



EXOBOT- INTELLIGENCE ANDROID TECHNOLOGY

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Abstract: - In this project, EXOBOT suit was designed. EXOBOT means EXO-outer structure of human body BOT- robotics, combination of human body and robotics is exobot. It is most powerful suit in this world. This suit designed for defence, prosthetic or rehabilitation patient and many other fields. In defence soldiers lost their life due to critical condition, person who wears this suit alive at any condition. Rehabilitation patient move their legs and hands by wear this suit. Exobot was operated with help of EMG (Electromyography) signal that takes from the own muscles of the body. Additionally android application and brain sensor (EEG – Electroencephalogram) was created to operate this suit. This suit made up of highly strongest and light weight material like titanium and aluminium alloy. People who wear this suit can carry more weight it doesn't affect to them.

Keywords: Exobot, Prosthetic, Rehabilitation, Titanium, Aluminium alloy, EMG (Electromyography) signal, EEG (Electroencephalogram signal).

1. INTRODUCTION

Exobot is a very protective suit to help the people who suffered from neurological conditions (or) spinal cord injury. But it is different from other suit. Because, it is not only for medical field and also useful for defence purpose. Peoples who are in army, Navy person wear this suit he can alive at any condition without lose their life. To control this suit by using android device. The device that is directly attached to the hand and operated by the person who wear the robot suit. In medical data that taken from the sensor and stored in the cloud computing, doctor analyse the changes that occurs in the body. This sensor helpful to monitor the body of the soldiers in the battlefield. It is useful for rehabilitation and prosthetic persons. Weight of the suit doesn't impact to the body. Brain neurons affected people can benefit from this suit. People wear this by giving continuously physical practise. Exactly it stimulated the affected neurons.

1.1 THE EXOBOT SUIT

This suit for everyone people who suffered neurological problem stroke attacks they unable to move their hand or leg by giving repetitive practices exactly stimulate the neuron which was affected. In army soldiers lose their life in battlefield and people get injured due to riots. They did not have protective device. These EXOBOT suit designed for extreme compact to make these people very protective. This suit designed for whole body of the humans. Main process of the project is motor it plays a most important role.

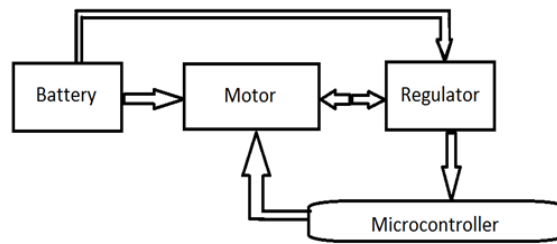


Fig 1. Exobot Motor Controller

2. SOLDIER SUIT

SolidWorks (stylized as SOLIDWORKS), is a solid modelling computer-aided design (CAD) and computer-aided engineering (CAE) computer program that runs on Microsoft Windows. SolidWorks is published by Dassault Systems. This suit designed with help of solid work software. This software is used for to design the mechanical structure. First step, the back position of the suit was completed.

