Wireless Mobile Mouse Using Python

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Abstract: The project involves a smart phone application that sends the joystick's x and y axis data, scroll status, left and right click status using Bluetooth to the Arduino Nano connected to the HC-05 Bluetooth module. These data upon reception to the Arduino is manipulated to make changes in the current cursor's position to obtain a new position. The resulting data along with scroll and button status is then printed as the output that is recognized to be read by the Python sketch. The Python sketch is made to execute mouse actions using the mouse module. The smart phone application is created using the MIT-App Inventor. Creating the app is simple as you just need to add the desired blocks to build your required application.

Keywords: Human-Computer Interaction (HCI), Hand Gestures, Movement Tracking, OpenCV, Image Processing, Augmented Reality.

I. INTRODUCTION

devices are becoming more and more popular today. Convenience and flexibility are two of the most important advantages of any wireless device over wired ones. The direct application of existing wired mouse is not adequately efficient in terms of mobility and disturbances caused by wired connection. In fact, this has become the primary reason for the current surge of users, moving towards a viable world of wireless solutions. The main advantages of these wireless devices such as wireless keyboards, headphones and mice are that they can help reduce the clutter of wires around the working area. This can in turn increase the ease of work and fineness of the end result. With a wireless mouse and keyboard, the ease of operation is significantly higher than wired ones. This can even prove very useful while

controlling computer from a distance. The very basis of a "mouse device" involves a pointing device that works on a supporting surface by detecting two-dimensional motion relative to it.

A typical Tactile Mouse By this it is meant that few major design flaws make it less useful than it could be. While in mid-air, accidental triggering of the laser sensor at the bottom of the mouse, is at times very frustrating. Likewise, the overall shape of this type is a compromise i.e. it's neither the ideal shape for a mouse nor the ideal shape for a remote. Despite being a strong contender of "wireless hands free" device, the 3D mice were finally discontinued because it did not provide sufficient resolution and precisions which is expected from such a costly device. Tactile Mice as shown in Fig. 2, on the other hand can augment user- interfaces such as giving feedback while crossing a window boundary. Unfortunately, though, it suffers from constant requirement of information feedback about the location and motions of the cursors on the screen.

For instance, an oblique motion path of the cursor is experienced for horizontal movement of a tactile mouse. Along with this there is a severe issue with "precision of the mouse" when it is lifted and placed at certain other location. Ergonomic mice as shown in Fig. 3, provide optimum comfort. In addition, avoidance to injuries such as carpal tunnel syndrome, arthritis and other repetitive strain injuries can be avoided by using the same. The only practical problem with this type is the huge cost that one needs to bear compared to the conventional mice. Hence it can't be afforded by many.

A typical Ergonomic Mouse Gaming mice have its share of acceptance but limited to pc gamers. With its wide array of controlling buttons, catchy design makes it differ radically from traditional mice. The above comparative discussion on various platforms leads us to the basis of this paper. Clearly it can be observed that all the mentioned mice provide pointing option with reasonable precision. Hence if one can build a prototype where both mouse and keyboard functionalities are indigenously built, it will indeed be a novel concept. Accordingly, in this paper, a successful attempt has been made to design and implement a "wireless hand-held mouse and keyboard" prototype that delivers effortless performance and seamless precisions, compared to that of a conventional mouse. The added benefit of a single touchpad used for keyboard along with mouse makes this work unique from every angle. Radio Frequencies (RF) predominantly serve as the basis for wireless mouse technology. Similar to

other radio technologies, this too requires a transmitter and a receiver.

The mouse transmits radio signals to a receiver, which is itself connected to the computer hardware, normally via a wire. This kind of wireless mouse is very reliable and is capable of transmitting the mouse's movements to the receiver from across a room. The flexibility offered by a wireless mouse is of course a huge advantage over wired ones. With the help of the hand-held touch screen one can comfortably control mouse pointer and keyboard without worrying about wire being tangled. Following this mode of operation, the prototype in this paper describes the design of a mouse pointer and keyboard device with wireless control and resistive touch sensors. The device has the advantage that it is microcontroller based and thus can be programmed to work as a mouse along with a keyboard. Other advantages include the use it as an 'air mouse' as it does not depend on surfaces like conventional optical mouse. The paper further explores the opportunity involving a remote handheld keyboard which works in conjunction to the mouse. Instead of a reflective surface for optical mouse, the principle of resistive touch sensor has been taken into cognizance. In addition to it, the wireless function has been implemented by using a Xbee Module.

