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Implementation of Low-Cost Data Glove to use in Virtual Reality Systems using Hall Sensor

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Abstract:- The primary point of this paper is to execute a low-cost information glove utilizing hall sensor, Arduino NANO (ATMEGA328P microcontroller) and Processing IDE. This glove is utilized in virtual reality condition and is incorporated into a suite of utilization. When we wear the glove to our hand and wave it before the PC, we will almost certainly move the pointer to the ideal area and play out a particular undertaking.

Keywords:- *Arduino NANO, Processing IDE, Data Glove.*

I. INTRODUCTION

Virtual Reality is a computer-generated simulation environment that makes everyone to experience the impossible. It can be explored and interacted by a person using specific electronic equipment like a helmet or a glove fitted with sensors. Virtual reality means an artificial environment. Communication systems means the VR systems which includes sensations and transmission of vibration to the user by devices is known as kinaesthetic communication systems. This is used in gaming zones, military training and medical applications. This VR system also refers to Virtual presence of users with artifact in remote communication environment.

A. Previous System

Previously we can able to track a particular object when something that points the object, which depends on the RGB color combination. Later it is developed as a stylus to work with the smart board and scribble pad.

As the any color combination which include red, green, or blue or some other color which has the more intensity is used for the object to be tracked. Once the program is done with the image processing the specified color is tracked. And this kind of mechanism is mostly seen in major supermarkets to identify and bill the fruits.

B. Proposed System

In addition, with the tracking of the object, we can even able to control our system with by our hand using this glove without any contact with the system this will happen we simply wave our hand in front of our system or laptops.

C. System Specifications

- *Scope of system specifications*

This framework determines the description of the function and the execution of the system and the user. The purpose of this task is to manage and control our system without any touch pads or stylus, by simply waving our hand in front of the screen.

- *System Description*

This framework has two sections to be specific hardware and software. The hardware here used is ATMEGA328P microcontroller which is a 28 pin IC, and the Hall Effect sensor. The software part used is Processing IDE and Arduino IDE.

II. HARDWARE USED

The following is the description of the hardware parts used in this project:

A. Arduino Nano

Arduino Nano is a microcontroller board dependent on the ATmega328P. It has 14 digital input/output pins (of which 6 can be utilized as PWM outputs), 8 analog inputs, 2 reset pins, 6 power pins, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It has everything expected to help a microcontroller. It has same usefulness as arduino UNO yet it is in little size. Variety of microprocessors and controllers are used by arduino board designs. A set of digital and analog input/output (I/O) pins are equipped in the board. These are utilized to interface different extension boards (shields) and different circuits. In some of

the models the board features serial communications interfaces. It is Universal Serial Bus (USB), this is used for loading programs from personal computers. Programming languages like C and C++ are used for programming the microcontroller.

Fig 1

B. Hall Sensor

Hall Effect Sensor is a transducer that changes its output voltage with respect to the external magnetic field applied on it. Magnetic field has two important characteristics. They are flux density and polarity (south and north poles). Hall Sensor has the following applications like proximity switching, positioning, speed detection, and current sensing applications. In a hall-effect sensor, there is a thin metallic strip with current flowing through it. In the presence of an external magnetic field the electrons are deflected towards the edge of the metal strip, this produces a voltage across the short-side of the strip (perpendicular to the feed current). At the point when the magnetic flux density around the sensor surpasses a certain pre-set limit, the sensor distinguishes it and produces a certain voltage called Hall voltage. These sensors have the favorable position that they can recognize static (non-changing) magnetic fields.

Fig 2

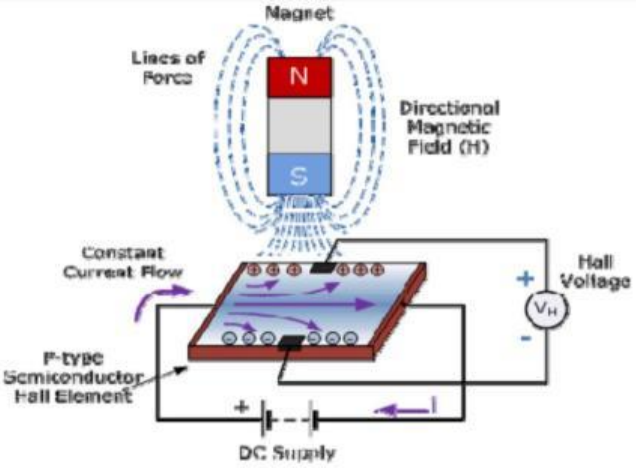

Fig 3

C. Bluetooth Module

Bluetooth module is intended to setup a wireless serial connection. The HC-05 Bluetooth module has two arrangements, Master and Slave setup. By default, it is in SLAVE configuration. The Master or Slave can be arranged just by AT COMMANDS. A Slave module cannot start a connection with another Bluetooth device, but can pair with other devices. Master module can start a connection to other devices. The user can utilize it setting up a sequential port replacement to build up association between MCU and GPS, PC to your embedded project, etc.

