Introduction to Industry 4.0 and Industrial Internet of Things

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Lecture – 62
Student Projects – Part I

Everyone I am Saketh Kumar from Computer Science and Engineering Department with my project partner Narayan Kunal from Computer Science and Engineering Department. Today we are going to demonstrate home automation system using node MCUESP 8266. Basically our project aims at designing home automation system using node MCUESP 8266 and MQTT protocol. So, we have used node MCU which reads the data from MQTT client and decides the switching action of electrical appliances of home and we have used things picked out for data visualization and storage. We have used components which are node MCUESP 8266 four relay module ultrasonic sensor that is CSR04 and a power module.

We are using connectivity module which is Wi-Fi IEEE 802.11. We are using communication protocol MQTT and HTTP, we have used Arduino IDE for our coding purposes and the cloud platform is thingspeak and the language used is C and C ++; now, the pin connections ok.

Working of my project is as follows we have used MQTT broker. So, MQTT is based on publish subscribe models. So, as a broker we have used high MQ broker which we have installed on our laptop and for client we have used MQTT dash which is installed on our smart phone and node MCU is also working as MQTT client. So, now, MQTT client is of two types; one is publisher, one is subscriber. So, here n node MCU is working as a subscriber and MQTT dash is working as a publisher.

So, through mobile we will control our electrical appliances, from mobile we will send the data based on that data, node MCU will take the action. Means it will actuate the fan bulb whatever we it is connected through relay module. Now one more thing we have used; we have used ultrasonic sensor. So, ultrasonic sensor, we have used to simulate motion detection. So, whenever we go near the ultrasonic sensor, it will activate the bulb or it will deactivate the bulb.

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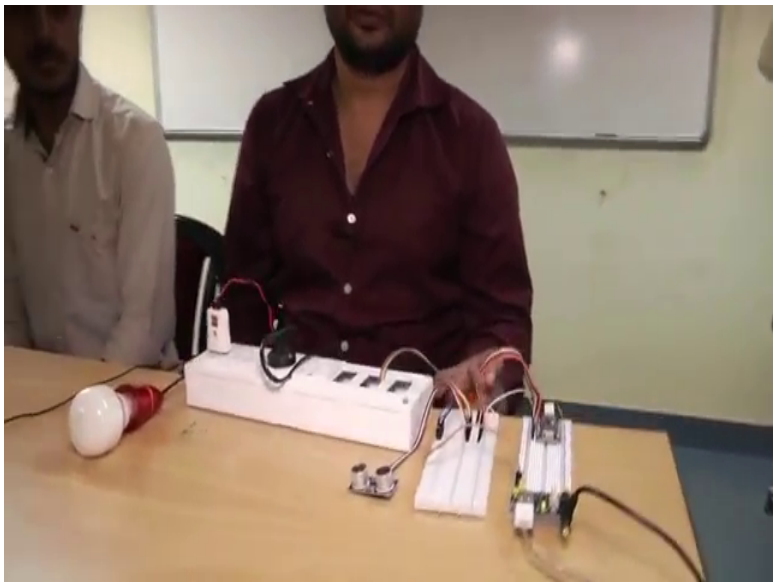

Now, I will give the demo about this project. So, this is our circuit diagram circuit of this project. So, this is node MCU and this is power module and this is ultrasonic sensor and here we have connected to relay module which is inside the board. Ok So, now, we will give the demo.

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So, and here we have MQTT dash which is MQTT client working as a publisher. So, in this one we have four port; relay module, relay 1 port, relate 2, relay 3, relay 4. So, when

we click on this one, it will send the data to a node MCU server, then node MCU server will take the action based on this data.

Now we are clicking this button click. So, here the bulb is glowing on and when we turn it off, it is getting off. Similarly we have simulated all the four ports of the relay which is relay three that will control the fan and when we switch it off, it will turned off. Similarly we have simulated LED bulb that is on the board and we turn it off ok.

Now, we have ultrasonic sensor; through ultrasonic sensor we have simulated motion detection. So, when we go closer between 5 centimetre to 50 centimetre, it will automatically turn on the bulb. So, now, I am going see now distance. Now distance is below 50 centimetre that is why it turned on. Now once again if I go there it will be turned off, see now it is turned off; so, whatever action is being taken by node MCU server that is being sent to thingspeak cloud. So, that data is here.

Hello everyone my name is Chandini Rai Chaudhary PhD research scholar of IIT, Kharagpur and department of CSE. So, I am going to demonstrate a project, the project is road surface monitoring detections and notifications. So, for this purpose I am using the node MCU and node MPU 6050 circuit.