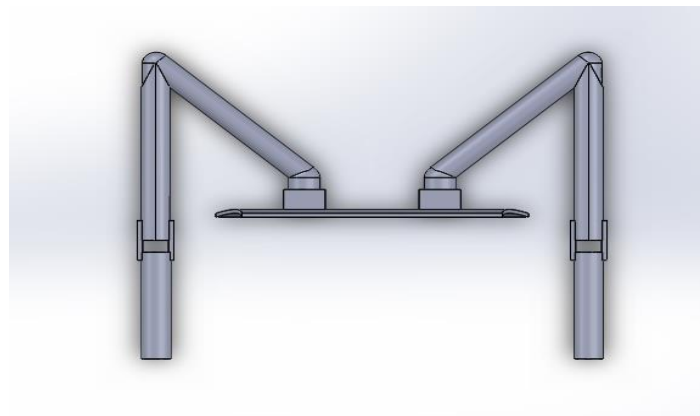


Fig 2. Exobot Suit Top View

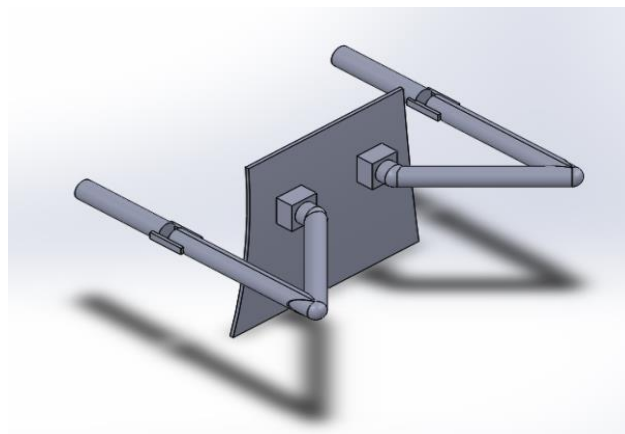


Fig 3. Exobot Suit Side View

3. MATERIALS

An outer layer of the suit made up of strong material. There are so many strongest material in this earth. So, this suit material would be strong and light weight. If the strong material is used it make great impact to the human body. To reduce this impact light weight and strongest material titanium is used. Titanium is very expensive but it is very useful in army field alternatively some other materials also good to use in robotic suit like aluminium alloy, wood, etc....



Fig 4. Titanium Material



Fig 5. Aluminium Material

4. EXOBOT CONTROL MECHANISM

The body anatomy of human play important role in exobot suit. Because this suit act as the protective layer of all the human beings. But more important to the defence people and medical field. Human beings having different muscle action depends on the environmental condition. In this project the lower limb muscle action was taken and executed. The main function of lower limb is flexion and extension. Flexion means humans move or lift their lower limbs up. Extension means humans move or down their lower limbs.

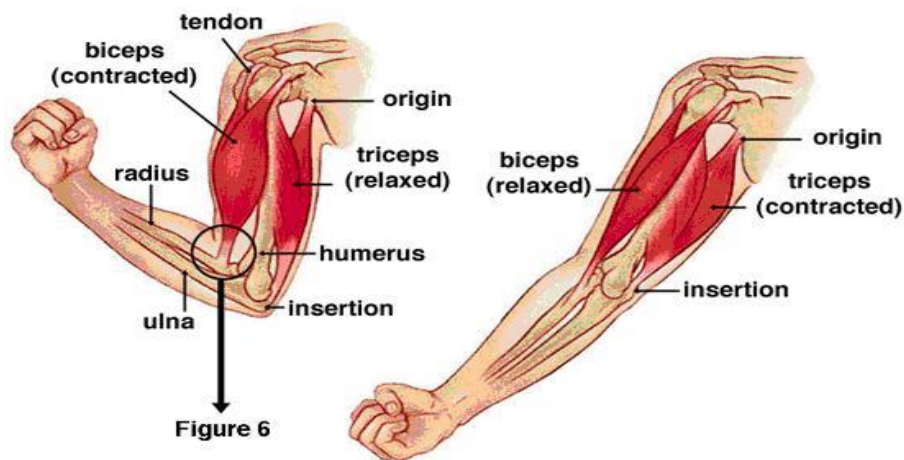


Fig 6. Lower Limb Action

The mechanism of exobot is based on the muscle action. To activate the robotic suit muscle signal is important, so muscle sensor play an important role in exobot suit.

5. MUSCLE CONTROL

By using muscle sensor the signal that taken from the targeted area like bicep, forearm, calf.

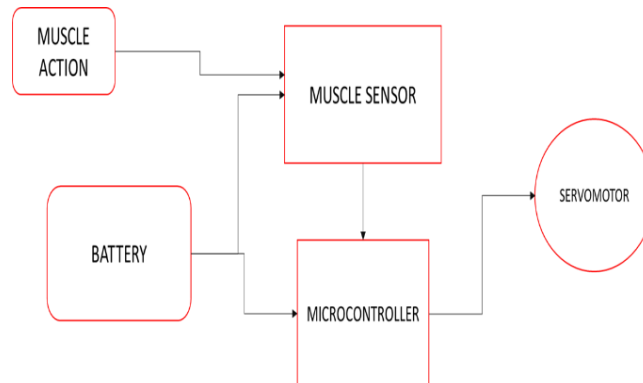


Fig 7. Exobot Muscle controller

Due to stretch our muscle bicep it generate the signal, the signal triggered by the muscle directly send to the muscle sensor. This muscle sensor give the analog signal to the microcontroller. The controller that control the movement of the servomotor position with help of muscle sensor. In this project Arduino microcontroller is used and Gear servo motor is act as the lower limb robotic position control.



