer sound will gives alerts and ship engine will automatically reduce its speed 50% slower and if ships cross its restricted limit then it displays an restricted zone then engine will gets in off automatically and working people may understand the situation and GPS information also sends to the coastal authorities through mapping system. so, at the condition of restricted zone the coastal guards will gives alerts to the ship through an satellite phone. coastal guards will said an exact solution for route changing and problem solving. Efficient monitoring, high performance, alert system and safe manner.

## II. PROPOSED SYSTEM DESIGN

### A. ARM7 Microcontroller (LPC 2148)

ARM Microcontroller (LPC 2138) is needed to continuous monitoring of GPS performance output. Also this is used to store some information which can be used for further processing. Interfacing an 5 different hardware's such as satellite phone, Mapping system, ship engine to be connected in I/O pins and the alert systems such as , LCD Display, Buzzer, LED, this to be connected in another I/O pins. The total pin is 64 and 48 I/O pin (port 0 and port 1).It has an programming language of Embedded C.

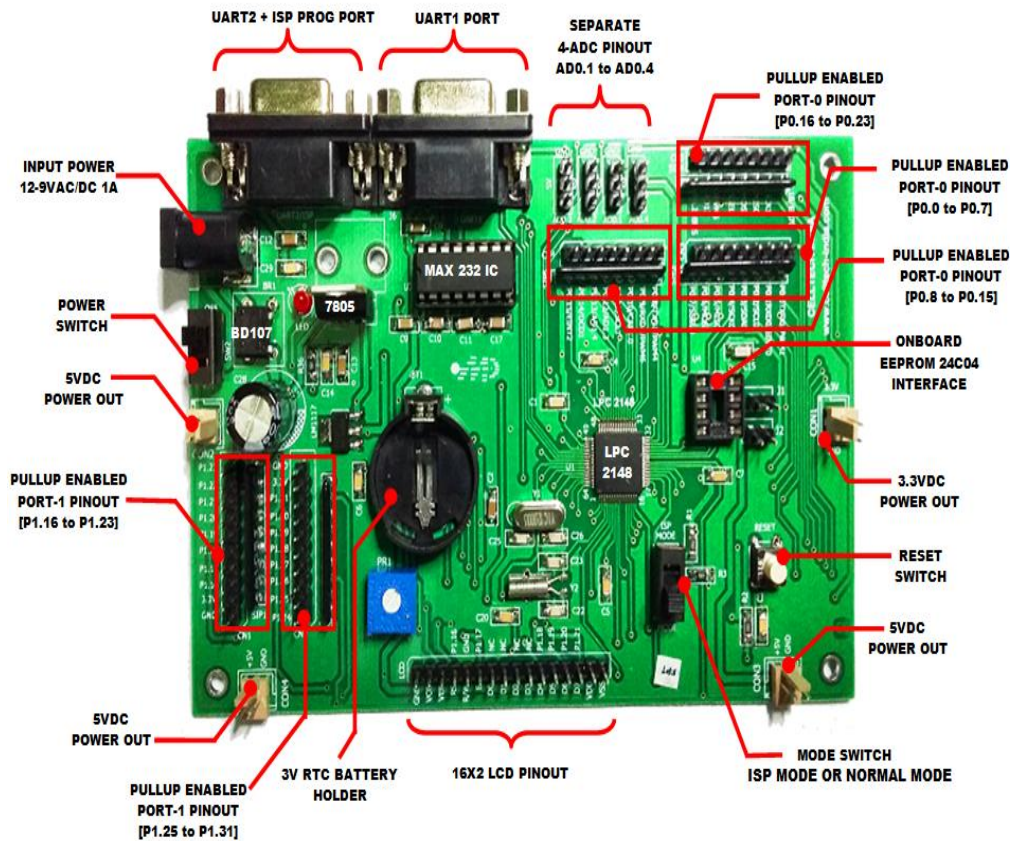


Fig.1. ARM Microcontroller(LPC 2148)

Smart Tracking System helps to alert an workers of workers under working in ships by using satellite phone. The performance of the GPS is represented in mapping for route analyzing and it is monitoring in both ship and coastal guards. From fig: 1 , In block diagram there are two section one for coastal guards and another section for ship controlling. At the coastal guards section there are 4 hardware blocks connected such as mapping system, Satellite phone for Emergency alert to ship, LCD Display and Regulated power supply interfacing microcontroller and at the ship controlling section there are 5 hardware blocks connected such as mapping system, ship engine, Satellite phone for receiving a alert to ship, LCD Display and Buzzer. GPS is the main part this bock is present in ship these blocks are interfaced with ARM Microcontroller. The block diagram of the complete system. The detailed functioning of the systems will be discussed here with the description of all the subsystems. The functioning of every subsystems built with the necessary components will be.This paper based on vessel tracking system. so, In future looking forward to long range tracking and identification system.

