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Bluetooth Controlled Robot using Android Smart Phone

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ABSTRACT

Robot is a reprogrammable, multifunctional device which is primarily designed to do work like human such as pick and place, loading and unloading, surveillance, health care, industrial, aerospace application. Robots can perform dangerous and accurate work to increase the productivity as they can work 24 hours without rest. This system deals with the design and control of automated robot which can move in desired direction using android application. An android application has developed using Bluetooth App and a Bluetooth communication is made with robot which interfaces with microcontroller to change direction. So the Android phone will transmit command using its in-built Bluetooth to the robot so that it can move in the required direction like moving forward, reverse, turning left, turning right and stop. Two obstacle detecting sensors are attached on the left and right side of the robot. If there is an obstacle in the moving direction, it will automatically change its direction.

KEYWORDS: Robot, android, Bluetooth, command, automatic

1. INTRODUCTION

1.1 OVERVIEW

A robot is an electromechanical machine that is controlled by computer program to perform various operations. Industrial robots have designed to reduce human effort and time to improve productivity and to reduce manufacturing cost. Today human-machine interaction is moving away from mouse and pen and becoming much more pervasive and much more compatible with the physical world. Android app can control the robot from a long distance using Bluetooth communication to interface controller and android. Microcontroller ATMEGA328P can be interfaced to the Bluetooth module though UART protocol and code is written in embedded C language. As per the commands received from android app the robot can be controlled. The output of a robotic vehicle is accurate and repeatable. Pick and Place robots can be reprogrammable and tool can be interchanged to provide for multiple applications. The purpose of this work is to design and implement an Android Controlled Bluetooth Robot which is used for Surveillance, home automation, wheelchairs, military and hostages Rescue applications.

1.2 EMBEDDED SYSTEM

An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. By contrast, a general-purpose computer, such as a personal computer (PC), is designed to be flexible and to meet a wide range of end-user needs. Embedded systems control many devices in common use today. Modern embedded systems are often based on microcontrollers (i.e. CPUs with integrated memory and/or peripheral interfaces) but ordinary microprocessors (using external chips for memory and peripheral interface circuits) are also still common, especially in more complex systems. In either case, the processor(s) used may be types ranging from rather general purpose to very specialized in certain class of computations, or even custom designed for the application at hand. A common standard class of dedicated processors is the digital signal processor (DSP).The key characteristic, however, is being dedicated to handle a particular task. Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale. Embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, and largely complex systems like hybrid vehicles, MRI, and avionics. By contrast, a generalpurpose computer, such as a personal computer (PC), is designed to be flexible and to meet a wide range of end-user needs.

1.2.1 Variety of embedded systems

Embedded systems are commonly found in consumer, cooking, industrial, automotive, medical, commercial and military applications. Telecommunications systems employ numerous embedded systems from telephone switches for the network to cell phones at the end-user. Computer networking uses dedicated routers and network bridges to route data. Consumer electronics include Personal Digital Assistants (PDAs), mp3 players, mobile phones, videogame consoles, digital cameras, DVD players, GPS receivers, and printers. Household appliances, such as microwave ovens, washing machines and dishwashers, include embedded systems to provide flexibility, efficiency and features. Transportation systems from flight to automobiles increasingly use embedded systems. Medical equipment uses embedded systems for vital signs monitoring, electronic stethoscopes for amplifying sounds, and various medical imaging for non-invasive internal inspections. Embedded Wi-Fi modules provide a simple means of wirelessly enabling any device which communicates via a serial port.

1.2.2 Characteristics

Embedded systems are designed to do some specific task, rather than be a general-purpose computer for multiple tasks. Some also have realtime performance constraints that must be met, for reasons such as safety and usability; others may have low or no performance requirements, allowing the system hardware to be simplified to reduce costs. Embedded systems are not always standalone devices. Many embedded systems consist of small parts within a larger device that serves a more general purpose. For example, the Gibson Robot Guitar features an embedded system for tuning the strings, but the overall purpose of the Robot Guitar is, of course, to play music. Similarly, an embedded system in an automobile provides a specific function as a subsystem of the car itself. The program instructions written for embedded systems are referred to as firmware, and are stored in read-only memory or flash memory chips. They run with limited computer hardware resources: little memory, small or non-existent keyboard or screen.