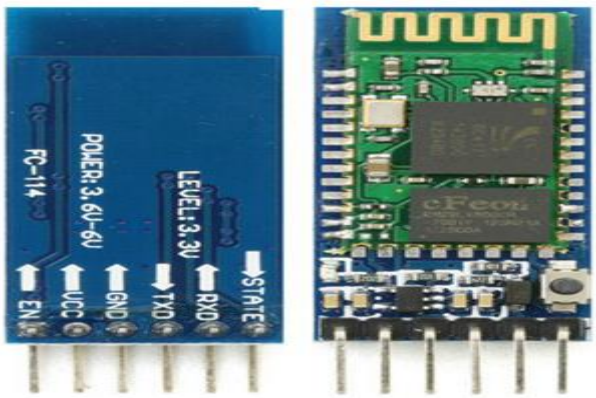

Fig 4

III. SOFTWARE USED

Software part utilized in this project is described below:

A. Arduino IDE

The Arduino Software (IDE) or Arduino Integrated Development Environment – consists of an editor of text type to compose code, a message zone, a text console, the distinctive buttons on toolbar for functions that are commonly utilized and diverse menus. It interlinks the Arduino equipment to upload the program and to interact with them. It is a cross platform Java application that is used as an editor of code and compiler and is also suitable for assigning the firmware to the board in a serial manner.

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Fig 5

B. Processing IDE

It is an integrated environment and open source language of computer programming developed for electronics arts, new media arts, and communities of optical design. The main aim is to teach the fundamental programming language in an optical setting and it is a software sketchbook which is very flexible. Processing has created another undertaking, Wiring, that utilizes the Processing IDE with a set of libraries which are composed in the C++ language so as to teach artists the approaches to code microcontrollers. At present there are two diverse hardware projects to be specific Wiring and Arduino, utilizing the language as well as Wiring environment. Fritzing is also a similar software environment, which supports designers and artists in documentation of their prototypes which are interactive and to make a forward step towards actual product from a basic physical prototype.

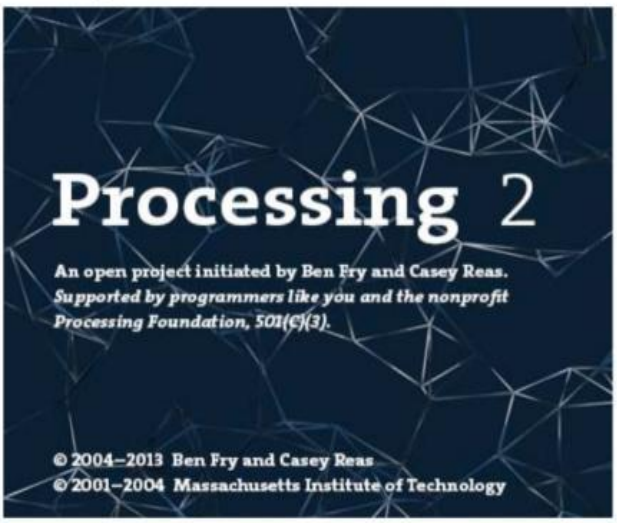

Fig 6

IV. BLOCK DIAGRAM

The Block diagram for this project is as follows,

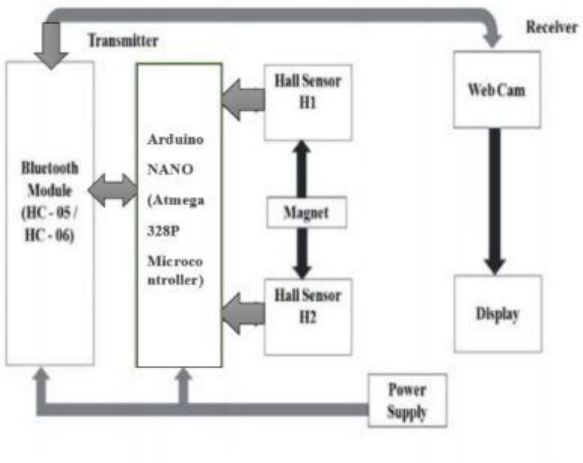

Fig 7

➢ *Working Principle*

Once the connection has been made as per the block diagram, the LED on the Bluetooth module must glow stable which means the connection has been established between the hardware and software. And we will get the calibration screen upon running the program, where we are going to trace the object on the glove and to calibrate the Hall Sensor, it gives the message as all sensors are active. When the calibration is completed, we get a home screen with a blue background. We have the two options one is the paint screen and other is the LED toggle screen. Therefore, when we wave our hand before the web camera, the hall sensor is able to find the position and helps to drag the screens and we are able to operate our system with no contact with the system.

V. CONCLUSION

Finally, we structured the glove for use in Virtual Reality frameworks and is incorporated into a suite of applications and we can wave our hand before the PC and move the pointer to the ideal area and perform some tasks

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