



## Development of Smart Hand Gloves to solve Parkinson's Disease

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### ABSTRACT:

Parkinson Disease is a brain disorder that causes uncontrollable movements such as shaking, stiffness, and difficulty with balance and coordination. To fix this issue, we have proposed a vibrational-based exoskeleton glove to those patients as well as aged people & injured army. The main feature of our device is that if the person wants to hold an object, she/he has to turn the hand toward the object and the object is detected by the sensor and then the finger will be bent down in the direction of the servo. The process will continue until the switch is off. So to reduce muscle tremors, we introduce this device which will be controlled by the user without the help of a third person. In this way, we can solve 60-70% of the hand-shaking problem and the problem of holding any object.

**KEYWORDS:** Tremors, Parkinson Disease, Hand gloves, Servo motors.

### 1.0 INTRODUCTION:

In this paper, we are introducing a device that will help patients to recover from Parkinson's Disease. The symptoms of Parkinson's arise when large groups of neurons abnormally fire in unison. Parkinson Disease is a brain disorder that causes uncontrollable movements such as shaking, stiffness, and difficulty with

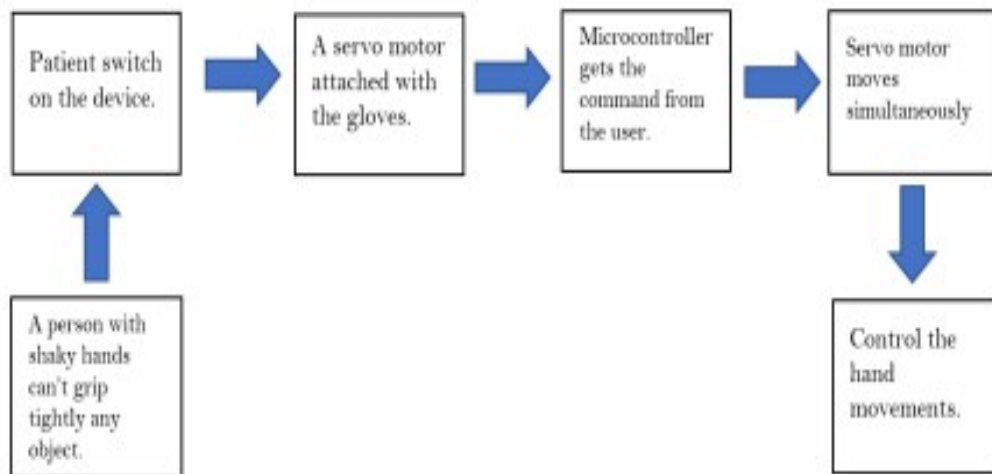
balance and coordination. The basal ganglia is the area of the brain that controls the movement of the limbs. Normally these nerve cells produce an important brain chemical known as dopamine. If the neurons die or become impaired, they produce less dopamine which causes the movement problems associated with Parkinson Disease. It has been found that aged people face problems gripping any object. These are the symptoms of Parkinson Disease Tremors in hands, arms, legs, jaw, and head. For example, people may have difficulty getting out of the chair. To solve this kind of problem we introduce a device that will help to reduce muscle tremors. In this device, we are making hand gloves that will control hand movement using servo motors. To solve this kind of problem we introduce a device that will help to reduce muscle tremors. In this device, we are making hand gloves that will control the hand movements using servo motors and mini vibrational motors and IR sensor. When the IR sensor will detect any object with in its range the servo motors will start to move, to grip any object and the vibrational motors which attached with the finger pulp are generate a wave formation passing through out the nerves. In this way the whole system will be work.

## 2.1 METHODOLOGY:

A Parkinson Disease affected patient wear these gloves into their hands for reducing the hand tremors. The gloves included a number of servo motors and mini vibrational motors which will helps to reduce the hand tremors. While the patient switch on the device, the

microcontroller sends the command to the servo motors and also to the vibrational motors. After taking the command the servo motors move simultaneously for opening and closing the finger grips and the vibrational motors which attached with the finger pulp are generate a wave formation passing through out the nerves. In this way the whole system will be work.

