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## Bluetooth Control Robot with Position Monitoring System

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**ABSTRACT:** Nuclear reactors are most complex areas where human intervention is not possible. It is often required to inspect the reactors visually. The electronics devices like a camera cannot be placed inside nuclear reactor it is the main drawback in nuclear plant. So several robots are send to inside the reactors for the inspection of temperature, quality of welds and components. In such situations it is often required to obtain the ergonomic position of the robot. To overcome such problem a robot with position monitoring system has been proposed.

In this paper discusses about the design and fabrication of Bluetooth controlling robot with position monitoring system. The main purpose of the paper is to develop a remote user interface to control a robot by wireless technology. This paper will explain the reader, how secure Bluetooth communications between a robot and computer through Bluetooth module (HC-06), then show the present robot position using X, Y & Z co-ordinates through processing software.

**KEYWORDS:** Bluetooth technology, Inertial Measurement Unit (IMU), Position and orientation, processing software

### I. INTRODUCTION

A robot's localization is a vital problem in the mobile robotics. Location details are essential for planning, robot movement and decision making processes. In this paper, we describe new method for localization of robot using Bluetooth and IMU (MPU-6050). Bluetooth has many advantages such as low power consumption, everywhere presence, low cost and easy availability. And also it is unaffected to electromagnetic because of its Frequency Hopping Spread Spectrum (FHSS). Other methods of communication like Wi-Fi, Global Positioning System (GPS), RFID etc. are not suitable for localization for the following reasons. GPS is not suitable for indoor environments. Wi-Fi has a higher data rate, its high power consumption makes it unsuitable. RFID is not capable of communication.

The main purpose of this paper is to develop a remote user interface to control a robot by wireless technology. There is a need to communicate with the robot remotely in order to control the robot movements and send data both ways.

This Paper is organized as follows. Section II describes the methodology of this paper. Its gives the details of block diagram and its description. Section III describes processing software details. Section IV explain about working of entire system. Section V conclusion and future scopes of this paper

### II. METHODOLOGY

The PC is used for send the command from the commenter to drive the vehicle and also it used to Shows the position of the vehicle inside the closed contour with respect to reference point. The Bluetooth controller is used to receive the signal from computer and it will send the corresponding signal to controller The arduino controller is used to control the motor direction as well as get the signal from bluetooth control (HC06) . The fig 2.1 shows the block diagram of the Bluetooth controlled mobile robot

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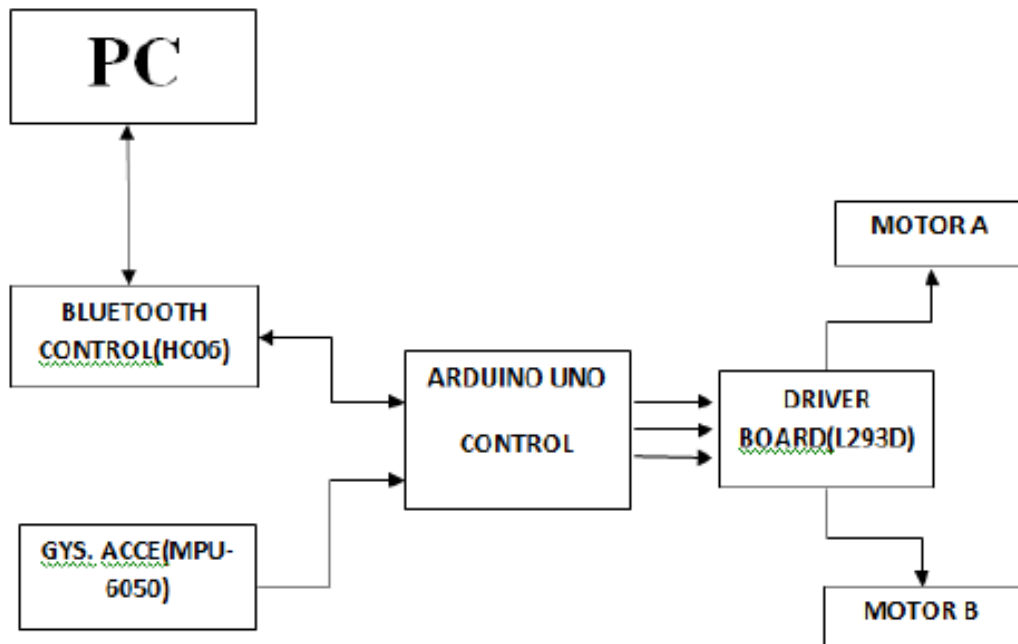


