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Flex Sensors Controlling PC and Providing Security Alerts and Home Automation

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ABSTRACT: The paper presents a hand-gesture based interface system. In the system, flex sensor and 3D accelerometer is used to recognize the hand gesture, this is to illustrate the practical use of the framework, gesture recognition experiment, controlling pc application such as Browsing, Video streaming, logging off PC, Restarting the PC etc. This paper also provides Home Automation such as "switching on/off fan and light and other appliances can be controlled as well. This will be helpful for the people with disability. Security has been an issue since the very inception of technology. Everywhere security is taken into account before and after implementing any new technology. Thus, an important part of this mechanism is providing security alerts through SMS GATEWAY to transmit ALERT messages to nearest help canters.

KEYWORDS: Wireless Flex sensor; accelerometer; microcontroller; gesture; Security Alerts

I. INTRODUCTION

The role of computer has grown very fast in society. The interaction with the computing devices has been advanced in such a way that it becomes the necessity of today's life. So facilitating human computer interaction (HCI) will have a positive impact on their use and home automation. The aim of HCI today is to bring HCI to a framework where interaction with computers will be as natural as interaction between humans. Though the invention of keyboard and mouse is a great progress, but there are still situations where these devices are incompatible for HCI, particularly for the interaction with 3D objects. The 2 degrees of freedom (DOFs) of the mouse cannot properly emulate the 3 dimensions (3D) of space. Using gesture as a device can help people communicate with computers in a more effective way. Gesture operation can be considered as an easy-to understand and easy-to-use method to operate the PC in an easy-to-understand and easy-to-use without using traditional mouse or keyboard. Therefore, these hand gestures are easy to understand for everyone and easy to use for anyone. Moreover, they are also intuitive gestures that are able to operate naturally. By associating these hand gestures with a shortcut operation on the PC, it is possible to perform similar operations even among multiple applications using hand gestures .The gesture can be defined as a physical movement of human hands, to convey information or meaning.

Hand gesture recognition, aims to design systems which can identify human hand gesture as an input and uses these gestures in order to control a device through mapping of command as an output. Accelerometer is attached, tilting of accelerometers to sense direction that the sensitive direction of the accelerometer is in the plane of the hand. A lot of sensors have been miniaturized by improving the MEMS technology in recent years. A lot of sensors are also installed in a location that we do not notice around us. In addition, there are accessories embedded the sensor. Acquisition of information using a sensor has become familiar in daily life. In particular, if sensor type of accessories is used, it is possible to wear the sensor without discomfort in daily life. And the acquisition of hand gestures is easy. Because of the advantages are able to wear on a daily basis, the operating environment is not limited, and resistance external noise, the wearable sensor can be applied to such as the operation of electric appliances or the operation of mobile devices on the go not only the PC operation.By using the operation of hand gestures using a wearable sensor, it can be expected that the interface can be operated naturally.

II. RELATED WORK

Most of existing systems in the gesture recognition follows image-based approaches[1], [2]. It requires sophisticated image processing platforms. Mostly cameras were used as input devices [3]. Object needs to be present in front of the cameras for capturing gestures, which limits the mobility. Power consumption is a challenging one. Several other

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existing devices can capture gestures, such as a "Wiimote," joystick, trackball and touch tablet. Some of them can also be employed to provide input to a gesture recognizer. But sometimes, the technology employed for capturing gestures can be relatively expensive, such as a vision system or a data glove. There are mainly two existing types of gesture recognition methods, i.e., vision based and accelerometer and/or gyroscope based [4]. Existing gesture recognition approaches include template matching, dictionary lookup, statistical matching, linguistic matching, and neural network. Three different gesture recognition models: First, sign sequence and Hopfield based gesture recognition model; Second, velocity increment based gesture recognition model; and Third, sign sequence and template matching based gesture recognition model are also available.

III. LITERATURE REVIEW

In [5] authors studied a pointing device using the hand gestures that are taken by the wearable camera. The position of the hand is estimated from the colour information and the shape information of the hand to use as a hand mouse. A computer vision-based pointing device and gesture input system. Asada et al supposed the operation of a web page using the hand gestures. The wearable computing is possible, thanks to install the camera to Head-Mounted Display. However, there is a limitation that user's hand must be held over the range of the camera. In addition, if the wearable camera is used, there is a risk that the privacy of others users is violated accidentally. In [6] and [7] authors recognized the hand gestures by using a Data Glove. Several sensors, such as acceleration sensor, bending sensor, and so on are installed on the Data Glove. On the other hand, Tomibayashi et al developed a DJ system to use the hand gestures with an acceleration sensor worn on the back of the hand. It is a very simple hand gesture used in the system, because the user only shakes the arm lightly.

