International Journal on Science and Technology (IJSAT)
E-ISSN: 2229-7677 ● Website: www.ijsat.org ● Email: editor@ijsat.org

Arduino Based Smart Phone Controlled Robot Car

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Abstract

The subject of robotics and automation has undergone a revolution in recent years due to the integration of smartphones with microcontroller-based devices. The creation of an Arduino-based robot automobile that can be operated by a smartphone using Bluetooth is the main goal of this project. The main goal is to create an affordable, easy-to-use robot car that can be commanded remotely and precisely navigate a variety of situations. Using a ULN2003 stepper motor driver and stepper motors, the system uses an Arduino Uno microcontroller to execute commands from a Bluetooth module (HC-05/06) and regulate the robot's movement. The Arduino understands and responds to directional commands sent by the smartphone, which serves as the user interface. The wireless control of robotic systems is demonstrated in this study, which also lays the groundwork for more sophisticated uses including home automation, surveillance robots, and driverless cars. Because of its exceptional responsiveness, low latency, and precise control, the robot car is perfect for DIY projects, education, and prototyping. The straightforward design and efficient operation demonstrate how cellphones and microcontrollers may be combined to create intelligent robotic systems.

Keywords: Internet of Things, Robot, Arduino, Control Systems

INTRODUCTION

Innovative robotics solutions have been made possible by the quick development of wireless and embedded systems. The creation of smartphone-controlled robots, which enable users to manage robotic systems from a distance via mobile applications, is one example of this invention. The Arduino Uno serves as the main controller for this project's smartphone-controlled robot car, which connects to a smartphone via Bluetooth to receive commands. Because of its ability to carry out movement commands like forward, backward, left, and right, the robot can be used for a variety of real-world jobs like automation, obstacle navigation, and surveillance.The emergence of wireless connectivity and the Internet of Things (IoT) has made it possible to create intelligent systems that are not only effective but also affordable and simple to deploy. These qualities are embodied in the robot automobile presented in this project, which provides a dependable, interactive, and modular system that can be controlled remotely with any Android smartphone that has Bluetooth.

Mechanical autonomy oversees the design, development, deployment, and use of robots as well as computer systems for data processing, control, and clear feedback. Nowadays, the majority of robots are used to perform repetitive tasks or jobs that are deemed too dangerous for humans. They served as post

artists earlier in the year. In fact, robots were already performing a great deal of labor and maintenance at that time. The idea behind the home security system is to protect the house from any outsiders without the owner's presence. These days, robots are making their way into modern life.

Additionally, robots are used in manufacturing facilities to build hardware, automobiles, and confections. A clever robot with speech, vision, and environmental awareness is called a "savvy robot." A robot is a machine, particularly one that can be programmed by a computer and is set up to carry out a challenging exercise regimen. Robots can be operated by an external control device or by an internal control system. Even though they can be made to resemble humans, most robots are devices designed to perform a task regardless of their appearance. There have been several records of client-configurable mechanical gadgets and even automata that resemble people and animals, arranged essentially as preoccupations, dating back to the era of ancient human advances. With the development of mechanical processes in the modern era, new convenient uses appeared, such as remote control and computerized machinery. People may need assistance in their houses to reduce manual labor; this is necessary essentially in the event that someone is physically tested.

From now on, this paper will be divided into expressive sections. The Arduino Uno microcontroller, the robot's central component, is part of the device. A selection of the work and research in this discipline is shown in the accompanying section. Such as programming requirements, segments, and the process of association formation. Once a robot is positioned in the entryway, sensors installed in its body are activated whenever a person or object approaches it. The robot instantly responds to this and emails the home's owner.

OBJECTIVES

The primary goals of the suggested home automation system are to: Offer an affordable and easy-to-use way to automate household equipment. To use Android apps to provide remote control of household equipment. To incorporate Bluetooth and other connectivity technologies for smooth device operation. To increase energy efficiency by automating device operations according to environmental conditions and user preferences. To improve home security by making it possible to remotely monitor and manage security equipment like alarms and cameras.

