



Interactive Video Gaming with Internet of Things

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Abstract. IoT enabled us to build environments that have potential to transform lifestyle of Humanity. Internet of things (IOT) a collection of networked interacting electronic devices provides the necessary infrastructure and enabling technologies to design and implement smart built environments. In this project it will be demonstrating a proof of concept by making a prototype of a system that can be controlled via game playing for enhancing the game playing experience. In this paper it will be discussing a different approach for video gaming which provides increased interactivity and can be available at a cheap price. In this paper it is focusing on how environments can dynamically interact with us as per the game play. This integration will be a different and more appealing approach for the entertainment industry. The idea came from observing the interactions of electronic items with internet. When we thought what would happen if we send instructions through game instead of sending the instructions manually. The prototype can be implemented with Open Cloud environment and a game engine. Data from game engine will be sent into Arduino.

Keywords: IoT · Arduino · Game engine · Open cloud

1 Introduction

As Internet of things begins to revolutionize with world we saw many projects and advancements being made daily [1]. People started building smart environments that can communicate with other devices via internet. Those are Automated street systems, Water meters, Motion capture systems and many more. Consider that player are playing a video game where we can ride vehicles, climb mountains, cross hot a volcano in each of the above mentioned scenario [2]. It have to different environment conditions that is if player riding a motor at a high speed in the real world [3]. Player can experience air blowing through our face and when player are on mountains it will experience a different climatic conditions

Now way days gaming industry plays a major role in the entertainment environment. An international video gaming industry charming is approximate to be \$81.5B in 2014. This is more than two times of the revenue of the international film industry in 2013. In 2015, it was estimated at US\$91.5 billion [4] and the demand for new features, new games and new experiences will always be high. Internet of things is a technology

that is allowing humans to communicate with environment [5, 6]. All the electronic gadgets are connected through Internet [6]. It is being used in many industries for the sake of automation and ease of life like; we can operate our electronic gadgets via internet. Some of the examples of using Internet of things in our daily life are switching on microwave when we start from the office, switching the air conditioner in our house when we are present in the office etc.

The most important component of the IOT industry is Relay [6]. The micro controllers like an Arduino, Raspberry Pi are not capable to handle high-powered circuits that are used to handle the house hold electronic items such as lights and fans so to mitigate with this situation Relay can be used [3]. Consider a situation where you have to control a fan from the cloud. The first step is to find the suitable micro controller. Then the next component which will be needed would be relay to handle the inefficiency of micro controllers in handling high electronic voltages. Another choice is the use of pre-made PCB board with all the circuitry and relays built on, including screw-down terminals for all connections.

In this project we are going to demonstrate a how we can use internet of things can be used in order to increase the effectiveness of video game playing. The paragraph underneath will give a brief of what we will be demonstrating in this project. In this paper demonstrating a workflow of how which can be utilized in video games for increasing interactivity.

2 Literature Survey

As we had some introduction about internet of things now we'll get a small introduction of video games and where we can implement Internet of things to enhance the gaming experience [4, 5]. Some of the places where we can implement IoT in video games are consider that we are driving a motor cycle in the video game. We will not experience any kind of air and vibrations [7]. We can develop smart fans and chairs that will enhance the game playing experience. If we are playing a horror video game then just imagine how amazing the experience would be when the lights in your gaming room glow according [8].

Research is being held in usage of Internet of things in video games for achieving cheap and better gaming experience in emerging startups and also in Huge Companies for instance Phillips is developing bulbs that can change their properties such as brightness and color to provide a beautiful gaming and cinematic experience [9]. Loop Fit is a product that is developed by loop reality a startup with a integration of virtual reality and internet of things. Loop fit is a product where we will be wearing a VR headset and cycling with a exercising cycle and even though we are stationary [10]. We will find ourselves moving in a virtual world some of the other features are we can connect to other friends online like an online multiplayer game [11].

Much advancement is being made in the field of internet of things [12]. It is making the interactions with environment possible as we can see many projects. It is involving in developing air conditioners, Microwave ovens, Lights that can be controlled with the help of WiFi and not only that facial recognition systems connected to each other to give a person's location etc. [12]. There is a development in gesture recognizing smart

environments that reacts based on our gestures such as weaving hands, clapping etc. [13]. Our proposed work is implemented based on a system that can be used to control environments with a cost efficient and home control environmental monitoring system.

