REHABILITATION THERAPY FOR SEMI-PARALYTIC PEOPLE

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Abstract— Paralysis is the loss of muscle which functions as a part of the body. Paralysis can affect any part of the body at any movement of an individual’s lifecycle. It happens when something turns out wrong with the way messages to pass between the brain and muscles. Paralysis can be generalized or localized. It can be either complete or partial type of paralysis. Completely paralyzed people can’t have control over their muscles in the affected areas. Paralyzed people can’t be in a position to move from one position to the other. So, it would be very difficult for them to go for the checkups and fulfill their necessities. This is the biggest problem which people are facing to go for the checkups and observe their health condition. To avoid this problem, in this project a mobile based game therapy is developed. This is a passive rehabilitation exercise for the disabled patients. This exercise tries to activate neuroplasticity. By using this mobile game patient can regain movement in his body especially in muscles. By using this game doctor can be able to check the day to day readings and can analyze the improvement of the muscle strength and prescribe the suggestions accordingly. The improvement in muscles starts very slowly but, trusts the game as long as the patient is playing this game the complete concentration will be towards the game so that the patient can restore daily the functionality of his nerves and muscles easily.

Keywords—rehabilitation, gaming Therapy.

1. INTRODUCTION

Paralysis is a major problem for people nowadays. Paralysis affects a large percentage of the population around the cosmos and has assumed epidemic dimensions. The current appraisal of the number of Paralytic patients in the world is increasing rapidly. Relatively; a large percentage of world population is affected by the paralysis. According to the study, there are nearly 1 in 50 people living with paralysis approximately 5.4 million people. An Individual may either suffer from partial palsy or full paralysis because of a number of causes which include trauma, polio, and nerve legal injury multiple sclerosis, stroke, cerebral palsy as well as other medical checkup issues. Physiotherapy also helps paralysis patient role to a great extent. Depending on the form of paralysis, patients undergo physiotherapy therapy sessions where they are made to do different exercises to help regain muscle movement. This type of treatment is slow and requires a stack of a campaign and strong will. But its result is most effective.

A. Overview

The paralytic affected role will need the help of another person for him to move from one place to another and also during rehabilitation affected person depend on others for undergoing painful physiatrist. The patient has to go to the hospital daily to take physiatrist, where it takes more clip for the patient. The twist for physiotherapy is large and expensive and that are available in hospitals only. It is very difficult for poor people to take physiotherapy in the hospital. Rehabilitation is often recommended to address problems that can occur as a consequence of the paralysis, to enable the
paralyzed mortal to live as independently as possible and to provide the person with a high quality of biography.

B. Rehabilitation:

A brain injury can be devastating, not only with gaze to physical disablement and lack of function but for memory, speech, cognitive thinking and reasoning processes as well. In some cases, you may be able to restore function and use of damaged surface area of the brain through physical, speech or occupational therapy, according to the Brain Injury Recovery Network. Understand the basic of brain injury recovery practice session and what they do, to offer the best rehabilitation and restoration of physical and cognitive function as possible following a brain injury.

Fig. 1: Patient playing a mobile.

Repeat and routine are keys to helping you regain your memory after stroke. Stimulating your brainpower with memory game can help you recover too.

Fig. 2: Rehabilitation Therapy using Game

Playing games has been proven to have many high quality behavioral and physiological effects. In rehabilitation settings, games have been shown to have fine impacts on cognitive performance, motor performance, and effect. In quasi-experimental studies evaluating game experts with video game novices, experts show increased attention capacity, expanded the useful field of vision, and improved the temporal resolution of attention relative to novices. Surgeons who played games made 37% fewer errors, had been 27% faster with laparoscopic drills and had been 33% better at suturing tasks than nongame surgeons. Although supportive of a game–training benefit, the quasi-experimental nature of these studies prevents any causal judgments. Thus, in this Special Interest article, we focus exclusively on experimental research of game training (by searching electronic databases and the bibliographies of relevant research). This Special Interest article is inclusive in the types of games used, duration of the intervention, and the sample population studied. Positive results and null findings found in published studies are presented hereafter. While we have tried to be comprehensive in our review of the evidence, the interpretations are qualitative rather than quantitative.
Considerable research still remains to be executed in this area before the effectiveness and efficacy of video games in rehabilitation can be conclusively determined.

