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Design an Auxiliary Device of Power Rehabilitation System for the Patients Interest

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Abstract
In the past, users of the rehabilitation system felt very bored with the use of the device. This study proposes an auxiliary device designed for the Power Rehabilitation System, which makes it easier and interested for users to rehabilitate. Users can display the image according to the screen through the tablet. The operation of the progress and the sound of the release can not only enable the user to achieve the rehabilitation goal given by the doctor more accurately, but also increase the interest and efficiency during reconstruction. When using this study for rehabilitation, the tablet will also make record, these records are then uploaded to a cloud database, enabling healthcare physicians and nurses to instantly monitor and access data. it will be easier for doctors to observe and understand the condition of the user's rehabilitation, which more convenient and effective methods are required to help doctors make better diagnoses. Therefore, this system is extremely beneficial to the medical rehabilitation field and enables doctors to learn of the analysis from complete training data of the users.

Keywords: *auxiliary device, rehabilitation, Power Rehabilitation System, cloud database.*

INTRODUCTION

The currently available patient's rehabilitation technologies merely rely on human vocals recorded in a CD player and doctors' observations and judgments to record users' rehabilitation status in a written manner. Therefore, the status of progress cannot be precisely recorded. With the integration and advancement of wireless communication and embedded microcontroller technology recently, many domestic and foreign studies associated with telemedicine and wireless healthcare system have been conducted. The most significant change is wireless sensors, which are unable to continuously and uninterruptedly collect physiological signals more precisely and make the rehabilitation system of patient's disease more precise. In the environment of advancement of medical technologies and health concepts, countries are becoming aging societies where the demand for rehabilitation services has significantly increased. As a result, more convenient and effective methods are required to help doctors make better diagnoses.

I. SYSTEM ARCHITECTURE

The system's sensing device includes an APP and an infrared sensor. The sensing end of the system consists of an acceleration sensor and a distance sensor. The values received by the sensors, such as acceleration and distance, are transmitted to the Android system of the tablet via Bluetooth connection. The Android system filters the data, converts it to a height, and displays it on the tablet to reflect the current user's progress. Lastly, after the user undergoes rehabilitation, the data are saved on the tablet. This system can assist the user in undergoing rehabilitation, and the user is able to obtain the detailed data on measured values of distance and acceleration through doctors. Such data can be provided as reference for doctors. The overall system architecture process is shown Fig. 1 and Fig. 2.

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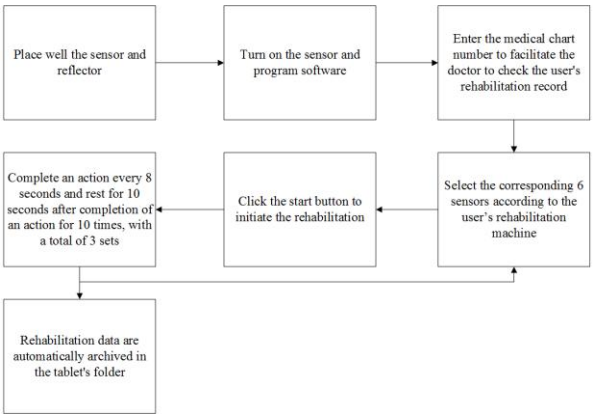

Figure 1: System Architecture Process - System Operation

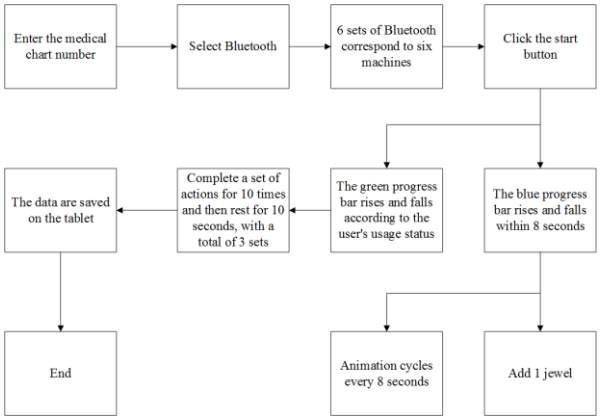

Figure 2: System Architecture Process - Tablet Operation

II. System Operations

A. Infrared Device

Acceleration is calculated and the values of the infrared sensor are read using the wafer nano100, as shown in Fig. 3. Originally, the error of data measured using infrared is very large, and thus a filter program is required to be added to the nano100. Every infrared sensor has to perform the measurement, measuring the data of each centimeter, finding the perfect trend line, converting it into a formula, and then entering the formula into the APP program. In this way, the infrared sensors can be used to measure the precise centimeter. Afterwards, the infrared sensors are placed on the weight of the rehabilitation machine, as shown in Fig. 4.

Figure 3: Infrared Device

Figure 4: Rehabilitation Machine

B. Bluetooth Program on the Android End

The bluetooth on the Android end must be paired and connected with the bluetooth on another Android end in the first place to be effective. The Bluetooth function of the system is shown in Fig. 5. The values from infrared sensors are transmitted to the tablet. In order to ensure the integrity of the received data, the receiving command is sent to the Android end every second. If the data are not received, the command will be issued again until the connection is interrupted.

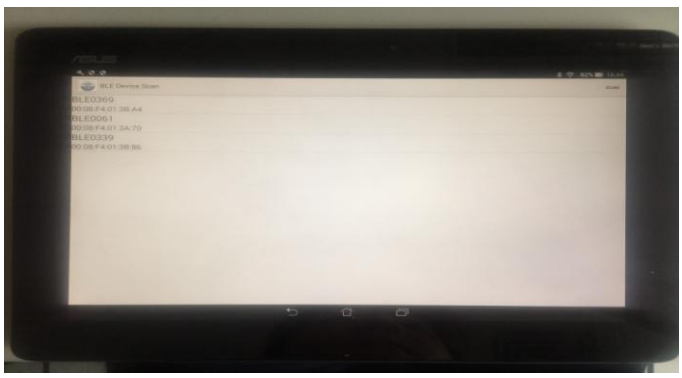

Figure 5: Bluetooth Selection Interface

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III. System Operation and Testing

It takes 8 seconds for the user to perform a complete rehabilitation action. The blue progress bar is fixed at 4 seconds from 0% to 100%, the next 4 seconds is from 100% to 0%, and the total is 8 seconds back and forth. The green progress bar is the distance that the user pulls up, and the value displayed is calculated according to the detected distance. For animation calculation, once an action is completed every 8 seconds, 1 jewel will shine. The user has to complete an action 10 times (8 seconds each) in 1 round. In total, 3 rounds have to be completed, and the user can rest for 10 seconds between each round. For the animation game, 20 images are changed every second, with a total of 160 images consisting of an animation in 8 seconds, as shown in Fig. 6.

Figure 6: Animation Diagram

Conclusion

In order to help patients with Parkinson's disease and elderly patients undergo rehabilitation more clearly and conveniently, an infrared measurement and mobile phone APP are used to solve the problem whereby doctors have to supervise patients one by one. With this APP, every patient can undergo rehabilitation simply by looking at the tablet and following the instructions on the screen. Every patient can follow the screen instruction to perform actions and adjust the speed, which makes the rehabilitation more interesting and can help achieve better rehabilitation efficiency. Therefore, this system is extremely beneficial to the medical rehabilitation field and enables doctors to learn of the analysis from complete training data of the users.

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