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ijirset@gmail.com



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Smart Robotic Wheelchair

Prof. T.S. Pujari ¹, Miss. Aarti Tupe ², Miss. Sakshi Tupe ³, Miss. Ishwari Jadhav ⁴,

Miss. Samiksha Koli ⁵

Professor, Department of Electronics and Telecommunication Engineering, Sanjay Ghodawat Institute, Atigre,
Maharashtra, India ¹

Students, Department of Electronics and Telecommunication Engineering, Sanjay Ghodawat Institute, Atigre,
Maharashtra, India ^{2,3,4,5}

ABSTRACT -The integration of robotics in assistive devices has propelled the development of smart robotic wheelchairs, revolutionizing mobility support for individuals with limited motor functions. This paper explores the design, functionality, and impact of smart robotic wheelchairs in enhancing user autonomy and navigation capabilities. It delves into the technological advancements, including sensor integration, and human-machine interfaces, enabling these wheelchairs to adapt to diverse environments and user requirements. Moreover, the report examines the challenges, such as safety concerns and regulatory frameworks, that accompany the deployment of these innovative devices. By analyzing case studies and user testimonials, this report demonstrates the potential of smart robotic wheelchairs in redefining independent mobility and improving the quality of life for individuals with mobility impairments.

KEYWORDS: Smart robotic wheelchair, assistive technology, mobility support, robotics, sensor integration, user autonomy, navigation capabilities, human-machine interface, adaptive technology, mobility impairments;

I. INTRODUCTION

In the world, many people are suffering from physical disabilities and other types of disabilities. According to the World Health Organization, it is established that 1% of the world's population, 75 million people are using wheelchairs due to various disabilities. The disabilities may be orthopedic which is related to bones and muscles or neuromuscular which is related to nerves and muscles. These people have difficulty in moving from one place to another. The initial approach of the electronic wheelchair was published by George Westinghouse in 1914 which was the first electric powered wheelchair. The main objective of this project is to design and develop a system that allows the user to interact with a smart wheelchair with a touch screen. This project provided a helping tool to the disabled and helped them move around. The wheelchair provides safety by adopting features such as movements like moving others forward, backward, left, and right, and the main feature is if the patient in the wheelchair feels uncomfortable or has some issues regarding health, they can send a message to their relatives or friends indicating the need for help.

II. LITERATURE SURVEY

Smart wheelchair paper is presented by the Department of Mechatronics Engg. Students. The main objective of this paper is to control a wheelchair using hand gestures. By means of smartphones. For this, purpose Android application is created. The Android platform was chosen because it provides open tools for this operation. Motor drivers are controlled via an Arduino controller. In this configuration, the Arduino app is connected via an Android application. In this, Paper the testing is done for the wheelchair movement using a built-in voice. For this user voice is recorded for the movements of forward, backward, left, and right, and stop. Voice is recorded in a quiet environment so that noise can be reduced and then user voice is recorded. If the user's words do not match the frequency of the words which are stored in the system then it is well according to it.

Voice-controlled wheelchair using Arduino a segment of the disabled community finds it impossible to use a wheelchair. There is extensive research on computer-controlled chairs where sensors and intelligent control algorithms have been used to minimize the level of human intervention. Here, they describe the design of a smart, motorized, voice-controlled wheelchair for physically disabled people by using an embedded system. Arduino microcontroller and speaker-dependent voice recognition processor have been used to support the navigation of the wheelchair. The wheelchair does not respond

to a false speech command. Depending on the direction selected on the joystick. The microcontroller controls the wheelchair's direction. This can be controlled through the voice commands also.

III. PROBLEM DEFINITION

In the world, many people are suffering from physical disabilities and types of disabilities. The main objective of this project is to design and develop a system that allows the user to interact with the smart wheelchair with a touch screen. More than 2% of the world's population has physical disabilities.

Manual wheelchairs, on the other hand, have proved to be helpful and have fulfilled the needs of people with minor disabilities. Consider the situation of a person who is unable to walk because of their disabled legs. It is extremely difficult for such a person. A wheelchair is a mechanically operated device that allows the user to move about independently. This minimizes the user's personal effort and force required to move the wheelchair wheels.

Furthermore, it allows visually or physically handicapped people to go from one location to another. This is conceived as an idea to ease the lives of those among us who are unfortunate enough to have lost the ability to move their legs due to a significant amount of paralysis, accident, or old age. Many differently-abled people usually depend on others in their daily lives, especially in moving from one place to another.

