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Accelerometer-Based Gesture-Based Wheelchair Control

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Abstract: ***There are approximately 6 million paralysed individuals in the world who desire wheelchairs, according to a study to improve their mobility.In the past, wheelchairs needed to be transported and externally supported using any method. Joystick-controlled wheelchairs are being enhanced to help combat this. In the past, wheelchairs needed to be transported and externally supported using any method. Joystick-controlled wheelchairs are being enhanced to help combat this. However, joystick-controlled scooters appear to be challenging to use on a daily basis. The use of the joystick is made more challenging by the hard buttons and the joystick's unidirectional use, particularly in the case of a paralysed individual. We attempted to create a "gesture-controlled wheelchair" that can be propelled with a small hand tilt in order to get around these issues. Control flows up the character's lower back and can be applied to either hand.***
Keywords: Gesture supervision, Arduino, transmission receiver, encoder, decoder, and Gesture sensor.

I. INTRODUCTION

A gesture-based wheelchair device is designed to increase the mobility and independence of people with physical disabilities. In this successful paper, a fully gesture-based wheelchair device is developed for partially paralyzed disabled people. In this approach, sensors are used to detect the actual physical movement of the hand. The detection signal is transformed into an electric power signal and relayed after the analogue signal has been transformed into a digital signal. The devices created are ideal for people disabled by accident or due to a genetic sequence. The device is designed to be activated and function entirely under the command of the character's hand/finger movement. Microcontrollers are used to build prototype wheelchairs due to their low cost, self-erase capability, and programming flexibility. A type of micro electro mechanical sensor called an accelerometer sensor can be used to effectively convert motion into a signal that a computer can understand. Accelerometer data is filtered and calibrated for motion recognition. Accelerometers measure motion caused by acceleration as well as the direction and magnitude of gravity. A DC motor powers this device. Currently, DC motors use internal commutation, permanent magnet stages, spinning electric drive magnets, and batteries to store and produce the DC power that powers the motor..Onboard C commands are used to program the microcontroller. In India today, people are disabled, people are paralyzed. Wheelchairs provide comfort and make people's lives easier. Around 500,000 people have been disabled by the movement. This wheelchair control system has proven to be a very versatile tool that can solve many problems in human-machine interface systems. This wheelchair is suitable for the following groups.

1) Paralyzed Mountaineers.
2) Who walk with help.
3) People with acute and permanent joint/muscle problems.
4) People with body stiffness, jerking or sagging
5) Those who have trouble synchronising their neurons.
6) Those who, due to paralysis or other issues, have lost feeling in their bottom bodies.
7) People who deform their body parts and suffer from any type of physical deformity.

II. LITERATURE REVIEW

Access to equipment like wheelchairs, which can offer a means of mobility for patients with lower extremity movement issues, is crucial when an unfortunate event affects a person's motor potential. In the field of wheelchair technology, great progress has been made. Yet even these major advances will not allow quadriplegics to operate wheelchairs independently. Some patients are unable to control the wheelchair with their hands due to stress loss or psychomotor problems in the elderly, thus requiring the use of a motorized wheelchair that moves frequently [1].An accelerometer, a set of distance and actuator sensors managed by a PIC microcontroller, and software progress in the lab view are used to provide progress under the control of management software.

For many years to come, the field of smart wheelchairs will continue to be ripe for technical advancement.Smart wheelchairs make great subjects for sensor study, particularly when it comes to on- device vision. The smart wheelchair also makes it possible to research human-computer interface, adaptive or shared control, and cutting-edge input methods like voice control and eye tracking. Additionally, the robotic control architecture will continue to be tested on the smart wheelchair.

With the rapid development of MEMS technology, gesture recognition based on accelerometer data is an emerging method of gesture interaction. Accelerometers are built into most modern personal electronic devices, such as Apple's iPhone, opening up new opportunities for engaging in a variety of environments, including offices, home appliances, video games and , above all, medical facilities.[3] Gesture recognition is the subject of a wide range of research.

