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DEVELOPMENT OF WEARABLE DEVICE TO REDUCE MENTAL ILLNESS OF BRAIN STROKE PATIENTS USING GAMING TECHNIQUE

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Abstract :
Stroke survivors frequently have permanent or partial limitations in their ability to move their hands, arms, and/or legs. Rehabilitation should begin as soon as the injury occurs to aid patients' recovery. Patients would struggle to engage in the rehabilitation process, which can be painful and uncomfortable at times, if they lacked drive. Wearable devices, games, and the Internet of Things (IoT) can help patients with their rehabilitation by providing a motivating environment and allowing for remote monitoring of their health and progress. This research describes the development and implementation of an IoT-based rehabilitation system for stroke patients with upper-limb disabilities that incorporates gaming and wearable technologies.

Key Words: IOT, rehabilitation,Upper-limb disabilities journals,

1.INTRODUCTION

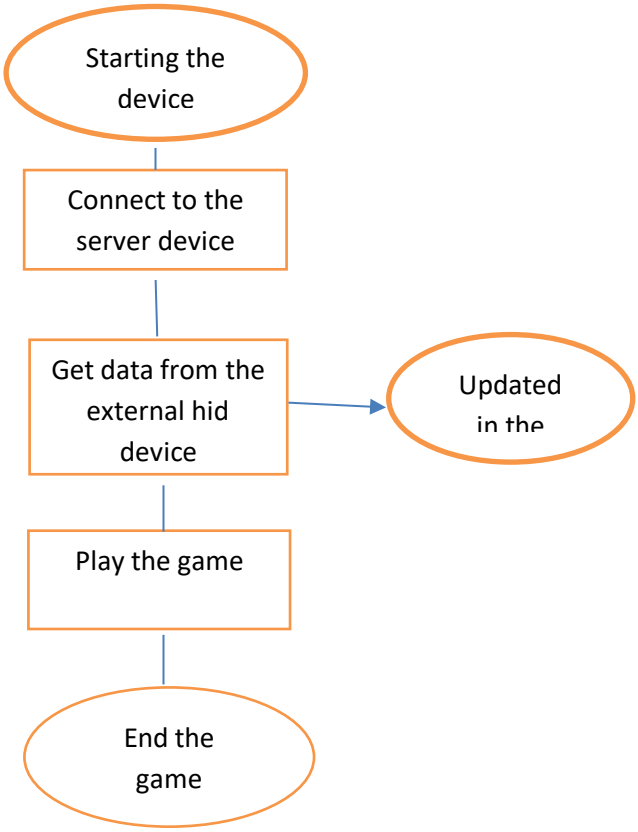
According to a recent survey, roughly 80 million people, or around 15% of the world's population, suffer from various types of disability. These limitations come in a variety of forms and provide a variety of obstacles. Smart rehabilitation strategies may be able to ease or perhaps accelerate the recovery process for people with a variety of disabilities. Because the limbs play such an important role in people's lives, people who have problems with their upper limbs have trouble doing simple tasks

Patients who do not receive treatment at the proper time will gradually lose their ability to function. The traditional rehabilitation technique and related equipment necessitates monotonous repeated activity . As a result, patients' enthusiasm and motivation for the rehabilitation process may be diminished, which could have a negative impact on their development and dedication. Patients must travel to the hospital or the rehabilitation centre on a daily basis to practise. This necessitates a significant amount of effort on the part of people who are already experiencing mobility issues. Furthermore, some patients are unable to attend rehabilitation centres due to the high expense. Even if money isn't an issue, the patient may lack motivation to travel to a rehabilitation centre and do the exercises.

