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Bilateral Trainer with Motes Using *e*-plus Functions

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Abstract:
BAT is specifically well-known exercises for the sufferers concerned by stroke. The bilateral arm exercise is essential and is treated as most excellent as, it benefits for stroke sufferers capability improvement proportional from serious attack through some upgrade training mechanisms. This system exits of traditional bilateral arm handler like sanding blocks which is made up of wooden and so it may not produce the information certainly. The recommended system exists with some motes of sensors utilizing WSN for automated data storage. First sensor mote has realized as a tension sensor for observing the arm effort, second sensor mote has realized as load weighing sensor to measure the load applied and third sensor mote has realized as range mapping sensor for sensing the distance. The application of bilateral arm exercise is to stimulate affected arteries, advocating affected networks so that it recovers the affected arms.

Keywords: *(BAT) Bilateral Arm Trainer, (WSN) Wireless Sensor Networks*

1. Introduction

WSN systems are advanced based on autonomous sensor mote techniques, and a WSN system is capable of aggregating decentralized sensor information storage and computing subsystems to realize a total ICT solution to better the operational efficiency. In general, WSN approaches are widely used in various applications, such as fitness auditing, liquid pressure checking, prognostics and health care, highway bridge estimation, senior caring systems, etc. Although a number of WSN utilizations were recommended, there still exist a large extent of methods and efforts working traditionally without automated operations, specifically for healing treatment and recovery facilities.

1.1. Existing system

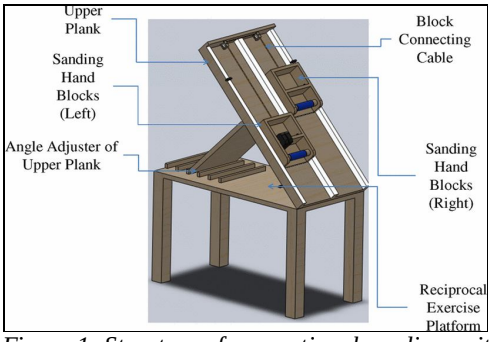

Figure 1: Structure of conventional sanding unit

A reciprocal sanding block is a well-known bilateral limb exercise apparatus for sufferers after stroke. Traditional sanding blocks are simply built by wooden, and they may not support significant coup data for automatic valuations. The appearance of traditional sanding blocks is simple in structure, high reliability, easy to maintain, and less cost. Nevertheless, a plain mechanical architecture without any electronic operations cannot automatically record rehabilitation data during exercises.

1.2. Problems faced

Two complications may appear when electronic recording components are not used. The first problem is that repeated analysis are generally required for such exercises, and those procedures would result in extra loads of caretakers as well as large amount of

healthcare human resources. The second complication occurs from the manual investigations. Manual investigations are generally hard to note quantitative data for correlative exercises.

1.3. Proposed System

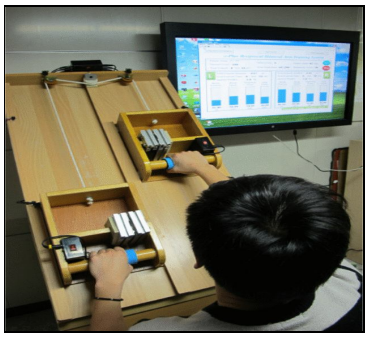

Figure 2: Structure of conventional sanding unit with e-plus functions

On establishing the significance of automated information storage, we introduce WSN results to advance recovery information storage capability for traditional sanding blocks. Hence, we do not produce new reciprocal bilateral arm training machine; instead, we target at recommending *e*-plus solutions for conventional sanding units to automatically collect rehabilitative data by using motes approaches. Hence, the proposed *e*-plus WSN solution can be directly attached to conventional reciprocal sanding units without hugely reconstructing the mechanical platform and control systems.

2. Design Concept

Due to reciprocal movements of bilateral sanding hand blocks, it is not feasible to connect the sensors attached on two sanding hand blocks together in wired manners for the concerns of operational inconvenience and possible noises. Hence, WSN techniques are introduced in this system to eliminate the wiring tasks for two sanding hand blocks. The wireless sensor node (mote) on each sanding hand block may deal with automatic sensor data collection of its own. The sensor data collected from bilateral sanding hand blocks is further aggregated with the wireless sensor node on the reciprocal exercise platform to represent the parametric rehabilitation performance. At the same time, in order to reduce the wiring efforts of using the *e*-plus functions, the sensors and WSN motes are developed modularly to perform easy installations.

The sanding block is wanted to imitate complementary move back and forth sanding unit with some impediment positions and the every position of impediment may be attained by extending varied loads on sanding grip sections or by changing uppermost board slant.

This traditional sanding entity bilateral limb instructor creates the sufferer to carry out the training in smooth and handy way. When an uppermost extremity controls lower gripping sanding limb section, has to supply a powerful tenacity to raise upward another sanding limb section controlled by the alternative arm. When one extremity drags downward one part of sanding limb section, at the same moment another part of the sanding limb section is raised upward by applying the other side of limb. So, the potent capacity of exercise of two limbs are conjoined, and they are integrated to finish a mutual phases. Thus resulting sanding workout boosts the sufferer ability and their muscular stamina.

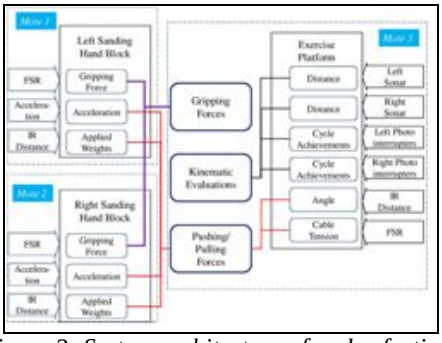

Figure 3: System architecture of e-plus fuctions

3. System Architecture

In this system, WSN methods are required for automated data storage. Three WSN motes are used to store the data. Two motes are used for a set of sanding hand blocks, and the remaining mote is used for the reciprocal exercise platform.

Three motes are used in this project, and they are work together and joined to perform the improvement achievement indices within the kinematic performance, gripping forces and pushing/pulling forces. Each mote is responsible for varied sensor data acquisitions, data changes, and data means.

For each sanding hand block (i.e., mote 1 and 2), three sensors are designed, including a force sensitive resistor (FSR) set, a one-axis accelerometer and an infrared (IR) distance detector. The FSR set is composed of two FSRs which are desired to detect the grip force applied on the handle. The one-axis accelerometer aims at measuring the accelerations of the exciting sanding hand block. The IR distance sensor is capable of measuring the number of loads applied on the sanding hand block. The number of applied weights is used to measure the total mass of a sanding hand block.

4. Conclusion and Future Scope

In this project, WSN ways are favorably projected to advance *e*-plus activities for traditional sanding units. In extension to the innovation of recommending *e*-plus activities, a pressure sensor is also introduced to amplitude the cable's pressure so that the patients arm force may be accurately handed out. Specifically, the composed sensor information is attentively documented to analyze its workability. Therefore, this system bestows a base price, promotable and hopeful result for well-known sanding units in most rehabilitation hubs to decrease the loads of caretakers, also to accomplish effective and efficient rehabilitation information acquisitions. At the same time, the pressure effort seen in the linked coaxial may serve as bilateral arm analysis work of sufferers with upper limit breakages. So, calculations of bilateral leg analysis for sufferers with different upper limit impairments will be the future works of this project.

5. References

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