1.2.3 User Interface

Embedded systems range from no user interface at all, in systems dedicated only to one task, to complex graphical user interfaces that resemble modern computer desktop operating systems. Simple embedded devices use buttons, LEDs, graphic or character LCDs (for example popular HD44780 LCD) with a simple menu system. Embedded systems are commonly found in consumer, cooking, industrial, automotive, medical, commercial and military, mobile phones, videogame consoles, digital cameras, DVD players. Telecommunications systems employ numerous embedded systems from telephone switches for the network to cell phones at the end-user. Computer networking uses dedicated routers and network bridges to route data. More sophisticated

devices which use a graphical screen with touch sensing or screen-edge buttons provide flexibility while minimizing space used: the meaning of the buttons can change with the screen, and selection involves the natural behavior of pointing at what's desired. Handheld systems often have a screen with a "joystick button" for a pointing device.

2.LITERATURE SURVEY

2.1 Dhiraj Sunehra et al

A robot is an integration of mechanics, electronics and software. Robots are essentially a self-contained tribute to the wonders of technology. Robots if well designed in architecture and programmed with concepts of artificial intelligence can ease the human work. There are many different reasons for using a robot. Use of robots reduces labor and cost by automating recurring tasks. Human intervention is avoided hence less chances of errors and better accuracy can be expected. And most importantly the areas where human life can have risk, danger; at such places robots can navigate dangerous places and potentially save lives. The most advanced robotic models use fast computer processing, high-definition cameras, artificial intelligence and long-range sensors. They are used for surveillance. Our project is all about developing a wireless surveillance robotic vehicle which can navigate through obstacles with the help of sensors, embedded system and its programming. It will be able to capture the footage or pictures of area with its camera eye and send them back using wireless transmission technology such as Bluetooth.

2.2 Hemesh Sawakar et al

Self-propelled patrolling vehicles can patrol periodically in the designed area to ensure the safety like men do. The proposed vehicle cannot only save manpower, but also ensure the performance without mistakes caused by man. It is different from the traditional patrolling system which is limited by the manpower and the fixed camera positions. To improve such 7 situation, this paper proposes a self-propelled patrolling vehicle which can move automatically to a wider range and record the monitored image by IPCAM within a predefined patrolling route. Besides, the user can use the mobile device or website to connect to the vehicle at anytime and anywhere and control it to move to the position to get the indoor image user wants. The position of self-propelled vehicles can be detected by the RFID reader as a feedback and be shown on the PC screen and smart phone. The recorded images can be also transmitted back to the server via WiFi system for face tracking and discriminating analysis. On the other hand, the self-propelled vehicle patrolling routes can be modified by the Android smart-phone remote-control module. When some defined events occur, the build-in MSN module will notice users by sending messages to PC and smart phone. Experimental results are given in the paper to validate its performance.

2.3 Hou-Tsan Lee et al

The security is a scenario in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The webcam has evolved from the convergence of wireless technologies and the Internet. The security system is the communication of anything with any other thing, the communication mainly transferring of useable data, for example, a sensor in a room to monitor and control the temperature. To describe a security alarm system using low processing power chips using Internet of things which helps to monitor and get alarms when motion is detected and sends photos and videos to a cloud server. Moreover, Internet of things based application can be used remotely to view the activity and get notifications when motion is detected. The photos and videos are sent directly to a cloud server when the cloud is not available then the data is stored locally on the Raspberry Pi and sent when the connection resumes. Therefore, advantages like these make this application ideal for monitoring homes in absence.

3.EXISTING SYSTEM

3.1 EXISTING SYSTEM

The existing self-propelled monitoring and surveillance Vehicle can be divided into the following parts: Wireless IPCAM video capture system, face detection system, remote monitor and alarm transmitter system, RFID position detection systems, and cell phone monitoring and control system. The diagram of system architecture The self-propelled vehicle uses RFID technology to control the moving direction. RFID tag is installed in the right hand side of the self-propelled vehicle. When the self-propelled vehicle moves to a

predefined routing path installed with RFID reader, the RFID reader would detect the RFID tag and send the signals back to the server to show the detected position on the map to indicate the status of the automatic vehicle.

3.2 DRAWBACKS

1. Limited for only single stair.
2. Limited angle detection (not able to detect faces under critical angle)
3. System itself having some limitations of capturing.