3 Proposed Model

The proposed model requires a dedicated cloud that can interact with similar systems and offers the necessary communication protocols which are required to control and monitor the environment with more than just the switching functionality. The model can interact with different devices such as lights, fans, Cycle wheels etc.

3.1 Implementation for Proposed Model

A sample of how to design a proposed model. Consider a video game where the player can jump off from high ledges and ride motorcycles. When designing this video game we have to consider the all the possible states that the player can encounter we should create a data structure for storing speeds and the current action performed by the player. Consider the following flow chart for a very simple game. The velocity of the player is also stored in a separate variable (Fig. 1).

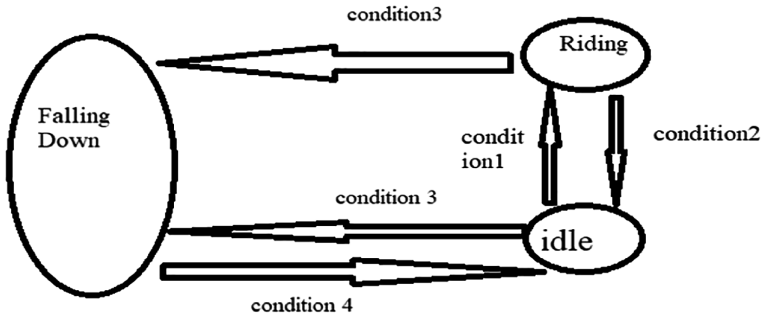


Fig. 1. A sample diagram representing the design of the proposed system

- Condition 1:** if(isRiding==true)
- Condition 2:** if(isRiding==false)
- Condition 3:** if(isfalling==true)
- Condition 4:** if(isfalling==false)

If any of the both Boolean variables are set to true then the fan will change its speed and that it emits to give a feel of interactivity.

3.2 Algorithm of Proposed Model

- (1) Receive data will be from the sensor.
- (2) Send the data into a public cloud.

- (3) Receive the data from cloud into Arduino.
- (4) Write the data on the game as input.
- (5) With the received inputs perform the actions specified in the game design document.
- (6) Send the some information in the form of variables to cloud.
- (7) Receive the data from cloud into Arduino.
- (8) Activate the Devices in the environment as per the data received.

The above all steps are consider as workflow of the proposed model is represented in Fig. 2.

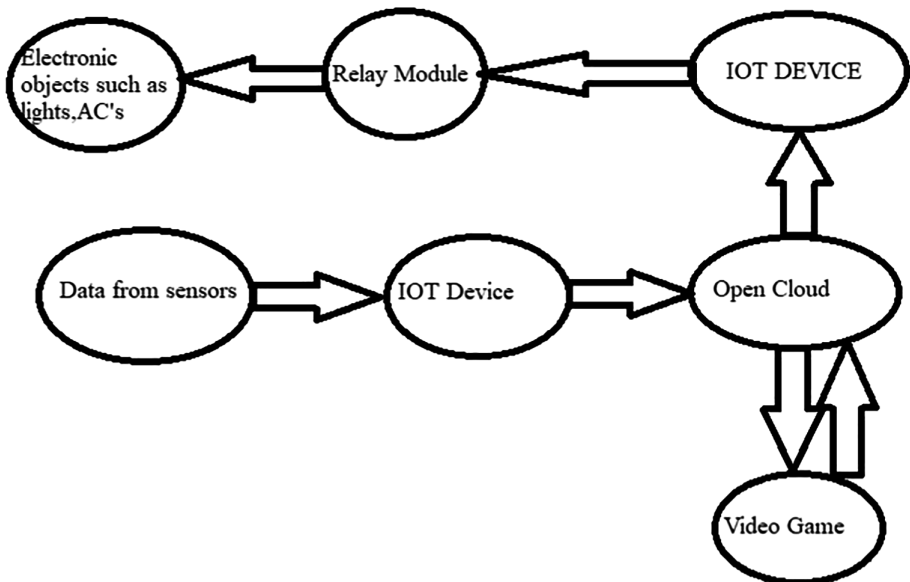


Fig. 2. Workflow of the model

3.3 Working Procedure of the Proposed Models

In Fig. 2 shows the work flow of the proposed model. In Fig. 3 shown the different components are require to implement the model. For implementing this kind of a system we need active internet connection, Arduino and ep8266 or raspberry pi, a public cloud that allows us to update and retrieve data with very low latency which will helps to provide seamless interaction. Each bulb First step is to create a database in one of the public clouds available. Now receive the data from all the sensors available and write the data into cloud database. Now from the cloud database read data the data into the game and as per the data read perform the specified operations mentioned. Another

