An Autonomous Manoeuvre Sailing Roboat for Oceanographic Research

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Abstract - *Sea Exploration and Navigational Research is driving endeavors by supporting undertakings with PC vision systems have indicated a potential for Sailboot robots created keeping in mind the end goal to make estimations at the surface. The sailing robot explores in the interpretation of video footage, the identification of sailing features, human-robot interaction, vehicle control, position estimation and mechanical design. Key applications for this vessel are the assessment of marine habitats and complex manoeuvres.*

An idea presented has been with a Robotic vehicle which controls the object in the water the robot that is Pick and place of the object. Here ARM7 processor is inbuilt with interfacing DTMF communication. The whole robot will be moving on the water. To control the robot from the remote place we are using a DTMF technique. DTMF (Dual Tone Multi Frequency) is used which converts the desired frequency into analog signals which are received by DTMF Decoder and given to microcontroller.

Mechanical ARM is utilized for the pick and place mechanism of any object. An ultrasonic sensor is placed to identify the distance of the object which will be approaching nearby during traveling. The distance will be displayed on LCD. A metal detector is used to identify the explosives and then to intimate by a buzzer. (GLOBAL POSITIONING SYSTEM) GPS and (Global System for Mobile) GSM is used for route reason so that two-dimensional (2D) position of a boat can be resolved and kept up.

***Key Words*: ARM7, DTMF, GPS, GSM, Manoeuvre, Roboat, Sailing**

1. INTRODUCTION

Autonomous sailing robot are generally new apply autonomy innovation; over the most recent couple of years with different advances recommended that depends on the twist to give drive, commonly the fundamental power buyer in an automated vessel[1]. Presently a day mechanical technology framework is creating for a sailing robot. in this project sailing roboat is travel on the water surface by using DTMF technology. The whole process of sailing boat navigation is performed by an autonomously acting system of the technical device. Autonomous robots have been demonstrated in a number of applications, including planetary and submerged exploration [2]. While the utilization of unmanned buoys for ocean observation is well established, the utilization of unmanned systems capable of long-term purposeful navigation is still in its infancy. A sailing vessel will just require negligible electrical energy to alter its control surfaces and power onboard PCs. Sail propelled vessels thus prove a captivating prospect for an investigation[3]. A range of sailing boat model and minutely diminutive cruising conveyances were examined, but a number of difficulties arise with each. The sailing boat will additionally require drastic modification to make them self-righting as well as requiring a modified rig to sanction reliable automatic control [4]. Sailing robots and were able to demonstrate rudimental working control systems and prototype developed has exceeded the initial expectations. This paper presents the autonomous sail propelled roboat for ocean observation with using DTMF technology.

This is an embedded hardware/software implementation system of a small-scale autonomous sailing roboat.

