

# Autonomous Sailing Boat

Mahendra Prajapati<sup>1</sup> Harsh Prajapati<sup>2</sup> Vinayak Rai<sup>3</sup> Tushar Sanap<sup>4</sup> Mohan Kumar<sup>5</sup>  
<sup>1,2,3,4</sup>Student <sup>5</sup>Assistant Professor

<sup>1,2,3,4,5</sup>Department of Electronics and Telecommunication Engineering  
<sup>1,2,3,4,5</sup>Atharva College of Engineering, Mumbai, Maharashtra, India

**Abstract**— The project aims to develop an autonomous boat that is capable of autonomously sailing and navigating by using cellular GPS and Bluetooth function, its way through obstacles present around it. Another important function of Autonomous Sailing boat such that it will help to detect radiation which may be hazardous for human health. It's important to have a proper platform for simulations and experiments apart from moving on a pre-defined path the boat can smartly avoid all the obstacles in the path through its ability. The electronic system designed for the boat has a great scalability and can be used for larger ships too, but with some modifications. The system developed is almost complete in terms of the hardware and software required for making a ship autonomous.

**Key words:** Data Mining, Heart Disease Risk Factors

## I. INTRODUCTION

The autonomous name suggest that the boat is self ruling, independent, determining and sufficient to handle position by its own. The objective of Sailboats has played a major part from past few decades in the development of modern life. The robotic system could replace the role of a sailor. Scope of this project focus on one of the particular aspect of the operation of a boat sailing, including sailboat boat terminology, the basics of sailing, and the physics of sailing. Second, we focus on the stability of a sailboat, introducing history sailboats have been involved in the daily controlled by manpower. Recently there are number of researches are going on atomization in sailing boat. Autonomous boat is used in long term mission in marine. Sail Boat include the number of sensor to make it autonomous such as follow.

## II. SENSORS USED

### A. Anemometer

It consist of two circuit parts namely:

- 1) DC Tachometer.
- 2) Angular Potentiometer.

#### 1) Dc tachometer

It is a device use to determine the speed of the wind. It has got two terminals in circuit, one connected to GND and another to the Atmega IC through which output from the circuit is given as determined signal.

#### 2) Angular Potentiometer

It is a device used to determine the direction of the wind. It uses a potentiometer or variable resistor arrangement to measure. It measures the direction according to the variation in resistance value.

### B. Thermistor

It is a NTC resistor, will varies in resistor value according to temperature which leads to change in voltage value and that changes will give the output result as sensed signal of temperature. Many NTC thermistors are made up of a pressed disc chip of a semiconductor such as a sintered metal oxide. It works because raising the temperature of a semiconductor increases the number of electron able to move about and carry charges - it promote them into conduction band. More charged carriers that are present, the large current a material can conduct.

The current is measured by using an ammeter. For large changes in the temperature, calibration is necessary. Over small changes in the temperature, if the proper semiconductor is used, the resistance of the material is linearly proportional to temperature. There are many semiconducting thermistors which ranges from about 0.01 K to 2,000 K (-273.14°C to 1,700°C).

### C. IR Radar Sensor

It is a 3-pin circuit device which interacts with IC to avoid obstacles. It has one in at GND and other pins are connected to Atmega IC to give the range of obstacle in path.

### D. Lcd

There are various display devices namely seven segment display. LCD display can be interfaced with microcontroller to read the output. In this project we use a two line LCD display with 16 characters each. LCD displays the temperature of measured element, which is determined by the microcontroller. CMOS technology makes the device for application in hand held and other battery instruction with lowest power consumption ability. It operates on 4-bit mode and is a device which is used to give

the display of the system as an output readings or commands for instruction. It use 4 pin as Input and uses 2 sets of input pins and gives an output of 8bit.

#### E. Bluetooth To Serial Port Module

HC-05 module is easy to use as it uses Bluetooth SPP designed for transparent wireless serial connection setup. It's fully qualified Bluetooth V2.0+EDR, 3Mbps Modulation which is complete with 2.4GHz radio transceiver and baseband. It use CSR Bluecore 04-External single chip Bluetooth system module with technology of CMOS and with AFH.