Fig 8. Exobot Muscle Controller

| ITEMS | SPECIFICATION |
|------------------------|--|
| Dimensions | 40.6 x 20.5 x 38.0 mm |
| Weight | 47 g |
| Speed | 0.19sec /degree (4.8v), 0.15 sec/degree (6v) |
| Stall torque | 5.5kg/cm(4.8v); 6.5kg/cm (6v); |
| Input Voltage (limits) | 4.8 to 6V |
| Temperature range | 0°C to 55°C |
| Gears | Plastic gears |

Table 1. Servo Motor Specification

The ability of the servo motor is able to lift up to 400 grams of weight. Because of the torque of the servo motor.

5.1 ANDROID DEVICE

The people who unable to move their hands or legs to fit a muscle sensor to them to give a regular practice by an android device was used. The robotic suit was fitted to the particular people, the doctor or other people can easily handle the person with help of android application. That application gives the signal to the controller, that controller control the position of the DC servo motor.

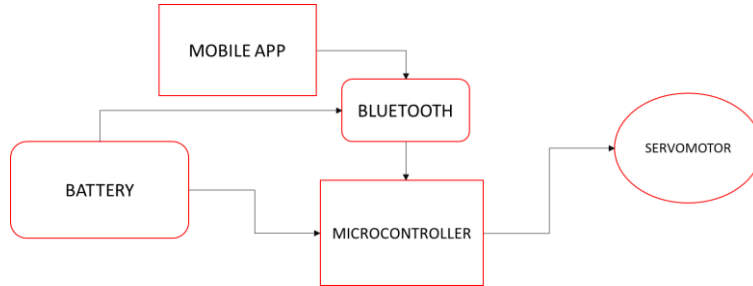


Fig 9. Exobot Bluetooth Controller

6. BRAIN CONTROL EXOBOT SUIT

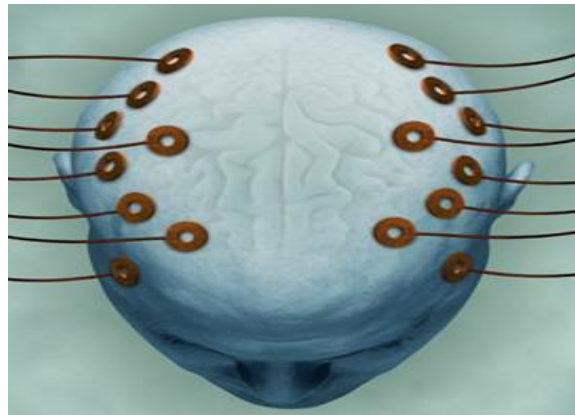


Fig 10. Brain Sensor Electrodes

In this brain sensor controller, the brain signal (EEG – Electroencephalogram) that takes from the brain sensor. This brain sensor generate number of frequency. That frequency easily interfaced with computer system. Due to the body action and deep focusing brain trigger the signal. This signal are stored in computer system.

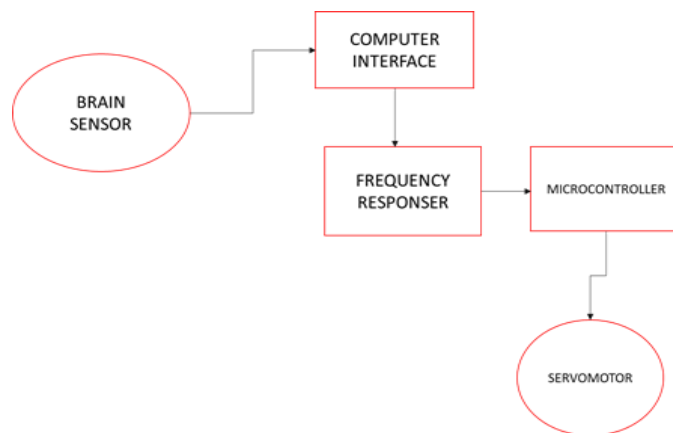


Fig 11. Exobot Brain Sensor Controller

The computer system analyse the frequency and it send to the frequency response circuit. That circuit gives the signal to the controller and controller, control the position of the servomotor.

7. CONCLUSION

In future, Exobot robotic suit will be used for defence directly interfaced with (artificial intelligence) A.I. It automatically detects the situation and give signal to the soldier and he can easily identified not only for defence, rehabilitation can walk and run with help of this suit. Exobot suit will be designed by covering whole body by bullet proofed to the soldier. They can do any work and life of the soldier will be protected by this suit. The advanced brain sensor interfaced with people they can walk like a normal human being with help of A.I. and robotic suit.

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