MOTIVATION

• Create such application which introduce use of AI world in small manner

• Exploring vision-based interfaces is motivated by the unnaturalness of some of the conventional input devices such as mice and joysticks in many intelligent environments where intuitive interactions and teleoperations are required.

• It is fair to say that the Virtual Mouse will soon to be substituting the traditional physical mouse in the near future, as people are aiming towards the lifestyle where that every technological device can be controlled and interacted remotely without using any peripheral devices such as the remote, keyboards, etc. it doesn't just provide convenience, but it's cost effective as well.

• It is known in order to interact with the computer system, users are required to use an actual physical mouse, which also requires a certain area of surface to operate, not to mention that it suffers from cable length limitations.

• Virtual Mouse requires none of it, as it only a webcam to allow image capturing of user's hand position in order to

determine the position of the pointers that the user want it to be.

• The motivation is to create an object tracking application to interact with the computer, and develop a virtual human computer interaction device.

II. LITERATURE SURVEY

As modern technology of human computer interactions become important in our everyday lives, varieties of mouse with all kind of shapes and sizes were invented, from a casual office mouse to a hard-core gaming mouse. However, there are some limitations to these hardware as they are not as environmentally friendly as it seems. For example, the physical mouse requires a flat surface to operate, not to mention that it requires a certain area to fully utilize the functions offered. Furthermore, some of this hardware are completely useless when it comes to interact with the computers remotely due to the cable lengths limitations, rendering it inaccessible.

To overcome the stated problems, Zhengyou et al. (2001), proposed an interface system named Visual Panel that utilize arbitrary quadrangle-shaped planar object as a panel to allow the user to use any tip-pointer tools to interact with the computer. The interaction movements will be captured, analysed and implement the

positions of the tip-pointer, resulting accurate and robust interaction with the computer. The overall system consists of panel tracker, tip-pointer tracker, holography, calculation and update, and action detector and event generator as it can simulate both mouse and keyboard.

Kamran Niyazi et al. (2012), mentioned that to solve the stated problem, ubiquitous computing method is required. Thus, colour tracking mouse simulation was proposed. The said system tracks two colour tapes on the user fingers by utilizing the computer vision technology. One of the tapes will be used for controlling the movement of the cursor while the other will act as an agent to trigger the click events of the mouse.

A mouse, in computing terms is a pointing device that detects two-dimensional movements relative to a surface. This movement is converted into the movement of a pointer on a display that allows to control the Graphical User Interface (GUI) on a computer platform. There are a lot of different types of mouse that have already existed in the modern days technology, there's the mechanical mouse that determines the movements by a hard rubber ball that rolls around as the mouse is moved.

Years later, the optical mouse was introduced that replace the hard rubber ball to a LED sensor to detects table top movement and then sends off the information to the computer for processing. On the year 2004, the laser mouse was then introduced to improve the accuracy movement with the slightest hand movement, it overcome the limitations of the optical mouse which is the difficulties to track high-gloss surfaces. However, no matter how accurate can it be, there are still limitations exist within the mouse itself in both physical and technical terms. For example, a computer mouse is a consumable hardware device as it requires replacement in the long run, either the mouse buttons were degraded that causes inappropriate clicks, or the whole mouse was no longer detected by the computer itself. Despite the limitations, the computer technology still continues to grow, so does the importance of the human computer interactions.

Ever since the introduction of a mobile device that can be interact with touch screen technology, the world is starting to demand the same technology to be applied on every technological device, this includes the desktop system. However, even though the touch screen technology for the desktop system is already exist, the price can be very steep. Therefore, a

virtual human computer interaction device that replaces the physical mouse or keyboard by using a webcam or any other image capturing devices can be an alternative way for the touch screen. This device which is the webcam will be constantly utilized by a software that monitors the gestures given by the user in order to process it and translate to motion of a pointes, as similar to a physical mouse.