The study of Tsukuda et al, Ubi-Finger is an interface that looks very similar to the MR. the Ubi-Finger is installing a variety of sensors on the index finger, such as acceleration sensor, bending sensor, touch sensor, and infrared sensor. The command format by the finger gesture is adopted. It is possible to input and operate intuitively. The Ubi-Finger is used to operate the electric appliances. The Ubi-Finger recognizes the gesture that is similar to real-life operation of electric appliances [8]. To use the operation by the hand gesture without interfering in daily life, an interface must perform good portability, immediacy, and operability. The MR that is a wearable sensor device in this study is excellent at portability and immediacy. Moreover, we assume that the system in this study is also excellent at operability showing how to operate easy and intuitive because the hand gestures used in this system is similar to the features of the PC operation.

IV. PROPOSED SYSTEM

The main purpose of this paper is Monitoring PC, providing Security Alerts and Home Automation using hand gestures interface with flex sensors. The system is used for monitoring PC and the applications which include while controlling the PC are locking the system, switching off the PC, opening the files and providing the vocal response, Browsing etc., Providing security alerts using SMS GATEWAY and also providing home automation such as switching on/off the fan, lights etc. The flex sensor modules were designed for low power operation with a program that can adjust power management depending on scenarios

To overcome the limitations such as unexpected ambient optical noise, slower dynamic response, and relatively large data collections/processing of vision-based method , and to strike a balance between accuracy of collected data and cost of devices, a Micro Inertial Measurement Unit is utilized here to detect the accelerations of hand motions in three dimensions.

The proposed recognition system is implemented based on MEMS acceleration sensors. It will be appreciated that the control of onscreen video, system function, music in a computer environment is desirable in order to provide real time interaction. This paper presents how to lower the communication barrier between the disabled with the general computers and appliances. It is based on the need of developing an electronic device that can translate gestures into commands in order to make the communication. A gesture is a particular movement of the finger with a specific shape made out of them. Here, Flex Sensor Plays the major role, Flex sensors are sensors thatchange in resistance depending on the amount of bend on the sensor. Also it is much more portable than the image based system and cheaper in cost

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A. *Block Diagram:*

Here, Atmel AT89S52 microcontroller is used, which is the heart of the system. The microcontroller has a flash memory of 8 kilobytes which can be re-written nearly one thousand times. An accelerometer is used to detect the tilt of the hand. Accelerometer is a new and very useful device of present times. This device can detect if it is tilted in any direction along the 3-axis. It has three analog outputs which directly gives output according to the tilt angle of the 3 axis, X, Y and Z. Accelerometers can be used for measuring both dynamic and static measurements of acceleration. Tilt is a static measurement where gravity is the acceleration being measured.

In this paper we have interfaced an accelerometer to the microcontroller through an ADC. Accelerometer has 3 outputs. Each output gives an analog output corresponding to the tilt of a particular axis. This analog output is given to the ADC which converts the analog value to its binary equivalent.

The ADC samples each analog channel and matches it with predefined sampling levels and thus provides the matching binary equivalent. The flux sensors used to control the gripper of human hand. The flux sensor will be bent by hand and the output of this will be given to the ADC. Then this digital output is given to the microcontroller as shown in fig 4.1. Based on this the controller will send the appropriate message to the ZigBee module, UART Protocol is used A universal asynchronous receiver/transmitter, abbreviated UART, is a piece of computer hardware that translates data between parallel and serial forms.