Fig 2.1 Block diagram of Bluetooth controlled robot

The MPU6050 sensor is an inertial measurement unit. It used to find the position and orientation of the vehicle with respect to 6 axes. In this 3 axis gives the linear movement of the vehicle and another 3 axes gives the orientation of the vehicle. The processing software is used to plot the 2d image for obtain the location of the vehicle .Depends upon the IMU data the processing software will generate the 2d image to show the position of the vehicle.

### To make a link between BLUETOOTH and PC:

1. Go to the Bluetooth icon , right click and select add a Device.
2. Search for new device in PC, Our Bluetooth module will appear as HC-05 , and add it .
3. Type the pairing code as 1234.
4. After finishing of pairing, we can now program to Arduino controller and upload a sketch to send or receive data from Computer.

### III. SOFTWARE

#### Processing software:

Processing is a programming language, development environment, and online community. Processing has promoted software literacy within the visual arts and visual literacy within technology. Initially created to serve as a software sketchbook and to teach computer programming fundamentals within a visual context, Processing evolved into a development tool for professionals. Processing for learning, prototyping, and production.

- » Free to download and open source
- » Interactive programs with 2D, 3D or PDF output
- » OpenGL integration for accelerated 3D
- » For GNU/Linux, Mac OS X, and Windows

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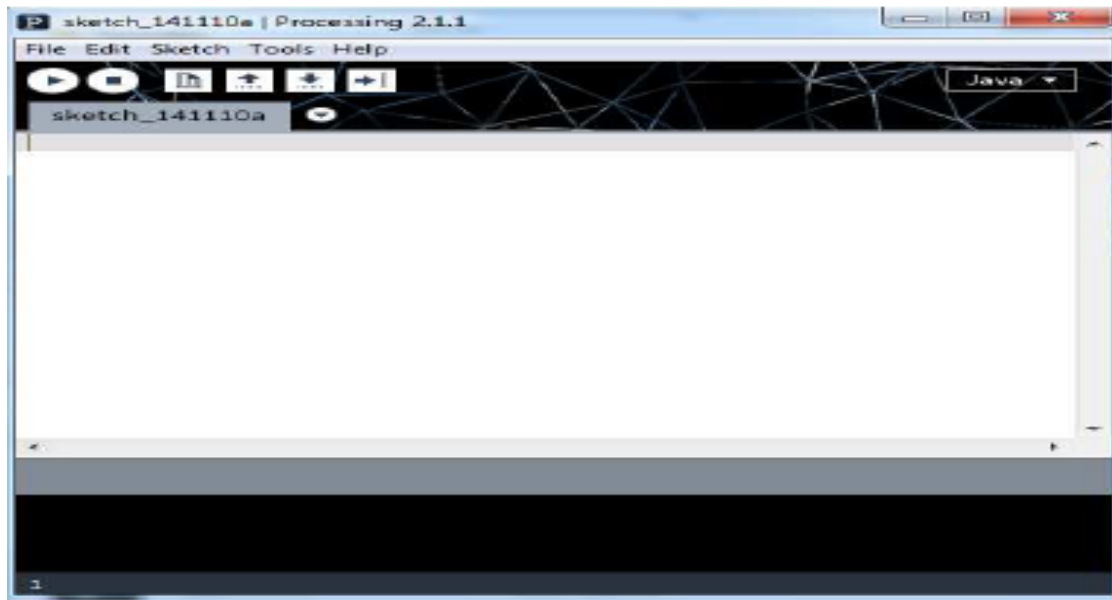


Fig 3.1 processing software window

## IV. PRINCIPLE OF WORKING

Initially the orientation of the robot in all the 6-axes will be measured using MPU-6050 unit. The raw data from the accelerometer and gyroscope is filtered and processed using the complementary filter to obtain pure pitch, roll and yaw values. These values are transmitted through Bluetooth control module to computer. The obtained values are displayed through processing software in the PC from this the exact position and orientation of the robot can be visualized graphically. The fig. 4.1 shows the entire robot hardware setup. From this image we can obtain the various components and their respective position on the vehicle.