way of environment interaction is getting the data from game and directly writing the data from the game into the cloud database and from cloud database the data should be read into the IoT device and with the help of relay module environment will be controlled as per the received data. A small example of how the environment will be controlled is considering a tube light whose power connection is controlled with Arduino and the power supply is provided as per the value of variables. If the data received from Arduino is false then the light will not get power supply else if the data received is true then light will receive power supply. Consider a light bulb which is to be interacted as per the data from video game let us see how to setup the environment this will be the block diagram of the implementation with Arduino.

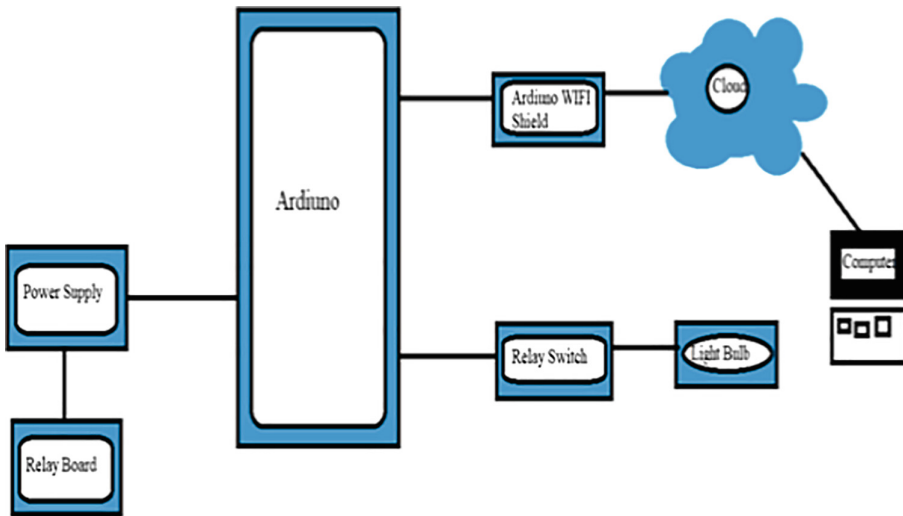


Fig. 3. Architecture of the proposed model

4 Experimental Results and Discussions

After following the above process and execution of the modules are presented. We took input from sensors via Arduino and gave it to a video game which acts as a proof of concept for using IoT in video games for increasing the interaction. In Fig. 4 demonstrate the position of the cube when it is outside the door in video game. Otherwise the LED bulb will glow when the cube didn't enter. It is shown in Fig. 5.

Here the cube is the player and input will be given via keyboard. An LED bulb connected to Arduino will be glowing.

In Fig. 6 shown, the cube is entering in to the door. Whenever the cube will enter the door the LED bulb stops working. This will demonstrate one of the models that we proposed in this project.

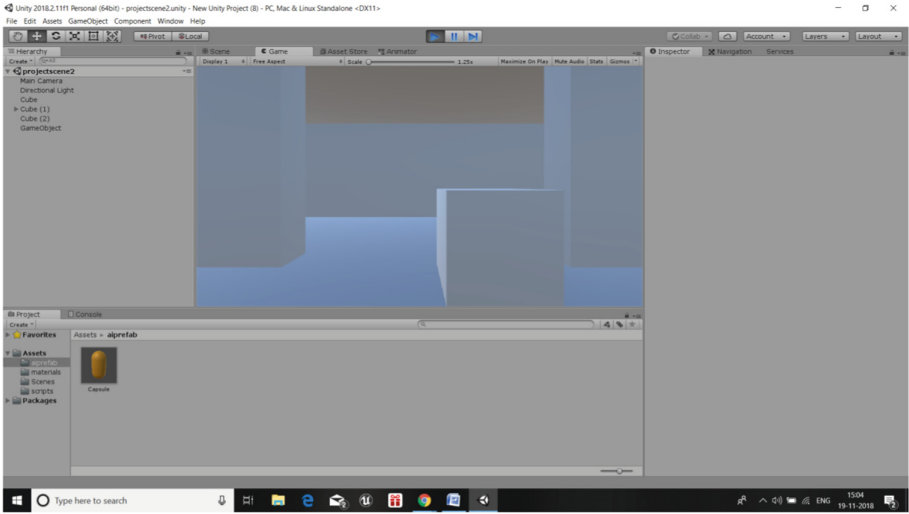


Fig. 4. Demonstrating the position of the cube when it is outside the door in video game