2. METHODOLOGY OF THE SYSTEM

This project based on based on DTMF (Dual Tone Multi Frequency) technique. The DTMF Decoder circuit is made using M8870 Decoder IC. Just connect your cell phone headset (headphone) jack to the mobile phone and then mobile control electrical appliances and electrical equipment via DTMF keypad of your cell phone and this concept is implemented in this Robot so that it can able to control anywhere in the world were ever mobile network is available[4]. A security framework is actualized so approved clients just ready to get to this Robot, each key has numerous capacities such a large number of operations can be performed in this robot. The Device is a high voltage, high current integrated four channel drivers designed for standard DTL or TTL logic levels and drive inductive loads and switching power transistors. Different supply information has accommodated the rationale which permits operations at lower voltages. The internal clamp diodes are enabled in the circuit and the device is suitable for switching applications at frequencies less than 5 kHz. The L293D assembled in a 16 lead plastic package has 4 center pins connected together while the L293DD assembled in 20 lead surface mount has 8 center pins connected together and both of them can be used for heat sinking.[6] The transmitter consists of GSM or CDMA handset (mobile) and is used as a remote control to operate a robot. AV or camera receiver is placed in transmitter section and DTMF encoder is fixed on a mobile phone as default. Mobile phone, Microcontrollers, DTMF receiver or decoder, motor drivers, a power source (battery), robot platform, arms, and camera are placed in the receiver section. metal detector, ultrasonic sensor, LCD and camera are mounted on sailing roboat. One cell phone is put in the Robot and get yield through the sound jack and its given to the DTMF decoder. DTMF decoder output is given to the input of master and the slave Microcontroller separately. Master Microcontroller is used to deal with password protection and the slave selection.DTMF encoder is placed in mobile phone acts as a remote control and 3x4 matrix mobile keypads are the control keys of the Roboat. The Robot demonstrations as indicated by the program coded by the programmer when a call is being made to the receiver mobile. The low and high-frequency new tone generated by the DTMF encoder is transmitted to the receiver through the[7] call and the remote controlled operation can be performed. One cell phone is kept forever in the receiver. Sound jack of cell phone sent the received analog signal to the DTMF decoder for decoding and filtering it, and gives a 4-bit digital output. The 4-bit output is fed to the input of Microcontrollers.

In this project, two Ultrasonic sensors are used for front and back position of object distance measurement, First ultrasonic sensor is interfaced with ARM7 microcontroller and the second one is interfaced with ATMEGA328 microcontroller. The Roboat uses 2 Microcontrollers of which one Microcontroller act as Master and second Microcontroller act as slaves.

3. BLOCK DIAGRAM OF SYSTEM

3.1 Transmitter section:

In a transmitter section used mobile as a remote control of sailing roboat.

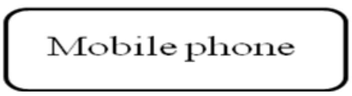

Fig.1 transmitter section

3.2 Receiver section:

All these components are arranged and connected in this configuration:

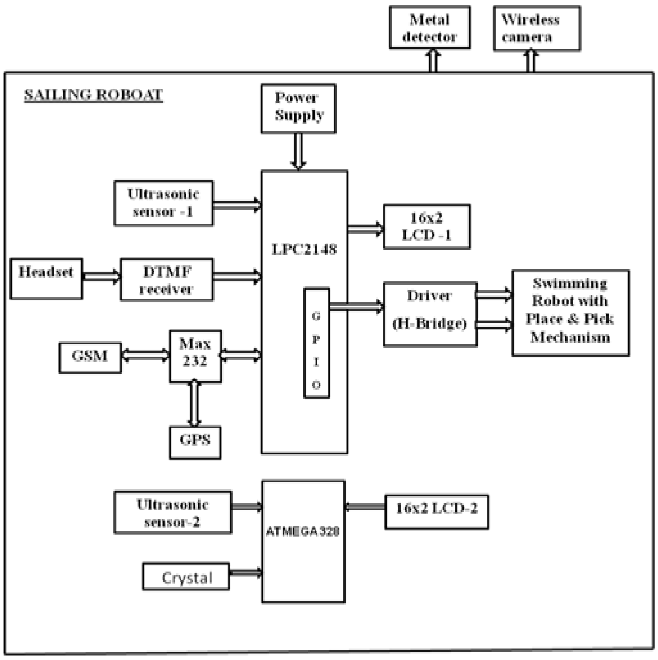

Fig.2 system block diagram of Receiver section

3.3 Camera section

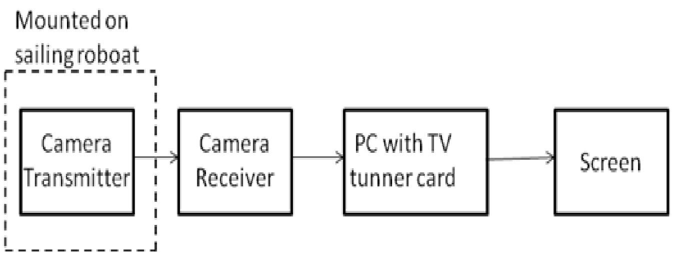

Fig.3 block diagram of camera section

The Camera transmitter is only the camera 1G with the microphone is utilized to catch the sound and video signals from the site and transmit them to its recipient. The camera beneficiary part is utilized to get the flag sent by camera transmitter and is associated with the best possible get together to view and also recording. The yield gadgets that are utilized here is TV or PC with a TV tuner card this gadget is associated with the camera beneficiary and in addition, the show where the contribution from a camera can be sent specifically or can be recorded for some other time seeing.

3.4 Metal detector:-

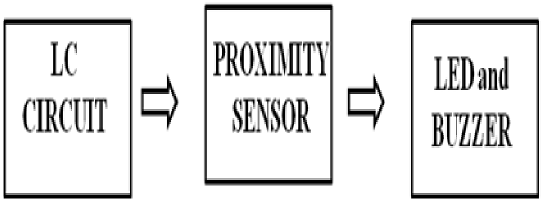

Fig. 4 block diagram of metal detector

LC circuit will trigger the proximity sensor on the off chance that it distinguishes any metal close to it. The proximity sensor will give glow the LED, and furthermore make the buzz with the assistance of the signal.

3.5 Flow Chart

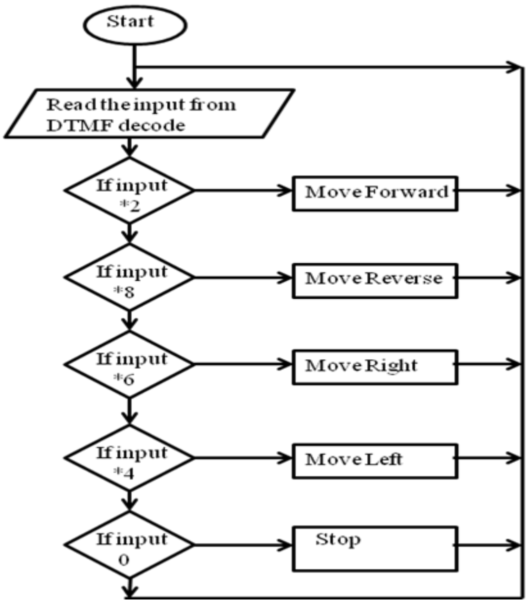

Fig. 5 Flow chart of the command to sailing roboat movement

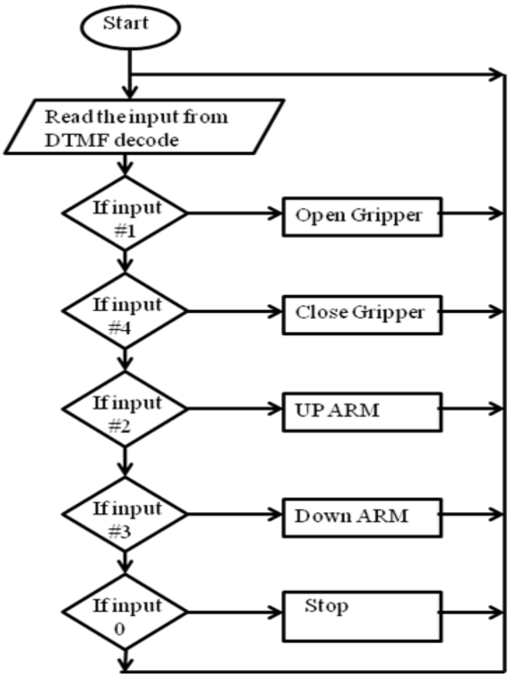

Fig.6 Flow chart of the command to sailing roboat movement

4. DESIGN OF A SAILING ROBOAT SYSTEM

Design of various components of autonomous sailing roboat System is essential part of this project. Hence after study of methodology review of the components has been done for implementation of it in the project. Design of sailing roboat system mainly comprises of Software and Hardware components. and they are stated as follows. For designing and implementing of this project used ARM7 microcontroller and ATMEGA328 microcontroller.

