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Hand Gestures Controlled Intelligent Wheel Chair With Bluetooth Device

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ABSTRACT

In this project, we developed a smart wheelchair controlled by hand gestures via a Bluetooth-enabled device. The system enhances mobility for individuals with disabilities, providing a seamless and intuitive control mechanism. By eliminating the need for physical exertion, the wheelchair ensures ease of use and independence for users.

KEYWORDS

Arduino Uno Microcontroller, DC Motor, MEMS Sensor, RPS, Bluetooth.

I. INTRODUCTION

The aim of this project is to controlling a wheel chair by using MEMS Accelerometer Sensor (Micro Electro-Mechanical Systems*)* technology and Bluetooth application. MEMS Accelerometer Sensor is a Micro Electro Mechanical Sensor which is a highly sensitive sensor and capable of detecting the tilt. This sensor finds the tilt and makes use of the accelerometer to change the direction of the wheel chair depending on tilt. For example, if the tilt is to the right side then the wheel chair moves in right direction or if the tilt is to the left side then the wheel chair moves in left direction. Wheel chair movement can be controlled in Forward, Reverse, Left and Right direction. Same as usually here the commands recieves from the bluetooth module for the respective functions like left, right, front and backward.

II. PROBLEM STATEMENT

For individuals with mobility impairments, navigating a wheelchair independently can be challenging, especially when relying on traditional joystick controls. This project introduces an intelligent wheelchair system that enhances accessibility and ease of use through hand gesture recognition and Bluetooth-based communication. By integrating gesture control with an Android-based interface, users can operate the wheelchair effortlessly using simple hand movements. This system aims to provide greater autonomy to individuals with physical disabilities, reducing dependence on caregivers and improving their quality of life.

III. METHODOLOGY

The development of the intelligent wheelchair system follows a structured approach to ensure seamless and reliable operation. The system consists of three primary components: gesture recognition, Bluetooth communication, and wheelchair control.

1. Gesture Recognition:

The user wears a sensor-enabled glove or utilizes a camera-based system that detects specific hand movements. These gestures are processed and translated into corresponding wheelchair commands.

2. Bluetooth Communication:

Once a gesture is recognized, the command is wirelessly transmitted via Bluetooth to the wheelchair's control unit. This ensures a quick and responsive connection between the user and the wheelchair.

3. Wheelchair Control System:

The wheelchair is equipped with microcontrollers and motor drivers that interpret the received signals and move the wheelchair accordingly. Safety mechanisms, such as obstacle detection and emergency stop features, are incorporated to prevent accidents.

4. Android Integration:

To enhance accessibility, an Android application is developed to provide an alternative control mode, allowing users to operate the wheelchair using voice commands or a touchscreen interface when needed.

By combining these technologies, the proposed system offers an intuitive and user-friendly solution, enabling individuals with mobility impairments to navigate their surroundings with ease and independence

IV. BLOCK DIAGRAM

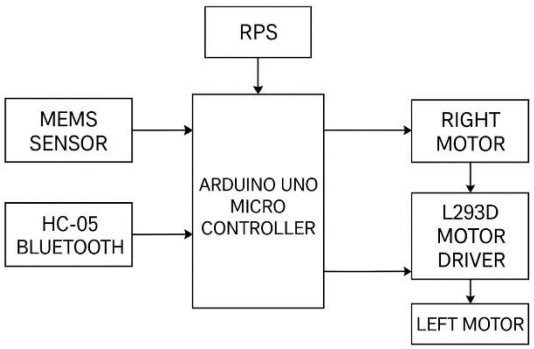


Fig: BLOCK DIAGRAM

V. COMPONENTS USED

1. ARDUINO UNO MICROCONTROLLER

ATmega328P is a high performance yet low power consumption 8-bit AVR micro controller that's able to achieve the most single clock cycle execution of 131 powerful instructions thanks to its advanced RISC architecture. It can
commonly be found as a processor in Arduino boards such as Arduino and Arduino Uno.