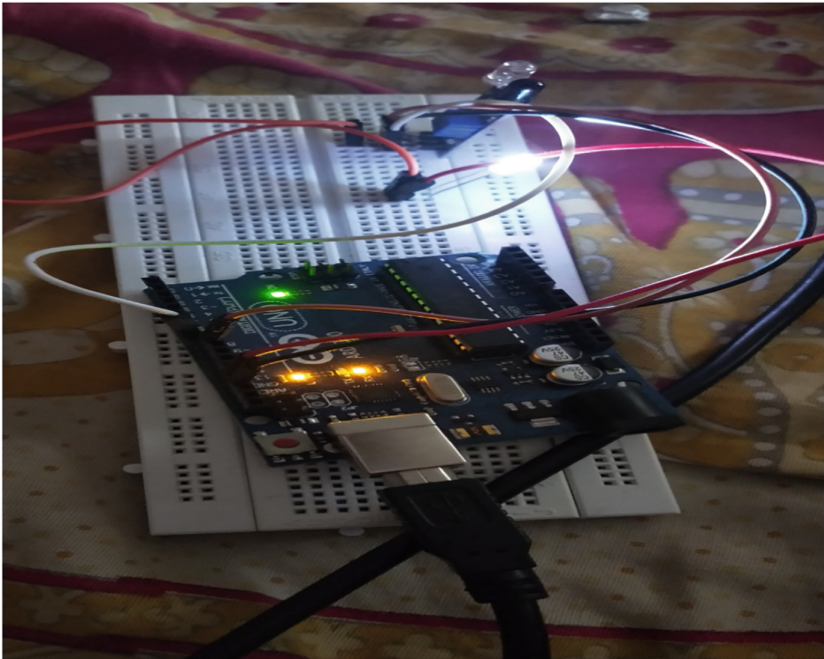


Fig. 5. LED bulb glowing when the cube didn't enter

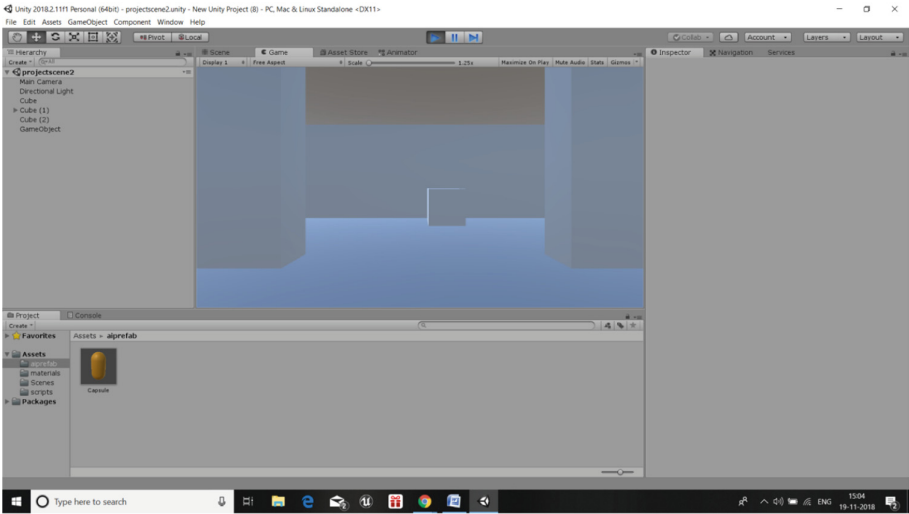


Fig. 6. Cube entering the door

In Fig. 7 shown an implementation of the first mentioned models prototype using open cloud. In this game it the cube should not touch the capsules. The cube should escape the capsules by jumping the cube will jump if the IR sensor detects an intrusion.



