3 Dimensional Manipulation Operation in Virtual and Voice Integrated Environment (3D M.O.V.V.I.E)

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ABSTRACT
As the technology developed over by time people wants to get along with it. One such technology is the virtual and voice integrated environment, there has been several research going on with these technology, it is so far in the development stage. In this paper creating this technology by using a 3D frame which can rotate about 360 degree and monitor every movement for the virtual control environment and the XML coding overlay upon the windows speech recognition for the voice integrated environment by combining these two with the Internet of Things We are taking this technology to the next level by creating a complete and total control over any IOT enabled devices and the PC. By combining all this technology into a single unit it can serve wide range of applications such a starting from taking a full control over PC to automating a day to day electronic devices. There is no limit to the number of possible combinations so the application will be limitless. In this paper the work is on a complete virtual and voice environment with the cutting edge virtual and voice platform which are in experimental stage. This paper have also devised a prototype with virtual capacitive environment that works on the basic concept of capacitive effect yet the prototype environment was a highly successful model that transformed basic capacitance into a highly accurate virtual control environment.

Keywords
Virtual environment, Voice environment, Capacitive control, PC manipulation, Speech processing, Internet of things.

1. INTRODUCTION
In the modern day the technology develops rapidly as far as the interface between the humans and machines development will take at least a decade to successfully implement the new technology and used by everyone. Starting from the keyboard and mouse to the present day touchscreen interfaces every stage will take its own time. The next upcoming technology is a virtual interface [1] which is still in a development process and voice interface is an emerging technology.

This paper is to develop the virtual environment integrated with the voice environment that can be used by everyone without any errors and customizable commands. It is compatible with any operating system and devices that can accept human input.

The virtual environment is comprised of two main components one is the 3D frame that is made up of a complex robotics system capable of rotating 360 degree and capable of capturing the readings from any possible direction and there is a capacitive environment that can track any objects within its radius. The voice environment uses the inbuilt windows speech recognition as its base and the XML coding overlay upon it makes the commands customizable and perform various operation with accuracy.

The Internet of things platform explained in this paper has a significance of not only to control and monitor with the users but also to interact with the users in a friendly which enables even a child to operate it with ease.

2. BACKGROUND AND MOTIVATION
Over the past decade every smart devices [1] were integrated with the voice recognition and speech processing but they were not accurate and reliable where the buttons are literally transformed into the touch screens. But to operate them without touching in an open space is still under development.

To develop one such technology with reliability and accuracy we choose the robotics platform where the tracking of objects and controlling things based on that is possible but to use the image processing technology and to implement in the day to day life has too many variables and cannot be accomplished in time. To overcome these drawbacks of the existing one we propose an innovative and cheap solution where the things can be easily established and implemented.

The internet of things was a developing technology but as of current status its not used for commercial purposes but with this paper the regular day to day application of internet of things has been deployed.

3. VIRTUAL CONTROL ENVIRONMENT

3.1 Design
As this paper is working on an experimental technology we designed the prototype with an open source platform such as Arduino and processing the robotic manipulation operation was done though Arduino Leonardo since it is capable of mimicking the keyboard and mouse operations in a pc.

Figure a represent the 3D frame design which was done using the OPEN Scad software then the frame was printed using a 3D printer there were 3 main rotational servos attached to it 1)Servo theta 2)Servo psi 3)Servo beta

Servo theta was able to rotate along the x axis where to can provide the x axis co-ordinates, Servo psi can rotate about the y-axis to can provide the co-ordinates of y-axis, Servo beta can rotate about z-axis and it provides the co-ordinates of the z-axis. The servo holder has a ultrasonic sensor SR-04 to locate the position of the object.

