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Paper Authors **SilveruMounika, ChittimallaVidya, DasariTejasri, RepakaRishi, NemindlaMahima, Valadasu Vikas**



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VOICE CONTROL WHEELCHAIR USING ARDUINO AND BLUETOOTH

SilveruMounika¹, ChittimallaVidya², DasariTejasri³, RepakaRishi⁴, NemindlaMahima⁵, Valadasu Vikas⁶.

¹Assistant Professor, Department of Electronics and Communication Engineering, Balaji Institute of Technology and Science, Narsampet, Warangal, Telangana, 506331, India.

^{2,3,4,5,6}Student, Department of Electronics and Communication Engineering, Balaji Institute of Technology and Science, Warangal, Telangana, 506331, India.

Abstract - Many people with disabilities can benefit from traditional, manual wheelchairs. A lot of research has been done on computer-controlled chairs with sensors and intelligent control. To decrease the amount of human interaction, algorithms were used. We show the design of a smart, motorised, voice-controlled wheelchair for physically challenged people using an embedded system. The proposed design features a manual voice activation mechanism for physically challenged users. Arduino and a voice recognition processor power the wheelchair. The wheelchair will travel in the direction specified by the microcontroller controls. This can also be controlled with voice commands. To assist persons with both upper and lower limb constraints, a voice-controlled wheelchair prototype was built utilising a commercially available manual wheelchair. The spoken instruction from the speech recognition module is processed by an Arduino microcontroller, which controls the wheelchair's motor movement. A Bluetooth module was also employed to avoid needless wire, and the prototype design included an optional joystick command. The wheelchair recognised spoken directions in English, Chinese, and Malay with high accuracy

I. INTRODUCTION

1.1 INTRODUCTION TO EMBEDDED SYSTEMS

Embedded System is currently at the height & the amount of data available is mind-boggling. The majority of embedded system engineers, on the other hand, share a similar gripe. There are no comprehensive resources on the internet that cover the various design and implementation difficulties associated with this technology. Intellectual property rules in many businesses, as well as the inclination to preserve technological know-how within a small group of researchers, are partially to blame. An embedded computer is one that has been configured for a specific purpose. In comparison, a typical PC is used for a range of functions such as email, internet browsing, music listening, document processing, and so on. However, embedded systems are frequently programmed to do a single task or a limited set of related tasks.

Every home contains numerous embedded gadgets or appliances like digital clock, for example, little integrated microprocessor

that does nothing except show the time. Onboard computers in modern automobiles handle things like spark timing and ABS using data with a variety of sensors.

Embedded computers, on the other hand, almost never have a universal interface. Even though an embedded system includes a keypad and an LCD display, it is distinctive in that it may employ a wide range of input and output techniques.

Because the bulk of embedded systems are time-critical applications, the embedded The system runs in a time-critical setting. In an aviation, an autopilot is a timer. The embedded system is quite important. If the autopilot detects a stall, it must correct the situation within milliseconds or the repercussions will be severe.

1.2 EMBEDDED SYSTEM:

Embedded systems in microwaves, washing machines, and dishwashers offer functionality, adaptability, and efficiency. Networked thermostats are used by sophisticated HVAC systems to adjust temperatures as they fluctuate throughout

the day and season. home automation systems make use of wired and wireless networking.

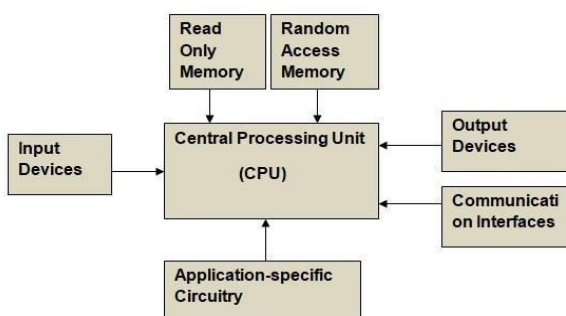
Embedded systems are rapidly being employed in transportation systems, from aeroplanes to automobiles. Advanced avionics like GPS receivers and inertial guiding systems are commonplace on modern aircraft. They adhere to tight safety regulations.

Medical gadgets with embedded systems Equipment is commonly powered by industrial computers.

In order to ensure fire safety, the systems may be designed to endure greater temperatures while remaining functioning. In terms of security, embedded systems are self-sufficient and can handle interruptions in electrical and communication infrastructure.

1.3 CHARACTERISTICS OF EMBEDDED SYSTEM:

Unlike general-purpose computers, embedded systems are designed to execute a specific task. Others may perform badly or not at all if they must meet real-time performance requirements for reasons such as safety and usability.



Embedded systems can have no user interface at all, systems specialised to a specific purpose, or elaborate graphical user interfaces similar to current computer desktop operating systems. Buttons, LEDs, or graphic or character LCDs (HD44780) are commonly used in simple embedded

systems.

For example, an LCD with a basic menu system. Devices with graphic displays, touch sensors, or screen-edge sensors are more advanced.

a remote reachable over a serial or network connection, such as RS232, USB, I2C, etc. With this technology, it is possible to increase the functionality of embedded systems, do away with the expense of a display, simplify the BSP, and give the PC a rich user interface.

1.4 PROCESSORS IN EMBEDDED SYSTEMS

There are two kinds of embedded processors. Microprocessors in general There are two kinds of embedded processors. Memory and peripherals are separate integrated circuits (Pa) in conventional microprocessors. Embedded processors are classified into two types. As a result, power usage, size, and cost are reduced. In contrast to the individual Because software is unique, several different fundamental CPU designs are employed in the computer industry.