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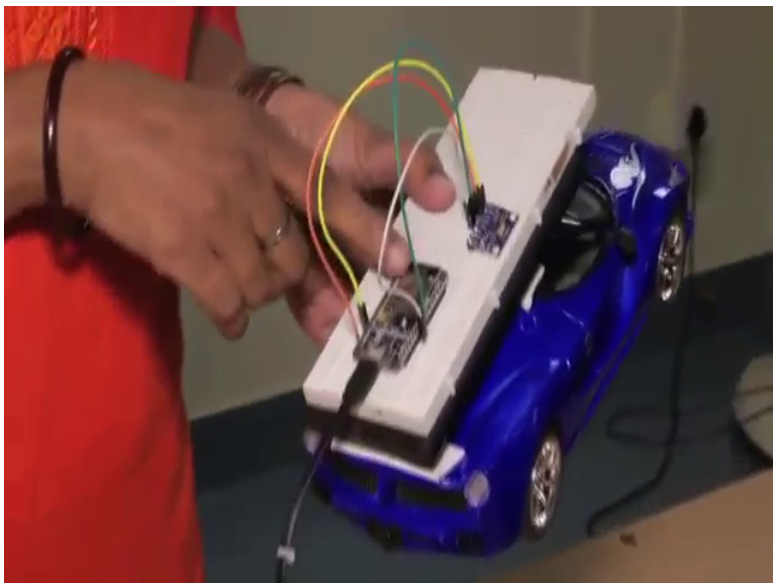

So, here the circuit consists of node MCU and this node MCU is connected with the MPU 6050 sensors. So, the basic things are that MPU 6050 sensor consists of

accelerometer, gyroscope and temperature sensor. So, these sensor detects the accelerations about the road surface and it send this data from the node MCU, from the node MCU these data is going to send one server.

So, in this case, my laptop is going to act as a server. So, here one Python code is running over here, apart from this I am using the MQTT protocol. So, MQTT basically acts on publish subscribe mechanism. So, here for publishing purpose, I am using the high MQ broker and there is another client is required over here.

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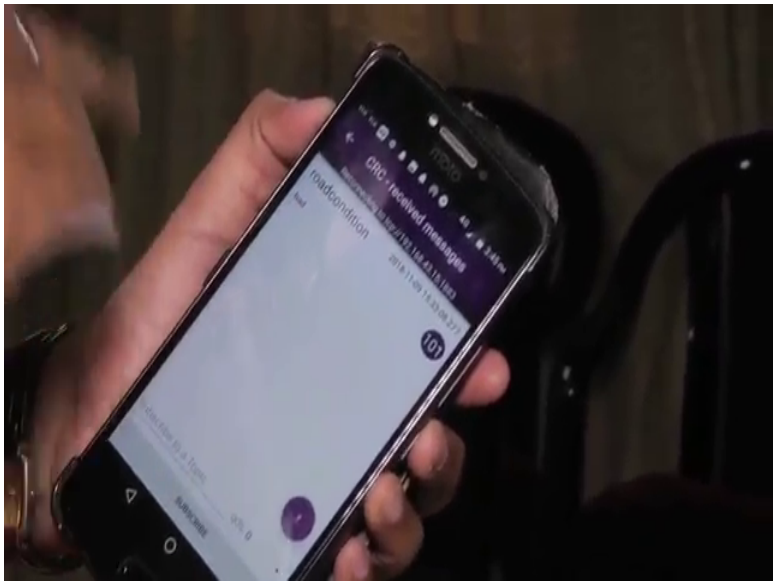

So, in my phone one client is here. So, that client is MQTT client. These client basically act and subscribe the informations about the road conditions. Say for examples, it is automatically displayed that is the road condition is bad, because it automatically subscribe about the topic road condition. So, it automatically gives the data.

So, this is the project about these things and the main purpose of this project is to aware about the road surfaces whether the road surface is bad or good and whether the road surface consists of potholes or bumps or not according to the notification is sent to the different address. So, that they can be also aware about the road service and accident also can be avoided in this way.

So, here I am going to demo of this project. So, basically thus the car which consists of this circuit; those car is moving and those car is simply acts gets the data about the road

surfaces. So, in this case the road surface totally smooth, there is no anomaly over here. So, for this purpose, the output will be shown as a smooth. But whenever this goes to there so, there is some anomalies over here. So, this will show the about the road service is bad and so on and the data will be transmitted into my server. So, for this purpose here, the server is simply whether the data road condition is smooth and bad.