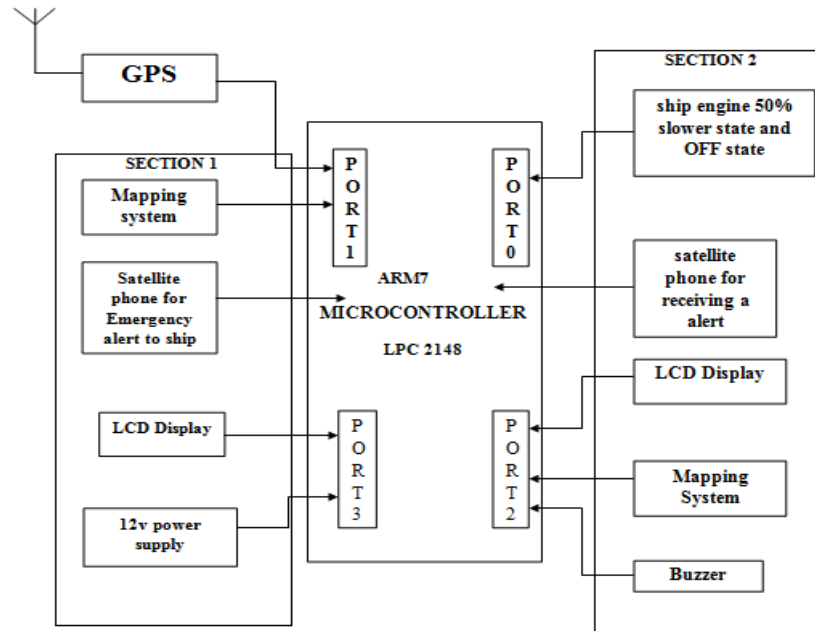


Fig.2.Block Diagram of Proposed System

### B. Global Positioning System Device

Global Positioning System (GPS) is a space system that provides location and time information in all weather conditions. The Global positioning system basically consists of two parts: Transmitter and Receiver. The transmitter's job is to track the location with the help of information from satellite. The satellite information is taken and this is sent to the receiver where the of the place is found. This to be interfaced with the microcontroller. The GPS information will be represented in the form of graphical by using mapping system this to taken reading from mapping system. Performance of the GPS is transmitted both ship controller and coast guards for taking an correct decision.

The working of GPS is explained as follows. First, the signal is transmitted to the satellites and the time taken for transmission is calculated. Depending on the time taken, the latitude and longitude information is fed into the receiver. Each GPS satellite transmits data that indicates its location and the current time. All GPS satellites synchronize operations so that these repeating signals are transmitted at the same instant. The signals, moving at the speed of light, arrive at a GPS receiver at slightly different times because some satellites are further away than others. The distance to the GPS satellites can be determined by estimating the amount of time it takes for their signals to reach the receiver. When the receiver estimates the distance to at least four GPS satellites can calculate its position in three dimensions. It also, since the pioneering of the internet, many GPS (vessel tracking systems) have managed to incorporate internet connection as a part of there core objective thus providing a better service.

### C. Satellite Phone

Communicating with people when on land is not a difficult task. coastal guards having satellite phone to communicate workers in ship and another satellite phone in ship it is used for receiving alert call from coastal guards if it is ship chooses an undesired path and after reaching an restricted zone the coastal guards will gives an alert call to the workers and notifies that ship is in wrong path. In satellite phone just punch a number in your cell phone and you are connected to the desired person. The service is easy, fast and reliable. Cell phones have stipulated towers to send and receive signals upto an approximate range of 1-5 miles. But what when we are at a place where there are no cell phone towers Satellite phone in an answer for a "No tower" communication system. A satellite phone directly connects to the satellite without the use of any mediator.After ship reaches to the restricted zone the ship engine will automatically moves to off state then it have an alert through an satellite phone from the coastal guards and they say reason of engine goes to off and they solve solution of engine off.

A satellite phone like any other cell phone uses radio waves for the transfer of signals. There are many satellite phone service providers but the quality of service depends on the type of satellite they use. The two main types of satellites are:

- Low Earth Orbit satellites(LEO)
- Geosynchronous satellites



Fig.3. Satellite Phone

#### *D. Geosynchronous Satellites*

Geosynchronous satellites are located at higher orbits, at an approximate height 22,300 miles above the earth's surface. This satellite is used for ship for communicating with satellite phone for longer distance coverage. These satellites move at the same rate as that of the earth. As they are located at higher orbits, they have a very large coverage area. One satellite can cover around one-third of the earth's surface. The phones using these satellites generally have long antennas, facing the direction of the satellite and often face delay in connection. It has an advantage longer distance coverage, higher mobility and major application as satellite mobiles.

