

Modeling and development of smart aid for akinesia disorder

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Abstract- Parkinson's disease (PD) is a chronic progressive disease caused by loss of dopaminergic neurons in the substantia nigra, degenerating the nervous system of a patient over time. Freezing of gait (FOG), which is a form of Akinesia (Akinesia is a term for the loss of ability to move your muscles voluntarily), is a symptom of Parkinson Disease. Meanwhile, recent studies show that the gait of Parkinson's Disease patients experiencing Freeze of Gait can be significantly improved by providing the regular visual and auditory patterns for the patients. In this paper, we propose a gait-aid system built upon smart glasses. Our system continuously monitors the gait and so on of a Parkinson's Disease affected patient to detect Freezing of Gait, and upon the detection of Freezing of Gait it projects visual patterns on the glasses as if the patterns were actually on the floor. Conducting experiments involving ten PD patients, we demonstrate that our system achieves the accuracy of 92.86% in detecting Freezing of Gait episodes and that it improves the gait speed and stride length of PD patients by 15.3~37.2% and 18.7~31.7%, respectively.

I. INTRODUCTION

Parkinson's disease (PD) is a long-term degenerative disorder of central nervous system that mainly affects the motor system. The symptoms generally come on slowly over time. Early in the disease, the most obvious are shaking, rigidity, slowness of movement, and difficulty with walking. Dementia becomes common in the advanced stages of the disease. Depression and anxiety are also common occurring in more than a third of people with PD. Other symptoms include sensory, sleep, and emotional problems. The main motor symptoms are collectively called "parkinsonism", or a "parkinsonian syndrome".

The cause of Parkinson's disease is generally unknown, but believed to involve both genetic and environmental factors. Those with a family member affected are more likely to get the disease themselves. There is also an increased risk in people exposed to certain pesticides and among those who have had prior head injuries, while there is a reduced risk in tobacco smokers and those who drink coffee or tea. The motor symptoms of the disease result from the death of cells in the substantia nigra, a region of the midbrain. This results in not enough dopamine in these areas.

There is no cure for Parkinson's disease, with treatment directed at improving symptoms. Initial treatment is typically with the antiparkinson medication levodopa (L-DOPA), with dopamine agonists being used once levodopa becomes less effective. As the disease progresses and neurons continue to be lost, these medications become less effective while at the same time they produce a complication marked by involuntary writhing movements. Diet and some forms of rehabilitation have shown some effectiveness at improving the actual symptoms. A Surgery to place microelectrodes for deep brain stimulation has been used to reduce motor symptoms in severe cases where drugs are ineffective. Evidence for treatments for the non-movement-

related symptoms of PD, such as sleep disturbances and emotional problems, is less strong

II. HARDWARE

ARDUINO UNO R3

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards. Memory: The ATmega328 has 32 KB (with 0.5 KB occupied by the bootloader). It also has 2 KB of SRAM and 1 KB of EEPROM.

Communication: Arduino/Genuino Uno has a number of facilities for communicating with a computer, another Arduino/Genuino board, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The 16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino

Software (IDE) includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial allows serial communication on any of the Uno's digital pins.

GYROSCOPE: Gyroscope is a device used for measuring or maintaining orientation and angular velocity. It is a spinning wheel or disc in which the axis of rotation is free to as in any orientation by itself. When rotating the orientation if this axis unaffected by tilting or rotation of the mounting, according to the conservation of angular momentum.

III. SOFTWARE

AVR: The AVR is a modified Harvard architecture 8-bit RISC single-chip microcontroller, which was developed by Atmel in 1996. The AVR was one of the first microcontroller families to use on-chip flash memory for program storage, as opposed to one-time programmable ROM, EPROM, or EEPROM used by other microcontrollers at the time. The AVR is a modified Harvard architecture machine, where program and data are stored in separate physical memory systems that appear in different address spaces, but having the ability to read data items from program memory using special instructions.

EMBEDDED C: An embedded system is an application that contains at least one programmable computer (typically in the form of a microcontroller, a microprocessor or digital signal processor chip) and which is used by individuals who are, in the main, unaware that the system is computer-based.

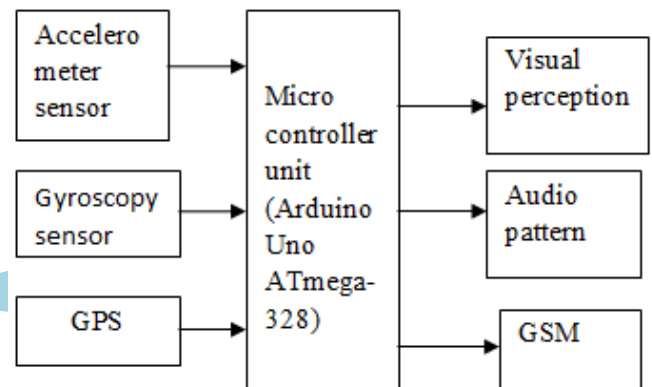
LCD: A liquid crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

GPS: The GPS (Global Positioning System) is approximately 30 well-spaced satellites that orbit the Earth and make it possible for people with ground receivers to pinpoint their geographic location. The location accuracy is anywhere from 100 to 10 meters for most equipment. Accuracy can be pinpointed to within one meter with special military-approved equipment. GPS equipment is widely used in science and has now become sufficiently low-cost so that almost anyone can own a GPS receiver.

EEPROM: Almost all AVR microcontrollers have internal EEPROM for semi-permanent data storage. Like flash memory, EEPROM can maintain its contents when electrical power is removed. In most variants of the AVR architecture, this internal EEPROM memory is not mapped into the MCU's

addressable memory space. It can only be accessed the same way an external peripheral device is, using special pointer registers and read/write instructions, which makes EEPROM access much slower than other internal RAM. However, some devices in the Secure AVR (AT90SC) family use a special EEPROM mapping to the data or program memory, depending on the configuration. The XMEGA family also allows the EEPROM to be mapped into the data address space.

BLOCK DIAGRAM:



V. CONCLUSION

In our project we can give assistance to Parkinson's Disease patients in freezing of gait in smart manner by continuously streaming the visuals. And our project will give assistance in monitoring and caring the PD patients.

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