4.PROPOSED SYSTEM

4.1 METHODOLOGY

The architecture is used for educational robotics, because students can build their own robots with less cost. Smart Phone controlled robot is controlled by using Android App instead of any other method like buttons, gesture etc. Here only needs to touch button in android phone to control the robot in forward, backward, left and right directions. So here android phone is used as transmitting device and Bluetooth module placed in car is used as receiver. Android phone will transmit command using its in-built Bluetooth to robot so that it can move in the required direction like moving forward, reverse, turning left, turning right and stop.

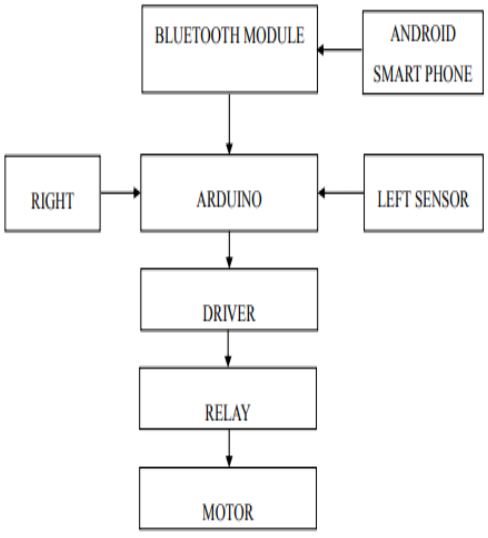

Fig 4.2: Architecture Design

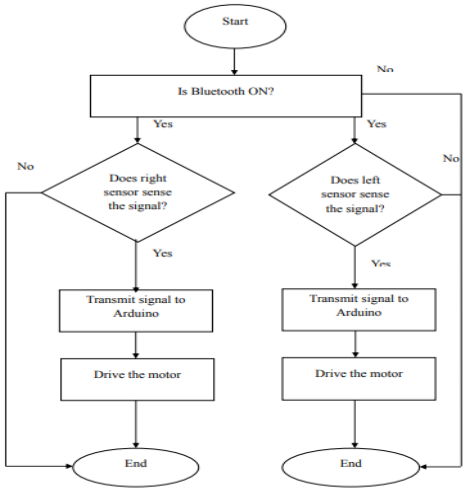

Fig 4.3: Flowchart

5.HARDWARE REQUIREMENTS

5.1 POWER SOURCE

This power supply section is required to convert AC signal to DC signal and also to reduce the amplitude of the signal. The available voltage signal from the mains is 230V/50Hz which is an AC voltage, but the required is DC voltage (no frequency) with the amplitude of +5V and +12V for various applications.

5.2 BRIDGE FULL WAVE RECTIFIER

The Bridge rectifier circuit is shown in figure, which converts an ac voltage to dc voltage using both half cycles of the input ac voltage. The Bridge rectifier circuit is shown in the figure. The circuit has four diodes connected to form a bridge. The ac input voltage is applied to the diagonally opposite ends of the bridge. The load resistance is connected between the other two ends of the bridge. For the positive half cycle of the input ac voltage, diodes D1 and D3 conduct, whereas diodes D2 and D4 remain in the OFF state. The conducting 15 diodes will be in series with the load resistance RL and hence the load current flows through RL.

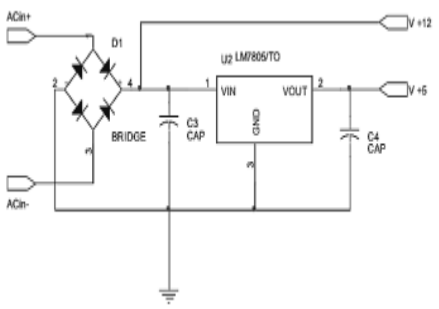

Fig 5.1 Circuit of power adapter

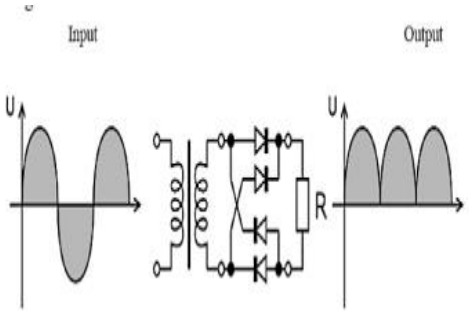

Fig 5.2 Bridge full wave rectifier

5.3 FILTERS

Electronic filters are electronic circuits, which perform signalprocessing functions, specifically to remove unwanted frequency components from the signal, to enhance wanted ones.