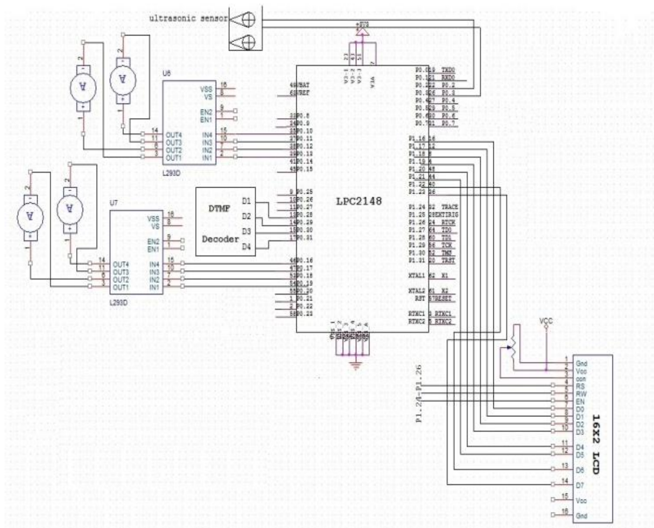

Fig.7 Interfacing hardware component with ARM7 LPC2148

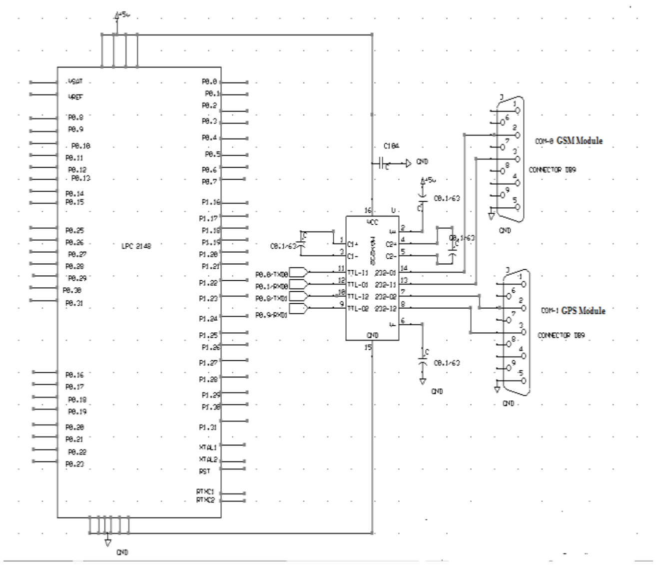

Fig.8 Interfacing of GPS Receiver &GSM modem with ARM7 LPC2148

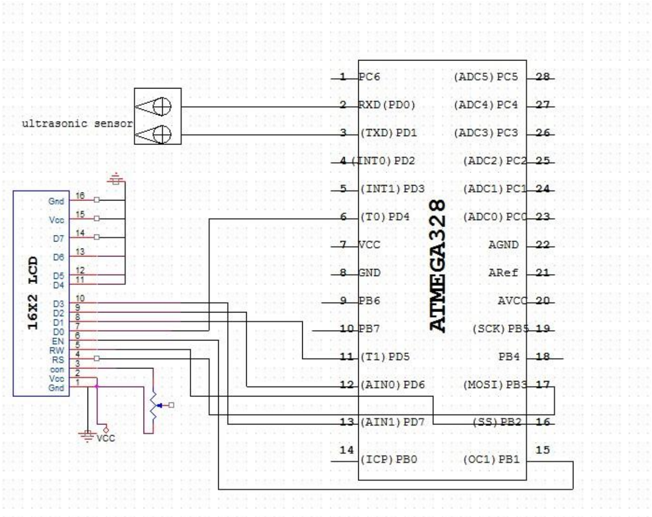

Fig.9 Interfacing with ATMEGA328 microcontroller

Fig. 10 Sailing Roboat

4.1 Ultrasonic Sensor

Ultrasonic sensors (also known as transceivers when they both send and receive) deal with a guideline like radar or sonar which assess qualities of an objective by translating the echoes from radio or sound waves separately. Ultrasonic sensors produce high-recurrence sound waves and assess the reverberate which is gotten back by the sensor. Sensors compute the time interim between sending the flag and getting the reverberate to decide the separation to a protest.