##### 1) Hardware Features

- 1) Typical -80dBm sensitivity
- 2) Up to +4dBm RF transmit power
- 3) Low Power 1.8V Operation ,1.8 to 3.6V I/O
- 4) PIO control
- 5) UART interface with programmable baud rate
- 6) With integrated antenna
- 7) With edge connector

##### 2) Software Features

- 1) By default Baud rate: 38400, Data bits:8, Stop bit:1,Parity:No parity, Data control: has.
- 2) Supported baud rate: 9600,19200,38400,57600,115200,230400,etc.
- 3) Gave a rising pulse in PIO0, device will be disconnected.
- 4) Status instruction port PIO1: low-disconnected, high-connected.
- 5) PIO10 and PIO11 can be connected to red and blue led. Where a master and slave are paired, red and blue led blinks 1time/2s in interval, while disconnected only blue led

#### F. Magnetic Flux

If magnetic field with flux lines perpendicular to the sensitive area applied to the sensor, then biased Hall plate forces a Hall voltage which is proportional to this field. Normally the Hall voltage is oftenly compared with the actual threshold level of comparator. The temperature-dependent bias increase supply voltage of the Hall plates and adjust the switching points to the reducing induction of magnets at higher temperatures. If the magnetic field crosses the threshold levels, the open drain output switches to the appropriate state. Built-in hysteresis eliminates the oscillation and provides switching behavior of output. Mechanical stress causes magnetic offset which is normally compensated by using "switching offset compensation technique". Hence an internal oscillator provides a two phase clock. At the end of the first phase the Hall voltage is sampled. During the end of the second phase, both sampled as well as actual Hall voltages are aver-aged and compared with the actual switching point. Consequently the open drain output switches to an appropriate state. Time from crossing the Magnetic switching level to switching of output varies between zero and  $1/f_{osc}$ . Reverse current gets limited at VDD-Pin by an internal series resistor up to -15 Volts. Thus No external reverse protection diode is needed for VDD-Pin for reverse voltages ranging from 0 to -15 Volts.

