

Prototype Model of Mechatronic Robot Controlled Through Bluetooth

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Abstract— The project report describes the methodology for analyzing, fabricating, developing, controlling and improving a Bluetooth Controlled mobile robot which have many applications, mainly agriculture purpose, within hospital portability system. Due to the untouchability situation occurred due to Covid-19 pandemic, it became necessary for making use of robot to porting medicines to the patients' bed without any human contact. The topic of this paper is development of a prototype model of four-wheeled Bluetooth controlled robot which was designed at Atmel Studios (Version 7.0). Designed robot is controlled by AVR, Motor Control Shield, Bluetooth Shield and a mobile app. By using proximity sensor, it is intended to make robot avoid collision. Motor speed parameters that will be sent to AVR are calculated by Linear Interpolation.

Keywords: Robot, Bluetooth, AVR, Porting Medicines

I. INTRODUCTION

Robotics is a development part devoted to the design, edifice, service, handiwork, and deployment of robots. Robotics is concerned with the electronics, engineering, mechanics, and software knowledges [1]. Task and follower robots are designed in order to complete the task which has been given in form of programming language.

The robots are capable of moving throughout a specific area to order to complete the work. In the modern time the robots are generally controlled by smartphones, using Bluetooth and other features. At this paper, information about design of field robot's arts and its production, its electronic components, Software was given. Mobile application that was written makes it possible to control robot by mobile phone or tablet [2] The robotic lawn mower requires the user to set up a border wire around the lawn that defines the area to be mowed. These kinds of robots are gradually sophisticated. Robotic lawn mower represented second largest category of domestic's robots. The robot being developed and fabricated was supposed to be a working model of an android controlled prototype model of four-wheeled Bluetooth controlled robot.

Due to the present situation occurring because of Pandemic we are unable to fabricate the Hard-model. We are writing the exact procedure and principle which will be required during fabrication process. This is especially important when the duties, that need be performed, are potentially harmful for the safety or the health of the workers, or when more conservative issues are granted by robotics.

Heavy chemicals or drugs dispensers, manure or fertilizers, spreaders, etc. are activities more and more concerned by the deployment of unmanned options [9]. Also, this kind of robot will work as a delivery robot in operation room where doctors will need any extra accessories at any emergency instance. This kind of robot has advantages such

as fast service, available 24x7, more reliable, more efficient [3].

II. MATERIALS USED

Principle components of Mechatronic Robot controlled through Bluetooth

A. ATMEGA16 Development Board

The AGV system begins from line detector that consists of LEDs and photodiodes. Line detector is reprocessed by Atmega16 as slave microcontroller. Atmega16 processes Information from the reading of line detector as position data. LFR (Light Light Dependent Resistor) detector was used to descry an Clog or object position. [4]

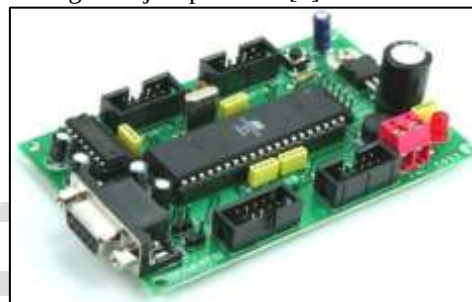


Fig. 2.1: ATMEGA16 Development board

B. ATMEGA16 Microcontroller IC

ATMEGA16 is a 40 leg low power microcontroller which is developed using CMOS technology. CMOS is an advanced technology which is generally used for developing integrated circuits. It comes with low power consumption and high noise immunity.

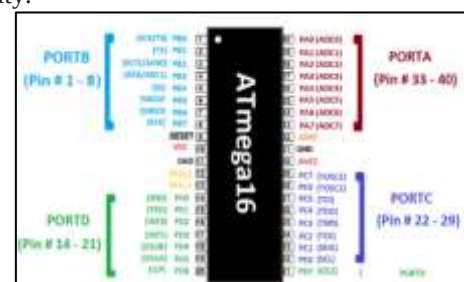


Fig. 2.2: ATMEGA16 Microcontrollers IC

Most of the necessary peripherals required run automatic functions are incorporated in this device like ADC (analogue to digital converter), Analog comparator, USART, SPI, which make it economical as compared to a microprocessor that requires external peripherals to perform various functions.