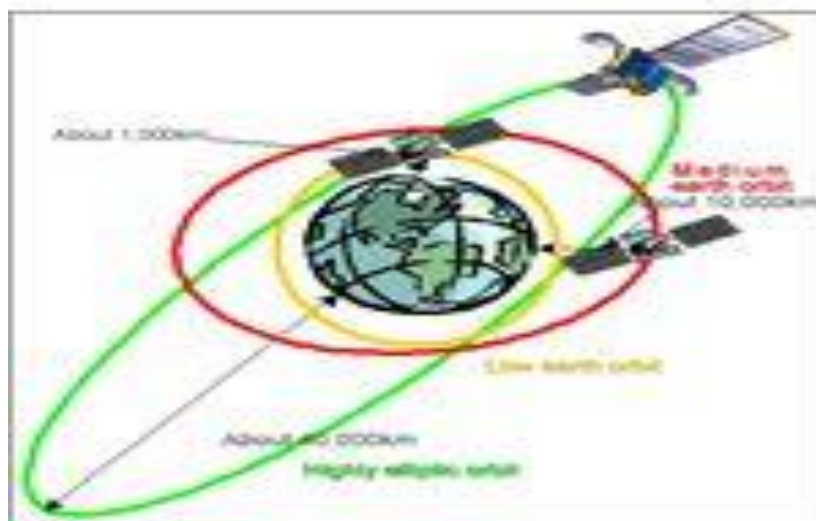


Fig.4. Geosynchronous Satellites



### *E. Ship Engine*

Marine propulsion is the mechanism or system used to generate thrust to move a ship or boat across water. when the GPS performance moves to warning zone then buzzer will ON and its alerts to the workers in ship. If it is beyond limit it moves to the restricted area the ship engine will automatically moves to the off state the reason of ship goes on off state is measured from coast guard through the mapping system in there system after reaching the restricted zone the alert call to the ship through the satellite phone by using (Geosynchronous satellite) name as VSAT.

While paddles and sails are still used on some smaller boats, most modern ships are propelled by mechanical systems consisting of an electric motor or engine turning a propeller, or less frequently, in pump-jets, an impeller. Marine engineering is the discipline concerned with the engineering design process of marine propulsion systems. Manpower, in the form of paddles, and sail were the first forms of marine propulsion. Rowed galleys, some equipped with sail, also played an important early role.

### *F. Mapping System*

The performance of the GPS is measured by using an mapping system. Mapping is the creation of maps, a graphic symbolic representation of the significant features of a part of the surface of the Earth.

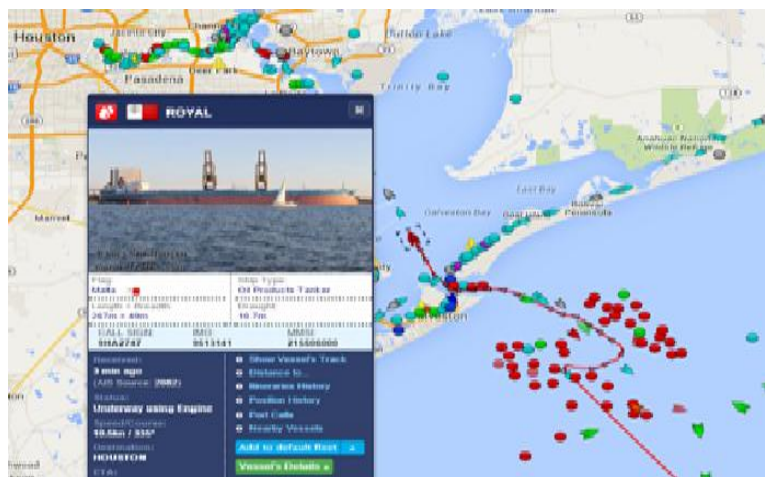


Fig.5. Mapping System

### *G. Marine Traffic*

MarineTraffic is a maritime information service that allows you to track the movements of any ship in the world. Founded in 2007, it builds technology based solutions that deliver actionable intelligence to shipping professionals, hobbyists and provides a link between seafarers and their families. An advocate for the democratization of data, MarineTraffic is an open, community-based project that creates online solutions, data services and mobile apps to leverage global real-time and historical ship positional data. It has databases of information on the vessels which includes details of where they were built, the dimensions of the ship, gross tonnage and International Maritime Organization (IMO) number. Users can submit photographs of the vessels which other users can rate. Vessel locations can be seen on different layers, including Google Maps (using the Google Maps API), Nautical Charts and OpenStreetMap. The basic MarineTraffic service can be used without cost; more advanced functions are available subject to payment.



Fig.6. Marine Traffic

MarineTraffic provides the most comprehensive maritime database to more than 6 million users monthly.

