# G. H. RAISONI COLLEGE OF ENGINEERING
(An Autonomous Institution Affiliated to R. T. M. Nagpur University declared by UGC Under Act 1956)
Programmes Accredited by National Board of Accreditation

## Synopsis on topic

# Wheelchair controlled by Vocal Muscles and via Internet OF Things.

For the Bachelor of Engineering Final Year Project

Computer Science and Engineering Department
And
Electronics Department

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# Problem Statement

# DEVELOPEMENT OF WHEELCHAIR CONTROLLED BY VOCAL MUSCLES AND VIA INTERNET OF THINGS.

## INTRODUCTION:

A **wheelchair** often abbreviated to just chair, is a chair with wheels, used when walking is difficult or impossible due to illness, injury, or disability. Wheelchairs come in a wide variety of formats to meet the specific needs of their users. They may include specialized seating adaptions, individualized controls, and may be specific to particular activities.

There are a wide variety of types of wheelchair, differing by propulsion method, mechanisms of control, and technology used. Some wheelchairs are designed for general everyday use, others for single activities, or to address specific access needs. Innovation within the wheelchair industry is relatively common, but many innovations ultimately fall by the wayside, either from over-specialization, or from failing to come to market at an accessible price-point.

The very basic model of wheelchair consists of a frame, seat, one or two footplates (footrests) and four wheels: usually two caster wheels at the front and two large wheels at the back. The larger rear wheels usually have push-rims of slightly smaller diameter projecting just beyond the tire; these allow the user to manoeuvre the chair by pushing on them without requiring them to grasp the tires. Manual wheelchairs generally have brakes that bear on the tires of the rear wheels, however these are solely a parking brake and in-motion braking is provided by the user's palms bearing directly on the push-rims. As this causes friction and heat build-up, particularly on long down slopes, many wheelchair users will choose to wear padded wheelchair gloves.

The rapid growth of industry and advancement of technology has resulted in reduction of human efforts, the main reason for which being machines!! Machines are playing an important role in our life. A machine might be anything, be it a cell phone or a bike or even a robot. Robots have found an increasing demand in a wide range of applications in our life. Their use in defense has increased by the day. For the people who are not able to control the wheelchair physically. We are trying to introduce the wheelchair that can controlled by the person's vocal cord and via internet. The concept is that to the people who are not able to control the wheelchair they can control that with the use of their vocal cord. The concept behind the vocal cord control system is that ,the sensors which are connected to our throat will take vibrations as a signals and move the wheelchair accordingly. If the person    siting on the wheelchair cannot control it physically or with the sensors , then the wheelchair will be controlled via internet. For this technology we are developing a web application that will helps the person to travel with the wheelchair. For that purpose we will use the image processing technology that will be very useful for the controlling of the wheelchair from a remote place. This will take the advantage of

high resolution camera for the proper controlling of wheelchair. This wheelchair will work as a embedded system for performing a particular task.

# Literature review:

## Vocal vibration frequency:

The vocal ligament is the tension-bearing element in the vocal folds at high pitches. It has traditionally been treated as a vibrating string, with only length and longitudinal stress governing its normal mode frequencies. Results of this investigation show that, when bending stiffness and variable cross section are included, the lowest normal mode frequency can more than double, depending on the strain of the ligament. This suggests that much higher phonation frequencies may be achievable than heretofore thought for a given vocal fold length (e.g., nearly 1000 Hz at 50% elongation over cadaveric resting length). It also brings back into the discussion the concept of "damping," an old misnomer for a reduction of the effective length of vibration of the vocal folds by relatively stiff boundary segments known as macula flavae. A formula is given for correcting the ideal string equation for the lowest mode frequency to include bending stiffness and macula flavae effects.
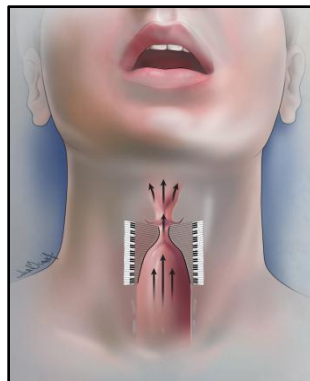


## Wireless connectivity :

The webcam will capture live data with regards to its surroundings and then send it to a desired device through internet. The user will be observing this data on the monitor at the user end. According to the desired movement, the user will control the wheel chair through the webpage or keyboard available at the user end. The input given through the webpage or the keyboard is then sent through the internet and the desired movement occurs at the robot end. The wheel chair is connected to the internet for the controlling purpose by the user. The wireless connectivity will be established with the use of ZigBee or GSM or WiFi.