ChenChiung Hsieh, Dung-Hua Liou, and David Lee 2010 proposed a study on "A Real-Time Hand Gesture Recognition System Using Motion History Images." In this paper, a face-based adaptive skin colour model and a motion history image-based hand-moving direction detection method were proposed. An adaptive skin color model based on face detection is utilized to detect skin color regions like hands. To classify the dynamic hand gestures, a simple and fast motion history image-based method is developed. The limitation of this model is the analysis of the tricky hand gestures used. Balamurugan. C1, Arumuga Kumar. M2, Arun Mozhi. N3 and Deepak. P4 proposed a study on "HCI SYSTEM WITH HAND GESTURE" in the International Research Journal of Engineering and Technology (IRJET). This project represents a concept of controlling our video display with the assistance of hand gestures, which relies

on one in each of the studies of Human-Computer Interaction. The target was to develop a Machine Learning application that will communicate with any digital device with fewer hardware needs and victimization of an indoor camera that act as a detector to capture the gestures. The limitation was it was complex to understand the model in real-life.

III. PROPOSED WORK

The project involves a smart phone application that sends the joystick's x and y axis data, scroll status, left and right click status using Bluetooth to the Arduino Nano connected to the HC-05 Bluetooth module. These data upon reception to the Arduino is manipulated to make changes in the current cursor's position to obtain a new position. The resulting data along with scroll and button status is then printed as the output that is recognized to be read by the Python sketch. The Python sketch is made to execute mouse actions using the mouse module. The smart phone application is created using the MIT-App Inventor. Creating the app is simple as you just need to add the desired blocks to build your required application.

IMPLEMENTATION

The project involves a smartphone application that sends the joystick's x and y axis data, scroll status, left and right click status using bluetooth to the Arduino Uno connected to the HC-05 bluetooth module. These data upon reception to the Arduino is manipulated to make changes in the current cursor's position to obtain a new position. The resulting data along with scroll and button status is then printed as the output that is recognized to be read by the Python sketch. The Python sketch is made to execute mouse actions using the mouse module.
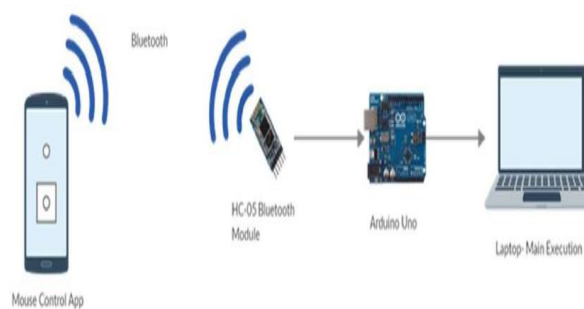

Fig.1 Implementation diagram

PYTHON SOFTWARE

Python is an interpreter, high-level, universally useful programming language. Made by Guido van Rossum and first discharged in 1991, Python has a plan reasoning that underlines code comprehensibility, strikingly utilizing huge whitespace. It gives develops that empower clear programming on both little and huge scales. Van Rossum drove the language network until venturing down as pioneer in July 2018.

Python includes a dynamic kind framework and programmed memory the board. It underpins different programming ideal models, including object-oriented, basic, useful and procedural, and has a huge and complete standard library.

Python translators are accessible for some operating frameworks. CPython, the reference execution of Python, is open source programming and has a network based improvement model, as do about the majority of Python's different usage. Python is a universally useful translated, intelligent, object-oriented, and high-level programming language. It was made by Guido van Rossum during 1985-1990. Like Perl, Python source code is additionally accessible under the GNU General Public License (GPL).

Python is a simple to adapt, ground-breaking programming language. It has proficient high- level information structures and a straightforward, however successful way to deal with article situated programming. Python's exquisite sentence structure and dynamic composing, together with its deciphered nature, make it a perfect language for scripting and quick application improvement in numerous regions on generally stages.

