

Bulbs Control in Virtual Reality by Using Leap Motion Somatosensory Controlled Switches

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Abstract—This study presented a Leap Motion somatosensory controlled switches. The switches were implemented by the relays. The “open” or “short” of the switching circuit were controlled by the sensing of the Leap Motion somatosensory module. The virtual switches on the screen have designed to be 5 circle buttons. When the sensing hand touched the circle buttons virtually, the programming language “Processing” sent the instruction codes to the Arduino MEGA module which gave the “high” and “low” signal to the transistor switches. Therefore, a four-channel Leap Motion somatosensory controlled switching module has been implemented. For testing the module, the bulbs have been connected with the switching module. Consequently, the “light” or “dark” of LED modules can be controlled by touching the virtual buttons on the screen.

Keywords—Leap motion, somatosensory, bulb, switch, Arduino, virtual reality

I. INTRODUCTION

The Leap motion control is based on the idea of magic [1]. The musicians employed their hands around a big glass bulb and performed their skill of change something that the audience watched at the big glass bulb. In the popular movie “Iron Man”, Tony controls the computer by his hands and voice. Consequently, it is very attractive that a man can control things without any touch of switches in the modern life.

Games are the main applications of the virtual reality (VR). The players can enter the environment which the computer screen displays to perform the skill of the game aims to train. Therefore, some somatosensory sensors are designed for inputting into the VR show. Following the concept [2], a system was implemented, i.e., a Leap motion somatosensory controlled switches to aid some persons whose hands have been damaged can not perform the switches well.

II. METHODS

Leap Motion somatosensory sensor (Fig. 1) is composed by 2 cameras to detect the distance and posture of the human fingers of hands. The detecting range of the Leap Motion Leap Motion somatosensory sensor is between 25 and 600 mm. The coordinate system is the traditional X-Y-Z system. The unit of sensing position is millimetre.

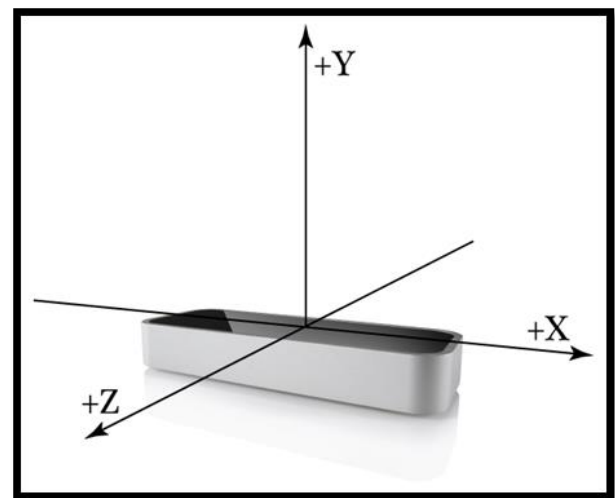


Figure 1. Leap Motion somatosensory sensor

The signal of Leap Motion somatosensory sensor was acquisitioned by the programming of professional computer language “PROCESSING” which has promoted software literacy within the visual arts and visual literacy within technology. Therefore, Fig. 2 presented the flow chart of the PROCESSING programming to detect whether the user’s hand has touched the colourful circles in the VR or not? There are many parts in the computer program. They are included: 1)

Constants and variables settings; 2) Include libraries; 3) USB port and font settings; 4) Set music; 5) Plot; and 6) Detection.

The Mega 2560 (Fig. 3) is employed to be the main controller of this system. The Mega 2560 is a microcontroller board, and the controller chip is the on-board ATmega 2560. The input/output part of the MEGA module includes 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports). The crystal oscillator is of the frequency of 6 MHz. The other components are a USB connection, a power jack, an ICSP header, and a reset button. The Mega 2560 board is compatible with other Arduino boards such as the Uno and the Duemilanove or Diecimila.

The coding processes of the MEGA module was all the Integrated Development Environment (IDE) of Arduino. The IDE is composed by C/C++ computer language, therefore, the program uploaded to the Mega 2560 is similar to the instructions of C/C++.

The conceptual circuit schematic was presented in Fig. 4. The control of the bulbs was depended on the "Open" or "Short" of the relays. The "Open" or "Short" of the relayed were controlled by the current flow (ON or OFF) of the input and output of the photo-isolated IC. Briefly, the "High" or "Low" levels of output pins of the Arduino MEGA module decided the "light on" or "light off" of the bulbs. In this study, the relay module was employed the commercial board which has 2 channel relay switches which can be controlled by the inputs of standard logic level of the relay module.

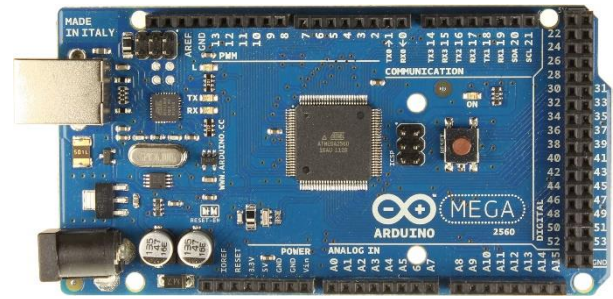


Figure 3. The Arduino Mega 2560 microcontroller board
(Photo source: Official Arduino Website
<https://www.arduino.cc/en/Main/ArduinoBoardMega2560>)