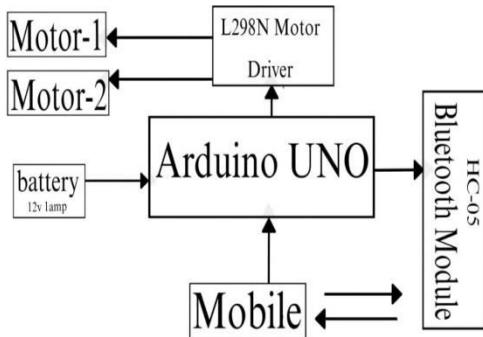
Microcontrollers made for embedded systems are widely available. Memory and peripherals should be implemented on separate integrated circuits. On-chip peripherals in microcontrollers (C) minimize power. consumption. In contrast to the personal computer sector size, application and cost are many alternative designs.

Word lengths range from four bits to 64 bits and beyond, with eight and sixteen bits being the most prevalent. The majority of architecture is produced by several businesses in a variety of shapes and styles. Numerous microcontrollers have been developed specifically for use in embedded systems.

1.5 DEBUGGING IN EMBEDDED SYSTEMS

The standard design technique is to test and debug the design on an FPGA prototype

board. Certus is a tool that is used to implant probes into the FPGA RTL that allow signals to be observed.



1.5 INTRODUCTION ABOUT PROJECT

The number of persons who are paralysed is growing due to vehicle accidents and illnesses that cause paralysis. Physically challenged persons outnumber those without impairments. A disabled person is reliant on others for everyday responsibilities such as transportation, food, and guidance. People who are physically challenged and utilise an electric wheelchair get a great deal of independence.

The smart wheelchair control described in this article uses an Arduino Uno and a Bluetooth module and is based on an Android application. Their lives are challenging because their wheelchairs lack an intuitive control system that allows them to move freely.

II. WORKING PRINCIPLE:

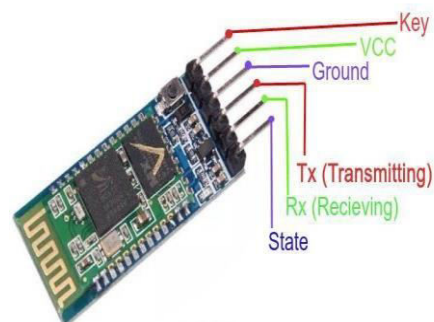
Using an Android application and an Android phone as the input device, the spoken signal is converted to text. The Arduino Uno uses a Bluetooth module to control the wheelchair's direction and movement after wirelessly receiving this text. The Arduino Uno selects how to control the two DC motors based on the text it receives. DC motors are driven by the L293D, a twin full bridge driver IC. The potential wheelchair positions and motions are displayed here. The wheelchair's motorised movement is controlled by an Arduino microcontroller, which interprets the spoken

instruction from the speech recognition module.

III. BLOCK DIAGRAM

A direct current motor's input electrical energy is direct current, which is translated into mechanical revolution. A direct-current motor turns direct-current electrical energy into mechanical energy. A series motor is suitable for lift operation in a specific area of its torque speed characteristics. Elevators require a high starting torque as well as a steady speed. As a consequence, the DC Series motor satisfies these requirements. The DC series motor is suitable for lifts due to its high starting torque.

BLUETOOTH MODULE HC05



HC-05 (Bluetooth Module)

The HC05 Bluetooth Module is an excellent choice for wireless communication since it may serve as a master or slave. By utilising it as a serial port replacement on your PC, you may simply connect the MCU and GPS for your embedded project. VCC, GND, TX, RX, Key, and LED are the six pins of the HCOS Bluetooth Module. Bluetooth communication normally has a range of less than 30 yards. When pairing with a phone, the module comes with a factory-set pin of "1234".

The HC-05 module may communicate with other modules. A master robot, for example, interacting with a slave Bluetooth module.

You may construct a wireless bridge to a laptop while in slave mode.

IV. RESULT OF THE PROJECT

V. CONCLUSION

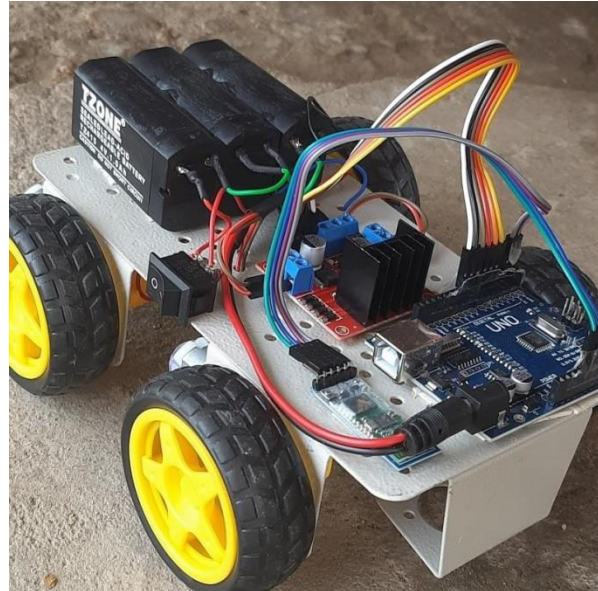
The fundamental function of a voice-controlled wheelchair is to respond to spoken orders. In addition to the usual modes of operation, such as a joystick or keypad, a novel method of controlling the chair through a web application will be made available. This allows the user to operate the wheelchair while sitting in a corner of the house. The proposed model incorporates current hardware that not only processes the speech but also controls the motors, resulting in a decrease in the number of pieces of hardware used and a reduction in cost. However, it has the issue of not discriminating between a normal dialogue and a directive. When the user wears a dynamic microphone with a limited field of sound, the difficulty of command identification by another person is decreased, which also partially lowers background noise and increases the change in color of oral instructions by the user. This has no bearing on the recognition's quality.

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