Clinical medicine and medical theory have demonstrated that proper and early training is critical in restoring a patient's body's damaged function. The majority of research agree that the improvement of damaged function rehabilitation is dependent on the patients' motivation. Patients are more driven to practise at home because they are in a more comfortable setting. Hospitals and rehabilitation centres are not always perceived to be a suitable environment for rehabilitation, thus patients are more inspired to practise at home. Games have recently grown in popularity in a variety of fields, including the military, health care, entertainment, education, and government, thanks to technological advancements that have made it easier to interact with games

The design and implementation of a rehabilitation system for stroke patients with upper and/or lower limb impairment is presented in this paper.

2. **Methodology:**



The process through which the information send is represented in the flow chart. Device is connected to the server device and the data is sent to the server through the HID device. The data is used to play the game and then it is sent to the cloud to get stored in the cloud for the therapist to verify the condition.

A wearable section of the project sense the flexibility of the finger using flex sensor and measures the angle of deflection using Gyroscope sensor Meanwhile it measures the Heart beat rate and oxygen level using SPO2 Sensor. The collected data is received by arduino and processed the values of gyroscope and SPO2 sensor transferred to the ESP8266 to get updated in the Blynk cloud. The gyroscope and flex values are sent to gaming server using Human interface device.

Hardware Requirements

A. Components

Flex sensor: A flex sensor is a type of sensor that is used to determine the degree of defection or bending. Materials like as plastic and carbon can be used in the design of this sensor. The carbon surface is set on a plastic strip, which can be turned away to modify the sensor's resistance. As a result, it's also known as a bend sensor. It can also be used as a goniometer because its fluctuating resistance is directly proportional to the number of turns.

SPO2 Sensor: The MAX30100 is a sensor system for pulse oximetry and heart rate monitoring. It detects pulse oximetry and heart rate signals using two LEDs, a photodetector, improved optics, and low-noise analogue signal processing.

Accelerometer Sensor: An accelerometer's basic functioning concept is similar to that of a dumped load on a spring. When this gadget senses acceleration, the mass is displaced until the spring can easily move the mass at the same rate as the sensed acceleration. This displacement number is then utilised to calculate the acceleration.

Arduino UNO: Arduino is a single-board microcontroller designed to make electronics more accessible in transdisciplinary projects. An open-source hardware board based on an 8-bit Atmel AVR microprocessor or a 32-bit Atmel ARM microcontroller is used. On the microcontroller, the software comprises of a standard programming language compiler and a boot loader.

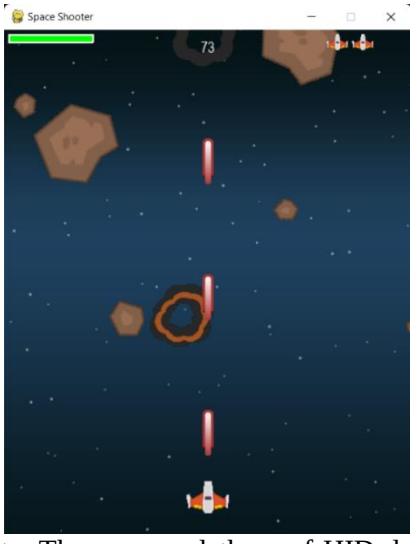
Node mcu 8266: The Espressif ESP8266 is a microcontroller created by Espressif Systems. The ESP8266 is a self-contained Wi-Fi networking device that can act as a bridge between existing microcontrollers and WiFi, as well as execute standalone applications. This module has a built-in USB connector as well as a large number of pin-outs. You may attach the NodeMCU devkit to your laptop through a microUSB cable and flash it just like an Arduino. It's also breadboard-friendly right away.

B. Software requirements

Arduino IDE: Arduino IDE is an open-source programme created by Arduino.cc that is used to write, compile, and upload code to practically all Arduino Modules. It is official Arduino software that makes code compilation so simple that even a non-technical person may get their feet wet

the learning process.

HID: A human interface device (HID) is a device that allows a person to engage with an electronic information system by inputting or outputting



data. There are a plethora of HID devices on the market. Keyboards, mice, computer speakers, cameras, and headsets are the most prevalent. HIDs are any devices that serve as a link between a user and a computer machine. It's a crucial component of a user interface, which is also known as a human-computer interface (HCI) or, more broadly, an interface device.

