Design and Development of Virtual Keyboard

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Abstract: In this paper, a new portable device for key striking purposes is proposed. It recognizes the hand movement with resistive carbon elements technology, specifically flex sensors. The frequency of some special character force us to limit the characters and main role of the device is to give the security from key loggers.

Keywords: Flex sensors, Real-time, Key loggers.

Introduction

Virtual keyboard is a input system that use gesture toenable a person to use a computer by performing intuitive hand and finger motions[1]. Glove-based systems represent one of the most important efforts aimed at acquiring hand movement data. Our gesture input system can be conveniently used by anyone who wishes not to be tied down to a desk when using a computer, making it better way for giving presentations.The hand motion control also allow the proposed work to serve as an alternative video game controller. While touch screens are a good alternative for portable computer mouse's, keyboards on touch screens give little haptic feedback, and are frequently small. This makes it difficult for people stick to normal keyboards to use.

Literature Survey

In past, few years many research works have been carried out in virtual reality and on data glove. Data glove based interface are designed and researched for replacing static and fixed keyboard and mouse to have more natural way of communication as human being does by making gestures while communication. But have this, the gesture must be recognized first and thus data glove is used. It provides data based on the angular measure of the bones in hand.Gestures are the first most interactive module for game control. In [1], the author introduces a new text input device called the chording glove. The keys of a chord keyboard are mounted on the fingers of a glove. A chord can be made by pressing the fingers against any surface. Shift buttons placed on the index finger enable the glove to enter the full ASCII character set. The glove is designed as a text input device for computers and virtual environments. An experiment was conducted to assess the performance of the glove. After 80 min of tutorial, ten persons reached a continuous text input speed of 8.9 +\- 1.4 words/min, and after 10 1-hr sessions, they achieved 16.8 +/- 2.5 words/min. The implementation of the chording glove used in the experiment was somewhat flawed in the bulky and inaccurate finger sensors. This led to a certain disadvantage as compared with the standard QWERTY keyboard, such as slower input speed. Any future models will have more accurate sensors, which should improve the chording glove's performance. Thus, the 16.8-words/min speed is a conservative estimate of the possible speed for the chording glove. In paper [2], The cognitive and motor difficulties of acquiring a touch-typing skill on the present system are analysed. It is proposed that poor cognitive structure is a main source of difficulty in the acquisition of typing skills. Experiments are described with a two-hand chord keyboard designed to provide an efficient alternative to the existing standard QWERTY keyboard. The new system is based upon simpler and more powerful cognitive and motor organization principles. It comprises two panels of five keys, one to each hand. Characters are entered by pressing together combination of keys. The system enables fast skill acquisition, with subjects reaching rates of 30-35 words per minute after 20 h of training. With 60 h of training, subjects can reach entry rates close to 60 words per minute. There is no negative transfer from the new skill to an existing typing proficiency. A cognitive oriented design approach to data entry devices, of the kind applied to the development of the present chord keyboards, appears to have a strong promise in the age of computers. The perceptual quality of a normal qwerty keypad is better than the device mentioned in the paper. In addition to this, the user experienced fatigue after long duration of usage. In [3], An easy and very useful glove-based text input device for wearable computers is presented. The key to the development of the proposed device is the use of a unique operator-to-key mapping method, key-to symbol mapping method and simple algorithm. An efficiency test was conducted and the results were compared with those of other glove-based devices and algorithms. Although there are several benefits to using one-handed text input devices, there are limits to how much the input speed can be increased and the error rate reduced. In order to popularize the use of the glove as a text input device, a more convenient and rapid method is needed. In [4], the author presents a wearable, fragmentized, idiomatic, generic and mobile keypad concept, making use of well-established metaphors, is suggested for entering digits and characters. The “Finger-Joint Gesture Wearable Keypad” terminal utilizes the inside of the phalanges of the fingers as a wearable telephone keypad. Negligible training time is required. By employing the thumb as an operator, depressing the insides of the finger’s phalanges, the familiar keypad digits and characters are created. By obtaining finger gestures by letting the operator depress the nail of a finger, different telephone functions are achieved. The concept is generic and several other functions can easily be generated. The context as a prerequisite for inducing restrictions is discussed as a viable way for creating support for suggesting new design approaches. First a restriction of the environment by several degrees of freedom has to be made: mobile user, one hand constantly occupied by other tasks, no table to put the device on when inputting digits, etc. By first inducing the different restrictions regarding context it is possible to provide a solution to a problem. In [5], the author describes Thumb code, a device-independent digital sign language. He lists and discusses requirements, then describes Thumb code and explains how it meets these requirements. He proposes several approaches to the machine recognition of Thumbcode, and concludes with a brief discussion of potential ergonomic health issues. Thumb code presents similar health risks to regular keyboards, involving repetitive small motions. In [6], the author describes the development of a low-cost data glove called FlexDglove. This system was designed for virtual reality applications and includes an integrated virtual hand simulator. The development steps are described and a set of preliminary results about the use of this glove. The proposed device can only be used on systems using only Arduino IDE. In [7], the paper explores the use of hand gestures as a means of human-computer interactions for virtual reality applications. For the application, specific hand gestures, such as “fist’’, “index finger”, and “victory sign”, have been defined. Most existing approaches use various camera-based recognition systems, which are rather costly and very sensitive to environmental changes. In contrast, this paper explores a data glove as the input device, which provides 18 measurement values for the angles of different finger joints. This paper compares the performance of deferent neural network models, such as back-propagation and radial-basis functions, which are used by the recognition system to recognize the actual gesture. Some network models achieve a recognition rate (training as well as generalization) of up to 100% over several test subjects. Due to its good performance, this recognition system is the first step towards virtual reality applications in which program execution is controlled by a sign language. The proposed device doesn’t dynamically recognize the gestures and uses only one hand.

