

Wireless Intelligent Pedometer for elderly patients using ARM10

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Abstract - In the recent decades many people face problem related imbalance, abnormal walking, unsteadiness, fall risk while walking. Probably this problem faces at age of 60. Here used different sensors like sensor wear on the body. In first stage research the problem and collect all required parameters, in second stage compare previous different methods on recent technology. This paper presents a method for computing clinically relevant temporal and spatial gait parameters. Therefore, an accelerometer and a gyroscope were positioned laterally below each ankle joint. Temporal gait events were detected by searching for characteristic features in the signals. To calculate stride length. In this develop an algorithm for the calculation of clinically relevant gait parameters derived from sensors is applicable in the diagnostic workup and also during long-term monitoring approaches in the elderly population. In this paper find a simple solution to overcome this problem and provide a best method.

Key Words: ARM10; Accelerometer; Pedometer.

1. INTRODUCTION

The ability to walk safely, effectively, and efficiently is essential for an independent, productive life. The fear of losing the ability to walk, to stand or sit in an upright position is frequently the first, most significant concern that is increase when a person is diagnosed with stroke, Parkinson's disease (PD), ataxia, or other movement disorders. It is not surprising that people make great efforts to maintain independent walking. The intensive work in gait and posture research throughout the world has created an urgent need for a unified language. Over the past 20 years, several groups have proposed classifications of gait and posture disturbances, focusing on the neurological systems, the anatomical source of dysfunction, or the clinical features.

Sensor-based objective mobility data analysis is increasingly developed to identify health risk factors, to support clinical diagnostics and monitor medical treatments, and to complement easily applicable assessment of the quality of life in the elderly. Sensor based gait analysis can also provide indicators for a beginning gait alternation in the elderly. If we consider elderly people aged 75 have postural instability. The evaluation of postural stability disorders is a delicate process because of the large number of pathologies related to the involved systems in maintaining equilibrium conditions. It should enable an accurate evaluation after noninvasive tests are performed in clinical laboratory.

This evaluation should be done by analyzing either static or dynamic posture. Static analysis uses a platform fitted with sensors to measure changes over time in the weight distribution. Dynamic analysis is not only to measure the distribution of weight on the platform, but also to identify problems of the study following a motion disturbance, and analyze opportunities to maintain balance.

1.1 Pedometer

A pedometer is a device, usually portable and electronic or electromechanical, that counts each step a person takes by detecting the motion of the foot step. Because the distance of each person's step varies, an informal calibration, performed by the user, is required if presentation of the distance covered in a unit of length is desired. Pedometers can be a motivation tool for people wanting to increase their physical activity. Step counters can give encouragement to compete with oneself in getting fit and losing weight. Pedometers have been shown in clinical studies to increase physical activity, and reduce blood pressure levels and Body Mass Index. Pedometer originally used by sports and physical fitness enthusiasts; But now it becoming popular as an everyday exercise measure and motivator. It records the total steps moved. The technology for our Pedometer with Wireless PC Communication includes a mechanical sensor and software to count steps.

1.2 Accelerometer:

The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of 3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. An accelerometer is an electromechanical device that will measure acceleration forces. These forces may be static, like the constant force of gravity pulling at your feet, or they could be dynamic - caused by moving or vibrating the accelerometer.

Accelerometers use the piezoelectric effect - they contain microscopic crystal structures that get stressed by accelerative forces, which causes a voltage to be generated. Accelerometer is an electronic device which is interfaced using I2C protocol and provides the reading after every 1msec.

According to the requirement of the application, the microcontroller will take the reading from the accelerometer within a fixed interval of time and do the necessary operation according to the requirement of the application.

2. LITERATURE REVIEW

Wearable sensors have the ability to measure mobility directly. Pedometers, foot-switches and heart rate measurements can measure a person's level of dynamic activity and energy expenditure however they do not provide information on the persons static activities. Accelerometer and gyroscope-based wearable can be used to distinguish between individual static postures and dynamic activity[1]. Specialists for movement disorders are able to identify and classify the neural control of locomotion and for enhancing functional assessment of aging, chronic disease and their impact on mobility impairments in the everyday clinical workup. Here use an electronic measurement system is a camera-based stationary 3-D tracking system Here, markers have to be affixed to the body to track motion with sub millimeter accuracy. Such a system is expensive and requires a complex and time-consuming preparation of the subject.

The usage of these systems requires special laboratory environment and is therefore not suitable for standard clinical settings [2]. For gait analysis, 3D gyroscopes and 3D accelerometers were used to measure angular velocity and acceleration. These sensors are integrated in the Shimmer sensor unit , an extensible platform for real-time motion sensing . The sensor platform contains a MSP430F1611 microprocessor running TinyOS with a MMA7260Q accelerometer and a built-in 500 series MEMS gyroscope. Data were directly transmitted via Bluetooth to a notebook for recording [3]. Ambulatory systems using foot switches or pressure sensors attached to the sole are used to monitor temporal parameters these techniques provide satisfactory results for normal walking. Here another method also used that is insole with a matrix of multitude pressure sensors has a high reliability to evaluate the time of each phase of the gait cycle. Although this system provides additional information on foot pressure distribution during gait [4].