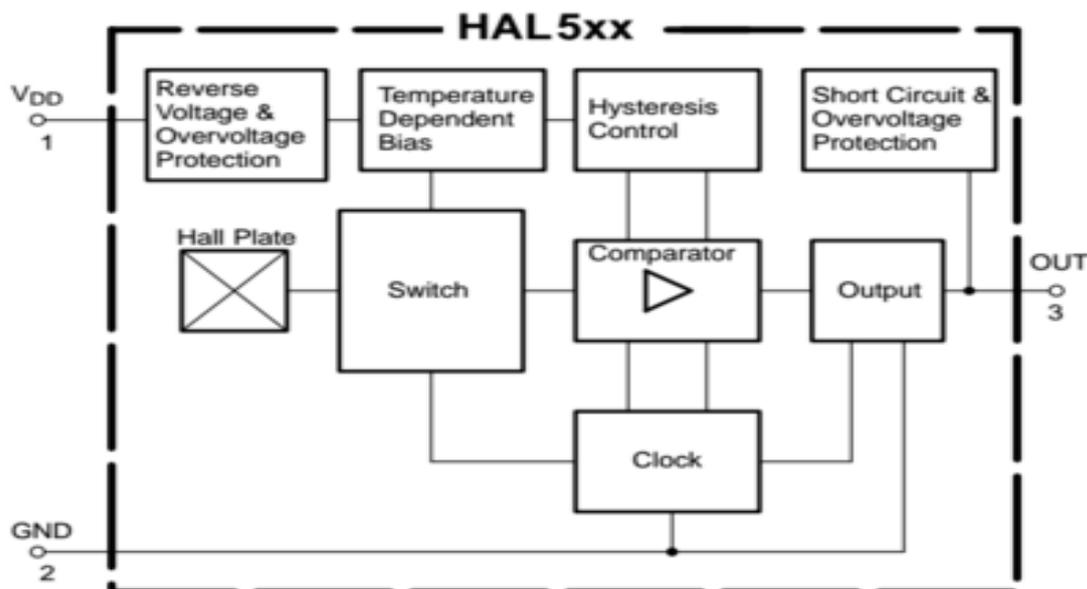


Fig. 1: Block diagram of HAL5xx

#### G. Pump Motor

It is used to drive the boat from position to position. It works

### III. EXPERIMENTAL SETUP

Using mobile phone's bluetooth command send to ATmega16 via 'RX' Pin Now, using rest pin the controller is reset and it will start executing program when the clock pulse is triggered by the crystal oscillator According to the code each and every sensor accordingly starts giving the real time value or sensed signal at various time varying instants

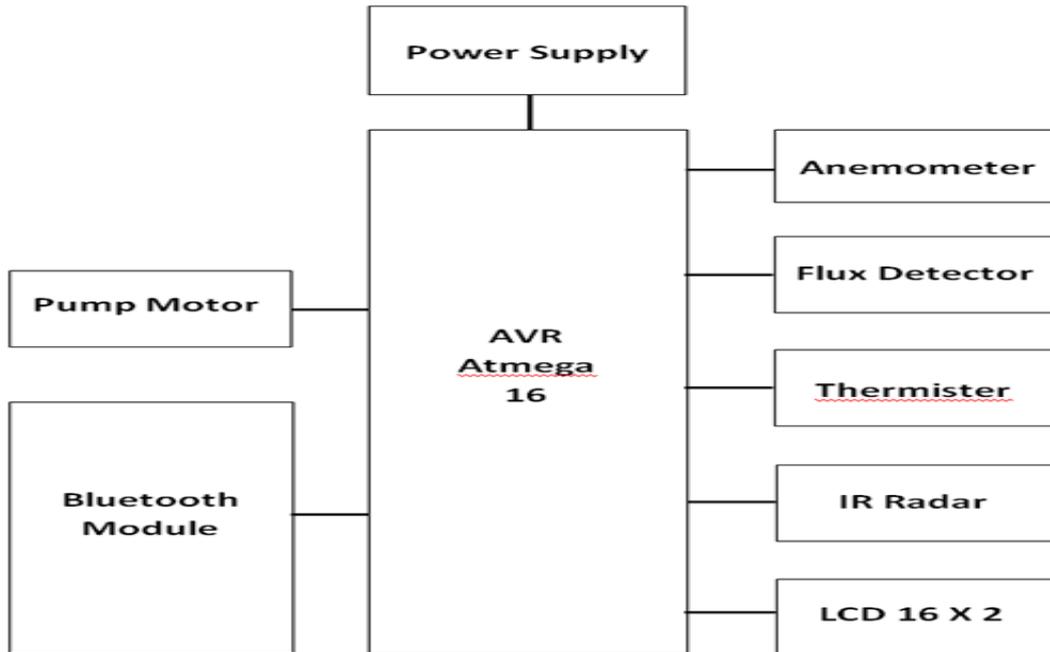


Fig. 2: Block Diagram

Anemometer uses tachometer to measure the speed of the wind while the angular potentiometer is used to indicate the direction of wind flow. On small scale, a magnetic flux detector is used to detect the varying magnetic field in the surrounding vicinity of the boat. It is actually a replacement of nuclear radiation detection due to harmful leakage if any caused at the sea which is implemented on a large scale and hence not practically implemented in this project.

Meanwhile, the boat when it is sailing driverless has to make sure of riding safely into sea has an added feature of avoiding the obstacle on its way. Avoiding obstacle is a major concern for safety of boat, for this IR radar is used and LCD is used as an indicator for the proper functioning of sensors and boat mechanism. The real time data is measured and it is transmitted to the mobile via bluetooth.