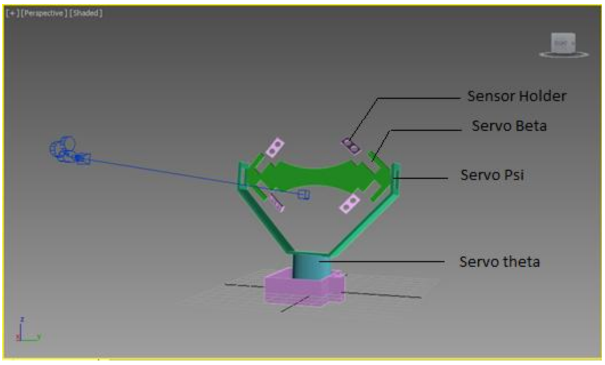

Figure 1 3D Frame Design

3.2 Mode of operation
The setup operates under two modes namely

- Observe mode
- Tracking mode

3.2.1 Observe mode
In observe mode the servo theta rotates about 4º, Servo psi remains constant, Servo beta rotates about ±75º, In this mode the setup observes if there is any change in its environment (3D space around it) if it detects a valid object such as hand it will enter the tracking mode.

3.2.2 Tracking mode
In tracking mode the setup will track the hand based upon the readings from the ping sensor. The input to the PC is based upon the position of the servo in degree (º) which is later converted into the co-ordinates by the Arduino Leonardo based upon the co-ordinates the manipulation operation is carried out.

3.3 Program
3.3.1 Servo Locators
```
servo_left_up.write(pos_left_up);
  servo_left_down.write(pos_left_down);
  servo_right_up.write(pos_right_up);
  servo_right_down.write(pos_right_down);
  servo_theta.write(pos_theta);
  servo_psi.write(pos_psi);
```

3.3.2 Code Conversion for pC
```
if ((left_up > 0)||(left_down > 0)) left = true; else left = false;
  if ((right_up > 0)||(right_down > 0)) right = true; else right = false;
  if ((left_up > 0)||(right_up > 0)) up = true; else up = false;
  if ((left_down > 0)||(right_down > 0)) down = true; else down = false;
  if (middle > 0) mid = true; else mid = false;
```

4. VOICE CONTROL ENVIRONMENT
4.1 Base
The voice control environment uses the windows speech recognition as its base , as the WSR is not capable for providing the accurate results and the commands are pretty much limited we are editing its source code to improve the accuracy and to increase the command list to the native language which also improves the accuracy of the operation.

4.2 Implementing the advanced commands
We are editing the source code of the WSR program to improvise its accuracy by changing the commands to native speech format thus it also has a custom commands such as “Is the core temperature normal?” which will execute a visual basic script written to OS and provides the result, we are also varying the timing of the recognizer to get accurate results.

4.3 Voice feedback system
We provide a voice feedback system for every command so that the user can feel interactive with his/her computer E.g. If the user asks his/her pc “I am bored!” the pc will reply “Shall I entertain you with some games or movies what will you prefer?” if user replies “movies” the pc will respond with “As you wish” and shows all the available movie list in the PC and its users choice to choose what he/she needs.

SAPI voice 5 which is the default text to speech converter has been used in this paper to simulate a voice feedback system.

4.4 Personal Customisation
This proposed model have provided the feature for the user to customise his/her voice assistant such as providing it a name, voice feedback gender etc..., This enables the user to emotionally attach with his or her system.

5. Internet of Things
This proposed model have used the open source platform Arduino for the IOT applications[2] every frequently used devices such as car, house hold appliance’s etc.., are connected to the IOT with the help of Arduino our virtual and voice integrated environment can manipulate the IOT devices directly or indirectly with the gestures’[2] or voice commands.

6. CAPACITIVE CONTROL ENVIRONMENT
6.1 Design
The capacitive control environment works on the basic principle of the charge and discharge of the capacitor [6]. Three 40 cm square cardboard is placed at its right angles they are layered with aluminium foil [5] on the inner side as shown in figure b.

6.2 Shielding
The wires from the capacitive environment is shielded because the ordinary wires [5] act as a long wire antenna is operated at AC.

6.3 Power
The controller connected to it will act as a power source to the environment, he ports are operated at 16MHz clock [5] pulse such that at low the port acts as input and at high the controller charges the aluminium foil.

Figure 2 Capacitive Environment Prototype

6.4 Prototype

Figure b shows the prototype model designed by us which acts as a virtual capacitive environment, as soon as our hand enters the environment [6] for which our hand has a dielectric constant of over 60 which is greater than that of the air in the environment the charge discharges based upon the discharge time the location of the object is detected, The co-ordinates are from the x, y & z axis which in return will be used to manipulate the PC or IoT devices.

