Wireless Control of Powered Wheelchairs with Tongue Motion Using Tongue Drive Assistive Technology

Tongue Drive system (TDS) is a tongue-operated unobtrusive wireless assistive technology, which can potentially provide people with severe disabilities with effective computer access and environment control. It translates users’ intentions into control commands by detecting and classifying their voluntary tongue motion utilizing a small permanent magnet, secured on the tongue, and an array of magnetic sensors mounted on a headset outside the mouth or an orthodontic brace inside. We have developed customized interface circuitry and implemented four control strategies to drive a powered wheel chair (PWC) using an external TDS prototype.

The magnetic sensors are nothing but hall-effect sensors. A Hall Effect sensor is a transducer that varies its output voltage in response to changes in magnetic field. In its simplest form, the sensor operates as an analogue transducer, directly returning a voltage. With a known magnetic field, its distance from the Hall plate can be determined.

The control system consists of Hall Effect sensor and microcontroller. Microcontroller collects data from the sensor and transmits the encoded data through the RF transmitter. At receiver end RF receiver receives the data through the decoder and fed as input to the micro controller. The controller performs the corresponding actions i.e., wheel chair movement.

This Project consists of two Microcontroller Units, Wheel chair and Hall Effect sensor and wireless communication through RF. Wheel chair is made up of High torque Geared DC Motors, the Motors Directions can be changed through the set of instructions given from the Hall Effect sensor and the action of these Instructions is already loaded into the Microcontroller using Embedded C programming. The RF receiver provides the
information to the microcontroller (on board computer) from RF transmitter and the controller judges whether the instruction is right movement or left movement based on the tongue movement and controls the direction

**The objectives of the project include:**

2. High torque Geared DC Motors and Driver interfacing.
3. RF transmitter and Receiver.

**The major building blocks of this project are:**

1. Regulated Power Supply
3. Micro Controller
4. RF transmitter
5. RF receiver.
6. Motor driver
7. High torque Geared DC Motors

**Software’s used:**

1. PIC-C compiler for Embedded C programming.
2. PIC kit 2 programmer for dumping code into Microcontroller.
3. OrCAD for Circuit design.
4. Proteus for hardware simulation.
Regulated power supply:

Block diagram:
Wireless Control of Powered Wheelchairs with Tongue Motion Using Tongue Drive Assistive Technology Transmitter

Regulated power supply

Hall effect sensor Modules

Magnet

Crystal Oscillator

Reset

Microcontroller

RF Transmitter

RF Encoder

LED indicators
Wireless Control of Powered Wheelchairs with Tongue Motion Using Tongue Drive Assistive Technology

Receiver

Regulated power supply

RF Receiver

RF Decoder

Crystal Oscillator

Reset

Battery power supply

DC motor driver

DC motor

DC motor

LED indicators