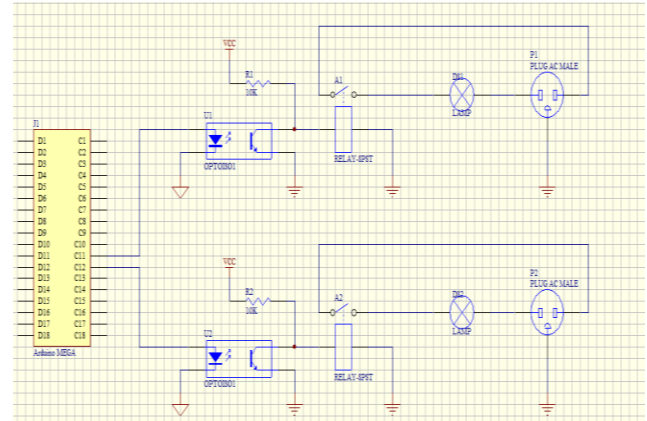


Figure 4. The conceptual circuit schematic

III.RESULTS

The implementation of the bulbs control in virtual reality by using leap motion somatosensory controlled switches in Fig. 5. A light bulb and an electrical fan were controlled by the leap motion somatosensory controlled switches. The relay module was served as electrical controlled switches which received the signal from Arduino Mega 2560 that received the instructions were controlled by using leap motion somatosensory.

The electrical fan was employed to prove that this system can control other AC electrical devices, if the users need to increase the operations of the AC electrical devices.

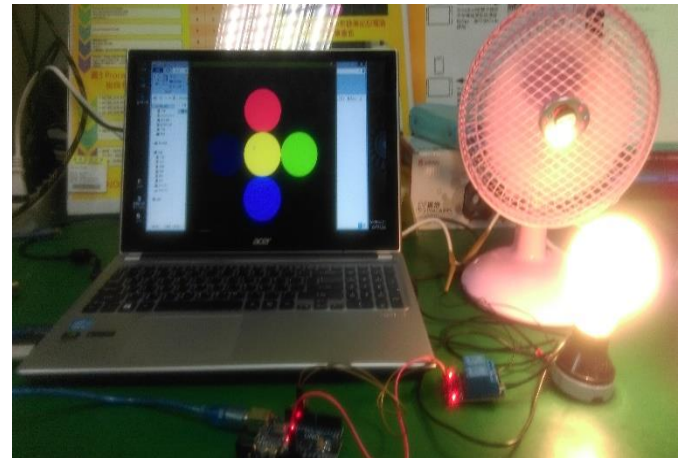


Figure 5. Bulbs control in virtual reality by using leap motion somatosensory controlled switches

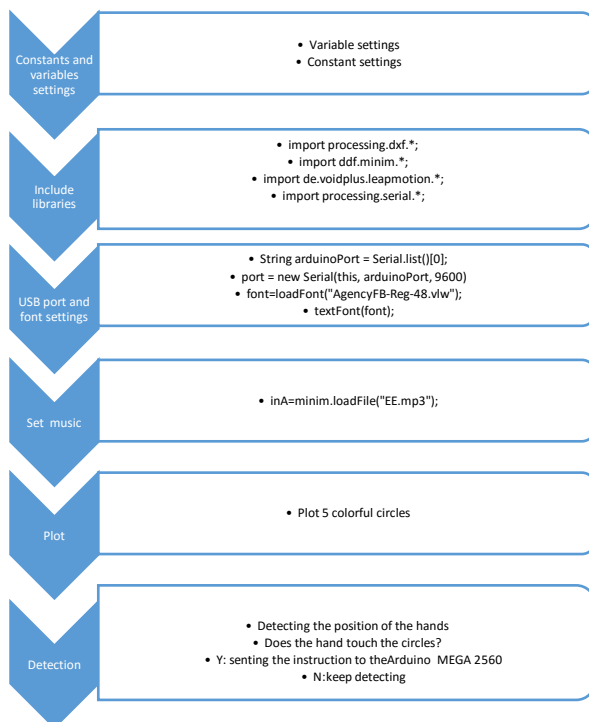


Figure 2. The flow chart of the PROCESSING computer language in the PC/NB

IV. DISCUSSIONS

The system supports the possibility of that the games can be extended to the real world. The light beams, water beams, and acoustic signals can be emitted by the control of this system in VR. Therefore, the games will be more interesting than the operations of the game devices only in the VR.

The system can aid the elders or disables control the lights, television, warmer, and other electrical devices well. That will improve the quality of their living conveniences.

The non-touch VR switches avoid to the possibility of infections which cause from the hands' touches of the switches in some places such as hospitals, surgery operating room, and centers of elders' health care.

The cost of this system will be reduced by mass production. The trend of using the somatosensory sensors have been predicted to be popular in the future. Therefore, the prototyping system is a basic trial of the future developments.

The educational purpose of the setup of the system will be a very practical training of software design, firmware design, and circuit design. Therefore, the system can be divide into parts for the training of the setup the system. The non-touch VR switches avoid to the possibility of infections which cause from the hands' touches of the switches in some places such as hospitals, surgery operating room, and centers of elders' health care.

V. CONCLUSIONS

Leap motion somatosensory controlled switches was implemented to aid some persons whose hands have been damaged can not perform the switches well. The implementation of the bulbs control in virtual reality by using leap motion somatosensory controlled switches in Fig. 5. A light bulb and an electrical fan were controlled by the leap motion somatosensory controlled switches. The relay module was served as electrical controlled switches which received the signal from Arduino Mega 2560 that received the instructions were controlled by using leap motion somatosensory.

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