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Biomechatronics for Rehabilitation of Stroke

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Abstract: **Stroke is the leading cause of disability. This disability leads to increased inactivity and deconditioning. Rehabilitation strategies that are task oriented and intensive can drive cortical reorganization and increase activity levels in people after stroke. Footwear-based physical activities monitor (System) that can reliably differentiate between most common postures and activities. The main goal of this project is to design a wearable device for use with such rehabilitation strategies. The device is based on a combination of system and a sensor and output is visualized using Lab VIEW. Pressure sensor and triple axis accelerometer are placed in the insole of the shoe. The data collected from the sensor is sent to the system via Bluetooth and is processed with the help of a microcontroller. A feedback is sent to the patient, which is in the form of alarm and message. The usage of Lab VIEW is to view the accelerometer graph and pressure which is indicated in the form of LED.**

Keywords: **Lab VIEW, physical activities monitor, stroke.**

I. INTRODUCTION

Many people after a stroke cannot walk independently, in their community. A method for monitoring various types of activities other than just walking may be necessary in order to provide effective behavioral enhancing feedback on activity level. This work describes a novel methodology for automatic recognition of the postures and activities of patients with stroke. The main focus has been converting the previously designed laboratory based system into a wearable system able to monitor a person's daily activities. The shoe based sensor will be able to monitor lower extremity activity, different postures and mobility tasks of an individual in his or her home and community.

Components:

- Wearable shoe sensor module
- Microcontroller
- Bluetooth module
- System (Lab VIEW)

II. SENSOR MODULE

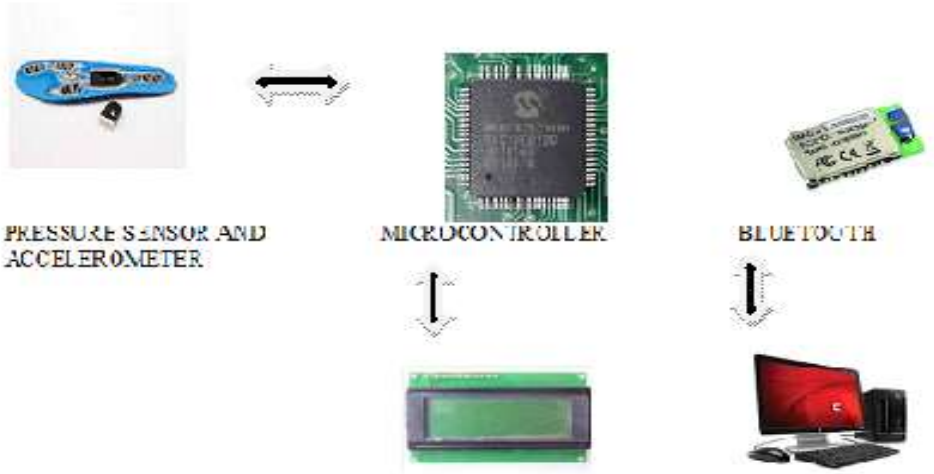
The previously designed laboratory based system consisted of a pair of wearable sensor shoes each with a pressure insole and triple axis accelerometer. The new system is composed of three major hardware components: the left shoe, the right shoe, and the system. The left and right shoes are designed to use identical software and hardware due to the symmetry of their operation and interaction. The pressure sensors and accelerometer is placed on the sole of shoe. The data from shoes are processed by microcontroller and transmitted to the system via Bluetooth. The system application allows for synchronized monitoring and data collection from of a pair of shoes.

III. MICROCONTROLLER

The sensor module on each shoe consists of a microcontroller which is responsible for sampling of the pressure and acceleration sensors, a Bluetooth communication module and an on-board accelerometer. The microcontroller used is PIC microcontroller. The pressure and vibration input from the shoe sole is processed by this microcontroller. Program is written in embedded C.

The Bluetooth is used for wireless transmission between hardware and software. As Bluetooth is used the person is allowed to walk freely without any disturbance. Bluetooth can cover a range of 10m so zigbee is used which can cover up to 50m.

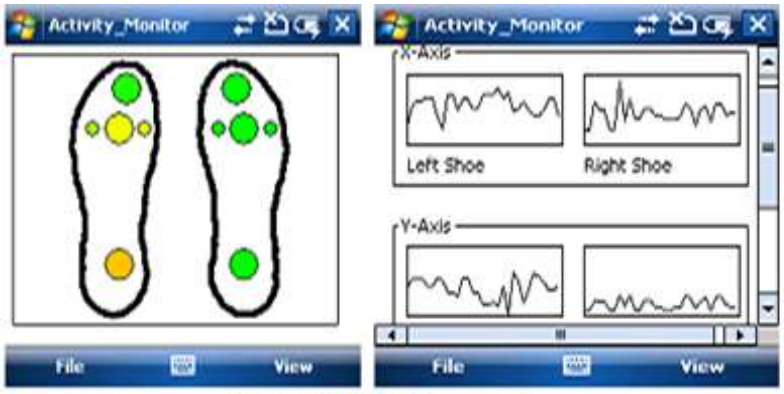
Block Diagram



IV. SYSTEM OPERATION

The wearable device's main goal is objective comparison of relative use of healthy and affected lower extremities in certain activities (for example, walking). To perform such a comparison the data collected from the left and right shoe should be time-synchronous. Upon receiving the data, the system must pair the sampled data from the left shoe with the data from the right shoe. Synchronizing the samples is done by pairing the readings, one from each shoe, with identical timestamps toCreate a sample. Samples are then logged or displayed by the GUI as needed.

Output



Lab VIEW Output

V. RESULT

The pressure sensor output and accelerometer output are visualized in system using Lab VIEW software. The pressure is indicated in lights using LED. Green indicates no pressure, red indicates more pressure. Accelerometer output is in waveform pattern. The feedback is sent back to the microcontroller and a message is viewed on the LCD screen stating the position of the patient. A normal person walks in the same axis if a stroke patient finds it difficult to walk and when he moves away from the axis and about to fall an alarm is sent so that the patient can be aware and the alarm alerts him. The results indicate that data collected by the wearable system are compatible and provide highly accurate posture and activity recognition rates.

VI. FUTURE SCOPE

The future improvement to the system will include posture and activity recognition on the Smartphone using a neural network and development of a biofeedback mechanism. Recognizing postures and activities on the Smartphone will allow for a complete wearable system for use in free living conditions.

REFERENCES

[1] E. S. Sazonov, G. Fulk, N. Sazonova, and S. Schuckers, "Automatic recognition of postures and activities in stroke patients," in 31st Annual International Conference of the IEEE EMBS, 2009, pp. 2200–2203

[2] E. Sazonov, G. Fulk, J. Hill , Y. Schutz and R. Browning," Monitoring of posture allocations and activities by a shoe-based wearable sensor", to appear in IEEE Transactions on Biomedical Engineering, 2010

[3] G. D. Fulk and E. Sazonov, "Using Sensors to Measure Activity in People with Stroke," submitted to Topics in Stroke Rehabilitation,2010

[4] E. Sazonov, V. Krishnamurthy and R. Schilling, "Wireless Intelligent Sensor and Actuator Network (WISAN) –a scalable platform for time-synchronous applications of structural health monitoring", accepted for publication in Structural Health Monitoring (International Journal), 2010

[5] Matthias Ringwald and Kay Romer. Practical time synchronization for bluetooth scatternets. In BROADNETS, pages337-345.IEEE,2007