A FLEX SENSOR BASED GESTURE CONTROLLED WHEELCHAIR

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Wheelchair is used by people who cannot move from one place to another on their own. This may be due to their illness or disability. As per Census 2011, there are over 27 million (2.7 Crore) people with disabilities out of which 5.4 million or 54 lakhs (54,36,826) have disability in movement in India. A small fraction of these have access to Wheelchairs i.e. around 80,000 to 1,60,000 people use wheelchair in India. This paves way for this project as a lot of disabled people require access to a wheelchair with a control of their own. This project is to provide the user a full control for the wheelchair with the help of flex sensors. These sensors take input from the user in the form of finger gestures and they drive the motor, which helps the wheels to move in the required direction. The required components such as Atmega32 microcontroller, L293D motor driver and LCD display and LEDs display the current status of the wheelchair.

Components required and their Interaction

The components required in this project are:-

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Flex sensors:
The flex sensor is a type of variable resistor. The resistance of the flex sensor increases as the body of the component bends. It is due to this property it has a wide range of applications.

![Flex Sensor](image)

Fig 1: Flex sensor.

Atmega32 Microcontroller:
ATmega32 is a low power CMOS 8-bit microcontroller based on RISC architecture. It takes flex sensor input from the internal Analog to Digital controller. It rotates the motors in forward or reverse direction to move the wheelchair.

L293D motordriver:
L293D IC is a typical Motor Driver IC which allows the DC motor to drive on any direction. This IC consists of 16 pins which are used to control a set of two DC motors instantaneously in any direction.

LCD Display:
A 16x2 LCD display is used to display the current status of the wheelchair. When the wheelchair moves in the required direction, the LCD gets the input from the microcontroller and the message is displayed on the screen.

LEDs:
It indicates wheelchair's direction of movement i.e. forward, reverse, left or right.

DC Motors:
Four DC motors are used to move the wheelchair in all the four directions: forward, backward, left and right.

![Block Diagram](image)

Fig 2: Block Diagram of Interaction between components.
Methodology:
Figure 2 shows the block diagram of the complete system. It consists of Flex sensors, microcontroller, LCD display, LEDs, motor driver and DC motors. In this project system consists of two components the system on the gloves and the system on the wheelchair. The system on the gloves consists of Flex Sensors and the other comprises of Microcontroller, LCD display, motor driver, DC motors.

The input is taken from the user in the form of finger gestures through the flex sensors. The flex sensors have a property that when they are bent their resistance changes and the current starts to flow. The input of the flex sensor is given to the Atmega 32 microcontroller through the internal ADC. The microcontroller does the necessary calculations (works as an analog to digital converter and converts the data into serial data) and sends the signals serially to the motor driver and the LCD display.

The microcontroller is programmed according to the variation in the input. The output of the microcontroller is then given to the motor driver which drives the motor in the required direction. Hence, the wheelchair begins to move according to the movement or bending of the user’s fingers.

Results and Discussion:
The purpose of this project is to provide a ‘Gesture controlled Wheelchair’ to the disabled people which is economical. The project involves the use of sensors and a 8 bit microcontroller and flex sensors. When the flex sensor is bent at an angle of 45°, the resistance changes. This causes the wheelchair to move. The project can be used to provide a low cost and technologically useful wheelchair with the help of electronics to the disabled people and is also capable of performing all the tasks which are performed by the advanced wheelchairs, at a much lower cost.

Conclusion:
In this paper, a new method of wheelchair control is discussed and is implemented. The prototype for the system is developed which is believed to be better because of low cost and also of lesser amount of force is required to use as compared to the joystick-control system, in which more force is required to move it. Further improvement includes a new system for improving the obstacle avoidance and to include the braking system.

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