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Electronic Device Control using Gesture Sensing Technology

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Abstract: We have designed a glove with flex and gyroscopic sensors. Depending upon the movement of the finger and motion of hands, the required object is moved. This method ensures effective communication. This paper aims to design a useful and fully functional real world system that efficiently translates the hand gestures into the movement of objects. This could also be further enhanced in various applications such as Robotics, Automation system, etc. This system is not complex as sensors used are common i.e. Flex sensors, Gyroscopic Sensors and Accelerometer.

KEYWORDS: FLEX SENSOR, GYROSCOPIC SENSORS, ACCELEROMETERINTRODUCTION

1. Introduction

Human gestures are undoubtedly natural. Gestures are one of the most intuitive ways of interacting with an application. They may often prove more efficient and powerful as compared to various other modes of interaction. Gesture Recognition means identification and recognition of gestures originates from any type of body motion but commonly originate from face or hand.

Gesture recognition is the process by which gestures made by the end user are used to fetch the information from the device which is pre-installed. The term "Gesture" is nothing but particular body actions shown to the computer to get the desired output. In everyday life, physical gestures are a powerful means of communication. "Body Language" plays a very vital role in the Inter personal communication. Gesture-based control generally wants to utilize this channel for human-machine interaction. Because traditional input devices constrain the expressive power of the human hand, researchers are developing an in numerous techniques to read hand and body movements directly. For example, most currently available interfaces make use of that particular data which can produce some results made by the user's movements. This sometimes stems from the use of inherently discrete input devices, such as a keyboard or mouse. Even with uninterrupted input devices, such as mouse, only specific events and data points (e.g., the co-ordinates of the pointer when the user clicks) are taken into account by most applications. This interaction attempts to take the profit of the continuity and dynamics of the end user's movements, instead of simply drawing discrete information from these particular movements. Tracking a head/hand or a body position configuration may be quite valuable for controlling object/system for feeding input parameter to the system.

There are three types of gesture recognition systems i.e. vision based, gyroscope, acceleration and flex based and MEMS based system.

Our proposed system is to use flex sensors and (6 degree of freedom) MPU 6050 accelerometer and gyroscope module. Flex sensor is an analog resistor. They work as variable analog voltage divider. In this paper flex sensors are used as key for every gesture with right flinching of fingers will activate recognition of MPU6050.

MPU6050's internal gyroscope will detect any changes in the degree of movement and acceleration will detect the change in velocity so that applications can be controlled dynamically. This paper will illustrate the control of three different applications (e.g. power mirror, wiper and engine). Number of different applications can also be controlled through this technique.

II. Working and Description.

1. Battery: The batteries used for this paper are LiPo (Lithium Phosphorous) batteries. The already charged batteries are used as a power source to the Arduino Pro Mini, Arduino Uno controller and the Servo Motor. The battery specification is: capacity 1450 mAh, Battery voltage 11.1V, Battery Weight 75g.

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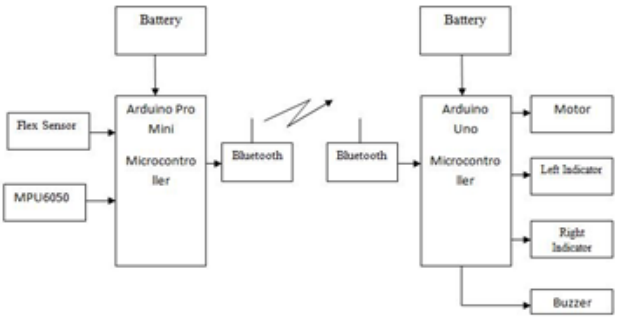

2.Arduino Pro Mini: The Arduino mini pro is a microcontroller which will take the signals from Flex sensor and MPU6050 as input and process them. The Arduino Pro Mini is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, an on-board resonator, a reset button, and holes for mounting pin headers.

3.Flex Sensor: The Flex Sensor is a unique component that changes resistance when bent. An unflexed sensor has a nominal resistance of 10,000 ohms (10 K). As the flex sensor is bent the resistance gradually increases. When the sensor is bent at 90 degrees its resistance will range between 30-40 K ohms. The flex sensor perceives changes in bend angle as a linear proportional change in current or voltage. Different flex angles cause the area of the resistor to differ from its un-flexed 10K value, resulting in this characteristic. The bending of the sensor is registered as a change in resistance only when the sensor is flexed in one direction.

4.MPU6050: It provides the motion sensing input to the Arduino Pro Mini. It consists of a 3-axis gyroscope, 3-axis accelerometer, and a Digital Motion Processor™ (DMP) all in a small 4x4x0.9mm package. The dedicated I2C sensor bus directly accepts inputs from an external 3-axis compass to provide a complete 9-axis Motion Fusion output. The MPU-60X0 features three 16-bit analog-to-digital converters (ADCs) for digitizing the gyroscope outputs and three 16-bit ADCs for digitizing the accelerometer outputs.

