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Touchless and Automatic Physiotherapy Machine For Legs

Pandit S. R.[1], Sarole G. G.[2], Bhandare S.B.[3]

[1-3]*Department of Instrumentation & Control Engineering, Maratha Vidya Prasarak Samaj's KBT College Of Engineering, Nashik, Maharashtra, India, 423713.*

Abstract - Touchless and automatic physiotherapy machine for legs is a biomedical related project. Because the current situation is badly tormented by Covid-19 pandemic, many physiotherapy patients aren't getting treatment and physiotherapy centers are becoming closed. The main advantage of this project is that it's touchless and automatic (as manual machines have their own limitations).

Parameters which are becoming monitored are – angle of rotation, speed of rotation and number of oscillations. By setting these parameters, patients can have the treatment by their own under the monitoring of physiotherapist.

Key Words: Angle of rotation, speed of rotation, oscillations

1. INTRODUCTION

This Project is to style and fabricate a less expensive Physiotherapy machine for legs than what's available commercially and with more versatile features.

After extensive joint surgery, attempts at joint motion cause pain in most of the patients and as a result, the patient fails to move the joint. This enables tissue round the joint to become stiff and scar tissue is made. This ends up in limited range of motion of the joint and sometimes may take months of physiotherapy to recover that motion. When the joint is moved without use of the patient's muscles, it is known as Passive range of motion. Because of use of this machine joint receives nutrition, venous flow increases and deterioration of cartilage is being prevented. Also pain is decreased, ROM is maintained. Scientific studies have determined that patients who have troubled achieving the conventional range of motion will be benefited by the employment of Physiotherapy Machine and also the recovery is accelerated.

METHODOLOGY

1.1 Proposed System

The equipment consists of Geared motors controlled by software, which receives the information generated by other software, interprets them and sends the information through drivers to the motors that drive the axles through synchronized The computerized Physiotherapy Machine will be applied to both upper limbs, enabling computerized control of your time and for the ROM to calculate automatically the speed from the information provided by the physiotherapist. The equipment structure includes an adjustable vertical rod, fixed at the lower end to a support base during a cross shape. At the upper a part of this rod there's an assembly attached, which is liable for the elbow flexion/extension movements. This consists of a metal plate where they're fixed by: Screw Drive arrangement, axles, angle sensor, Geared Motor.

The motor is connected to the screw and platform to Movement Supporter [Ankle]. The arm supporting base is connected to the support rod and has adjustable angular positioning that permits for an inclination of up to 90º within the sagittal plane of the patient's body. This base contains the thie support / and also an extension adjustment mechanism .The lateral rods from the ankle supporting base fit the lateral rods of the arm supporting base.

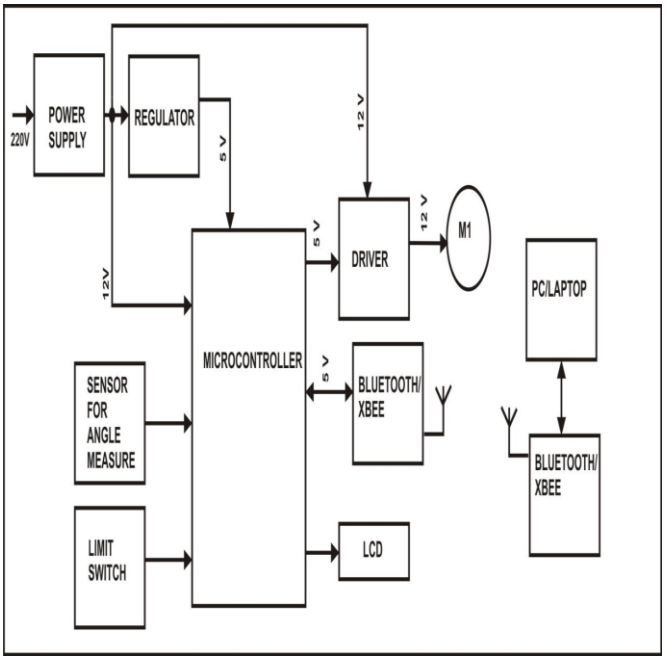

Fig. 1 Block Diagram

1.2 Design Components

a. REGULATOR IC 7805

Voltage regulators are quite common in electronic circuits. they supply a relentless output voltage for a varied input voltage. The name 7805 signifies two meaning, "78" means it's a positive transformer and "05" implies

that it provides 5V as output. So our 7805 will provide a +5V output voltage.