Motivation

The most important choice that a user or a producer needs to make early on in the projects an anthological review of applications of virtual keyboard in seven areas: design and manufacturing, information visualization, robotics, art and entertainment, understanding of gesture based movements, medicine and health care, and wearable and portable computers. The last comprehensive review of this sort was published by Sturman and Zeltzer in 1994 in an IEEE journal. Back then gloves were starting to gain attention in the first five areas. We chose to summarize the major advances in such fields since the mid-1990s and to describe significant projects in the industrial and computers areas. While these two fields have started looking at glove devices only recently, they appear to be the main motivators and leaders behind the innovation in glove technology that has just started taking place.

Problem statement

In the existing keyboards when a key is pressed there is a high probability that the pressed key can be identified. This may lead to security hacks. Also, the existing keyboards occupy more space and cannot be carried where ever we want, like during presentation. They won’t provide comfort while playing the video games. Hence, it is essential to develop a cost effective, user friendly virtual keyboard where key logging drawback is eliminated and security is enhanced.

Objectives

- To develop a practical and fully functional real-world model that efficiently converts the movement of the fingers into the appropriate alphabet based on the conditions provided.
- To make presentation easier and to provide a more flexible approach.
- To provide a next generation keyboard that provides an additional security from key loggers.

Design and Implementation

The schematic of working and data flow block diagram is shown in figure 1.The Flex sensors embedded in the Smart Gloves as shown in figure 2 will generate the analog values which are processed by the microcontroller. The microcontroller decides the character/word to be deduced by the values which are predefined in the Arduino. As to make the system more accurate we are adding the push button to each of the flex sensor.

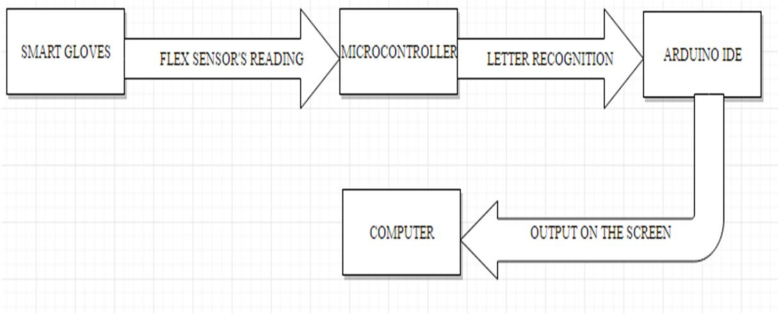


Figure 1. Block Diagram of Proposed Work

The combination of flex sensors and push buttons are designed in such a way that data is read only when the button is pushed, which ignores default values read from other flex sensors which makes data computation easier and faster. The algorithm is designed in such a way that a particular letter is displayed based on the movement of the hand.

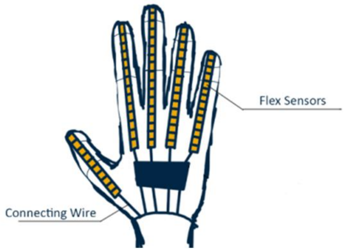


Figure 2. Flex sensors embedded with gloves

Gesture recognition research look forwards to design and implement the system using gesture as input. The gesture recognition in this paper is done using a flexible, resistive sensors known as Flex Sensor as shown in figure 3. The main principle of a Flex sensor is that the variation in resistance gives respective amount of change in voltage. A flex sensor is designedsuch that as sensor is bent, the resistance of sensor alters. Resistance of 45-degree bend is different from that of a 90-degree bend of a sensor. Thus, as the sensor is bent, the resistance of sensor varies and so is output voltage.