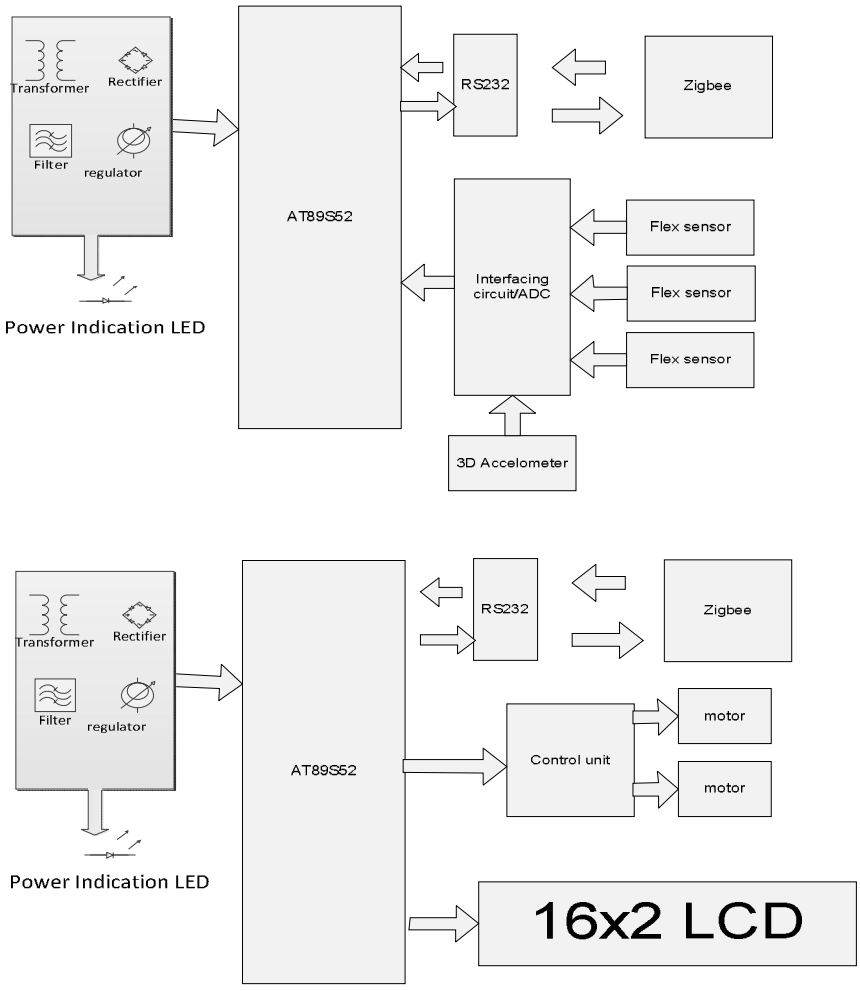

Fig. 4.1 System Architecture

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V. EXPERIMENTAL RESULT

The experiment was done by tilting the accelerometer and bending the flex sensor. These data were read in from the accelerometer and flex sensor by the Microcontroller and it was transmitted serially using ZigBee transmitter to the PC and to home automation ps4 board. The results are obtained by keeping the accelerometer at various positions and bending the flex sensor and the transmitted data compares the raw data with model data in PC and performs the specific actions as shown in the below in table 5.1 when Zig Bee is attached to PC and table 5.2 for the Home Automation Board (F1,F2,F3 represent flex sensor 1,flex sensor 2 and flex sensor 3).

The table 5.1 given below shows the software application which is performed in PC. There are set of cases which accomplishes the function on PC based on accelerometer value and three flex sensor values. Case A performs opening image on PC where accelerometer value is 101, first Flex sensor value is 56, second flex sensor value is 102 and third flex sensor value is 103.Case B performssending emergency alert through SMS where accelerometer value is 101, first Flex sensor value is 95, second flex sensor value is 40 and third flex sensor value is 103.Case C performs video streaming on PC where accelerometer value is 101, first Flex sensor value is 95, second flex sensor value is 102 and third flex sensor value is 35.Case D performs opening browser application on PC where accelerometer value is 78, first Flex sensor value is 52, second flex sensor value is 102 and third flex sensor value is 103.Case E performs locking g the system where accelerometer value is 79, first Flex sensor value is 95, second flex sensor value is 35 and third flex sensor value is 103.Case F performs logging off the system where accelerometer value is 85, first Flex sensor value is 95, second flex sensor value is 102 and third flex sensor value is 42.

