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IOT based Game Controlling Device(Joy Glove)

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***Abstract*—**Nowadays, there is a huge inclination of youngsters and adults towards video games and of course in our childhood everyone might definitely have experienced it. However, we are controlling the game using typical input devices such as mouse, keyboard, joystick, etc but how about, if we control the game using our hand gestures ? These days we have lots of game controllers that are surpassing the gaming experience however they are quite expensive too. Through this project we have designed our own game controlling glove using Arduino. In addition we have also developed a car game using UNITY 3D. The areas of IOT and hand gesture recognition will be explored by this project.

Keywords- *Internet of Things (IOT) , Unity 3D , Game controller, Hand gestures recognition*

I. INTRODUCTION

Gaming industry has witnessed significant growth over the years. Invention of cathode ray tube in 1940s have deployed the foundation of gaming industry. There was an era of arcade games and their growth began in mid 1960s. No sooner in coming decades we had 8 bits computer games came in market since then the growth of hardware for games raised year by year. Companies like microsoft, Sega, Westwood studio introduced many games like Solitaire, Sonic the Hedgehog, Dune etc. In min 90s Sony releases very first PlayStation and soon after few years released Playstation2 and became dominant in the business. Continuing in the business Microsoft took a lead by introducing Xbox 360 with high-definition realism to the game market, as well as even better multiplayer competitions on Xbox Live and popular titles such as Alan Wake. In addition, Intel and Nvidia released Graphic card which led huge business in 3D graphics based gaming platforms and improved the perception of gaming in the 2000s. The 2010s have completely changed the way of playing games by Virtual reality and augmented reality.

There is a hype, that Internet of Things is an independent technology. However, IoT is being enabled by the existence of other independent technologies which makes the fundamental component of IoT. *Hardware, Software, and Communication infrastructure* are the core fundamental components of IoT.
Hardware-Making the physical objects responsive and allows them to retreat the data and respond to the instructions accordingly.
Software-Allowing certain operation on data such as store the data, process, manipulate and instructing.
Communication Infrastructure-One of the most important component that consist of the protocols and technology which enable two physical objects to exchange the data.

As the speed of internet is increasing and the cost of computer devices are decreasing, it's resulting an integration of IoT in the gaming industry, moreover, the number of free video games also increasing. There is a considerable growth in gaming community throughout the globe due to production of game development and hardware.

Hand gesture controlling method is used to directly interact with the computer without any physical contact. Implementation of this method can be done via Gaming glove, 3D camera, Motion sensor etc. For instance, Kinect, it detects skeleton images of the user and track it's movement with the help of Depth camera and Motion sensor.

Unity is a game engine developed by Unity Technologies, in which we can make 2D as well as 3D games for various platforms. It provides support for two programming languages: C# and JavaScript. Arduino is an open source hardware and software to interface with different sensors and actuators. Arduino provides an IDE in which we can write programs in C and C++ language and upload them to Arduino board.

Input devices generates an input for the computer and so that computer can process it.
Such input devices are used for game controller for example Keyboard, Mouse, Joystick, Touchscreen etc. Our main intention is to design a cost friendly gaming controller for the game. We have developer our own car racing game in Unity 3D.

II. PROPOSED SYSTEM

We will try to construct a game controller using MPU 6050(accelerometer) sensor and 4x4 keyboard matrix in this proposed system. We will be able to control the game without any need of keypad or mouse or the idea proposed in existing system.

Building the game scene and interfacing sensors.

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Unity Game Engine can be used for building the game scene. Car prefab is used from the provided Unity Standard Assets as a user object of the game.
The device consists of the simple controller built up on embedded sensor MPU 6050(accelerometer) and 4x4 matrix keypad. Arduino is used as an interfacing device. Moreover, Unity engine also provide support to communicate serially with Arduino

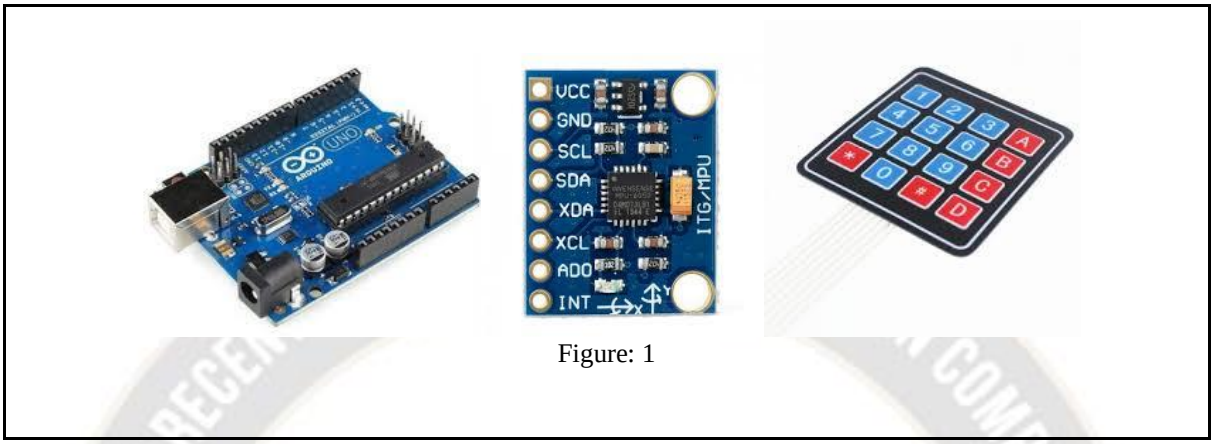

Figure: 1

MPU 6050 sensor will generate an input reading for all the axis: X,Y and Z. To run the car ahead and reverse, readings of X axis will be used however for turning the car in right or left direction reading of Y axis will be used. We have also integrated 4x4 matrix keypad which can be used to change the views of camera modes, we can set three different camera modes such as first person, far camera and normal camera.
We can scale and form the values to let them pass serially to Unity game engine from Arduino UNO.

