

SMART WHEELCHAIR FOR QUADRIPLEGIC PEOPLE

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Abstract—Quadriplegia is a condition that occurs when the body is unable to move any part of its limbs. This can occur as a result of injury or illness. It is typically caused by nerve damage, which causes muscle weakness in the arms and legs. There are many different types of quadriplegia, but all involve some degree of paralysis. In most cases, this means that you can't move your limbs at all, although some patients may experience limited movement (such as the ability to grasp objects with their hands). Quadriplegia can have serious implications for your physical health and quality of life. A person with quadriplegia may need assistance with daily tasks like walking, bathing and dressing themselves. They may also need assistance from caregivers or family members to help them perform basic tasks like getting out of bed or eating meals. Since quadriplegic patients cannot move themselves around freely anymore, they must rely on others for help in order for them to get around. In this paper it is proposed to design a system to create and handle Smart Wheelchair based on intelligent processes. Which would use machine vision and advanced imagery and sensors to help people with quadriplegia navigate through their daily travel with much more ease.

Keywords- Electric Vehicle, Internet Device, Internet Of Things, Image sensor, Image processing, Machine Vision.

I. INTRODUCTION

A major medical disorder known as spinal cord injury (SCI) frequently causes significant morbidity and long-term disability. It happens when the axons of spinal cord-crossing neurons are damaged, which results in the loss of motor and sensory function below the site of injury. Major trauma is typically the cause of injury, and initial injury is frequently irreparable. These injuries are very expensive and disabling because they disproportionately impact patients under the age of 30, cause serious functional impairment for the rest of the person's life, and put the person at risk for a variety of

consequences that raise the morbidity and death rate. The projected lifetime economic impact of SCI is between \$2 and \$4 billion. A spinal cord injury affects between 250,000 and 500,000 people annually. The majority of these incidents are the result of preventable factors like violence and auto accidents. Quadriplegia is the most common symptom of traumatic spinal cord injury, happening in about 60% of cases. About 20 per 100 000 people will likely be fully paralysed, making the occurrence around 50 per 100 000. (3 quadriplegic and 19 paraplegic). A smart wheelchair helps you control your movements by tracking where you are moving your eyes through sensors that are built into the chair's design. The new technology allows you to move freely even when your hands & legs are not available due to injury or surgery.

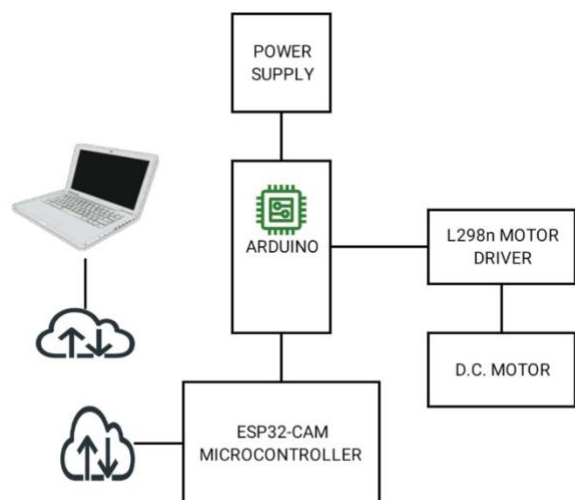


Fig: Block Diagram

II. LITERATURE SURVEY

Quadruplegia, or the partial or complete loss of function and feeling in all four limbs, is arguably the most physically and psychologically traumatic injury. Quadriplegics experience numerous challenging challenges in all area of their lives, including their personal and familial lives as well as their professional lives. Such injuries frequently have medical bills in the millions of dollars, which can be a significant roadblock to rehabilitation. Quadriplegics typically require at least 6 to 8 months of intensive rehabilitation simply to be allowed to leave the hospital and start receiving care and therapy. In addition to having lifetime-long medical expenses, such persons are unable to find jobs. Despite the fact that it is against the law to discriminate against people who have a disability, many, if not most, businesses will find a method to go around the rules and deny a quadriplegic a fair chance at a job. Overall, paraplegics earn significantly less money than the majority of other people; 24% of households with paralysed people earn less than \$10,000, compared to just 7% of all households. After taking part in a rehabilitation programme, over 80% of people with incomplete spinal cord damage (SCI) can walk again. Yet, the majority of them can only walk ineffectively and need a walking aid. Those with spinal cord damage are more likely to experience mental health issues. Quadriplegics also experience a great deal of emotional distress as a result of a variety of unfavourable social statements and opinions held by others. Quadriplegics can experience depression in addition to their other symptoms. Quadriplegics are also unable to drive, necessitating their reliance on others to get them to appointments for physical therapy and doctor visits, for example, or on public transportation or rides from friends. These problems are faced by a lot of the population of third world countries. Where money raises another big obstacle for them and solutions to those problems cost an fortune. Where a normal wheelchair cost ₹ 6000-8000. A smart wheelchair that uses a joystick to work can cost upto ₹ 60000-100000. Ten times more than a normal wheelchair.

III. METHODOLOGY

1. The system uses ESP32-Cam module as the microcontroller.
2. ESP32 proves beneficial as it has Wi-Fi inbuilt in it which makes it suitable for IoT Applications.
3. Users can livestream the video taken by the ESP32-CAM on a server.
4. This data is taken by the python script and using OpenCV library we detect the position of the eyeball and also whether the user has blinked or not.
5. This detection is shared back to the ESP32-CAM and then shared to the Arduino connected.
6. Arduino accordingly commands the two motors on the motion they need to perform.
7. If the user blinks once the wheelchair moves in the forward direction and while moving if the user blinks again the wheelchair stops in the path.

IV. Connections and circuit

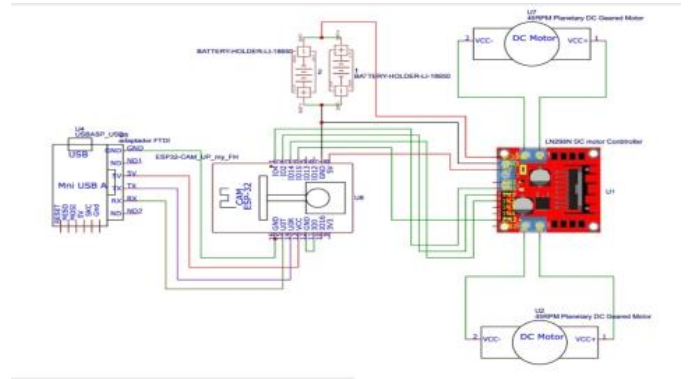


Fig: Connections

V. CONCLUSION

The system proposed in this paper provides benefits in several aspects to people suffering from quadriplegia and is also a cheaper alternative. Since the wheelchair is connected to the internet it can be upgraded to also provide other features as well. Additional features like distress button, calling, geological location, remote control, and much more. These wheelchairs could be made personalized for specific people with specific injuries and their requirements. The system not only provides a cheap solution but also provides ease of access along with proper framework. Monetization of the system is also possible due to which the system has a great market potential.

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