## 2.2 BLOCK DIAGRAM:



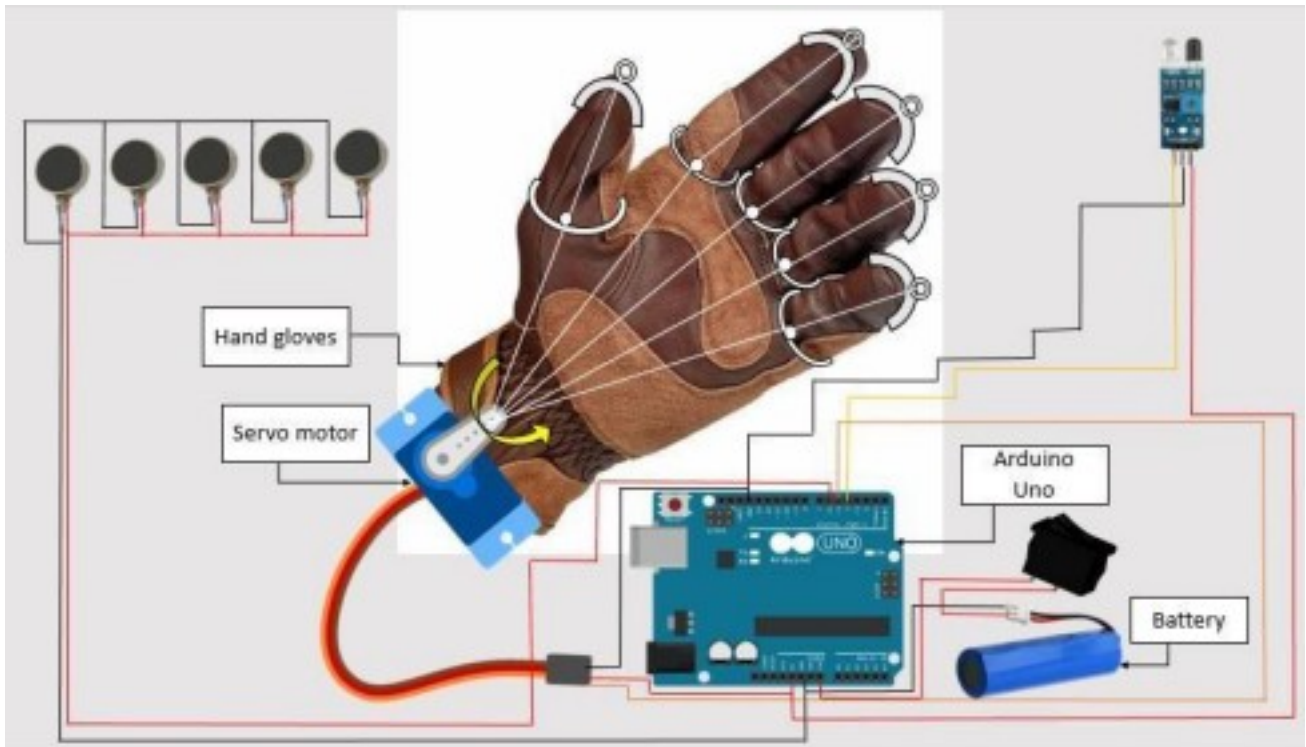


Fig. 1: Connection Diagram of the Hand Gloves Design

### 3.1 REQUIRED COMPONENTS:

1. Microcontroller
2. Gloves
3. Arduino Uno & Cable
4. Jumper Wire
5. Battery
6. Switch
7. Servo Motor-SG90
8. Fishing wire
9. HW 201 IR sensor
10. MVM (mini vibrating motor)