b. MOTOR DRIVER IC L239D

The L293D could be a popular 16-Pin Motor Driver IC. because the name suggests it's mainly accustomed drive motors. one L293D IC is capable of running two DC motors at the identical time; also the direction of those two motors are often controlled independently. So if you've got motors which has operating voltage but 36V and operating current but 600mA, which are to be controlled by digital circuits like Op-Amp, 555 timers, digital gates or maybe Micron rollers like Arduino, PIC, ARM etc Using this L293D motor driver IC is incredibly simple. The IC works on Half H-Bridge principle.H bridge could be a founded which is employed to run motors both in clock wise and anti clockwise direction. This IC is capable of running two motors at any direction at the identical time.

c. PIC 16F886- 8 Bit Microcontroller

PIC16F886 is microcontroller from 'PIC16F' family and is formed by MICROCHIP TECHNOLOGY. it's an 8-Bit CMOS Microcontroller with nano-Watt Technology. This microcontroller is popular among hobbyists and engineers due its features and value.

d. Liquid Display (LCD)

LCD modules are very commonly employed in most embedded projects, the explanation being its cheap price, availability and programmer friendly. 16×2 LCD is known as so because; it's 16 Columns and a couple of Rows. There are plenty of combinations available like, 8×1, 8×2, 10×2, 16×1, etc. but the foremost used one is that the 16×2 LCD. So, it'll have (16×2=32) 32 characters in total and every character are fabricated from 5×8 Pixel Dots.

e. RELAYS

The most common switching devices in electronics are relays. Because the relay has 12V trigger voltage, a +12V DC supply is used to one end of the coil and the other end to ground through a switch. We are using a transistor as a switching device.

f. Transformer (Center-tapped)

A centre-tapped transformer also known **as** two phase three wire transformer is normally used for rectifier circuits. A Transformer is used to step-down the voltage when a digital project has to work with AC mains (here, 24V or 12V) and then convert it to DC by using a rectifier circuit.

g. Accelerometer ADXL 335

The ADXL335 is a small, low power, complete 3-axis accelerometer. It has signal conditioned voltage outputs. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration.

h. Bluetooth Module

The BT module is a very cool module which can add two-way (half-duplex) wireless functionality to your projects. You can use this module to communicate between two microcontrollers like PIC or communicate with any device with Bluetooth functionality like a Phone or Laptop.

2. RESULTS

The Oscillations of leg are often adjusted.
• The Physiotherapy machine will bend joint in keeping with angle settings. The Physiotherapist may program the Physiotherapy machine to extend the number that the joint is flexed over time. Oscillations may prevent connective tissue from forming. this could also prevent pain and stiffness within the knee.
• Muscles may get stronger more quickly.
• The Physiotherapy machine will gently exercise leg muscles to stop them from getting weak. Tendons and ligaments, the tissue that connects to the muscles and bones, can also get stronger by employing a Physiotherapy machine.
• Patients may have less pain. A Physiotherapy machine will elevate leg and reduce swelling. Patient may have less pain if the swelling is decreased.
• Patients may have increased blood flow in their leg. Increased blood flow to your tissues will help them heal faster.

				
Lower limit	0	30^0	45^0/min	0s
Upper limit	115^0	50^0	155^0 /min	900s
Speed	1-9(30^0- 55^0)/min			
Extension pause	15 min			

Table 1: Operation Parameters

3. CONCLUSIONS

Being one in every of the important healthcare professions, physiotherapy plays a really vital role in recovering from joint injuries after accident. The device presented highlights the facility of touchless and automatic physiotherapy machine aided for rehabilitation engineering. within the current situation of Covid pandemic, many physiotherapy centres have gotten closed and patients aren't getting the treatment.

The model we've got designed may help the paralyzed patients and this may also help the

physiotherapists to handle patients without direct contact. This new technique would allow physiotherapists to implement targeted rehabilitative strategies for the patients. that the patient can recover quickly by prompt adjustment of the treatment. This novel technology, with therapeutic treatment, opens the thanks to a successful application of touchless and automatic physiotherapy machine techniques on to the leg fractured patients. Further fabrication is required to patient's home without assistance. Further studies are required to validate this rehabilitation technique for patients to substantiate the biomedical applications. This research opens a replacement avenue for rehabilitation. Further fabrication is required to change the look for biomedical and commercial application.

Fig. 2: Ready Application

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