LITERATURESURVEY

In today's world, all mobile phones are Android devices that are freely available in the market. Every designer has utilized their mobile phones with no expense incurred. Every student is acquainted with smartphones and their features because the Java programming language is implemented in their smartphones. Developers can easily access numerous functions and Android hardware components that are not sandboxed [1]. The Bluetooth technology utilizes radio frequency (RF) phenomena. Therefore, a radio signal is generated to control any devices with the assistance of Bluetooth. A robotic car does not perform any positive actions autonomously on its own because it is consistently controlled by human operators wirelessly without any risks or interruptions [2]. A personal area network is employed to manage any devices wirelessly within a range of 5-10 meters. Thus, this type of technology has dramatically been integrated into various electronic devices such as MacBooks, printers, laptops, notebooks, and other electronic items [3]. Nowadays, Android operating systems are being implemented significantly in smartphones with numerous new features and functionalities. Hence, Linux is utilized to create Android smartphones [4]. Linux is based on both the software stack OS (operating system) and SDK (software development kit) available freely, allowing developers to easily

customize and add new features according to customer needs in a feasible manner [5]. In the past, every person was afraid to communicate with one another and with real-world individuals. However, currently, IoT devices like smartphones, laptops, and other communication gadgets are used to facilitate easy and comfortable communication between individuals without requiring any assistance [6]. Bluetooth technology was introduced by JaapHaartsen in the 1990s and was developed by Ericsson in the 1994s. Here, Jaap transformed all his office's wired connections into a wireless setup without requiring any help [7]. In the 1988s, the Institute of Electrical and Electronics Engineers (IEEE) confirmed Bluetooth IEEE802. 15. 1 with the aid of a special interest group, which simultaneously promoted and launched it in the market [8]. A typical data transmission rate of 9600 kb per second is used by default to communicate with various devices via the Bluetooth module [9].

EXISTINGSYSTEM:

Existing systems frequently have functional and security flaws. Strong face detection for security may be lacking in current home automation systems, making houses open to unwanted entry. Furthermore, a lot of IoT configurations have poor integration and control, which results in ineffective device management and a constrained operational range. These flaws can lead to inconsistent performance and decreased convenience, underscoring the need for more sophisticated systems with enhanced security measures, better IoT integration, and more control options.

Disadvantages:

- Inadequate facial detection and low security.
- Performance problems are caused by inadequate IoT integration.
- Limited range of operation.
- Intricate setup procedure.
- Absence of notifications and monitoring in real time.

PROPOSEDSYSTEM

The suggested solution comprises of a robotic vehicle that may be operated over Bluetooth from a smartphone. The Bluetooth module receives commands sent by the user via a smartphone app. To operate the DC motors and move the robot in the appropriate direction, the Arduino microcontroller processes these commands and relays the signals to the motor driver. The system runs smoothly and effectively thanks to its battery-powered design and real-time responsiveness. Its functionality and versatility are increased by adding further features like voice control and servo motors for auxiliary jobs.

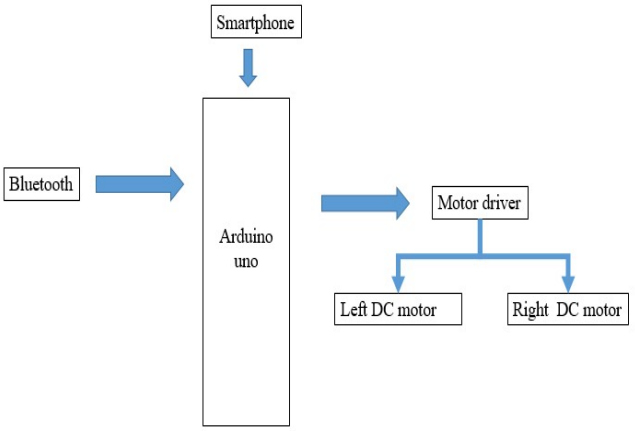
Advantages:

- Enables immediate notifications and real-time monitoring for prompt threat action.
- Allows for remote control and access through a mobile app. improves security by detecting different threats using several sensors.
- Uses automated threat detection and response to minimize manual interaction.
- Provides data analysis and logging for better security insights.

BLOCKDIAGRAM

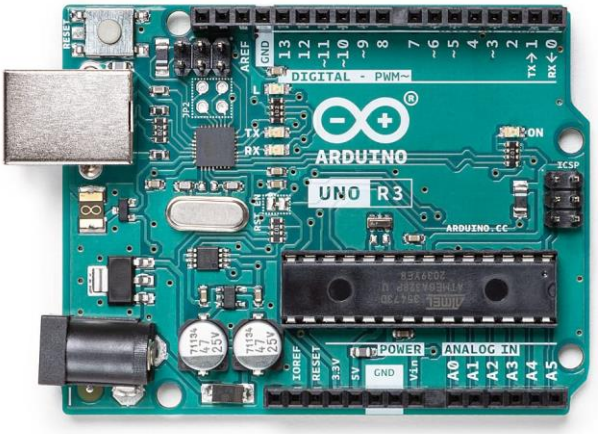
The description of the software's general features is closely related to the device's order and

requirements. The architectural design process includes the description and design of numerous web pages and their interactions. Key software components are recognized, deconstructed into conceptual processing modules and records systems, and their relationships are described. The proposed system defines the following modules.



