Potentiometric Sensor Based 3-D Mouse Control

Pankaj P Kolhe, Mahesh N. Tidke, Nikhil K. Dabhade, Pratapsinh B. Ghule

Abstract— **A gesture is a form of non-verbal communication in which visible bodily actions communicate with some specific messages, in place of speech or with combination of words. Gestures is movement of the hand, face or any other parts of our the body. Gestures is different from physical non-verbal communication which actually do not communicate a specific message .The gesture movements can be used to interact with the technology like computers, using touch or multi-touch popularized by the iPhone, physical movements detection and capturing of visual motion, used in video game consoles .Human Computer Interaction(HCI) plays a vital role in day to day activities. Use of computer vision has taken HCI to an altogether different level. In this project, simple potentiometers are used for tracking hand movements to control mouse pointer. The features to be detected include hand movement. Our objective is to implement all the mouse tasks without the use of mouse.**

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Index Terms—**Gesture, interaction with technology, potentiometers, implementation of mouse**

I. INTRODUCTION

In this paper the result of the work done in development of "Hand Gesture Controlled Mouse" operated wirelessly is discussed. The objective is to design a equivalent model of mouse which can be operated wirelessly and control mouse actions using hand gesture recognition. This project can be used with great versatility in day to day life. The transmitter model takes data from potentiometer sensor, encode it and sends using Radio-Frequency transmitter 434MHz. The Radio-Frequency receiver receives data and amplifies it. This data is then sent to PC for mouse controlling action according to data received. The data is decoded using proper decoding technique. According to data received the mouse pointer is controlled. For detecting a hand gesture, first the hand needs to be recognized. Then its features can be detected using different logic. Finally the features extracted are used for making gestures recognized by a system as input. In this project, the designed system is capable of identifying three different gestures. To make sure that only one of the three required tasks is performed, at that particular instant.

Proper entry and exit conditions in the state machine ensure smooth functioning of the gesture recognition system .The ability to track a person's movements and determine what gestures they may be performing can be achieved

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through different tools .Although there has been a large amount of researches in image/video based gesture recognition, there is some variation in the tools and environments used between implementations.

II. HAND GESTURE MOUSE CONTROLLING

A. Arrangement of potentiometric sensors

Fig.1.Potentiometric arrangement

The arrangement of potentiometric sensors, play a vital role in development of this project. A perpendicular arrangement of the potentiometric sensors shown in Fig.1 is made in order to scan the exact position of hand in xy-plane. The third sensor is placed on the hinge of the arm to locate the movement of arm in z plane. The potentiometric sensors are used as voltage divider circuitry, which supply the dc voltage from voltage divider circuitry to the analog input pins of the ATmega328p IC.

B. Symmetric-key cryptography

We used symmetric key cryptography to encode the data to be transmitted wirelessly in order to reduce the data losses caused due to the transmission media and it also keeps a check while decryption that the correct data gets extracted. The 10 bit data from ADC was split into 2, 5 bit data and added 3 bit encryption to make it 8 bit data .We encoded the data using 3 bit code word. '010' assigned to the first 5 bit data of x-axis and code word '101' is assigned to the second 5 bits of x-axis .the **'stream cipher'** technique was used to encrypt the data further i.e. The XOR of the data was taken and send as third 8 bit data which give us the assurance that the data was from the same time instant .The y-axis data was also encrypted similarly by using 3 bit code words as '100' and '011' and the z-axis data by using by using 3 bit code words as '001' and '110'.

C. USB to serial convertor

To interface USB directly with ATmega 328 we need some circuitry. We used 2 diodes in series to Vcc pin of USB to lower down the voltage level to 3.6V. Since ATmega 328 can work on minimum 1.8V.Most people link an Arduino to a host using serial communications across a USB connection

with custom code running on the host to send information to the Arduino or receive it in return, but giving our Arduino the ability to pretend to be a keyboard or mouse opens up a whole world of possibilities because it means your Arduino can interact with software that was never intended for external control .which can be desktop software such as game or a web browser: Arduino could "type" into a web form and submit it on your behalf, or it also acts as a custom controller for a game.
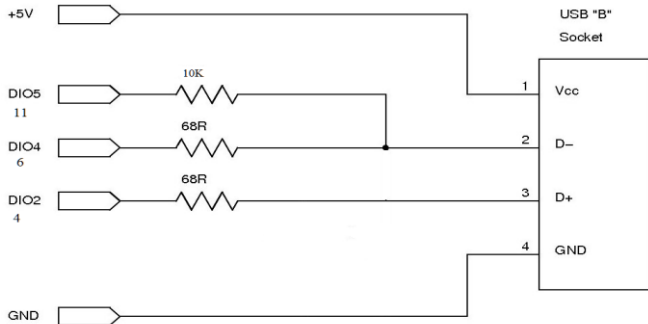