For wheelchair users, they need someone to help them in getting the wheelchair moving. Caretakers are not always able to actively monitor disabled person individuals. The disabled person needs a way to control their wheelchair that meets their specific needs.

IV. PROPOSED METHODOLOGY

A. Information

The Smart Wheelchair is a mechanical device that is designed for movement according to the user's command. Touch screen technology is a direct manipulation type, IoT-based technology. A touch screen placed on the wheelchair to perform different types of operations that is movement of the wheelchair. If the patient has some issues regarding health they can send a message to their relative using Wi-Fi technology. If the patient falls off the wheelchair due to dizziness we will join some sensors like the tilt sensor then this message is immediately sent to their relatives or friends. For IoT applications, we have used with Wi-Fi interface. The overall purpose of this project is for physically handicapped people.

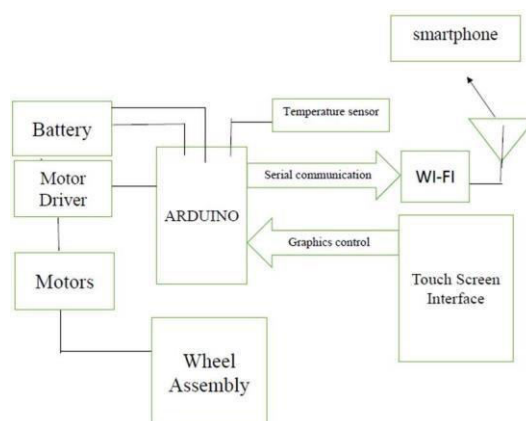


Fig.1 Block Diagram

B. Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328. 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 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.

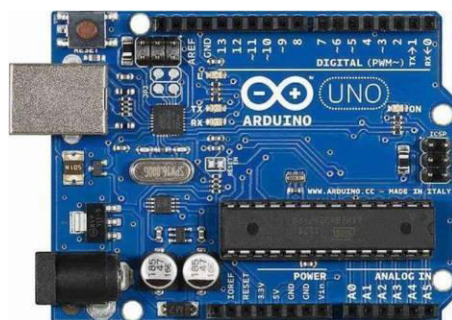


Fig.2 Arduino Uno

C. Wi-fi Module

The fundamental function of a Wi-Fi module is to give any microcontroller access to a Wi-Fi network. The number of IoT devices is scaling up exponentially and, stable Wi-Fi connectivity is essential for the working of these IoT devices. Wi-Fi modules usually encompass multiple input- output pins of ADCs, DACs, timers, serial communication interfaces, etc. These modules are chosen depending on the requirement of a single or host processor plus a Wi-Fi module. Here are some of the popular Wi-Fi modules that will aid in a wide range of IoT projects.

D. DC Motor

A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor. Most types produce rotary motion; a linear motor directly produces force and motion in a straight line. DC motors were the first type widely used since they could be powered by existing direct-current lighting power distribution systems.



Fig.3 DC Motor

E. Temperature Sensor

LM35 sensor uses the basic principle of a diode, when the temperature increases, the voltage across a diode increases at a known rate. LM35 is a temperature sensor that outputs an analog signal which is proportional to the instantaneous temperature. The output voltage can easily be interpreted to obtain a temperature reading in Celsius. The advantage of LM35 over the thermistor is it does not require any external calibration.

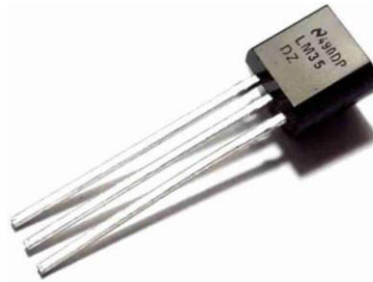


Fig.4 Temperature Sensor

F. Touch screen

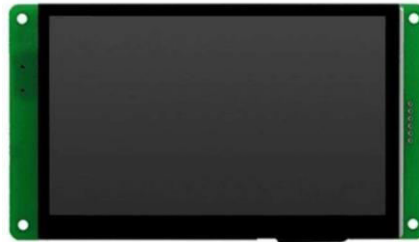


Fig.5 Touch Screen

A touch screen is an electronic display screen that is also an input device. A touchscreen is an electronic display screen that is also an input device. A touch sensor is a type of device that captures and records physical touch or embrace on a device there are three components that work together to create the magic of touch screen capability: the touch sensor, the controller, and the software. The touch sensor can be one of three types: resistive, surface acoustic wave, or capacitive. Resistive and capacitive are the most common and are quite ingenious.

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