How to use device:

- ➢ Move hand forward to move car in forward direction and move backward to move car in backward direction.
- ➢ Turn hand left to turn car left and turn right to turn car right.
- ➢ Press 1 from keypad for first person camera view, 2 for far camera view and 3 for normal camera view.

Setup for Device:

Software Requirements: Unity Game Engine and Arduino IDE
Hardware Requirements: Arduino Uno, MPU6050 Sensor, 4x4 Keypad Matrix, Connecting Wires and USB 2.0 cable
You can download the I2Cdev.h and MPU6050.h libraries online.
Connect Arduino with MPU6050 with Arduino and load "MPU6050_calibration.ino" and open serial monitor to set offset values for your MPU6050. Make sure MPU6050 is stable with no movement. You will get output as given below:

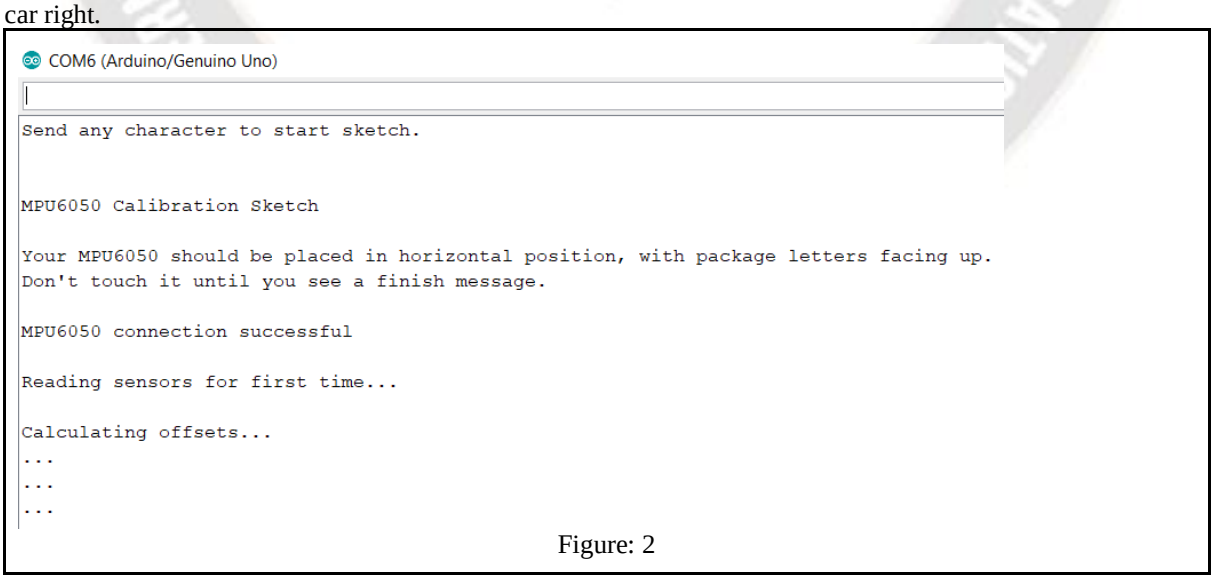

Figure: 2

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Once you obtain offsets value, input those values in "game_arduino.ino" as given in below figure. We need to set these offset values in the script as there is a requirement to stabilize these values in order to minimize fluctuation in the values.

```
void setup() {
  lastReport = millis();
    // join I2C bus (I2Cdev library doesn't do this automatically)
    #if I2CDEV_IMPLEMENTATION == I2CDEV_ARDUINO_WIRE
        Wire.begin();
    #elif I2CDEV_IMPLEMENTATION == I2CDEV_BUILTIN_FASTWIRE
        Fastwire::setup(400, true);
    #endif
    Serial.begin(9600);
    DEBUG_PRINTLN("Initializing I2C devices...");
    accelgyro.initialize();

    // supply your own gyro offsets here, scaled for min sensitivity
    accelgyro.setXGyroOffset(-850);
    accelgyro.setYGyroOffset(145);
    accelgyro.setZGyroOffset(1707);
    accelgyro.setXAccelOffset(8);
    accelgyro.setYAccelOffset(-11);
    accelgyro.setZAccelOffset(37);
```

Figure: 3

"game_arduino.ino" script will scale accelerometer values according to speed of car in unity and pass these values serially to game engine along with value obtained using 4x4 keypad matrix. Upload that script in Arduino.
Once values are available on Arduino serial monitor open the game scene in Unity game engine, change the port number and set baud rate to 9600 in "CarUserControl.cs" script which is associated with the movement of car prefab provided by Unity Standard Assets. You can find the game scene in Assets folder.

```
//Staring serial communication
SerialPort seri = new SerialPort("COM6", 9600);//define our port
private void Awake()
{
    // get the car controller
    seri.Open();//open our port
    StartCoroutine(ReadDataFromSerialPort());//start loop
    m_Car = GetComponent<CarController>();
    cameraControl = GetComponent<CameraMode>();
}
```

Figure: 4

Build the scene again and open the .exe file from the Build folder or choose the option of Build and Run to play the game.

III. CONCLUSION

During this implementation period, we concentrated on the process of integration of hardware and circuits and conversion along with development of controlling device for game. In future, we will try to revert back the process by providing more features of controlling and to give more accuracy and stability in our product.

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