- Game: Health bar for the space ship.
- Score board to show how you are faring so far.
- Power ups like,
  - shield: increases the space ships life.
  - bolt: increases the shooting capability of the ship by firing 2 to 3 bullets instead of one at time.
- Custom sounds and sprite animation for things like
  - meteorite explosion
  - bullet shoots
  - player explosion
- 3 lives per game

3. CONCLUSIONS

Results and Discussions

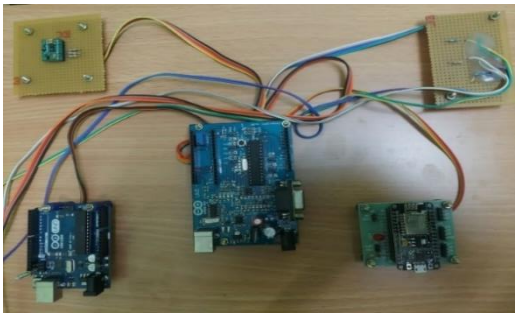
The proposed system consists of both hardware and software modules.

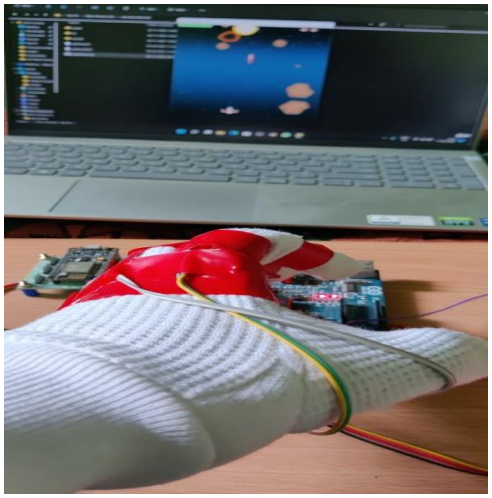
The main hardware components used are Arduino IDE, flex sensor, nodemcu, accelerometer sensor and gyroscopic sensor-MAX 30100.

HARDWARE SETUP

WORKING POSITION

Wifi module-ESP 8266. All codes required for the written visual studio using pygame technology and Arduino is coded using C Programming Language. The





experimental results of the proposed wearable device to reduce the mental illness of stroke patient are shown below.

INPUT

The input to play the game using the angle of movement of a finger and blood pressure is sensed by the wearable device to reduce mental illness of a stroke patient according to the hand movement of the patient.

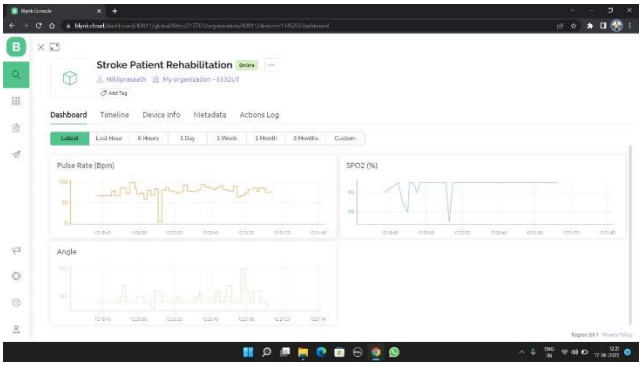
SOFTWARE PROCESSING

The information to Play the game is received by the angle of deflection of the sensor and is further processed on the

PC by using the Visual studio Software. A screen shot of the software processing is

OUTPUT:

Based on the command received from the flex sensor, the firing and the movement of the shooter bot is performed. The SPO2 sensor in the device helps to get the Heart Beat rate, oxygen level and the angle of movement of the hand. A demonstration of the proposed wearable device to reduce the mental illness of stroke patient is shown below.



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