C. B-type USB cable (for program upload)

USB type-B is a standard USB connector have roughly square in appearance, with a squarish protrusion on top. Type- B anchorages are established on legion USB non-host bent,

cognate as audio interfaces, external hard drives, and printers. USB3.0 uses a 9- leg form of Type-B connection, which allows for faster data transfer. However, the pins in the USB 3.0 are arranged such a way that compatibility with 4-Pin USB 1.1 and USB 2.0 connectors are ensured.



Fig. 2.3: B-type USB Cable

D. USPASP Programmer

USBa is a USB in- circuit programmer for Atmel AVR controllers. The programmer uses a firmware- only USB automobilst, no special USB control is challenged, and that makes it low- cost USB programmer..

The technology used to get the data as well as the notification on mobile and email.[5].



Fig. 2.4: USBASP Programmer

E. Bluetooth Module (HC-05)

HC-05 Bluetooth Module is an easy-to- use Bluetooth SPP (Serialized Port Protocol) module, designed for transparent wireless serialized connection setup. Its communication is via serialized communication which makes an easy way to band with regulator or PC. HC-05 Bluetooth module provides switching mode between master and slave mode which means it qualified to use neither taking nor transmitting data.

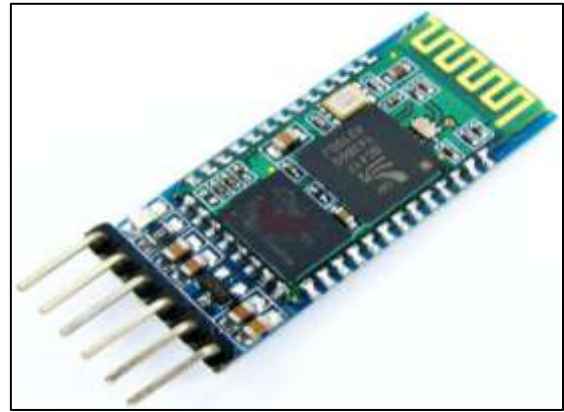


Fig. 2.5: Bluetooth module (HC-05)

F. Motor Driver Module -L293

The motor driver module is a component that allows us to control the working speed and direction of two motors simultaneously. This motor wheelman is designed and developed predicated on L293D IC. L290D is a Leg motor Wheelman IC. This is designed to hand bidirectional drive currents at voltages from 5V to 36V.Control for the two motors in the system is carried out by using the L298D,[6]. L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction.[7]

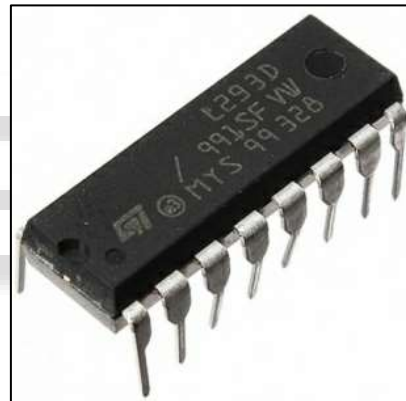
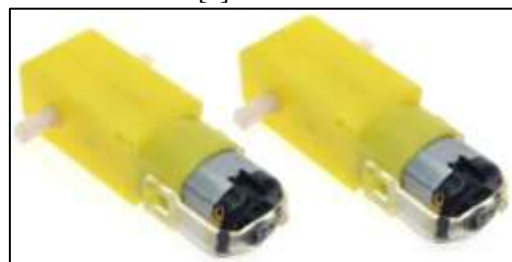


Fig. 2.6: Motor drivers Module (L293D)

G. DC Gear motors

A DC motor is any of a class of rotary electrical machines that converts direct current electrical power into Mechanical power. The most common types depend on the forces produced by enchanting fields. Nearly all types of DC Motors have some internal expedient, either electromechanical or electronic, to periodically change the direction of Current inpouring in part of the motor.7] Actually, it is better to use gearbox motors instead of common DC motors because it has gears and an axle and its speed does not change towards the top of a hill or downhill.[8]



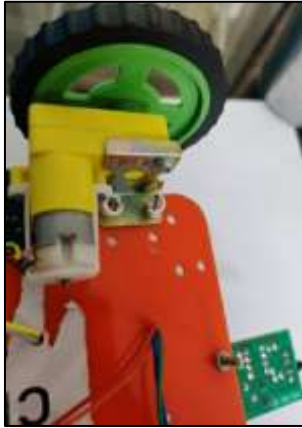


Fig. 2.7: DC Motor

H. Motor Chassis Kit

This shape comes with encoder hunk and twofold shaft BO motors for developing varied sovereign and mass-produced controlled robots. AVR compatible holes and standoffs are included so ATMEGA16 IC can be easily mounted on top. Build multiple types of Robots from one chassis. It has slots for all our general needs. Chassis size is 210 x 149mm.