6.4.1 Program for Processing 2.0

```
void updateSerial() {
 String cur = serial.readStringUntil('\n');
 if(cur != null) {
  String[] parts = split(cur, " ");
  if(parts.length == sen) {
   float[] xyz = new float[sen];
   for(int i = 0; i < sen; i++)
    xyz[i] = float(parts[i]);
   if(mousePressed && mouseButton == LEFT)
    for(int i = 0; i < sen; i++)
     n[i].note(xyz[i]);
   nxyz = new float[sen];
   for(int i = 0; i < sen; i++) {
    float raw = n[i].choose(xyz[i]);
    nxyz[i] = flip[i] ? 1 - raw : raw;
    cama[i].note(nxyz[i]);
    axyz[i].note(nxyz[i]);
    ixyz[i] = getPosition(axyz[i].avg);
   }
```

6.4.2 Momentum Average

```
class MomentumAverage {
 float adapt;
 float avg;
 MomentumAverage(float adapt) {
  this.adapt = adapt;
  reset();
 }
 void note(float x) {
  if(x == Float.POSITIVE_INFINITY)
   return;
  else
   avg = (avg * (1 - adapt)) + (x * adapt);
 }
 void reset() {
  avg = 0;
 }
}
```

6.5 Processing environment

Figure 3 Capacitive control environment

Figure 3 shows the prototype designed in this paper in its operational mode and the Figure d shows the magnified image of the prototyped capacitive environment.

Figure 5 shows the prototype model of the virtual frame proposed in this paper.

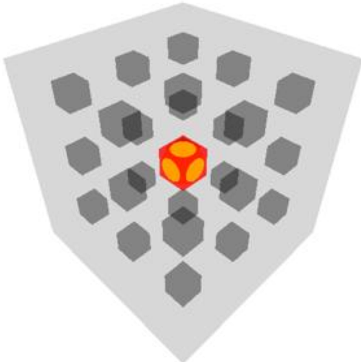

Figure 4 Prototype tracker

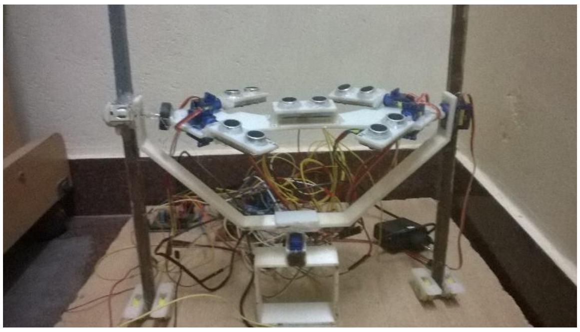

Figure 5 Virtual Frame Prototype

7. APPLICATIONS

7.1 Robotics Control operation

Since the setup tracks the entire hand with precision the robotic arm which has a same skeletal structure as human can be controlled easily by any user.

7.2 Physically Disabled Assistance

The voice environments' accuracy and the customisable property allows it to be controlled by any one which means the physically disabled who are not capable of operating a typical pc interface can access the full potential of the computer with ease.

7.3 Biomedical applications

As in [4] the enhanced form of this sensor can not only track the patient's activity but also can acquire the ECG signals of the patient.

7.4 Navigation guidance and automation

This project provides a seamless navigation guidance[8] and assistance to the user by interacting with them through voice feedback and auto drive mode when the user wants it.

8. RESULTS

The prototype of the sensor was proved to be useful in various applications, as the sensors accuracy was tested to be 95% in a confined environment which proves it to be more reliable.

9. COMPARISON

Table 1 Features Comparison

S.No	Features	Existing Technology	Proposed Model
1	Contactless Model	No	Yes
2	Monitor Bio Potentials while operating	No	Yes
3	Wide area coverage	No	Yes
4	Standalone Capability	Yes	Yes
5	Customisability	No	Yes

This features comparison table shows that the proposed model is much better than the existing technology in many ways.

10. CONCLUSION

We are only at the experimental stage of the prototype to unlock its full potential and accuracy further research and the more practical testing has to be carried out for its improvement and stability.

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