The Python translator and the broad standard library are openly accessible in source or binary structure for every single real stage from the Python Web website, and might be uninhibitedly circulated. A similar site likewise contains appropriations of and pointers to many free outsider Python modules, projects and instruments, and extra documentation. 24

The Python interpreter is effectively reached out with new capacities and information types executed in C or C++ (or different languages callable from C). Python is likewise appropriate as an augmentation language for adaptable applications.

About the Application

The smart phone application is created using the MIT-App Inventor. Creating the app is simple as you just need to add the desired blocks to build your required application. I have referred to the Tabletop robotics tutorial on making them

Before sending the main information to the HC-05 module, the application first sends a one byte number(255) to denote the start of information. The sequence of data transfer is as follows-

1. Send '255' to denote start

2. Send 1 byte joystick x-axis value

3. Send 1 byte joystick y-axis value

4. Send status of left click, right click button and scroll status(1 byte).

The data from the application is sent every 20 milliseconds to the Arduino UNO

1. Arduino's Side

The data bytes from the Application are received by the Arduino with the help of HC-05 Bluetooth module. The Arduino contains the current coordinates of the cursor where the x coordinates range from 0 to 1279 and the y coordinates range from 0 to 799. I have obtained these extreme coordinates form the python function mouse. get_position() that returns the coordinates when the cursor is moved (not used in the main sketch).

Based on the data received upon moving the joystick, the current cursor's position (x and y coordinates) is then added/subtracted with the data received by the application to move the cursor to the new desired coordinate.
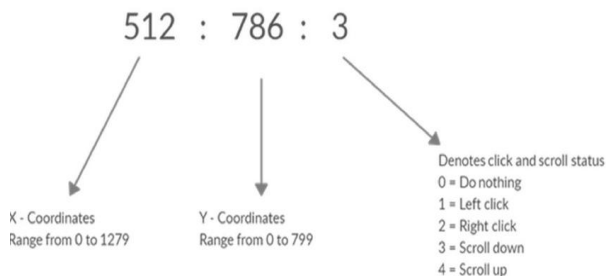

Fig.2 Data sent to python

The following data sequence is finally read by the python program to execute it. For

this, we will need to download additional modules namely mouse and pyserial in the steps given below
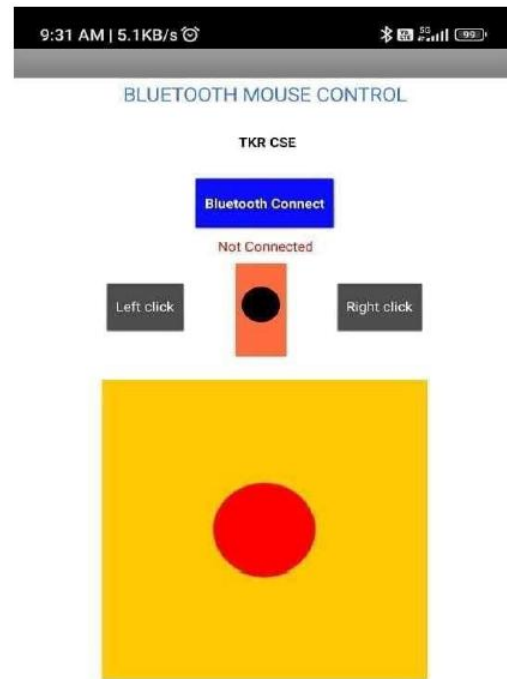
IV.   RESULTS

Fig.3 Bluetooth mouse control

V.   CONCLUSION

In this project, a wireless mouse is implemented using a android app which eliminates the constraint of a wire. The arduino nano board and blueetooth is used as a platform for user interface. A blueetooth is connected to the microcontroller Arduino nano which receives the data and sends to the laptop device,receives the data wirelessly and sends to Leonardo board which controls the mouse as per requirement. Hence, in this prototype we have managed to make a

wireless mouse that has the following functionality of right and left click and mouse pointer. Along with it, the prototype clearly demonstrated the working of handheld with feature.

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