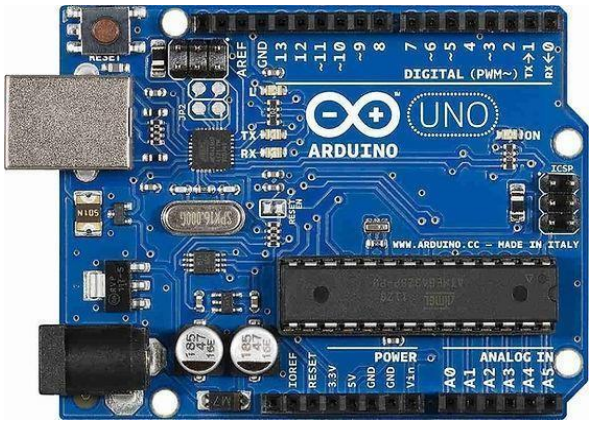


Fig: ARDUINO UNO

2. MEMS SENSOR

MEMS accelerometer use nanotechnology in order to enhance the natural abilities common between all accelerators; hence, these devices are extremely fine-tuned and accurate. MEMS stands for Micro Electro Mechanical Systems, and when discussing the technicalities of accelerometers it refers specifically to a mass-displacer that can translate external forces such as gravity into kinetic motion energy.

Fig: MEMS SENSOR

3. DC MOTOR

The DC motor or Direct Current Motor to give it its full title, is the most commonly used actuator for producing continuous movement and whose speed of rotation can easily be controlled, making them ideal for use in applications were speed control, servo type control, and/or positioning is required. A DC motor consists of two parts, a "Stator" which is the stationary part and a "Rotor" which is the rotating part. The result is that there are basically three types of DC Motor available.

Fig: DC MOTOR

4. BLUETOOTH

A Bluetooth device uses radio waves instead of wires or cables to connect to a phone or computer. A Bluetooth product, like a headset or watch, contains a tiny computer chip with a Bluetooth radio and software that makes it easy to connect. When two Bluetooth devices want to talk to each other, they need to pair. Communication between Bluetooth devices happens over short-range, ad hoc networks known as piconets. A

piconet is a network of devices connected using Bluetooth technology. The network ranges from two to eight connected devices.

Fig: BLUETOOTH

5. REGULATED POWER SUPPLY (RPS)

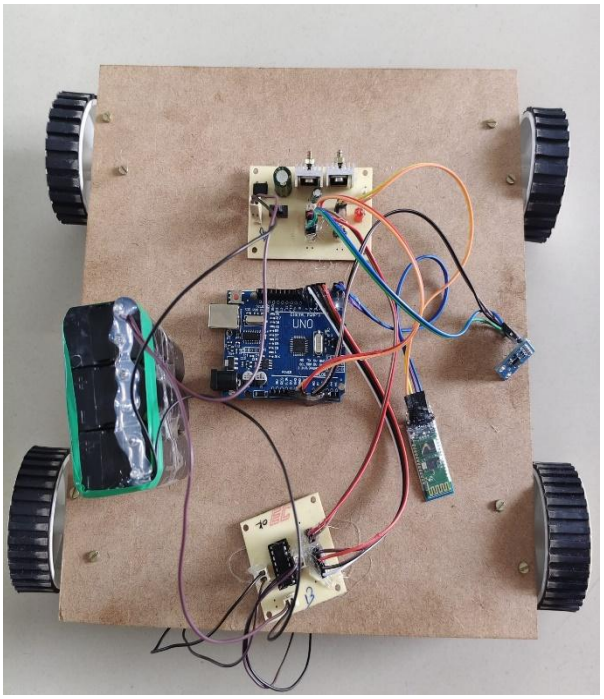
A The ac voltage, typically 220V, is connected to a transformer, which steps down that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.

6. LED

LED is abbreviation of Light Emitting Diode. It's nothing, but just a combination of semiconductors which emits light when current pass through it. Over the years, semiconductor technology has advanced to bigger heights, Light Emitting Devices have also been a part of this revolution and as a result, Now we have LED's which give better illumination with low power consumption.

Fig: LED

RESULT: -



CONCLUSION: -

The proposed **MEMS sensor-based wheelchair control system** successfully enables hands-free operation for physically challenged individuals. By utilizing **gesture-based control** and **wireless Bluetooth communication**, the system allows smooth and efficient movement of the wheelchair in different directions. The use of **DC motors** controlled by a **microcontroller** ensures precise and reliable motion control.

This project provides a **cost-effective, user-friendly, and assistive** technology solution that enhances mobility for people with disabilities. The integration of **MEMS sensors** eliminates the need for physical effort, making it a practical alternative to traditional joystick-controlled or manually operated wheelchairs.

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