

# Tongue Controlled Wheelchair for Disabled Person with Heart Rate Monitoring

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**Abstract:** Now-a-days many of peoples live with the different types of disabilities. Also patients using wheelchairs are not only limited to the paralysis. People having Blindness, hands and legs fractured or lost in accidents, neurological issues etc. are also using the chairs. Many of them use electrically powered wheelchairs (PWC). These electrical wheelchairs are the most helpful tools allowing individuals to complete daily tasks, and to access school, work, and community environments. Now-a-days, electrical wheelchairs are generally controlled by voice, arm, eyes, etc. But no one using tongue controlled wheelchair. Reason behind using tongue as controlling organ is that person having any disabilities has tongue and it is smoothly movable. It is a new and innovative concept which uses Tongue Drive System (TDS). Microcontroller, Hall Effect sensors, motors are used for detection and moving respectively wheelchair in required direction. When magnet is close to hall sensor chair will move in forward and left or right. Also IR sensor will help operator to detect obstacle present in his path. Also adding feature of heart monitoring system to the tongue controlled wheelchair to keep eye on the health of the wheelchair user.

**Keywords:** TDS, Wheelchair, Heart rate monitoring, Assistive system.

## 1. Introduction

Many of the people are facing various types of disabilities. Many of the significant disabilities include:

- Hands and legs fractured
- Musculoskeletal issues
- Balance or gait problems
- Neurological issues
- Genetic disorders

Many of the peoples who have disabilities uses electrically powered wheelchairs (PWC) that are the most helpful tools allowing individuals to complete daily tasks with greater independence, and to access school, work. Tongue is used to operate the system because unlike the feet and hand, which are connected by brain through spinal cord, the tongue and brain has a direct connection through cranial nerve that generally escapes damage in severe spinal cord injuries or

Neuromuscular disease, so it is useful to use the tongue to drive the wheelchair. Tongue movements are fast, accurate and do not required much thinking, concentration or efforts. Tongue can work without getting much tired. People with different physical disabilities (handicapped, blind, dumb, etc.) are using

electrical wheelchairs controlled by voice, eyes, arm etc. All of them can use tongue operated wheelchair. Assistive systems used nowadays are only providing the mobility to the person with disability. They do not give any health condition of the user of wheelchair, so heart monitoring system is added with the TDS.

## 2. Implementation

### A. Controlling of wheelchair by tongue

To control the wheelchair by tongue, first motion of tongue need to capture and then according to the tongue motion wheelchair is moved.

#### 1) Capturing tongue motion

For this Hall Effect sensor is used. Hall Effect sensor is a device that is used to measure the magnitude of a magnetic field. Its output voltage is directly proportional to the magnetic field strength through it.

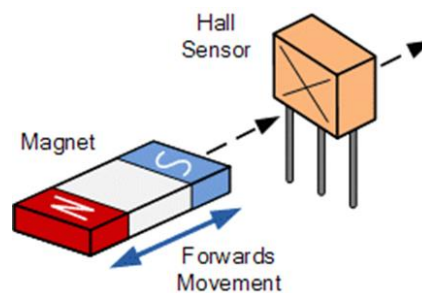


Fig. 1. Working of hall effect sensor

Three Hall Effect sensors are used to trace the motion of the tongue and small magnet is used. One sensor for turning the chair to left, one for turning to right and last one for forward motion of wheelchair. All sensors and magnet are placed inside the mask. Magnet need to move by tongue in the direction to which user wants to move the wheelchair. When the magnet is moved towards the sensor then signal is generated and sent to the microcontroller. According to the signals sent by the all three sensors the microcontroller drives the motor accordingly. Motors are connected to the wheelchair.

Working of motors according to the sensor signal is shown in table:

Table 1  
 Working of motors according to the sensor signal

S. No.	Left Sensor	Right Sensor	Front Sensor	Left Motor	Right Motor
1	No Detection	No Detection	No Detection	Off	Off
2	No Detection	Detection	No Detection	On	Off
3	Detection	No Detection	No Detection	Off	On
4	No Detection	No Detection	Detection	On	On

As shown in the table when there is no detection of any sensor i.e. no movement of the tongue then the both motors of chair remains OFF i.e. wheelchair is in idle state. When only left side sensor gives signal to the controller then the right side motor turns ON so that chair will move to left side. Similarly, for detection for only right side sensor, left side motor turns ON and chair will turn to right side. When front sensor gives signal both the motors will ON so wheelchair moves in forward direction.

- [2] M. N. Sahadat, S. Dighe, F. Islam, and M. Ghovanloo, "An Independent Tongue-Operated Assistive System for Both Access and Mobility," *IEEE Sens. J.*, vol. 18, no. 22, pp. 9401–9409, 2018.
- [3] M. M. Tahsin, R. Khan, and A. K. Sen Gupta, "Assistive technology for physically challenged or paralyzed person using voluntary tongue movement," 2016.
- [4] L. Liao et al., "Control system of powered wheelchairs based on tongue motion detection," *Proc. 2016 IEEE 15th Int. Conf. Cogn. Informatics Cogn. Comput. ICCICC 2016*, pp. 411–414, 2017.

### 3. Heart monitoring system

The heart rate abnormalities can be detected by continuously monitoring the behavior of the heart rate. Electrocardiogram (ECG) sensor is used to continuously monitor the heart. ECG is test which measures the electrical activity of heart beat. ECG detects the cardiac abnormalities by measuring electrical activity generated by the heart. Heart Rate can be monitored by examining the different spike values observed in the ECG. They are the P, Q, R, S, T spikes. By studying various spikes correspondence, the abnormalities can be detected.

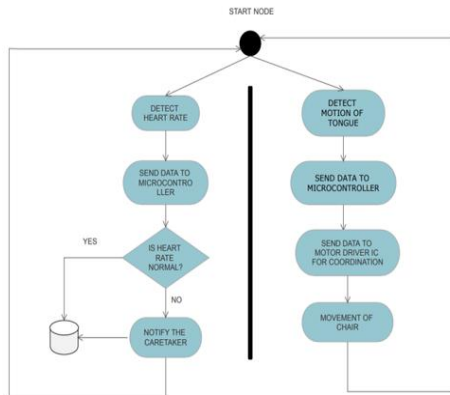


Fig. 2. Activity diagram

### 4. Conclusion

Various limitations regarding previous developed wheelchair movement system for handicapped are overcome in this project. This helps the handicapped person to move without the help of the care taker simply with the help of tongue motion. It also provides the continues heart monitoring system. This system detects heart disease by using heart rate pattern. Also it notifies the care taker if the heart rate is abnormal.

### References

- [1] J. Johri, J. Pillai, and M. Shakya, "Tongue Operated Integrated System," 2017, 14th IEEE India Council. Int. Conf. INDICON 2017, pp. 0–5, 2018.