Table 5.1: Software Application

Case	AccelerometerValue	F1	F2	F3	Function
A	101	56	102	103	Opening image
B	101	95	40	103	Sending emergency alert through SMS
C	101	95	102	35	Video stream
D	78	52	102	103	Opening Browser application

The table 5.2 shows the home automation with the following cases such as Case A turns On the Fan when accelerometer value is 101, first flex sensor value is 56, second flex sensor value is 102 and third flex sensor value is 103.Case B turns off the Fan when accelerometer value is 101, first flex sensor value is 56, second flex sensor value is 102 and third flex sensor value is 103.Case C turns On the Light when accelerometer value is 101, first flex sensor value is 56, second flex sensor value is 102 and third flex sensor value is 103.Case D turns off the light when accelerometer value is 78, first flex sensor value is 52, second flex sensor value is 102 and third flex sensor value is 103.

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Table 5.2: Home Automation

Case	Accelerometer value	F1	F2	F3	Functions
A	101	56	102	103	Fan On
B	101	95	50	103	Fan Off
C	101	95	102	43	Light On
D	78	52	102	103	Light Off

PS4 board shown in below figure 5.1 consist of 3 flex sensors, accelerometer, LCD screen and microcontroller which is used to perform the bending of flex sensor and tilting the accelerometer. Based on the values generated by flex sensor and accelerometer,the software application is performed on PC and it also provides security alerts and home automation.

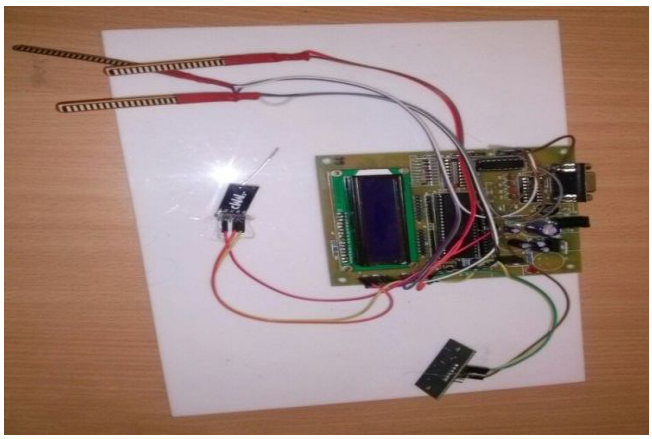

Fig. 5.1PS4 board used to perform gesture

Home automation PS4 board consist of light bulb, motor and ZigBee shown in below figure 5.2 which performs the switching off light, switching on light, switching on fan and switching off fan and lot more applications can be performed.

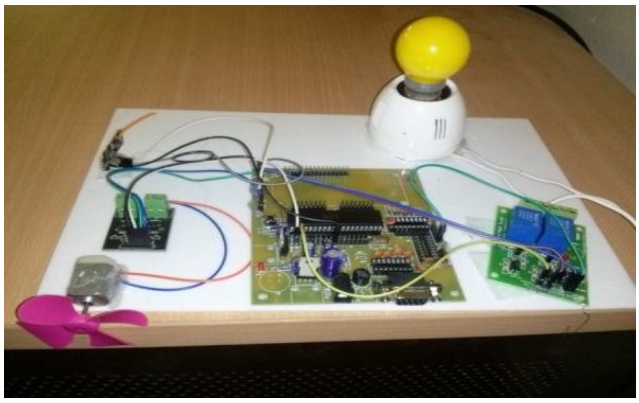

Fig. 5.2 PS4 Home Automation board

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VI. CONCLUSION AND FUTURE WORK

In this paper, we have presented our work on gesture recognition through the use of MEMS accelerometers and flex sensors. So, it provides accuracy to this system. The system consists of one ADXL335 accelerometers for sensing the hand posture, a microcontroller and display unit. The incoming acceleration value for each gesture will be compared with values in the stored templates. Since the standard gesture patterns are generated by motion analysis and are simple features represented by only acceleration values, big data base and complex recognition systems were not required and no needs to collect as many gestures made by different people as possible to improve the recognition accuracy. Advantage of this approach is the potential of mobility. The main aim of this work is to make a system which can act as an artificial vocal tract for impaired people without use of complex form of inputs. In this work we have used a simple MEMS accelerometer and flex sensors which is very easy to use and it don't need any special training, so it's user friendly and can be used by all.We are also able to handle dynamic image processing and event handling accordingly.The use of hand gesture interfaces can be used to control computer games, robots, medical visualization devices and crisis management systems allows an expressive, natural and intuitive way of interaction.

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BIOGRAPHY

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