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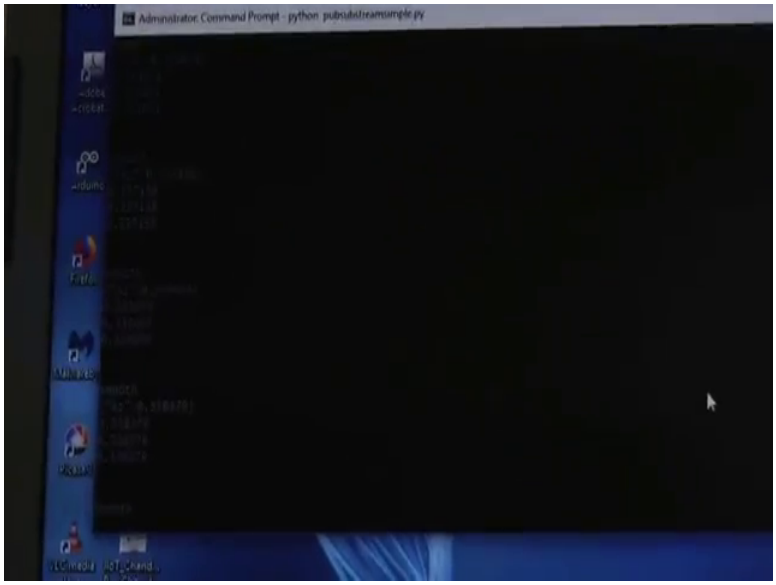

So, as there is no anomaly into the service. So, it simply shows road condition is smooth; that means, from these car the data is transmitted into the server here the high MQ broker is installed. And apart from the from these broker the data is given a data is going into this mobile phone because this mobile phone already subscribe the information and it is automatically showsthat the road conditions that was the smooth.

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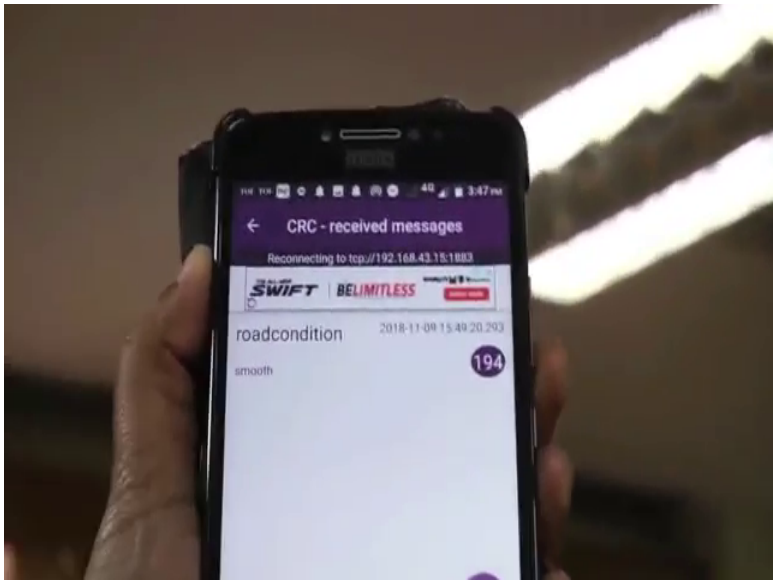

So, it shows and the number of messages which arrives over here that is 190 number of messages; that means, the data is automatically transmitted here.

Hello everyone I am Arun, this is Abbas. We both are from Department of Computer Science IIT, Kharagpur. Our project is a Smart Doorbell which is using the IoT technologies to improve the present day doorbells. The present day doorbells are sound notification system which will give a sound notification to the owner of the house if somebody is outside. And some advanced doorbell improve the functionality of a peephole which is already x which was already existing by showing the view of outside of the house by a CC TV camera or something.

So, we are using IOT technologies to improve this technologies by. There are mainly actually three features that we will we have included in this project. First one is if somebody clicks a doorbell even though the owner of the house is not present at house, our system can inform the owner on a smart phone through IoT technologies.

The second feature is even though if somebody is roaming around your house and not clicking the bell, we have a distance sensor to sense the presence of a person nearby. In that case also, we click an image and send to the owner whoever and I mean wherever he is in the world. And the third feature is if the owner wants to see what is going on near nearby his house, he can click an image from a remote place. Through IoT technologies, we can send that image from our doorbell to the owners smart phone.

So, for this we are using mainly Wi-Fi, MQTT and the rest protocol the coding and software pattern done in the Python language.