Fig. 2.8: Motor Chassis Kit (Assembled)

I. Battery (5V)

A lithium polymer battery, or additional fittingly lithium-ion polymer battery (curtailed as LiPo, LIP, Li-poly, lithium-poly and others), is a rechargeable battery of lithium-ion technology using a polymer electrolyte instead of a liquid electrolyte. High conductivity semisolid (gel gel) polymers form this electrolyte. These batteries deliver advanced specific energy than other lithium battery types and are used in employments where weight is a critical affection, akin as mobile affection and radio- controlled aircraft..



Fig. 2.9: Li-Po Battery (5V)

J. Connecting Cable

The transmission of electric current is done using a connecting wire. This wire is connected to maintain interference between the various equipment of the circuit. These are thin in size and have different connecting end and each. These are specially designed to carry 5v to 12V DC supply without any much loss. In our work we required the following ended connecting wires:

- Female to male cable
- Female to female cable
- Male to female cable



Fig. 2.10: Connecting wires

III. METHODOLOGY

In our project, it was supposed to make the robot by the following method, but due to pandemic, we were unable tom work on our hardware. We have enlisted the detailed, functionality of the various components using diagrams. We are using ATMEL studios version 7.0 software for writing our C program which is supposed to run on Proteus Design Suite version 8.0.

The circuit connection will be dependent on the port configuration of ATMEGA16 microcontroller IC. It will be mounted on ATMEGA16 Development Board, including DC motors, L293D motor driver module, HC05 Bluetooth module and the connections will be established. We have given the details of our exact working process and other components. We have only performed the simulation and programming part.

IV. FINAL PRODUCT PICTORIAL



Fig. 4.1. Final Machine Top View



Fig. 4.2 Final Machine Front View



Fig. 4.3 Final Machine Side View

V. RESEARCH ISSUES

Mechatronic Robot controlled through Bluetooth robot was Developed for medical field. It works with the help of the battery. The robot can choose the driving method and anyone of its medical operations automatically according to the needs [1]. In this section we analyse the recent work which can be characterised as AI Robotics, by arranging it into the two basic issues in robot design Action and Perception [10]. This research is a research development that aims to make a multiplatform robot as a medium for the introduction of technology among adolescents.[11]. They're used to deliver communications and drugs in ahospital.it can be suggested to run autos, mass transport systems and freestanding autos which navigating the road. They can be used in service as mole sprats, shop bottom, etc (12). While, investigators are working on ways to help robots move and suppose more efficiently. Since paramount robots in use now are designed for specific tasks, our meaning is to ultimately make universal robots that are flexible enough to do just about anything a human does and farther. [12]

VI. CONCLUSION

In this project, we've learned the thanks to design a HC-05 Bluetooth based Android Mobile controlled wireless robot with AVR ATmega16 microcontroller. Presently, we will use the Android Mobile as the input device to drive the robot in different direction. We have learned how to interfacing a L293D based DC Motor Driver in 5V mode with AVR ATmega16 microcontroller. The 5V mode is employed to run a DC motor at constant speed in clockwise and anti-clockwise

direction. In 5V mode, 5V is given to 2 enable pins of L293D. Here, we use the DC Motor Driver to control the direction of two DC motor mounted on a Robot at constant speed.

The ATmega16 microcontroller provided the necessary signal to the DC Motor Driver to run the robot in forward, left, right, reverse direction and to stop it respectively each for 2 minutes. The communication was set up between HC-05 Bluetooth module & Android Smart Phone successfully. The communication channel between HC- Bluetooth module and ATMEGA Microcontroller took place through USART serial communication protocol. The programming was coded on Atmel Studios Version 7.0 and run on Prptius 8 design suite for simulation of the circuit desired. And finally using USBASP programmer it was writing on ATMEGA16 microcontroller.