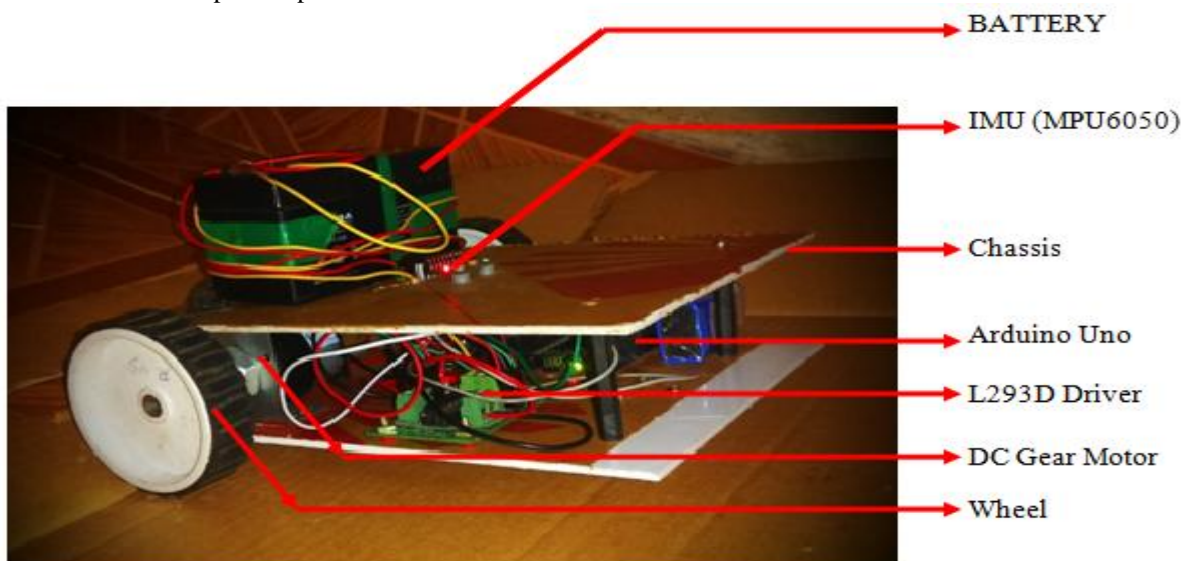


Fig 4.1 Robot Hardware setup

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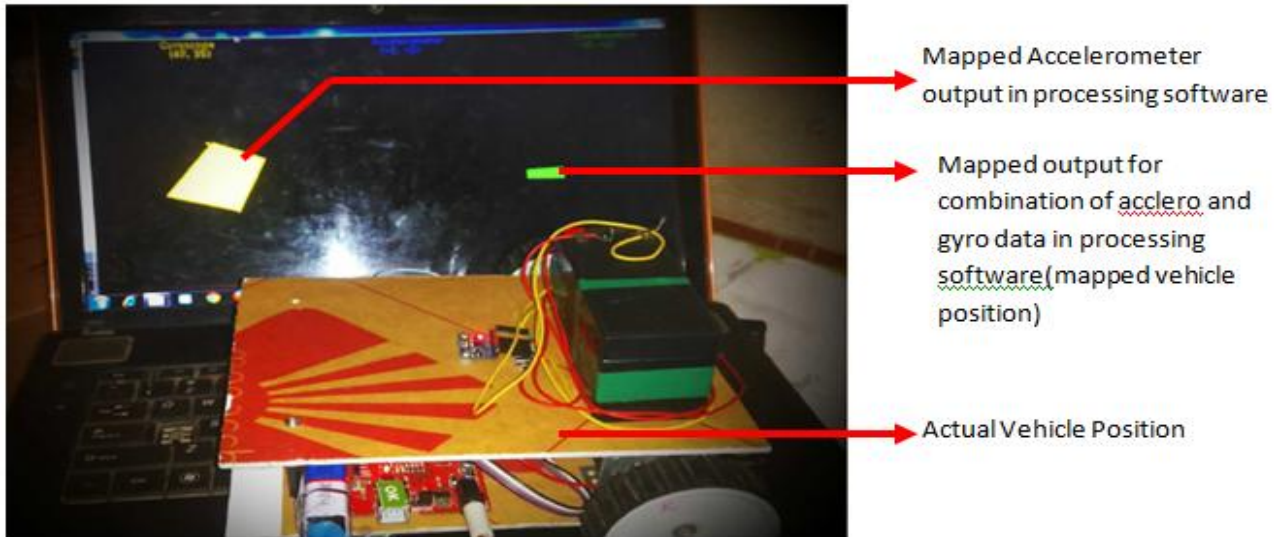