Calculation for target finding

The time from transmission of the pulse to reception of the echo is the time taken for the signal energy to travel through the air to the object and back again. Since the speed of signal is constant through air measuring the echo reflection time lets you calculate the distance to the object using the DST equation:

Distance = (s * t)/2 (in meters)

You need to divide by 2 as the distance is the round trip distance i.e. from transmitter to object and back again

Where:

s [m/s]	the speed of sound in air
t [s]	The round trip echo time.

4.2 GSM MODEM

GSM MODEM is a class of remote MODEM gadgets that are intended for correspondence of a PC with the GSM organize. It requires a SIM (Subscriber Identity Module) card simply like cell phones to actuate correspondence with the system. Additionally, they have IMEI (International Mobile Equipment Identity) number like cell phones for their distinguishing proof. A GSM MODEM can perform the following operations:

1. Receive, send or delete SMS messages in a SIM.
2. Read, add, search phonebook entries of the SIM.
3. Make, Receive, or reject a voice call.

The MODEM needs AT summons, for interfacing with processor or controller, which are conveyed through serial correspondence. These charges are sent by the controller/processor.[8] The MODEM sends back an outcome after it receives a command. Distinctive AT command supported by the MODEM can be sent by the processor/controller/PC to communicate with the GSM cell phone.

A GSM module collects a GSM modem with standard correspondence interfaces like RS-232 (Serial Port), USB and so on., so it can be effectively interfaced with a PC or a microchip/microcontroller based framework. The power supply circuit is additionally implicit the module that can be enacted by utilizing a reasonable connector

4.3 GPS receiver

The ultra- sensitive GPS receiver can gain GPS signals from 32 stations of satellites and produce quick position fixes with high precision into a great degree testing situations and under poor flag conditions because of its dynamic reception apparatus and high-affectability. [8]The bi-directional NMEA 0183 v3.0 convention offers industry standard information messages and a summon set for the simple interface to mapping programming and inserted gadgets.

4.3.1Features

- High sensitivity -159dBm
- Searching up to 32 Channel of satellites
- Fast Position Fix with LED indication of status
- Low power consumption
- RTCM- in ready
- Built-inWAAS/EGNOS/MSAS Demodulator
- Supports NMEA0183 V 3.01 data protocol
- Real time navigation for location based services
- For Car Navigation, Marine Navigation, Fleet Management, AVL and Location-Based Services, Auto Pilot, Personal Navigation or touring devices, Tracking devices/systems
- Mapping devices application

5. RESULTS

Sailing roboat travel in a water surface and pick and place mechanism is done by using DTMF technology. By GSM modem and GPS receiver got the 2D position (latitude and longitude) of sailing boat by SMS communication technique. By ultrasonic sensor measured the distance of an object. Metal detector detects the metal and intimate by a buzzer. By Wireless camera seen the live video.

6. CONCLUSIONS

In this project we have studied and implemented a Water Robot with the help of DTMF communication using LPC2148 in the stream of embedded systems. ARM7 processor is in built with interfacing a wireless Camera. The DC motors are used to rotate the arms of the robot to catch habitats. The whole robot will be moving on the water. The live video will be heck out in the TV.

As we can improve the system in future by allowing the use of solar driven batteries. We can monitor or control it with IOT based embedded web server also we can monitor its location on IOT (Internet of Thing).

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