**UNMANNED ROBOTIC WHEELCHAIR FOR INDEPENDENT LIVING**

**ABSTRACT**

We know that a person who is joining the army is responding to a call: A call to duty, A call to sacrifice, A call to serve, and protect the nation and his own freedom. They may also lose their lives, and some may become handicapped in wars. In our Indian army nearly 20-30% of people is handicapped and is not able to do regular human activities on their own and is in a situation like seeking for others assistance. In the view of helping them, we are developing a robotic assistance so that they can do their regular activities on their own and can also have easier way to communicate with others.

Our prototype basically activated by two inputs that are

* Input given through Brain signal sensing technology.
* Input given through voice.

Through these inputs our prototype can be accessed when the person is physically challenged which includes disabilities like not having hands, legs, or even speech. The wheelchair consists of integrated or inbuilt robotic arms for feeding system and integrated phone calling. These provisions are activated by the two inputs either through brain signals or through the voice recognition system.

The features that are embedded in the wheelchair are –

* Movement of the wheelchair (inputs given either by brain signals or by voice recognition).
* Communication to the opposite person (if the victim has no speech, the input is given through brain signals).
* Feeding or giving basic liquids through the robotic arms (input is given either by brain signals or by voice recognition).
* Calling and messaging through the integrated phone (inputs given either by brain signals or by voice recognition).

Through this technology we are focusing in fulfilling the basic needs of a physically challenged person thereby

making him eligible for an independent living.

**TECHNICAL PROPOSAL**

The **idea** behind the project is to give a physically challenged army individual a normal life. As we know people who work in the army are very brave that they risk their own life to save the country and protect from the opponent country. Indian government once said in a press release that “We are fighting our own disabled soldiers”. This means the army individuals who are disabled are struggling to live a normal life. They even struggle in fulfilling their basic needs that is having food or drinking water or even communicating with the other individual.

Independent mobility is core to being able to perform activities of daily living by one self. Millions of people around the world and also in the army suffer from mobility impairments and hundreds and thousands of them are rely upon the powered wheelchair to get on with their activities of daily living. However, many victims are not prescribed powered wheelchairs because they are physically unable to control the chair using the conventional interface. Therefore, we have come up with a **concept and solution** to help them to lead an independent life. In this project we have developed a cost-effective Brain Computer Interface application and also voice recognition interface that will help the physically challenged to lead an independent life with the help of their brain signals using non-invasive techniques and voice signals.

The main aim of this project is to create friendly user technology to communicate the physically liable people like dumb, deaf and blind. This project uses the brain sensing technology and speech processing and microcontroller to make real time basic needs to be solved for disabled people.

This problem is so important to tackle because of the following reasons:

* It avoids the dependency.
* Disabled person himself can work as a normal person to some extent.

This project uses the brain signals and voice signal processing to convert programmed phrases into speech and similarly, to produce movement of robotic arms and entire wheel chair chassis using Arduino which gives movement to their body connected to the sensor. Provides feasible model for physically disabled or paralyzed persons or old person who depend on others presence.

**This prototype mainly consists of two types of inputs: -**

* **Brain Signals Input**
* **Voice Recognition Input**

**Brain Signal Input:**

The brain signals used here are Spontaneous EEG signals. These signals are associated with various aspects of brain function related to mental tasks carried out by the subject at his/her own will. The mental tasks include integrated phone calling, robotic feeding system and movement for forward, reverse and stop actions respectively.

**Voice Recognition Input:**

The voice signals used here are Spontaneous voice processing signals. These signals are associated with various aspects of voice commands related to tasks carried out by the subject at his/her own will. The tasks include integrated phone calling, robotic feeding system and movement for forward, reverse and stop actions respectively.

**EEG Signal Acquisition Unit:**

In this application a headgear is used for signal acquisition instead of the electrode cap. The headgear or the brainwave starter kit makes use of dry sensors which does not require application of a conductive gel between the sensors and the scalp. Also this device is much lighter and convenient for usage when compared to the conventional EEG sensors as it requires only one electrode for sensing. Another advantage of using this kit is that the data or brain signals are transmitted to the signal processing unit via Bluetooth connection which was not possible with the conventional signal acquisition methods.

**Signal Processing Unit:**

The signal processing unit used in this application is a laptop/PC. The brain signals are transmitted from the headgear via Bluetooth to MATLAB platform in the laptop. The digitized value is then passed on to suitable microcontroller through USB port for further mapping of brain signal values to control signals of the motors.

**Current Booster:**

An H bridge is an electronic circuit that enables a voltage to be applied across a load in either direction. These circuits are often used in robotics and other applications to allow DC motors to run forward or backwards H bridges are available as integrated circuits. They can be built using discrete components.

**Wheelchair prototype:**

Two motors of 60rpm each are used to form a wheelchair prototype. The frame is constructed using aluminum sheets. The control signals from the H-bridge circuit are sent to the motors. Depending on the action performed, the control signals will cause the motor to run in either in clockwise, anticlockwise direction or stop.