Fig 4.2 Comparison between mapped vehicle position and actual vehicle position without orientation

The graphically mapped vehicle position is displayed in the processing software screen. The Fig 4.2 shows the different between mapped vehicle positions and actual vehicle position. The Yellow rectangle shows the accelerometer raw data output. The green rectangular box shows the mapped vehicle position graphically. The gyro information is not obtained due to the vehicle don't have any orientation with respect to reference. So only the mapped vehicle will be parallel to reference axis. It don't have any orientation.

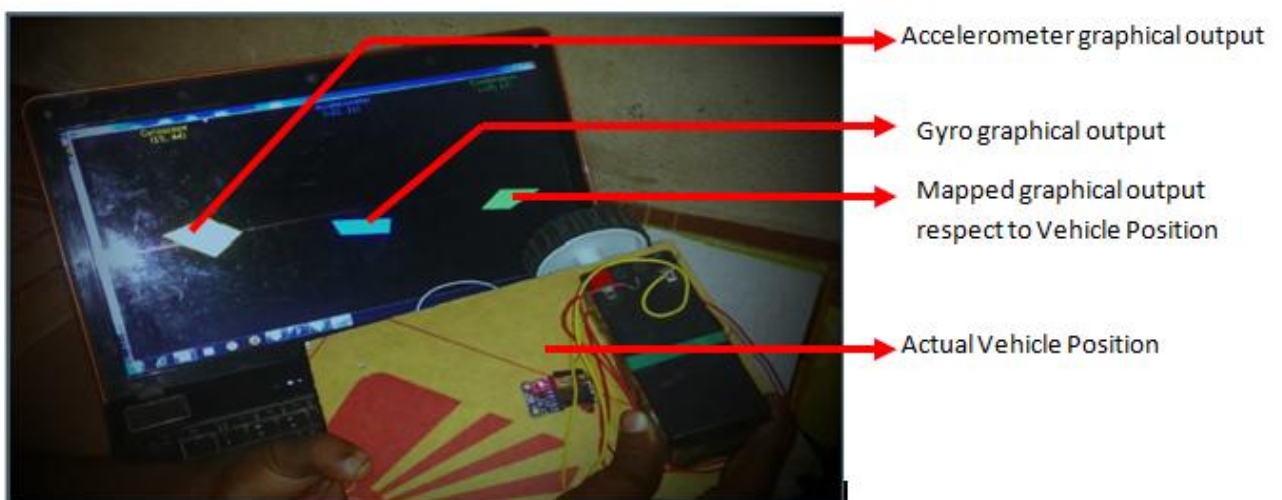


Fig 4.3 Testing of the robot with respect to 6 axes movement

The robot will be tested in the normal environment for checking the algorithm. Fig 4.3 shows the testing of robot with respect to 6 axes movement. The robot was moved by sending the command from the laptop. Depends on the command it will move respect to the 6 axes. The yellow colour rectangle shows the accelerometer mapped graphical output. It gives the vehicle distance from the reference point with respect to 3 axes in linear movement. The

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blue colour rectangle shows the gyroscope graphical output. It gives the orientation of the vehicle with respect to reference. The green colour rectangle gives the accurate position and orientation of the vehicle with respect to reference axes. By combining the accelerometer and gyroscope raw data it gives the correct position and orientation of the vehicle in processing software

### V. CONCLUSION AND FUTURE SCOPE

This paper is being able to controlled the movements of a robot wirelessly, keep monitoring the position of the robot using MPU 6050 sensor. This development could be deployed later in an nuclear wastage area surveillance robot which is a study that is being developed and moved through a wired controller, but the ultimate goal is to be wireless. Finally, we achieved in this paper by used the Bluetooth Module, which uses technology WPAN (Wireless Personal Area Network) and an Arduino board which contains a AT mega 328 microcontroller and MPU 6050 (Accelerometer with gyroscope sensor) to monitoring the position of the robot, which is widely used for programming the data transmission with Processing Software.

In this paper the localization of the robot shown by processing software in 2D. In future scope the localization will be produced in 3D model.

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