



Ship Collision Prevention and Automatic Border Crossing Detection

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Abstract: A system to facilitate the collision avoidance capabilities for marine vessels during ocean navigation is presented in this project. This proposed concept also helps to safeguard the ship crossing the border and guides them to go in a right path and save their life. This idea helps in locating the ships and fishing boat using GPS system. This information is transmitted using wireless mode to the control system. The Bluetooth technology helps us to communicate from both the end that is the ship and the control system. Similarly the temperature and humidity is also calculated using respective sensors. Ultra sound sensors is used to avoid ship collision. All the information related to the process is sent to the micro controller unit and process take place. Microcontroller is pre-programmed in such a way to undergo the process. Similarly the border crossing alert is sent to the coast guards from the controller section through the Bluetooth module.

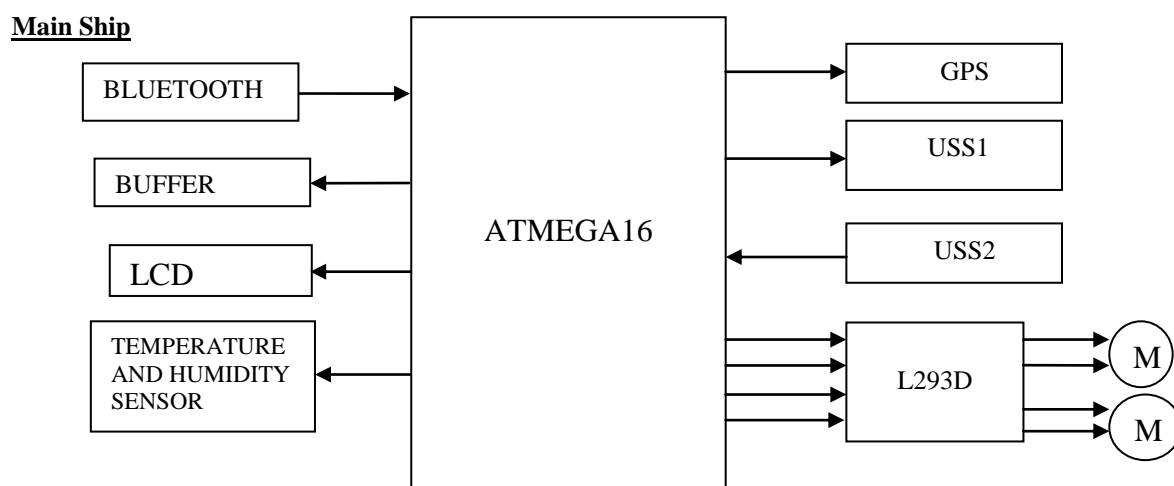
Keywords: GPS, Ultrasound sensor, Microcontroller, Bluetooth

I. INTRODUCTION

Navigation technology is a branch of autonomous intelligent systems, which is steadily gaining in importance and is being recognized by government, funding agencies and industry. Development of effective tools to assist commercial vessels in navigating safely through waterways is vitally important for global commerce. A study gathered in this paper aims to build an autonomous intelligent system to assist group-wise vessel navigation in the open sea and sends the current location of a particular ship to the control station. Specifically, this paper presents a progress ongoing research effort that makes use of a system designed to save the ship from crossing the boundary. The proposed system identifies the location of the travelling ship and alerts the ship itself if it nears the boundary and also passes information to control section when it almost. In this paper, we address the design of the collision avoidance control algorithm