3. PROPOSED SYSTEM

Step counters can give encouragement to compete with oneself in getting fit and losing weight. Pedometers have been shown in clinical studies to increase physical activity, and reduce blood pressure levels and Body Mass Index. Here there are 2 separate units. One is the Pedometer device which is worn by the patient and the other is the analysis software which at the base station. Using the analysis software the doctor /physiotherapist can observe the patient's performance and can use it to make it better. The communication between the two devices id wireless so that

the person can carry the pedometer on board his body and the server can be places outside the hospital.

A system which will analyze the stride pattern and posture pattern for geriatric elderly patients. For this here using Accelerometer to analyze the stride patterns using some graphs and mathematical calculations on Visual basic server.

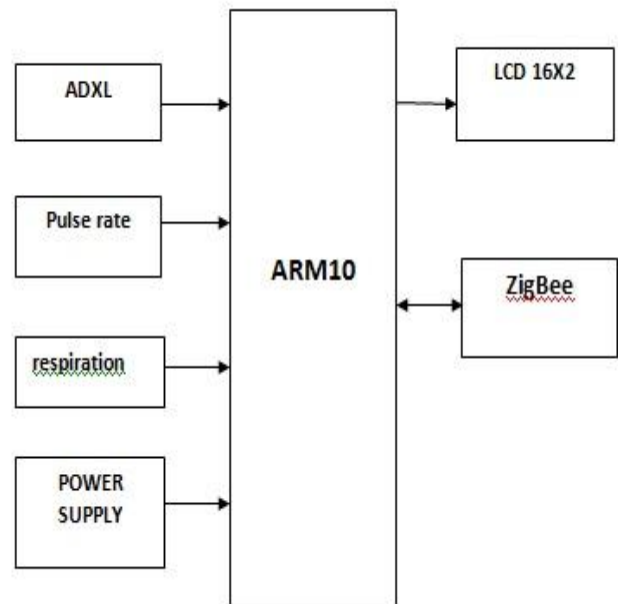


Fig -1: Block diagram of system.

As well as pulse rate and respiration sensors to monitor persons heart beat and breathing rate. Here heart beat and breathing rate are interfaced with controller which will take readings of sensor in every 2 sec. In any case a sensor reading goes predefined set points doctor /physiotherapist can suggest medicine or exercise.

3.1. Pulse Rate Sensor

It is a low-power high performance RISC processor. ARM10's purpose was to again double the performance of its predecessor on the same fabrication, while allowing for further improvements with smaller processes. ARM10 has a dedicated adder for multiplication, which runs in the memory stage, speeding up multiplication throughput. It having six stage pipeline, and a 64-bit wide split instruction and data memory is used to allow multiple instructions to be fetched in one clock cycle.

3.2. LCD 16x2

An LCD is a small low cost display. It is easy to interface with a micro-controller because of an embedded controller. This controller is standard across many displays (HD 44780) which means many micro-controllers have libraries that make displaying messages as easy as a single line of code.

3.3. ZigBee

XBee and XBee-PRO Modules were engineered to meet ZigBee/IEEE 802.15.4 standards and support the unique needs of low-cost, low-power wireless sensor networks. The modules require minimal power and provide reliable delivery of critical data between devices. The modules operate within the ISM 2.4 GHz frequency band and are pin-for-pin compatible with each other. Retries and acknowledgements DSSS. Each direct sequence channels has over 65,000 unique network addresses available Point-to-point, point-to-multipoint and peer-to-peer topologies supported 128-bit Encryption, Self-routing/Self-healing mesh networking. No configuration necessary for out-of box RF communications frees X-CTU Software. AT Command Mode for simple configuration of module parameters Small form factor Network compatible with other ZigBee/802.15.4 devices.

3.4. Pulse Rate Sensor

Pulse Sensor is a well-designed plug-and-play heart-rate sensor for Adriano. It can be used by students, artists, athletes, makers, and game mobile developers who want to easily incorporate live heart rate data into their projects. The sensor clips onto a fingertip or earlobe and plugs right into Adriano with some jumper cables. It also includes an open source monitoring app that graphs your pulse in real time.

3.5. Wireless Sensor

Here there are 2 separate units. One is the Pedometer device which is worn by the patient and the other is the analysis software which at the base station. Using the analysis software the doctor /physiotherapist can observe the patients performance and can use it to make it better. The communication between the two devices is wireless so that the athlete can carry the pedometer on board his body and the server can be placed outside the hospital.

6. CONCLUSION

Here implement a method that is able to calculate clinically relevant gait parameters. The primary goal is to develop a method that is able to calculate clinically relevant gait parameters from inertial sensor data of gait sequences. It was shown that the algorithm yields proper results when applying it on altered gait that is typically for geriatric patients. To provide an objective decision-making basis for gait analysis, simple applicable tests analyzing a high number of strides are required. Temporal gait events were detected by searching for characteristic features in the signals. To calculate stride length, the gravity compensated accelerometer signal was double integrated, and sensor drift was modeled using a piece-wise defined linear function. However, the walking aid interfered with the automated

analysis of the GAIT Rite system, but not with the inertial sensor based approach. Here with the help of algorithm for the calculation of clinically relevant gait parameters derived from sensors is applicable in the diagnostic workup and also during long-term monitoring approaches in the elderly population.

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