# Existing Systems :

## Eye-Controlled Wheelchair

A powered wheel chair is a mobility-aided device for person with moderate/serve physical disabilities. Various kinds of control interface have been developed for wheelchair control. These forms of interface may not use of an eye tracker, a different form of wheelchair control is possible. Patients who have no use of their limbs are extremely restricted in terms of mobility. Certain ways of movement such as sip and puff wheelchairs provide an alternative, but restrict the ability to speak and may be difficult for those with respiratory problem. Our eye controlled wheelchair has little to no restriction on the user's other four senses and even sight will not be totally impaired due to the front camera stream being displayed on the movement screen.
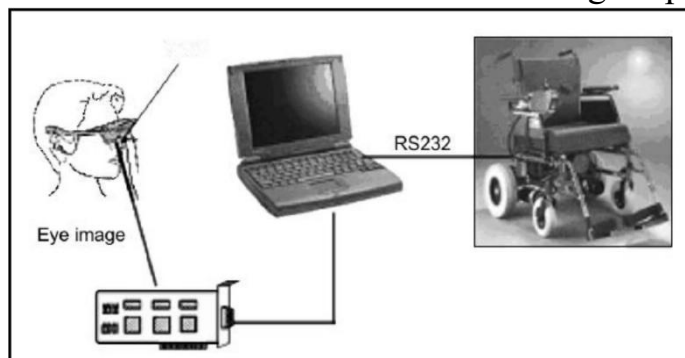


## Brain controlled wheelchair

Robot have not only been extensively used in industrial areas, but progressively introduced in human day today life. For disable people, assertive robots are widely used to do their work without human interaction. Particularly, with the conventional input tools like joysticks, mouse, voice, keyboard, but these input methods can be efficiently used by healthy person only. However, these input methods are not easy to operate because of the joystick quick turn may leads to more complexity to control the wheelchair for elderly and disabled person.

To address these problem, Brain-Computer Interface(BCI) system has been developed. It eliminates the conventional type of communication and provides a direct connection between the human brain and external device. The Brain-Computer Interface started with the discovery of electrical pattern of the human brain and recorded it with the help of EEG(Electroencephalography).

# Objective of this project:

1 . To control the wheelchair with the help of sensors connected to vocal cord.
2 . To implement the concept of Internet of Things(IoT).
3 . To minimize the work of other person to handle a particular patient.
4 . To control the wheelchair from remote place.
5. To minimize the limitations of the range or distance between the user and the wheelchair.

# Proposed system / Implementation / Tools:

If we consider the system in which the wheelchair is controlled by brain, the main problem is that we cannot a single thing at a time. So it must be create problem to control the wheelchair.

So we are introducing a wheel chair which will be controlled by the human vocal cord and via internet also. The concept behind that is the sensors will be connected to human on his throat, the vibrations of vocal ligaments will generate some different signals that will be the inputs to the sensor. That sensors will convert the signals into electric signals and then it will converted into digital signals that will be understand by the micro-controller which will indicate the motors to do movement as per the instruction.

This system may have some limitations e.g., if a person is unable to talk therefore there is no input signals to the sensors to control the wheelchair. We have decided to do some enhancement to the system that we are using the concept of Internet of Things. It implies that now the wheelchair is directly connected to the internet for its controlling. So we are going to develop a web app that will be used to control the wheelchair via web/internet. The web app will display user the way where to move further with the help of camera embedded into the wheelchair. The web app consists of some keys that will helps to control the wheelchair with the display screen to the way where the person wants to go.

## Implementation :

In this is the part of the synopsis the actual implementation of the wheelchair is proposed. The wheelchair will consists of a arduino micro-controller which will be provided the signals by the sensors connected to the throat of the person sitting on the wheel chair. The micro-controller will perform as per the instruction given to it by some programming work. The signals are the frequencies emitted from the vocal cord of the person. This will get converted into electrical signals with the help of EMG sensors and will transmitted to micro-controller and according to the signals the wheelchair will move in left, right, forward and backward direction.

On The other hand we are applying here the internet connectivity to the wheel chair so that the wheel chair will operated via internet with the use of web app. The wheelchair consist of Espressif ESP8266 ESP-01 connected to ARDUINO Genuino UNO which will used to generate signals through internet which gives us the connectivity between internet and ARDUINO. The web app requires the ip address of the camera and arduino to interact with each other via internet. The web app consists of a frame in which the output of the camera will displayed and some buttons for controlling the wheelchair in required direction.