**This device is technically advanced, could be mainly used for the communication of dumb and paralyzed**

**people.**

With the growing advancements in the technology the mode of communication is being utilized in every field is becoming popular these days. In the past, "mind reading" systems have been able to guess what single-digit number a person might be thinking of, but deeper thoughts have been beyond the technology's reach. This device will let others know what we are thinking in our mind by to an electroencephalogram (EEG) worn on the user's forehead which detects neural impulses that reach the scalp allowing the micro-controller on board to detect the user's thought process and displaying it on a

**LCD** screen.

**Robotic Arm Feeding System: -** When the command through voice or through brain signals the robotic armsmove and according to face detection process, the spoon or water glass fixed to it are brought to the mouth of the victim.

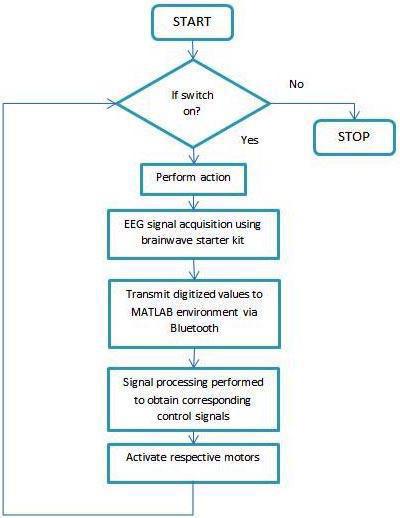
Initially Bluetooth connection is established between the brain sensor headset and the signal processing unit (PC/Laptop). Once the headset is turned on, depending on the requirements of the motor movements, actions are performed. The brain signals are now extracted using Brainwave kit and converted to digital values and transmitted to signal processing unit via Bluetooth. These values are then processed and mapped into control signals of required amplitude using Arduino (ATMega8) and are then used to activate the motors of the wheelchair prototype

**Project Advantages**:

* Non-invasive signal acquisition.
* Wireless transmission via Bluetooth.
* Cost effective and portable.
* Mapping of brain signals to corresponding motor movements and can also help the patient communication as a normal human being.

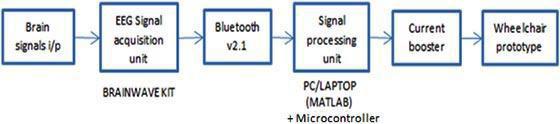
**The project finally is aimed at making a divyang person as a normal person to the maximum extent.**

**FLOWCHART: -**



**BLOCK DIAGRAM:**

**FOR BRAIN SIGNAL PROCESSING: -**



|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **INPUT THROUGH BRAIN SENSOR** | | | **INPUT THROUGH VOICE RECOGNITION** | | |
|  | | |  | | |
| (FOR A SPEECHLESS VICTIM) | |  |  |  |  |
|  |  |  |  |
|  |  | **MOVEMENT OF** |  |  | **MOVEMENT** |
|  |  | **THE WHEELCHAIR** |  |  | **OF THE** |
|  |  |  |  |  | **WHEELCHAIR** |
|  |  | **TALKING(TO OPPOSITE** |  | **PROCESSING** |  |
|  |  | **PERSON) DONE** |  |  |
|  | **PROCESSING** |  | **DONE** |  |
|  | **THROUGH LCD SCREEN** |  | **FEEDING DONE** |
|  |  |  |
|  | **DONE** |  |  |
| **INPUT** | **AND VOICE OUTPUT** |  | **ACCORDING** | **THROUGH** |
|  |  |  |
| **COMANND** | **ACCORDING** | **(SPEECHLESS VICTIM)** | **INPUT** | **TO THE** | **ROBOTIC ARM** |
| **THROUGH** | **TO THE** |  | **COMMAND** | **PROGRAM** | **AND FACE** |
| **THE** |  |
| **PROGRAM BY** |  | **THROUGH** | **BY** | **DETECTION** |
|  | **FEEDING DONE** |
| **BRAIN** |  | **VOICE** |  |
| **ARDUINO/** | **THROUGH** | **ARDUINO/** |  |
| **SENSOR** |  |  |
| **RASPBERRY** | **ROBOTIC ARM** |  | **RASPBERRY** |  |
| **I** | **AND FACE** |  | **DRINKING** |
|  |  |  |  |
|  | **Pi** |  | **Pi** |  |
|  | **DETECTION** |  | **WATER GLASS** |
|  |  |  |  |  |
|  |  |  |  |  | **BROUGHT BY** |
|  |  |  |  |  | **ROBOTIC ARM** |
|  |  | **DRINKING WATER** |  |  | **AND FACE** |
|  |  | **GLASS BROUGHT** |  |  | **DETECTION** |
|  |  | **BY THE ROBOTIC** |  |  |  |
|  |  | **ARM AND FACE** |  |  |  |
|  |  | **DETECTION** |  |  |  |
|  | **COMMUNICATION (CALLING** | |  | **COMMUNICATION (CALLING** | |
|  |  | **AND MESSAGING) THROUGH** | |
|  | **AND MESSAGING) THROUGH** | |  |
|  |  | **INTEGRATED GSM MODULE** | |
|  | **INTEGRATED GSM MODULE** | |  |
|  |  |  |  |
|  |  |  |  |  |  |

**CONCLUSION:**

The ground work for the development of the Unmanned Robotic Wheelchair is done and all practical problems are mostly solved. According to our concept and research, the prototype can be done easily and accurately. The equipment like wheelchair chassis (movement), sensors and robotic arms are already tested individually and have shown good results, fixing them together and bringing up a perfect prototype is simple.