HARDWAREEXPLANTION

Arduino Uno:

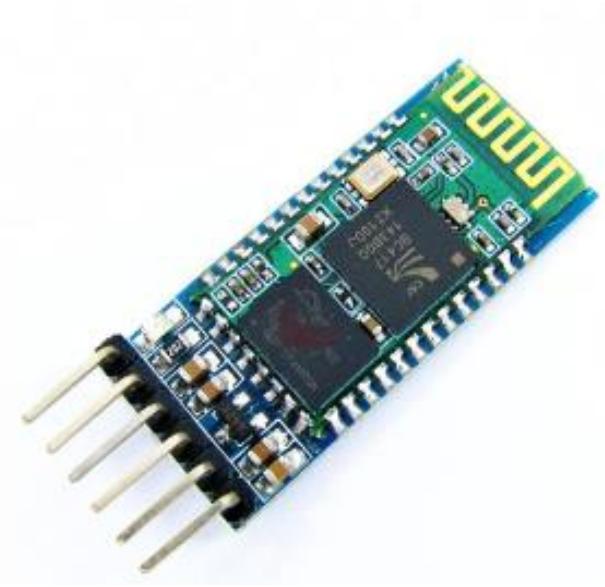


The Arduino UNO is an open-source, programmable microcontroller board that is inexpensive, versatile, and simple to use. It may be used in a wide range of electronic projects. In addition to controlling relays, LEDs, servos, and motors as an output, this board can communicate with other Arduino boards, Arduino shields, and Raspberry Pi boards. Instead of being an abbreviation, "Arduino Uno" is a combination of the brand name "Arduino" and the model identifier "Uno." Arduino is an open-source electronics platform that offers software and hardware for creating interactive objects and digital gadgets.

RELAY

There need to be no electrically operated switch. Current flowing via the relay coil creates a magnetic discipline that attracts the bar and changes the transfer contact. The coil present day can be turned on or off, so the slider position has two positions and is a double function (toggle) transfer. Allow one circuit to bypass via the second, which may be completely separate from the primary. For instance, an excessive-voltage battery circuit can use an AC 230 V circuit: internal there is no electrical connection among the two circuits; the relationship is magnetic and mechanical. The coil present day incorporates a high inner present day, normally 30mA for 12V devices, but can be as high as 100mA for devices designed to function at lower voltages. Most ICs (eu) can't provide this present day, and the transistor to a larger fee is used to increase the small IC cutting-edge for the larger coil required. The popular 555 chip has a most modern of 2 hundred mA, so those gadgets can directly power any circuits without amplification.

BLUETOOTH



Using Bluetooth technology to connect and send data, a Bluetooth module is a tiny piece of hardware that allows wireless communication between devices over short distances. The robot and a distant device can communicate wirelessly thanks to the Bluetooth module. Battery: The robot is powered by the battery. Sensors: Sensors take in information from the surroundings and give the microcontroller response.

FUTURE SCOPE

I have successfully designed this model in accordance with my requirements. Therefore, there are numerous challenges to solve in order to construct this model. I observed the object while relocating from one location to another. Therefore, it may be possible to add a camera in the future to solve this problem. The second issue I have observed is that the robot car's range is extremely limited when it comes to long-distance operation. To fix the problem, update to the most recent Bluetooth version and improve the design going forward. The third problem I have discovered is that sometimes it is rather difficult to control the robot automobile remotely. Therefore, it is very easy to govern the addition of Google Assistant in the future.

CONCLUSION

The creation of the Arduino-based smartphone-controlled robot car serves as an excellent example of how microcontroller systems and wireless communication technologies like Bluetooth may be used to produce affordable, portable, and easy-to-use robotic solutions. An Arduino Uno, ULN2003 stepper motor driver, and Bluetooth module are used in this project to successfully enable real-time smartphone control of a robot car. The system's straightforward architecture and directional movements (forward, backward, left, and right) guarantee dependable operation within a constrained range.

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