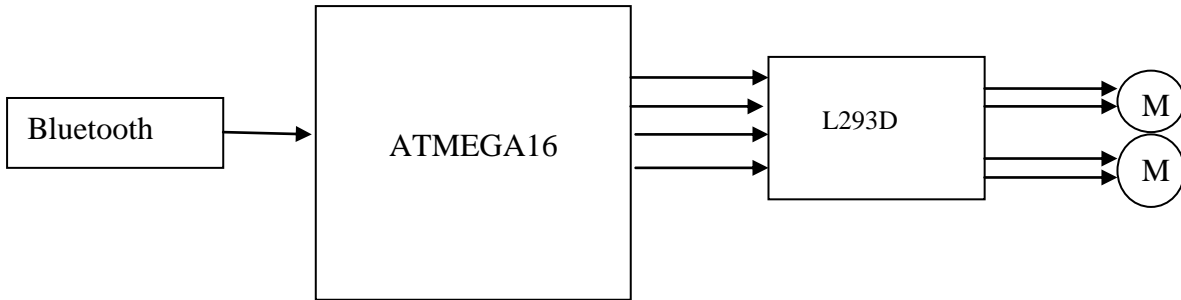
II. PROPOSED SYSTEM

The proposed system is explained using the following Block Diagram



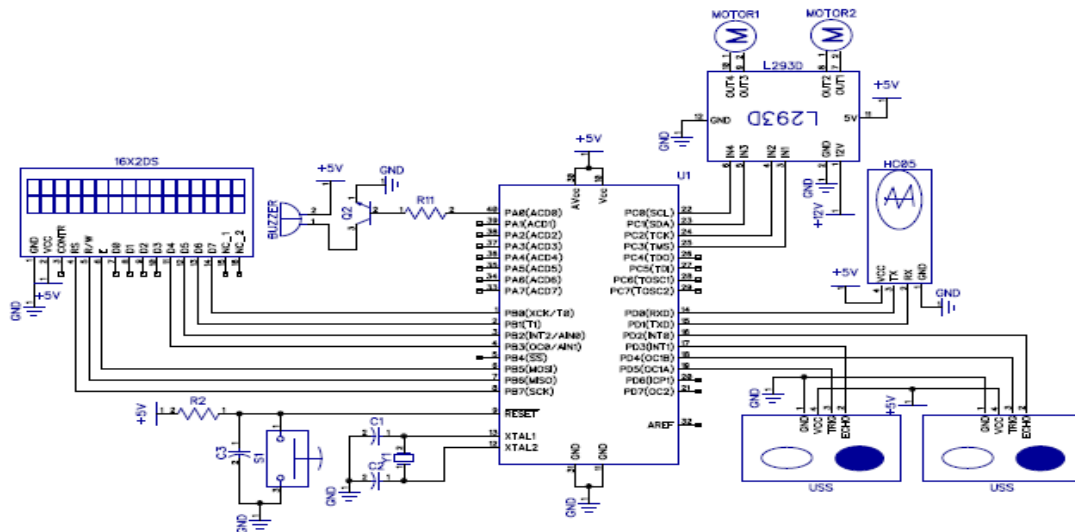


Secondary ship



III. IMPLEMENTATION

A) Circuit Diagram



B) Working

This project is to identify our border limit in the sea area. The base station is placed at the border area. When the ship reaches the border line the receiver setup which is placed inside the ship receives the signal. On receiving the signal, a message is transmitted to the people in the ship by means of buzzer and LCD. On receiving the signal a message is transmitted to the coast guards too. Ultra Sound Sensor is used in the system to avoid ship collision. USS measures distance by sending out a sound wave at a particular frequency and waiting for an echo. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between sonar sensor and the autonomous ship. This idea helps in locating the ships and fishing boat using GPS system. This information is transmitted using wireless mode to the control system.

C) Component List and Overall view

ATMEGA16: A micro controller is a true computer on a chip. The design incorporates all the features found in a microprocessor such as CPU, ALU, PC, SP and registers. It also has some added features needed to make a complete computer ROM, RAM, parallel I/O, serial I/O, counters and clock circuit. The prime use of a micro controller is to control the operation of a machine using a fixed program that is stored in ROM and that does not change over the life time of the system. The areas of applications of micro controllers include control process, manufacturing process, medicine, instrumentation etc. The ATmega16 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the Atmega16 achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed. The AVR core combines a rich instruction set with 32 general purpose working registers.

Ultrasound Sensor: Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The



basic principle of work:(1) Using IO trigger for at least 10us high level signal, (2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back. (3) IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning. Test distance = (high level time×velocity of sound (340M/S) / 2.

Global Positioning System: The GPS (Global Positioning System) is a "constellation" of approximately 30 well-spaced satellites that orbit the Earth and make it possible for people with ground receivers to pinpoint their geographic location. The location accuracy is anywhere from 100 to 10 meters for most equipment. Accuracy can be pinpointed to within one meter with special military-approved equipment. GPS equipment is widely used in science and has now become sufficiently low-cost so that almost anyone can own a GPS receiver. The GPS does not require the user to transmit any data, and it operates independently of any telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information. The GPS provides critical positioning capabilities to military, civil, and commercial users around the world.

Temperature Sensor: The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly proportional to the Centigrade temperature. The LM35 device does not require any external calibration or trimming to provide typical accuracies of $\pm 1/4^{\circ}\text{C}$ at room temperature and $\pm 3/4^{\circ}\text{C}$ over a full -55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the wafer level. The low-output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy.

Sensors: DHT11 digital temperature and humidity sensor is a composite Sensor contains a calibrated digital signal output of the temperature and humidity. Application of a dedicated digital modules collection technology and the temperature and humidity sensing technology, to ensure that the product has high reliability and excellent long-term stability the sensor includes a resistive sense of wet components and NTC temperature measurement devices, and connected with a high-performance 8-bit microcontroller

Bluetooth Module: HC-05 Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Its communication is via serial communication which makes an easy way to interface with controller or PC. HC-05 Bluetooth module provides switching mode between master and slave mode which means it able to use neither receiving nor transmitting data.

Buzzer: A buzzer is a simple electronic noisemaking component. When given a voltage or alternating current, it creates a buzzing sound. Many electronic beeps that we hear in daily life are generated by buzzers.

L293D: The L293 and L293D devices are quadruple high-current half H drivers.L293 is designed to provide bidirectional current limits up to 1A at voltages from 4.5V to 36V.

Liquid Crystal Display: A liquid crystal display (LCD) is an electronically modulated optical amplification device shaped into a thin, flat panel made up of any number of colour or monochrome pixels filled with liquid crystals and arrayed in front of a light source (backlight) or reflector. It is often utilized in battery-powered electronic devices because it uses very small amounts of electric power.

IV. ADVANTAGES AND DISADVANTAGES

A) Advantages

- Reduce maritime accidents and respective causalities.
- Regulates prevention of collisions in shipping.
- Provides navigation in shipping.
- No longer do you need to carry a map around with you when exploring a town by car or hiking in an area that you are unfamiliar with. Instead, there are Global Positional Systems, known as GPS that can help you find your location and the area you are attempting to travel to

B) Disadvantages

- Purchasing a GPS based on price can be a major disadvantage.
- GPS devices are limited by having clear access to the satellites that provide the tracking. In locations with tall buildings or sparse coverage, reception can be poor.

**V. FUTURE SCOPE**

This proposed system could be made more efficiently implemented in future with a raspberry pie controller on addition of a translator application. This application will enable the fisherman or uneducated ship workers to identify danger on displaying the alerts in their local languages.

VI. CONCLUSION

In first phase we have compared the existing system and studied various journals regarding the technologies used. The requirements have been analysed and the block diagram of both the boat section and the control section were designed. A part of the proposed concept was simulated. In the second phase we have added features such as automatic turning of ship engine on detecting an obstacle, sensing and displaying the temperature and humidity in that area and intimating the crossing of boundary, making the system more efficient.

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