C. **Gesture Moments used in rehabilitation therapy:**

Stability and control are much more complex for an airplane, which can move freely in three dimensions, than for cars or boats, which only move in two. A change in any one of the three types of motion affects the other two.

![Fig.3: Various Directions](image)

- Rotation around the front-to-back axis is called **roll**.
- Rotation around the side-to-side axis is called **pitch**.
- Rotation around the vertical axis is called **yaw**.

D. **Assessment**

Assessment can be described in three ways:

- To measure the x,y and z co-ordinates by using ADXL335 accelerometer
- To measure the roll and pitch values of a semi-paralyzed person.
- By comparing the roll and pitch values of normal and semi-paralytic person we can analyze the patients’ health condition.

Assessment should not be confused with Evaluation, to which it may contribute. Evaluation is concerned with finding out how effective activities, components and approaches have been in achieving the aims and objectives of a learning experience and their impact on the target audience. Evaluating physical therapy is particularly important as it offers valuable knowledge and insight for the educator to use so that, as future work evolves and develops, effectiveness is improved.

E. **Importance**

Throughout its development, gaming in rehabilitation has gained a large amount of support for its differences in comparison to regular therapeutic methods. The biggest of these differences is the user engagement and enjoyment. It has been extensively shown that people feel more engaged in a gaming environment and less contained in a doctor’s office when interacting in a virtual reality, gaming environment. Additionally, those who are able to participate in gaming rehabilitation have also been shown to use less energy than those participating in normal therapeutic methods. While this may not be positive for all patients, this is beneficial for those patients who may be elderly or have minimal energy to expend in therapy-type settings. Saving energy while still participating in therapy has proven effective for these groups of people, since they are still able to progress in their goals towards rehabilitation, but not over-work themselves in the process. On the other hand, normal physical rehabilitation routine requires commitment to lengthy periods of difficult exercise which causes the patient to drop out of the therapy routines. Rehabilitation through gaming provides the opportunity to address two important areas: accessibility of rehabilitation and patient motivation.
F. Scope

The Scope of Practice Statement identifies knowledge and skills required for the provision of effective rehabilitation counseling services to persons with physical, mental, developmental, cognitive, and emotional disabilities as embodied in the standards of the profession's credentialing organizations. Several rehabilitation disciplines and related processes (e.g., vocational evaluation, job development and job placement, work adjustment, case management) are tied to the central field of rehabilitation counseling. The field of rehabilitation counseling is a specialty within the rehabilitation profession with counseling at its core, and is differentiated from other related counseling fields. The professional scope of rehabilitation counseling practice is also differentiated from an individual scope of practice, which may overlap, but is more specialized than the professional scope. An individual scope of practice is based on one's own knowledge of the abilities and skills that have been gained through a program of education and professional experience. A person is ethically bound to limit his/her practice to that individual scope of practice.

G. Objectives

The main aim of the project is to design and develop a rehabilitation therapy that includes a continuous change in the values of an accelerometer for a particular time.

The main objectives of the project are:

- To design a prototype for the improvement of the health condition of a semi-paralytic person.
- The main aim of the system is for a paralytic patient to need help of another person for him to move from one place to another and also during rehabilitation patients depend on others for undergoing painful physiotherapy. The patient have to go to the hospital daily to take physiotherapy, where it takes more time for the patient. The devices for physiotherapy are large and expensive and that are available in hospitals only. It is very difficult for the poor people to take physiotherapy in the hospital.

2. DESIGN AND ANALYSIS

A. Block diagram

The Block diagram is a combination of various modules such as Pushbuttons, ADXL-335 and a core module known as Arduino UNO. The above figure represents the block diagram. In the block diagram mobile application is the major part where the hand moment of the patient in the game plays a vital role.