**<u>Flowchart</u>** :
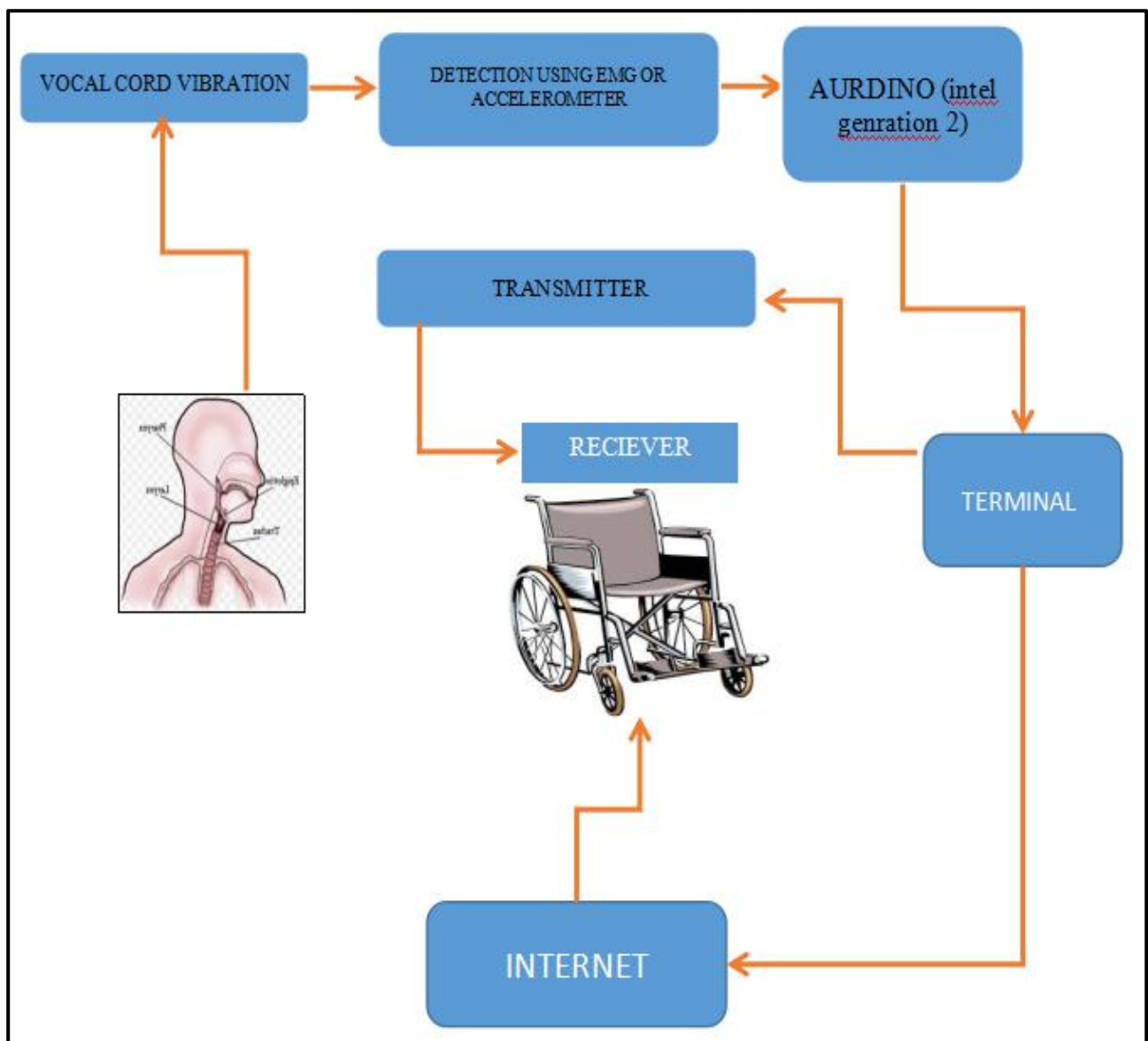
**System Requirements** :

**Hardware** :-
    1. EMG sensor.
    2. Arduino kit.
    3. EMG shield.
    4. PO motors.
    5. IP Camera / Android phone.
    6. Espressif ESP8266.
    7. Some Resistors.
    8. Plywood.
    9. Connecting wires.

**Software** :-
    1. Arduino IDE.
    2. Any Text editor.
        Programming languages used :-
            1. Embedded C.
            2. HML.
            3. CSS.
            4. JavaScript

**CONCLUSION** :

        With this Bio-medical proposed model of vocal cord controlled wheel chair will efficiently reached the targeted place as per the instructions of person who is controlling the wheelchair. The sensors connected to the person will transmit signals to the micro-controller to perform task allotted to each part of the wheelchair. As the sensors are connected to the person's vocal cord, the vibrations emitted from the cord will give different frequencies that are the input signal to the sensors and these signals are further transmitted to the micro-controller for the motion of the wheelchair in specific direction. The EMG sensor is used to take vibrations as a signal from the body. As the earlier project has been made to control the wheel chair by brain that problems to control the wheel chair because at a time different different thoughts are come into our mind so that will create problem to control the wheelchair and a person who is sitting on the chair not in the condition to command via brain then it will be problematic. That's why the vocal cord concept is good to use easy to control the wheelchair just we need to say left or right to control it. If there is person who is not in the condition to command the wheelchair we are implementing internet connection to the wheel chair so that the other user can handle the chair via internet. Web app is very useful to control the wheelchair through internet so that there will be the ease to control by the user. And that will be the proper use of Internet to control the wheelchair efficiently.

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