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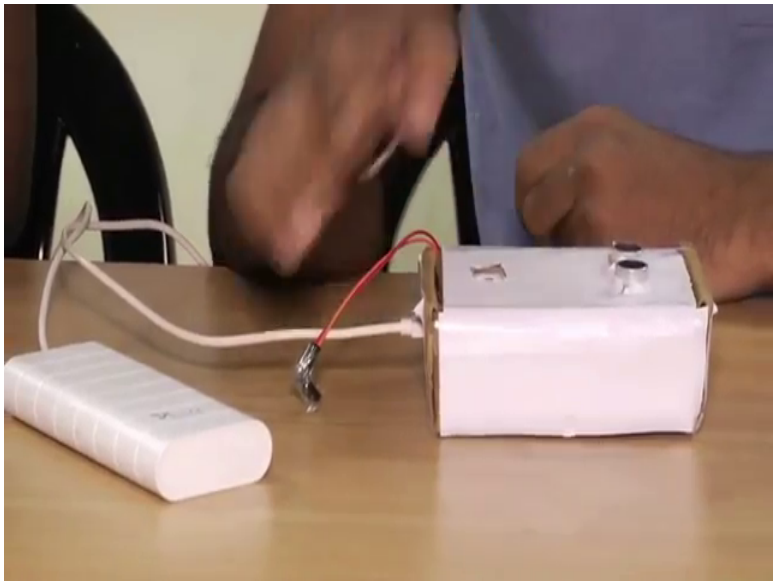

So, this is the product. It has a Raspberry Pi Zero or camera which is fit inside you can see this one and it has a distance sensor and the button. So, the button is put inside to simulate a bell, the distance sensor is for observing if someone is wandering around and there is a camera for clicking an image. The basic architecture of the; the basic architecture of the project is that there is a Raspberry Pi inside or camera is connected to it of 5 megapixel camera and using the GPI o pins, we have connected the distance sensor and a button. Also there is another server which is running up or which is running on a different machine which is a rest API server.

Now, what happens is there is (Refer Time: 10:17) is a MQTT broker on the Raspberry Pi. It is created using the mosquito, it is a Linux package. So, using mosquito, we have created a MQTT broker. Now whenever some event is happening like pressing a bell or distance sensor checking if someone is there or not. And even if someone is trying to check remotely if there is a presence of some person inside in front of the house. So, in that case a MQTT event is published on a topic, there is an android app MQTT dash so, using that we can check. So, if you press the button, it publishes an MQTT message which reaches the broker on the Raspberry Pi. The Raspberry Pi instructs the camera to click an image, the clicked image is then sent to the rest API server which is on a

different machine. There the image processing takes place. Now the image processing part is done using the openCV library and using the scikit-learn, we have created the HCM classifier for it. That deep it is a deep neural network torch in a framework named torch which is being used for the facial recognition.

We have a database of known faces. So, we can create different folders for different people like for example, you can use the family members faces, you can store them and learn the classifier; HCM classifier for those faces. After that what happens is the rest API server processes the faces and checks whether some known person is found from the database. If it is yes, then its fine; if some unknown face is found, then it has to trigger an event to the owner of the house that someone is trying to visit, someone either someone is visiting you or there is an intrusion. In both cases, it sends a notification on the android app where MQTT dash which is installed on the phone.

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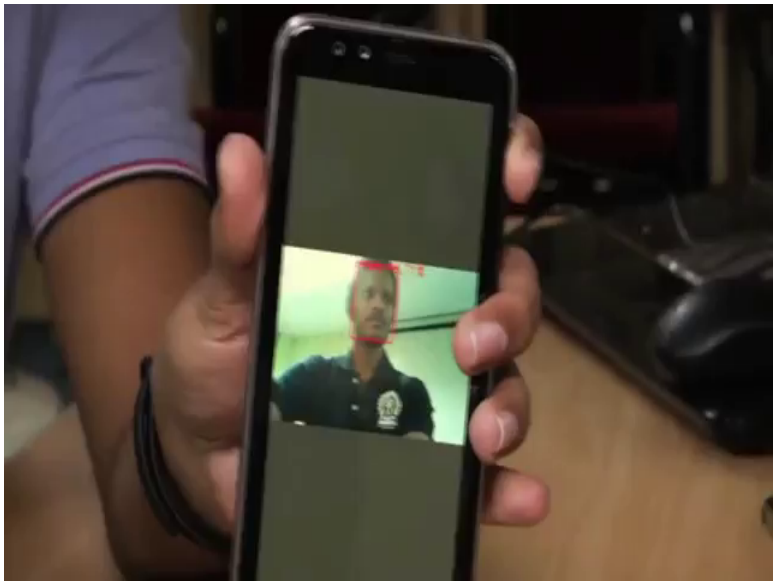

This is the android app from here you can monitor your doorbell using the remote click. So, if you click on this place, the pi will click a image. So, this is the camera (Refer Time: 12:21) and it will come in this part. So, if I zoom it so, you can see that it has been identified as Arun. Yeah So, it published the image, it published the image and sent it to the server. After the server recognized it, it send back to this client app. So, you can monitor whoever in front of your house. Similarly you can; this will work with the button and the distance sensor.

Thank you.