![Fig. 4: Block Diagram](image-url)
B. Design:

The accelerometer values which are observed through the hand gesture moments of a healthy person is compared to the patient’s hand gesture moments with respect to the co ordinal axis values and stored in the data base with respect to the day to day health condition of patient. The health condition is observed and displayed on the serial monitor whether the health condition is improved or stable.

C. Gaming Application Analysis:

![Diagram of game execution](image)

**Fig. 5: Flow of game Execution**

3. IMPLEMENTATION

A. Hardware implementation

This section has importance on the actual hardware implementation of the system, the various modules, components, peripherals and the interconnections between them are discussed. The first stage of the implementation is to prepare the Arduino UNO module for its boot; this is done by downloading the latest version of the Arduino UNO software from the official Arduino website. The Arduino is further connected either peripherals using jumper wires and the system via a USB cable the first boot is then completed on the Arduino UNO by connecting the required peripherals.

B. Hardware requirements:

- Arduino UNO
- ADXL-335
- Push Buttons
- Resistors
- Jumper Wires

C. Software requirements:

- Arduino 1.6.12
- Language – C language
- MIT App Inventor
D. Applications:
1. Health care
2. Hospitals
3. Home
4. Gym Centers
5. Rehabilitation Centres.

Steps to configure Arduino Board:

Step 1:

![Device manager settings](image)

Fig. 6: Device manager settings

Step 2:

![Arduino Tools configuration](image)

Fig. 7: Arduino Tools configuration

Step 3:
Fig. 8: Port Configuration

Step 4:

Fig. 9: Arduino Working Console
E. FLOWCHART OF THE PROJECT

![Flow Chart]

Fig. 10: Flow Chart

4. RESULTS & DISCUSSIONS

A. Project setup

This section gives us the final results of the project, the system has been configured to display the message to the patient at a certain time every day and to run the accelerometer continuously and compare the values to observe the patients’ health condition.
Fig. 11: Final Setup

The system gives the exact health condition of the patient and gives information whether he need more practice or the way patient is playing is good or need to improve. So, that the doctor can prescribe the medication to the patient in a proper way using the database.

Fig. 12: Project setup including connections

It includes Adxl-335, Arduino UNO, Push Buttons, Jumper wires, resistors. The message is displayed on the serial monitor about the improvement of the patient.

B. Project results

1) Patient Health condition By measuring the values

![Image of measurement values]

Fig. 13: Final message

2) How to open and Run the code:
C. Output Of Mobile Application

Fig. 14: Code Verification

Fig. 15: Game Console

5. CONCLUSION AND FUTURE SCOPE

The consolidated results of those experimental studies are promising, and with elaborated analysis and development, gameplay may be a safe, cost-efficient, and effective supplement to traditional physiatrists. As research in this area grows, however, there is still a lack of criteria by which therapists can judge how games could be integrated into rehabilitation or assist patients in choosing games appropriate for in-home use. One option is designing therapy-specific games. This might be an option for the future as this niche develops, but it is costly and time-consuming at present. Thus, we advocate the use of readily available, commercial video games designed in the highly competitive gaming industry. We argue that these commercial games are effective, motivating, and engaging for patients because these are based on key factors of game design. We next explore game design factors that are most salient for rehabilitation and use empirical research from psychology, neuroscience, and motor learning to point out that there’s a scientific basis for what makes a successful video game (i.e. one that’s motivating and engaging).

Gaming in rehabilitation is widely employed used by clinicians. Preliminary findings show that video gaming technology are often applied across a wide variety of rehabilitation populations, with some evidence showing clinical gains in physical functioning (e.g. gait and balance). There’s a necessity for more robust clinical trials evaluating the efficacy of using video game systems as an adjunct to traditional rehabilitation.
Implications for Rehabilitation

- Gaming may be readily available technology that has been suggested as an enjoyable and motivating activity that engages patients in rehabilitation programming.
- Gaming is turning into an increasingly popular adjunct to traditional therapy.
- Gaming is most typically utilized by physical therapists in a hospital setting for those with balance impairments.
- Gaming has been shown to boost functional outcomes.

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