Fig.2. USB to serial convertor

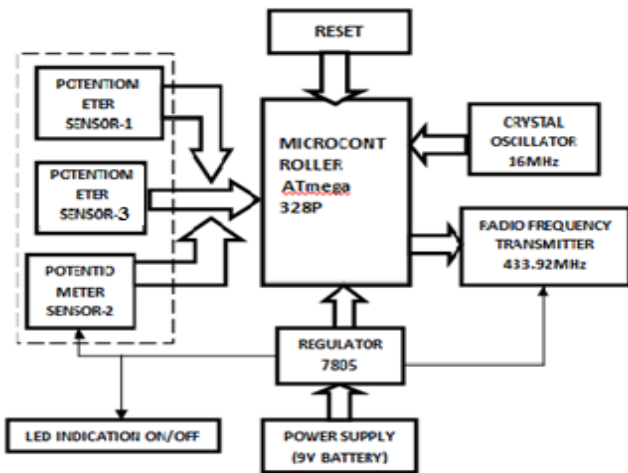### III. IMPLEMENTATION

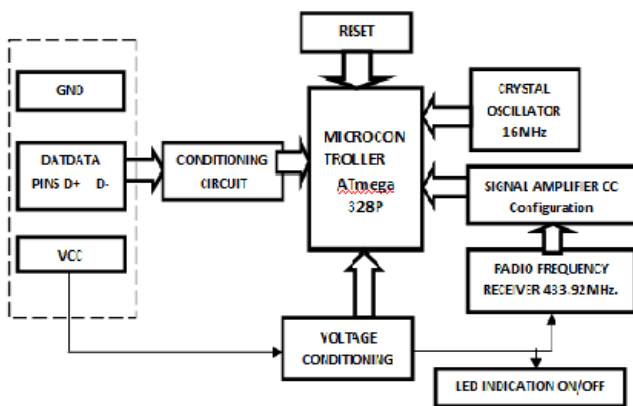*A. Block diagrams:*

Fig.3.Transmitter block diagram

Fig.3.Receiver block diagram

The block diagram in Fig.3 represent the transmitter side and the Fig.3 represent the receiver side of our circuitry.

B. *Working*

In this project contains control of mouse pointers using 3 potentiometric sensors which track the actual position of the hand .The projects consists of a pair of Radio-Frequency 434Mhz transmitter and receiver. The transmitter consists of two potentiometric sensors which are placed perpendicular to each other to track the x and y position of the hand movement ,and the third potentiometric sensor is placed on the hinge of our hand which capture the movement of hand in z-plane. Potentiometric sensors work as a voltage divider circuit. The analog voltage at the output of sensors is given to the analog input pins of the ATmega328P IC, the analog input is read by the controller .The analog input in converted in digital 10 bit data, which is split in 2, 5 bit data and encrypted by 3 bits data and to upgrade the encryption and to make it cipher-block chaining there sum is send in next 8 bits to check whether the receiver bits are correct .the encoded data is send serially by using print.serail() command the serial data is transmitted using Radio-Frequency 434Mhz transmitter .the transmitted bits are received by the 434Mhz receiver the received data is amplified using BC547 transistor to strengthen the received data the data is made high and the redundant data gets suppressed to zero. The received signal is given to digital input pin of the receiver, the data is read using digital.read() command .the received data is send to the pc using USB to serial convertor. The serial data is received on the PC it is decoded using the reference of encoding technique used in the transmitter side with the help of processing software the processing converts the received data again into original 10bit data and the data can be used for further application. The received data is used to locate the mouse pointer using the robot libraries in processing .the position of the mouse is located using r.mousemove() command. Using MATLAB the position of the mouse in 3-Dimentional space can be demonstrated .Using this technique the cost of wireless mouse can be reduced. And use the 3-D mouse in future 3-D application like 3-D WINDOWS.

IV. CONCLUSION

Thus implementation of Radio-Frequency module based Hand Gesture Controlled Mouse was done successfully .The working model of 3-D mouse was made and it's dynamic positioning was displayed using MATLAB. It provided with good results.

V. FUTURE SCOPE

 If modified further will help in reducing the cost of making 3-D mouse. It will also provide better experience for the person in gaming platform to actually recognize the gestures.

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