5.4 TRANSFORMERS

If a load is connected to the secondary, an electric current will flow in the secondary winding and electrical energy will be transferred from the primary circuit through the transformer to the load. This field is made up from lines of force and has the same shape as a bar magnet. If the current is increased, the lines of force move outwards from the coil. If the current is reduced, the lines of force move inwards. If another coil is placed adjacent to the first coil then, as the field moves out or in, the moving lines of force will "cut" the turns of the second coil. As it does this, a voltage is induced in the second coil. With the 50 Hz AC mains supply, this will happen 50 times a second. This is called mutual induction and forms the basis of the transformer. The input coil is called the primary winding; the output coil is the secondary winding. For example, if the secondary has half the primary turns; the secondary will have half the primary voltage. Another example is if the primary has 5000 turns and the secondary has 500 turns, then the turn's ratio is 10:1. If the primary voltage is 240 volts then the secondary voltage will be x 10 smaller = 24 volts. Assuming a perfect transformer, the power provided by the primary must equal the power taken by a load on the secondary. If a 24-watt lamp is connected across a 24 volt secondary, then the primary must supply 24 watts.

5.5.VOLTAGE REGULATOR

The LM78XX series of voltage regulators are designed for positive input. For applications requiring negative input, the LM79XX series is used. Using a pair of voltage divider resistors can increase the output voltage of a regulator circuit. It is not possible to obtain a voltage lower than the stated rating. You cannot use a 12V regulator to make a 5V power supply. Voltage regulators are very robust. These can withstand over-current draw due to short circuits and also over-heating. In both cases, the regulator will cut off before any damage occurs. The only way to destroy a regulator is to apply reverse voltage to its input. Reverse polarity destroys the regulator almost instantly.

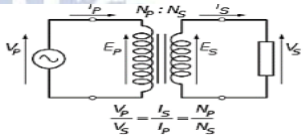

Fig 5.3 Transformer

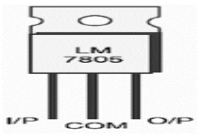

Fig 5.4 Voltage Regulator

5.6 ARDUINO UNO MICROCONTROLLER

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB 19 connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

Fig 5.6 Arduino UNO Board

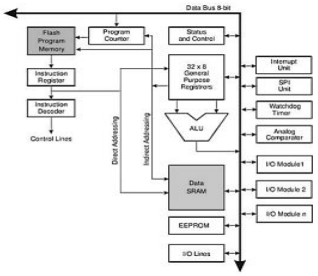

Fig 5.6 Arduino Architecture

5.7 BLUETOOTH MODULE

Specification

- Model: HC-05
- Input Voltage: DC 5V Communication
- Method: Serial Communication 26
- Master and slave mode can be switched

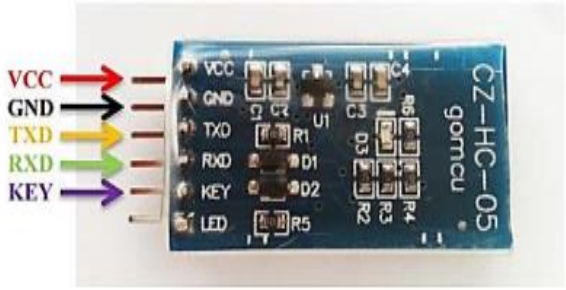

Fig 5.7 Pin Definition

5.8. WORKING PRINCIPLE

Relay works on the principle of electromagnetic induction. When the electromagnet is applied with some current it induces a magnetic field around it. Above image shows working of the relay. A switch is used to apply DC current to the load. In the relay Copper coil and the iron core acts as electromagnet. When the coil is applied with DC current it starts attracting the contact as shown. This is called energizing of relay. When the supply is removed it retrieves back to the original position. This is called De energizing of relay. There are also such relays, whose contacts are initially closed and opened when there is supply i.e. exactly to opposite to the above shown relay. Solid state relays will have sensing element to sense the input voltage and switches the output using opto-coupling.

5.9 MOTOR DRIVER

L298 is a high voltage and high current motor drive chip which receives TTL logic signals. They are mostly used when it is needed to operate different loads like motors and solenoid etc. where a H-Bridge is required. High power motor driver is required. Control unit can only provide TTL outputs. Current control and PWM operable single chip device is needed. It has two enable inputs to enable or disable the particular device attached at its output independently.