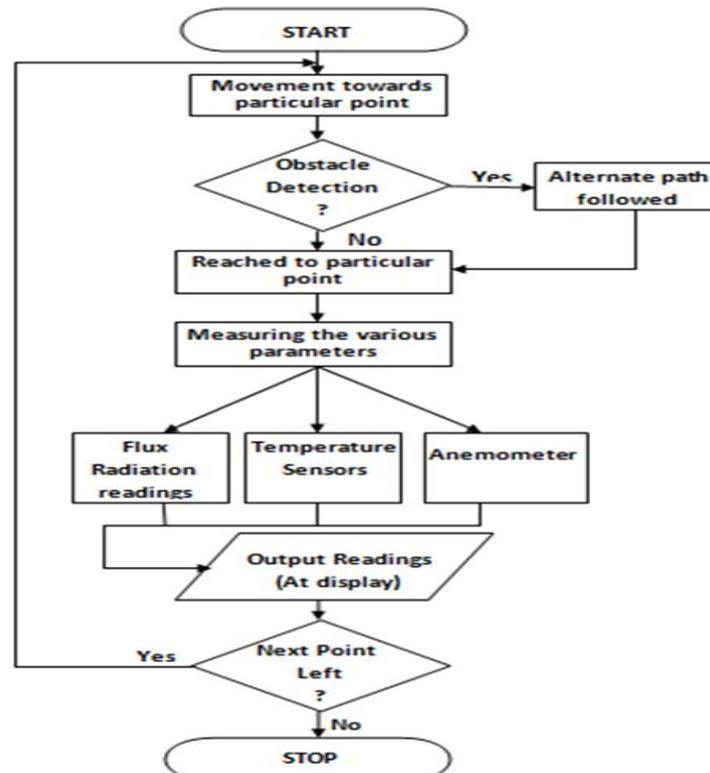


Fig. 3: System Flow

#### IV. ADVANTAGES

- a) As per the requirement autonomous sailing is the major advantage in the system of boat which helps in possibly completely no interactions or to say practically less interaction of humans and the system.
- b) There is no necessity of pilot in the boat that's why the boat can be accommodated in any radiational environmental conditions dangerous for Humans.
- c) The whole system can be made compact to bring out to be portable, small scale usable.
- d) Because of IR sensor radar used in compatible in the system which is very useful for detection, any obstacle reaching into its path is completely dodged or collision is avoided.
- e) Boat includes the various kind of sensor which includes the flux detector which detect the magnetic flux present in the marine to show us magnetic radiation in marine as well as sea coastal area.

#### V. APPLICATIONS

- a) Each and every project is expected to deliver some useful applications. Regarding our concept of this project, the name itself suggests autonomous which means independent, self ruling, self-determine boat which take some logical decision.
- b) Pilotless boat limelight in autonomous sailing boat, robotic submarine are used in various cases.
- c) The major application in autonomous sailing boat is to implement rescue mission and monitoring the environmental details.
- d) Use of Autonomous sailing boat rather than a living human can operate in dangerous region. Where dangerous and hazardous radiation gets exposed for human life in ocean.

#### VI. CONCLUSION

- a) The autonomous sailing boat is designed and developed for the purpose of, to make a boat for surveillance. The predefine program which is build in the AVR Atmega 16 controller is used to make it autonomous.
- b) The parameter and assumption used for detection of the obstacles is included in it.
- c) As we used 12v DC battery which can manipulated into 5 V by voltage regulator IC 7805
- d) Pump motor used in boat gives constant speed to it and provide appropriate direction to boat as program is coded in controller.

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#### REFERENCES

- [1] Microtransat. <http://www.microtransat.org/>.
- [2] Tracksail. <http://tracksail.sourceforge.net/>.
- [3] World robot sailing championship. <http://www.wrsc2011.org/>.
- [4] <http://motherboard.vice.com/read/why-we-need-autonomous-sailboats>
- [5] Roland Stelzer, T. Proll, and Robert John. Fuzzy logic control system for autonomous sailboats.