5. Bluetooth Transceiver: The module used for this purpose is Bluetooth HC05. Based on the input of the sensors it gets through the Arduino, the Bluetooth transmitter sends the appropriate signal to the Bluetooth Receiver. At the receiver, the Bluetooth provides the signal to Arduino Uno microcontroller.

6. Arduino Uno: It is used at the receiver side. Uno will receive signals from Bluetooth receiver. It is placed near the application end. Arduino is an open-source physical computing platform based on a simple I/O board and a development environment that implements the Processing/Wiring language. Arduino can be used to develop stand-alone interactive objects or can be connected to software on your computer (e.g. Flash, Processing, and MaxMSP). The Uno can be programmed with the Arduino Software (IDE). Arduino Uno signals the motor, indicators and a buzzer to perform their respective operations.

III. SOFTWARE DESIGN

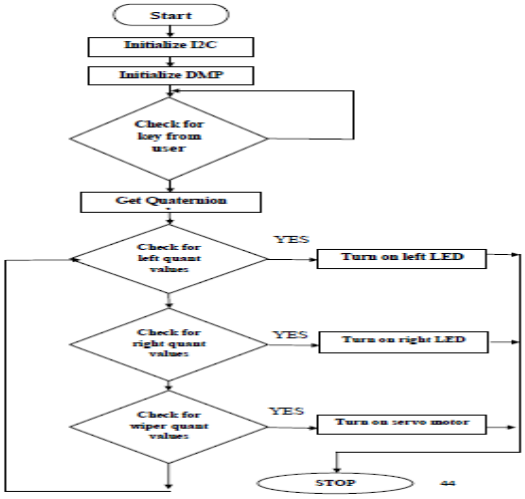

Figure 2: Flow Chart for working of Gyroscopic Sensor

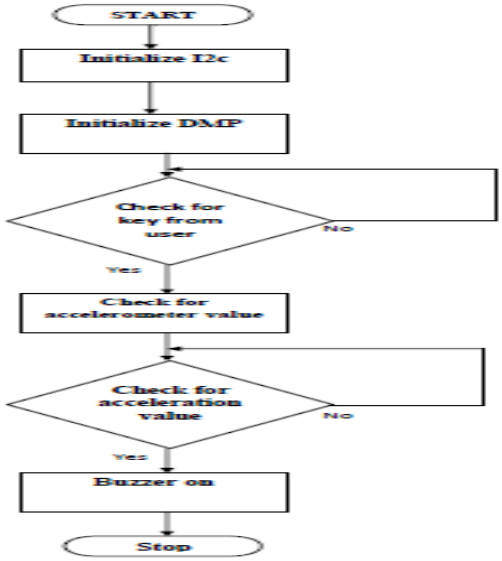

Figure 3: Flow Chart for working of Accelerometer Sensor

III. TESTING AND RESULT

Arduino :Blink program is installed in the Arduino by default unless it has been used by someone. So after connecting the board to the PC via a USB cable, LED on pin13 will start blinking automatically. This testing process can help identify if Arduino is working or not.

MPU6050:Self-test of MPU6050 allows for the testing of the mechanical and electrical portions of the sensors. The self-test for each measurement axis can be activated by means of the gyroscope and accelerometer self-test registers (registers 13 to 16).When self-test is activated, the electronics cause the sensors to be actuated and produce an output signal. The output signal is used to observe the self-test response. The self-test response is defined as follows: Self-test response = Sensor output with self-test enabled – Sensor output without self-test enabled. After testing all the components successfully, they were assembled and checked for the required output. Specific hand movements were assigned to particular tasks like moving hand in such a way to indicate left or right. Buzzer worked after moving hand up and down which made use of accelerometer. Thus the paper was tested successfully.

IV. FUTURE SCOPE

1. Hand recognition system can be useful in many fields like Artificial Intelligence, Embedded Systems and Neural networks as well as Fuzzy logics.

2. Gestures are intended to play an increasingly important role in human-computer interaction in the future.

3. Facial Gesture Recognition Method can also be used as an alternate while driving, especially when the driver is intended to sleep.

4. As this technology is very user and environment friendly, it will surely create a good impact as well as curiosity between the researchers.

V CONCLUSION

The race in the technology sector is going at faster rate than ever before. Every day we see new developments in the automobile field. Introduction of self-driving cars thrilled everyone. Maybe in the next few years, such cars would also be introduced in the market. But such cars would not be affordable to everyone. Gesture Sensing Technology is available in high end cars which are very expensive. Our paper is simple and enhancement of an already existing paper.

We see many people driving with ignorance on the road, maybe because they feel lethargic about indicating during turning. This paper will use simple movement of hands for performing these functions. This will also eventually reduce the cluttering of buttons on the dashboard and this space can be used for other things, say a budget entertainment system. Our paper gives us a glimpse of what the future of technology holds in store and lot more is yet to come.

VI REFERENCE

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