VII. FUTURE SCOPE

- 1) This robot can be used in the borders for disposing isolated land mines.
- 2) The robot is small in size so can be used for espionage.
- 3) The robot can be used for surveillance or reconnaissance.
- 4) It can be further automated installing advanced technology sensors.

REFERENCES

- [1] Barua Vicky, Md. Arif Istiek Neloy, Shahid Uddin Rahat, Mithun Das, Md. Shafiul Islam Joy, Nazmun Nahar & Abhijit Pathak (2020) "An Ultrasonic Line Follower Robot to Detect Obstacles and Edges for Industrial and Rescue Operations" International Journal of Computer Applications (0975 – 8887) Volume 176 – No. 31
- [2] Tezel Cengiz & Batuhan Hangün (2017) "Design and Implementation of Bluetooth Controlled Collision Avoidance 4 Wheel Robot using Arduino with Linear Interpolation Method for Determination" International Journal of Engineering Science and Application, Vol. 1, No. 4, pp 152-157
- [3] Chaudhari Jagruti, Asmita Desai & S. Gavarskar (2019), "Line Following Robot Using Arduino for Hospitals" 2019 2nd International Conference on Intelligent Communication and Computational Techniques (ICCT) Manipal University Jaipur.
- [4] Schulze Lothar, Sebastian Behling, and Stefan Buhrs, (2008) "Automated Guided Vehicle System: a Driver for Increased Business Performance", International Multi Conference of Engineers and Computer Scientists 2008 Vol II IMECS 2008, 19-21 March, 2008, Hong Kong.
- [5] Srivastva Anshuka, Sonali Kesarwani, Devesh Mishra & K.K. Agrawal (2019), "Design and Development of Automatic Soil Moisture Monitoring with Irrigation System for Sustainable Growth in Agriculture" International Conference on Sustainable Computing in Science, Technology & Management (SUSCOM-2019)
- [6] Hymavathi V & G Vijay Kumar (2011), "Design and Implementation of Double Line Follower Robot" International Journal of Engineering Science and Technology (IJEST) ISSN: 0975-5462 Vol. 3, No 6.

- [7] Ismail S. Mohammed, I. Richards Infant Dhanaraj & M. Tharik sajeen (2018) "Android Controlled Robot Car" International Journal of Management, Technology And Engineering Volume 8, Issue XI, ISSN NO : 2249-7455 pp 2612-2628
- [8] Pakdaman Mehran, M. Mehdi Sanaatiyan & Mahdi Rezaei Ghahroudi, (2010) "A Line Follower Robot from design to Implementation: Technical issues and problems", 2nd International Conference on Computer and Automation Engineering (ICCAE), Singapore, 2010, pp. 5-9, doi: 10.1109/ICCAE.2010.5451881.
- [9] Balaji B S, Shivakumara M C, Sunil Y S, Yamuna A S & Shruthi M (2018), "Smart Phone Operated Multipurpose Agricultural Robot" International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 IJERTV7IS050249 Vol. 7 Issue 05, May-2018 pp 478-481
- [10] Chella Antonio, Lucca Iocchi, Irene Macaluso & Daniele Nardi (2006), "Artificial Intelligence and Robotics" Anno III, N° 1/2, Marzo-Giugno 2006 pp 87-93[22]
- [11] Darmawan Ilham Akbar & Nova Eka Budiyantha (2020), "Multiplatform Mobile Robot as Robotics Technology Socialization Media" International Journal of Advanced Science and Technology Vol. 29, No. 7s, (2020), pp. 3437-3444
- [12] Vamsi Anupoju Sai, Badana Manasa, Kocherla Rama Krishna, Tarigoppula Venu & A N V N Shashank (2019) "Design to Implementation of A Line Follower Robot Using 5 Sensors" International Journal of Engineering and Information Systems (IJEAIS) ISSN: 2000-000X Vol. 3 Issue 1, January – 2019, Pages: 42-47
- [13] Yeole Aniket R. , Sapana M. Bramhankar, Monali D. Wani, Mukesh P. Mahajan (2015), "Smart Phone Controlled Robot Using ATMEGA328 Microcontroller" International Journal of Innovative Research in Computer and Communication Engineering Vol. 3, Issue 1 SSN(Online): 2320-9801 ISSN (Print): 2320-9798