III.PROPOSE SYSTEM

Solutions based on instrumented gloves (smart gloves) can recognize very fine movements, such as finger movements and configurations, but require users to wear gloves equipped with several sensors to finely capture the movements of hand and fingers. They may not be suitable for spontaneous interactions due to high participation overload. Film piezo, servo electromechanical, piezoelectric, fluid tilt, piezoresistive micro-machined bulk, capacitive, and capacitive micro-machined ground are some types of sensors that can measure acceleration, shock, or tilt. Regarding output signal, modification expense, and operating environment, each has outstanding qualities. This wheelchair is intended for people with disabilities who need assistance to move from place to place. Thanks to this activity, they can move from place to place in their own wheelchair. They are able to control the wheelchair well with hand gestures. Arduino Nano is connected to the MPU6050 to detect hand movement. Information is sent wirelessly to the Arduino Uno, which responds to hand movement. An Arduino controls the wheels of the wheelchair. Nowadays, interacting with household electronics and mobile devices through gestures is common. In the block diagram below, the motion of the wheelchair can be controlled using an accelerometer combined with hand gestures. One of the main objectives of study on gesture popularity is to develop machines that can recognise particular human gestures and use them to transmit data or control tools. The method of interpreting movements to identify targets is known as gesture recognition. This wheelchair is intended for people with disabilities who need assistance to move from place to place. Arduino is connected to the MPU6050 to detect hand movement. Information is sent wirelessly to the Arduino, which responds to hand movement. An Arduino controls the wheels of the wheelchair.

early research focused on identifying patterns of hand movement. In this sense, various computer vision techniques have been intensively studied. For instance, the Wii Remote tracks the relative motion of an IR emitter placed on the screen to identify motion using an internal "camera" (IR sensor). In essence, this converts "gesture" into "handwriting," opening the door to a number of handwriting detection techniques. J.S. [6] Kim, C.S. Li, K.J. Song, B. Min, and Z. Bien use pattern recognition algorithms to analyse hand characteristics. There are numerous papers that address the issue of hand entrainment by using a sizable number of roughly 5,000 to10,000 positive and negative images. However, this procedure is time-consuming and demanding. A three-axis accelerometer is used by Francisco Arce and José Mario Garca Valdez to track different hand motions. However, more electronics on the hand requires many accelerometers to be connected to the hand, which can be annoying to the user and can lead to loose connections in the system producing erratic results. Colored gloves are often used in gesture recognition algorithms for image processing. As Luigi Lamberti1 and Francesco Camastra explain, different hand movements can be deciphered by following the glove of that color. Here they simulate a learned vector quantization color classifier. In order to analyse gestures, Anala Pandit, Dhairya Dand, Sisil Mehta, Shashank Sabesan, and Ankit Daftery use a mix of accelerometers and gyroscopes. Here, the gyroscope is used to rotate the virtual object, while the accelerometer is used to capture dynamic and static translational changes of the hand position vector and infer them as mouse movements. Many articles [10] study movements using gloves of different colors. Data gloves are a special kind of gloves with built-in fiber optic sensors. Using an Arduino- based microcontroller and a Node MCU, the design and execution of a gesture-controlled autonomous wheelchair are shown in this article. This study's primary goal is the wrist movements-based wheelchair management [16].

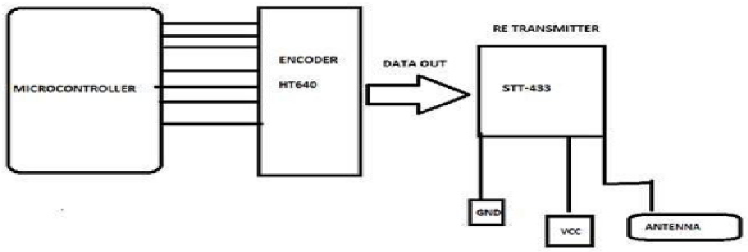

Fig. 1. Block Diagram

Table I

FUNCTION	PALM MOVEMENT	ACTION
LEFT	LEFT	CHAIR MOVES LEFT
RIGHT	RIGHT	CHAIR MOVES RIGHT
HORIZONTAL	STOP	CHAIR STOP's
DOWNWARD	BACKWARD	CHAIR MOVES BACKWARD's
UPRWARD	FORWARD	CHAIR MOVES FORWARD

IV. CONCLUSIONS

This paper presents a wheelchair motion control system for people with disabilities. It is designed and implemented using the Atmel 89S52 microcontroller in the field of embedded machines. Parallel motors assist the wheelchair in moving along the chosen trajectory using data from the accelerometer to calculate the X, Y, and Z axes' trajectory. Automatic consumption. The execution of the experimental paintings is meticulous. The overall results show that the use of an on-board machine undoubtedly brings superior performance. The proposed strategy has proven to be extremely useful for home use. People with disabilities will undoubtedly benefit from this method, which will ease their struggle. Four motor commands that are determined by hand position are used in a first prototype to evaluate the viability of the suggested approach. In our upcoming work, we want to use various experimental settings to further investigate how this method is used in practise. Building a novel gesture-based system that can recognise human arm movements and offer specific functionality for more applications is the long-term objective of this project".