### 4.0 WORKING PROCESS:

In the device, we are using a hand glove. A total of five Servo motors (SG90) are connected to the Arduino Uno servo driver (PCA9685). IR sensor is also connected to the

Arduino Uno board. A total of five mini-vibrating motors are used in the glove. All GND of the MVM are in series connected to the Arduino Uno's GND pin and all the positives are in series connected to

the D4 pin. It uses vibrotactile simulation to relieve a wide range of movement symptoms. In this case, the vibrating motors will pass waveform throughout the nerves. A 7-volt lithium battery is connected to the system to give the power. The servo motors are fixed in the MCP joint (Metacarpophalangeal) of the hand gloves and a small pulley system is attached to the proximal interphalangeal joint of every finger. The end of the servo motor is tightly fixed with an elastic wire and the other end of the elastic wire is fixed with the edge of the fingers. The IR sensor is fixed on the edge of the middle finger. The IR sensor's VCC is connected to the Arduino's 5V, GND is connected to the Arduino's GND pin, and

the output pin is connected to the digital pin 4. By using the Arduino IDE software, we have to upload the code to the Arduino. An SPST switch is used to do the on/off of the system. According to the above diagram, when the user switches on the system, the IR sensor detects the object. If the patient wants to hold an object, she/he has to turn the hand toward the object and then detect the object by the sensor. Next, the servo motors will be started, and the finger will be bent down in the direction of the servo. The process will continue until the switch is off. In that way, we can solve 60-70% of the hand-shaking problem and the problem of holding any object.

## 5.0 RESULT:

The project has been finished with success and utmost satisfaction. The constraints square measure met and triumphs over with achievement. This system is required to solve the Parkinson Disease problem. The project gives a clever plan for growing a full-fledged utility fulfilling the patient's need. It is a novel innovation. According to this prototype all over the system is working properly. It is sometimes difficult to fixed the servo motors in the MCP joint for rotating the fingers according to the direction of the servo. The code which we used to run the device automatically. The using components like servo motors, IR sensor and MVM (mini vibrating motor) are interfaced with Arduino. Servo motor operating voltage is +5 volt

typically and operating speed is 0.1 second/60 degree and torque 2.5 kg/cm and rotation angle is 0 degree to 180 degree and the mini vibrating motor's operating voltage lies between DC 3 volt to 4.2 volt. By taking the input voltage from the Arduino, MVM start to vibrate simultaneously as per to the code. The working voltage of the IR sensor lies between 3.3 volt to 5 volt and the object detection angle is 35 degree that means if any object is under the view angle of 35 degree of the IR sensor, then the object will be detected by the sensor and we have to give 20 mA supply current to the sensor. The device created met it's objectives with the aid of being truthful to apply. All the modules inside the device are examined and legitimate records and invalid records and the entirety paintings with achievement

## 6.0 APPLICATION & FUTURE SCOPES:

1. In the future, we attach one servo motor for each finger joint so that the gripping power will be increased.
2. Also, we attached one temperature sensor for sensing the temperature of any object through some distance. If the temperature is not ideal for touch, then one LED light is

## 7.0 CONCLUSION:

A vibrational based exoskeleton glove for Parkinson Disease patients has been made, with high comfort and low cost. The vibrational based exoskeleton glove analyses the muscle weakness and tremor in the patient's hand, which bring a breakthrough in

blinking for warning. 3. In the future also try to reduce the weight and compact the whole thing so that it does not feel so heavy.

4. The EMG sensor detects the electrical activity from a muscle using conductive pads placed on the skin. When any of the muscles are activated, individual fibres within it receive electrical impulses, causing them to contract.

assessing the hand function of Parkinson Disease patients. We are designing a hand grasping, pinching and clicking actions for specific hand. Different parts like finger pulp, finger tips and pulicue is used to illustrate the hand muscle strength condition. Our results indicated that the vibrational based exoskeleton glove detect the object by the sensor when someone turn the hand toward any object.

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