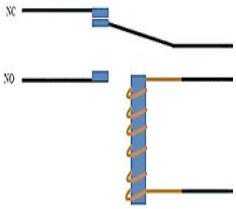

Fig 5.8 Working Principle

Fig 5.9 L298 Dual H-Bridge Motor Driver

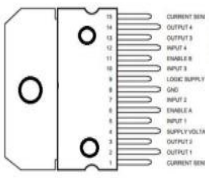

Fig 5.10 L298 Pin-out

5.10 WORKING PRINCIPLE

The direct current motor is represented by the circle in the center, on which is mounted the brushes, where we connect the external terminals, from where supply voltage is given. On the mechanical terminal we have a shaft coming out of the Motor, and connected to the armature, and the armature- 37 shaft is coupled to the mechanical load. On the supply terminals we represent the armature resistance Ra in series. Now, let the input voltage E, is applied across the brushes. Electric current which flows through the rotor armature via brushes, in presence of the magnetic field, produces a torque Tg. Due to this torque Tg the dc motor armature rotates. As the armature conductors are carrying currents and the armature rotates inside the stator magnetic field, it also produces an emf Eb in the manner very similar to that of a generator. The generated Emf Eb is directed opposite to the supplied voltage and is known as the back Emf, as it counters the forward voltage. The back emf like in case of a generator is represented by

$$E_b = \frac{P.\varphi.Z.N}{60.A} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$I_a = \frac{E - E_b}{R_a}$. Now at starting, speed $\omega = 0$ so at starting $Eb = 0$.

$$\therefore I_a = \frac{E}{R_a} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Now since the armature winding electrical resistance Ra is small, this motor has a very high starting current in the absence of back Emf. As a result, we need to use a starter for starting a DC Motor. Now as the motor continues to rotate, the back Emf starts being generated and gradually the current decreases as the motor picks up speed.

6.CONCLUSION

We achieved Bluetooth control communication between the mobile via android application- and the robot. The objective of the system is to realize the smart living, more specifically the home lighting control system using Bluetooth Technology. Robot and smart phones is a perfect match, especially mobile robots. As phones and mobile devices are each time more powerful, using them as robot for building robot with advanced features such as voice recognition. Android Bluetooth - enabled phones and blue tooth module via

HC-06 and communication among blue tooth devices. The smart living will gradually turn into reality that every consumer can control their vehicle from remotely and through wirelessly.

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Conflict of interest statement

Authors declare that they do not have any conflict of interest.

REFERENCES

[1] Dhiraj Sunehra, Veena M. "Implementation of Interactive Home Automation Based on Email & Bluetooth technology". International conference on Information Processing (ICIP) Vishwakarma Institute of Technology, Dec 2015.

[2] D. Jaya Sree, M. Jhansi Lakshmi. "Android Mobile based Home Automation Using Bluetooth". International Journal of Advanced Research in Computer Engineering and Technology (IJARCET). Vol.3, Issue 9, September 2014.

[3] Hemesh Sawakar, Shantanu Shingate, Amit Kanojia, Gaurav Hajare, "Wireless Surveillance Robot using Automatic & Manual Control", International Research Journal of Engineering and Technology (IRJET), Volume: 04, Issue: 10, Oct -2017.

[4] Hou-Tsan Lee, Wei-Chuan Lin, and Ching-Hsiang Huang, "Indoor Surveillance Security Robot with a Self-Propelled Patrolling Vehicle", Hindawi Publishing Corporation Journal of Robotics, Volume 2011.

[5] S. A. Ahirrao, Sayali S. Ballal, Divya K. Sawant, Harsha H. Chahira, Amisha A. Savaliya, "Android Based Remote Surveillance System and Content Sharing Between PC And Mobile", International Journal of Computer Applications Technology and Research, Volume 4, Issue 2, 2015.

[6] N.Sugumaran, G.V.Vijay, E.Annadevi, "Smart Surveillance Monitoring System using Raspberry Pi and PIR sensor", International Journal of Innovative Research in Advanced Engineering (IJIRAE), Issue 04, Volume 4, April 2017.

[7] L. Zhu, F. R. Yu, B. Ning, and T. Tang, "Cross-layer handoff design in mimoenabled wlans for communication-based train control (cbtc) systems," IEEE J. Sel. Areas Commun., vol. 30, no. 4, pp. 719–728, May 2012.

[8] H. Jiang, B. Bing, and Z. Hongli, "A novel handover scheme in wireless lan in cbtc system," in Proc. IEEE Int. Conf. SOLI, 2011, pp. 473–477