- 800 million vessel positions recorded monthly
- 18 million vessel and port related events recorded monthly
- Details of over 650 thousand marine assets available (vessels, ports, lights)

#### *H. Buzzer*

Buzzer is used to identify that the vessel has crossed the wrong route (Warning zone). Under normal zone, i.e., when ship is within correct route, current flows through emitter. And hence, buzzer is not activated. When boat crosses wrong route (warning zone), circuit is closed and current flows to buzzer. Thus alarm is generated then the workers gets alerts at the time.

#### *I. LCD Display*

GPS performance measured by using an mapping system the performance of the mapping system is send to LCDdisplay.It is measured by using an three zone conditions such as Normal zone, Warning zone and Restricted zone. Each zone conditions have an different alerts to the workers based on the performance of mapping the workers gets alerts through the LCD display.

### **III. FUTURE SCOPE**

For long range communication high performance satellite phone is used in future. To increase the accuracy instead of using GPS receiver the long range tracking and identification system is used in ships such as

- 1.Garmin eTrex venture HC GPS Receiver.
- 2.Garmin etrex 20 worldwide Handheld GPS navigator.
- 3.Garmin GPSMAP 76CSX.
- 4.Magellam Explorist GC.
- 5.Garmin GPSMAP 76CX.

### **IV. CONCLUSION**

GPS is the safest tool for workers in ship, especially in maritime navigation purpose. All these systems completely integrated and possible solution for alerting workers in maritime when they are wrong route. This system keeps control on navigation purpose for seaway transport, and help workers for safe fishing. Basic modules need for these systems are GPS for navigation and monitoring respectively. With the help of this system user can determine the vessel location, can get distance information from destination point. This system can be easily upgradable with any module to make it efficient.

### **REFERENCES**

- [1] Keisha Wu, Lin Go, Lionel M. Ni, Zhanjiang Lou and Zhongwen Goo(2012) "Ship Detection with Wireless Sensor Networks" IEEE Trans. Vol. 23 No.7.
- [2] Abid khan and Ravi Mishra (2012) , "GPS – GSM Based Tracking System" International Journal of Engineering Trends and Technology Volume3Issue2.
- [3] GPS-based vessel position monitoring and display system. Aerospace and Electronic Systems Magazine, IEEE, Jul 1990. [2] www.falcomusa.com. [3] A. Michalski, J. Czajewski, The accuracy of the global positioning systems, IEEE Instrumentation & Measurement Magazine, vol. 7 (1), pp. 56–60, 2004.
- [4] K. Suresh Kumar et. al. / Design of low cost maritime boundary identification device using GPS system/International Journal of Engineering Science and Technology Vol. 2(9), 2010, 4665–4672.
- [5] M Sivaramaganesh/International journal of innovative research in electrical, electronics, instrumentation and control engineering vol. 2, issue 3, march 2014 [http://www.thehindu.com/multimedia/dynamic/01689/TH\\_09\\_GROWING\\_rev\\_\\_1689954g](http://www.thehindu.com/multimedia/dynamic/01689/TH_09_GROWING_rev__1689954g)
- [6] S. Mani Sunder/Deep sea fishermen patrol system for coastal intruder positioning/ Scientific Engineering and Technology (ISSN : 1581)Volume 2 Issue 3, PP : 129
- [7] P.Satheesh, Maritime Border Refuge System [MBR]/ National Conference on Emerging Trends in Computer, Communication & Instrumentation in Strengthe Security.
- [8] Mohammad A. Al-Khedher and Al-Balqa (2011)," Hybrid GPS-GSM Localization of Automobile Tracking System"- International Journal of Computer Science & Information Technology (IJCSIT) Vol 3, No 6.
- [9] Francis Enejo Idachaba (2011) , " Design of a GPS/GSM based tracker for the location of stolen items and kidnapped or missing persons in nigeria"- ARPN Journal Of Engineering And Applied Sciences Vol. 6, No. 10.
- [10] Kunal Maurya 1, Mandeep Singh 2, Neelu Jain 3 (2011) "Real Time Vehicle Tracking System using GSM and GPS Technology- An Anti-theft Tracking system" International Journal of Electronics and Computer Science Engineering ISSN., 2277-1956/VIN3-1103-1107
- [11] S. Mani Sunder/Deep sea fishermen patrol system for coastal intruder positioning/ Scientific Engineering and Technology (ISSN : 1581)Volume 2 Issue 3, PP : 129
- [12] M. Li, Y Liu and Z. Yang, (2007) "Sea Depth Measurement with Restricted Floating Sensors," Proc. IEEE 28th Int'l Real-Time Systems Symp. (RTSS '07), pp. 469-478.
- [13] Mohammad A. Al – Khedher, Montaser N. Ramadan and Sharaf A. Al – Kheder (2012),"Intelligent Anti-Theft and Tracking System for Automobiles"International Journal of Machine Learning and Computing, Vol. 2, No. 1