Fig. 7. LED bulb stopped glowing after the cube enters the door

This is the state of game when there is no obstacle with IR Sensor

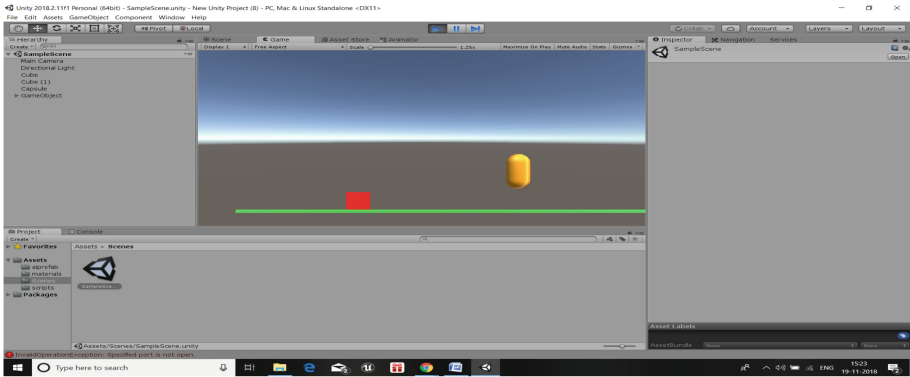


Fig. 8. Cube receives no input from IR Sensor

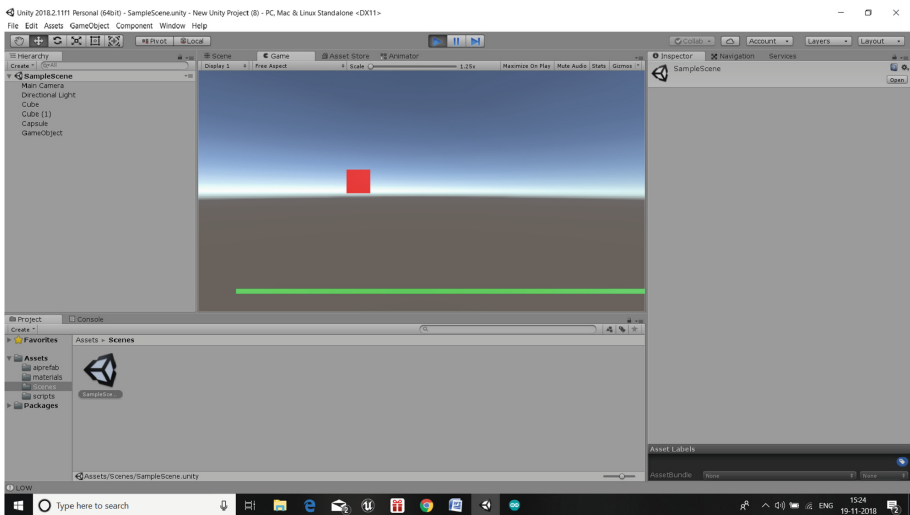


Fig. 9. When cube receives an input from IR Sensor

Discussions

Yet the proposed system is efficient there are some precautions that are to be taken in order to be taken in order to design this kind of systems. First thing to be kept while designing is that different sensors will have different latencies and time delays that are to be used to take inputs. As we have to give inputs from video game to Micro Controller if a same board is used for both input and output the rate at which the micro controller receives input will also have delay which causes the proposed system to give wrong effects at the wrong time. From Figs. 8 and 9, our design was a cube will receive input from Arduino with IR sensor and when the cube receives input it will move into a forward. When the cube enter the hallway a led which is in glowing state that is connected to the Arduino will turn off. For IR sensor we have to transmit on the data

with a minimum delay of 50 ms in order to receive the correct input in the above video game that is in Unity3d. But as we send data from Unity3d on the as the light should change its state within a fraction of second by the time Arduino reads data from the serial controller and process it there is at least a delay of 2–3 s. The most important thing to remember is that if complexity of the program that is embedded into the micro controller that give input the performance of the will decrease drastically.

Implementing such kind of system is complex and requires a huge support from the current gaming industry. Because this system has some minimum design requirements on how the electrical system of the house should be designed. It might take time for the existing gaming industry and to adapt to this new technology. When coming to the game experience this experience might be wonderful for experience while playing horror games. As the environments interact according to the variables in the cloud one should make sure that the security of that cloud is not compromised. For some features which require physical motions as input a small extra hardware attachment will do the trick.

5 Conclusion

The technology that is needed to implement the proposed system is already in hand. The main idea of this paper is to organizing the design pattern and strategies and features that might be existing system in providing interactivity in video games. Because of that the developers might find these techniques and strategies to be useful.

Future Enhancements

Once fully automated homes are implemented successfully then we can improve the above system by connecting our video games directly to the micro controller that provides power supply. The whole system can be automated reducing the effort of programming every time. We have to setup such kind of system. If Ipv6 is introduced it might eliminate the need of public cloud.

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