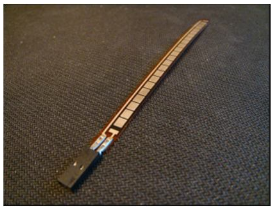


Figure 3. Flex sensor

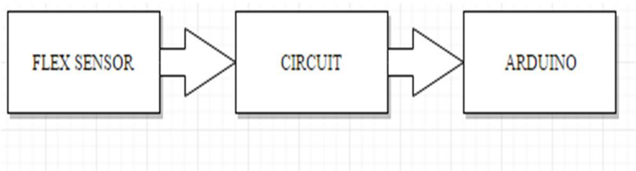
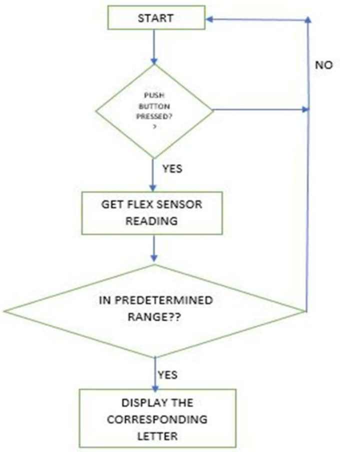


Figure 4. Interfacing of flex sensor with arduino

The interfacing of Flex sensor and Arduino is shown in figure 4.

Flow Chart

The flowchart is shown below. The program continuously looks for a press from the push button. When a button is pressed, the flex sensor reading is taken and compared whether it lies within the given range. If the flex sensor reading is in the range of the desired output, then that corresponding alphabet is generated and displayed.



Results

The flex sensor based keyboard is designed and simulated in ArduinoIDE. Readings from the flex sensors are sent to the decision maker where based on the finger movement the letters are predicted and displayed.Decision making involves the predictive analysis in the Arduino integrated development environment. The flex sensors and Push buttons are stitched to the glove as shown in figure 5. The push buttons are used to specify which finger is being pressed. When the push button is pressed the corresponding value of flex sensor is observed and corresponding letter is printed as shown in figure 6. In figure 7, the values without the push buttons are shown.

Figure 5. Push buttons and flex sensors integration

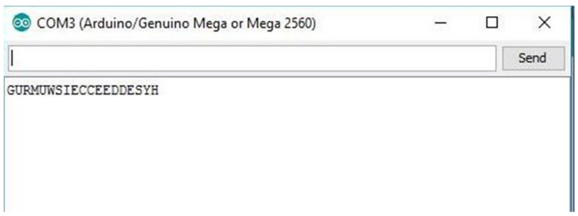


Figure 6. Output

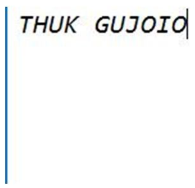


Figure 7. Output without Push buttons

Comparison with existing models

From table 1. we infer that when compared with the existing models, the proposed model proves to be better in many aspects such as providing security from key logging, portability, ease of use, cost effectiveness etc.

Table 1. Comparison between present keyboards and proposed work

Attributes	Present Key board	Proposed work	Remarks
Key Logging	No security from key logging	Presents key logging from hacking	The current keyboard lacks security issues
QWERTY layout	The key board type is qwerty	Even we used QWERTY base keyboard	QWERTY based keyboards are flexible
Tactile Keyboard	There must be some forced involved to get acknowledged	No tactile feedback required	The design complexity is reduced
Portable	No portability	Portable	Portability makes device more efficient

References

[1] Robert Rosenberg and Mel Slater, "The Chording Glove: A Glove-Based Text Input Device", IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS—PART C: APPLICATIONS AND REVIEWS, VOL. 29, NO. 2, MAY 1999.

[2] DANIEL GOPHER AND DAVID RAIJ," Typing with a Two-Hand Chord Keyboard: Will the QWERTY Become Obsolete?", IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS, VOI. 18, NO. 4. JULY/AUGUST 1988.

[3] J.-H. Shin and K.-S. Hong," Keypad gloves: glove-based text input device and input method for wearable computers", ELECTRONICS LETTERS, Vol. 41 No. 16, 4th August 2005.

[4] Mikael Goldstein and Didier Chincholle, "The Finger-Joint Gesture Wearable Keypad"

[5] Pratt, V.R. (1999). Thumbcode: A Device-Independent Digital Sign Language. Available at http:// boole.stanford.edu/thumbcode/thumbcode.html

[6] Lucas Cassiano Pereira, Rafael Aroca, Rummenigge Dantas, "FlexDGlove: A low cost dataglove with virtual hand simulator for virtual reality applications", XV Symposium on Virtual and Augmented Reality, 2013.

[7] John Weissmann, Ralf Salomon, "Gesture Recognition for Virtual Reality Applications Using Data Gloves and Neural Networks",