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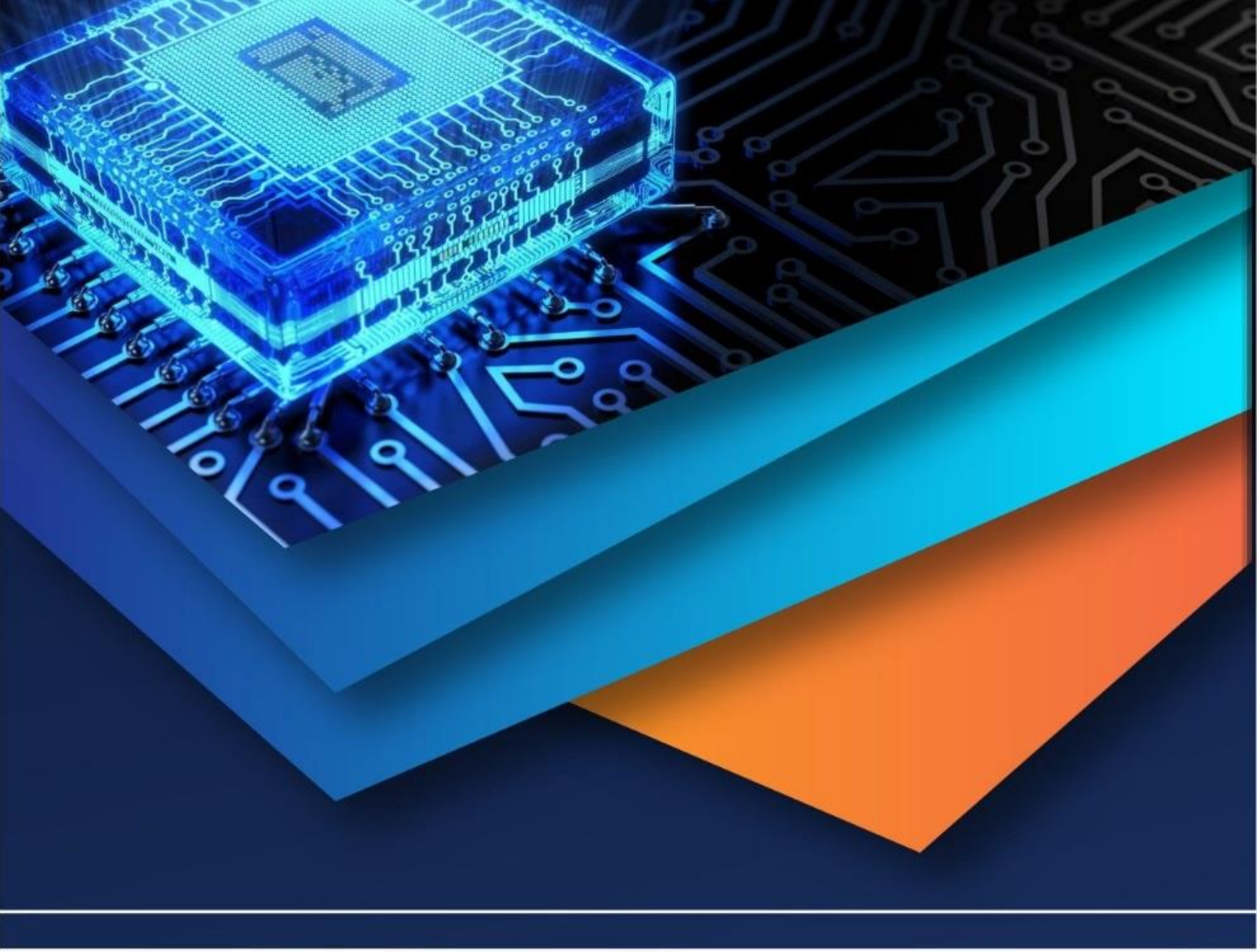

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