Embedded System Design with ARM
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Lecture – 41
Experiment with Gas Sensor

Welcome to lecture 41. In this lecture, we will be showing you another experiment with a sensor which is a gas sensor ok. So, in this experiment, what we will do is that we will again read the sensor values in this case the sensor is the gas sensor. And depending on that an alarm system will be activated this is a simple experiment that we can do. But you can think of doing many more application on many more experiment with the various sensors that we have discussed in this course, so roughly we have come to the end of the course and this will be the final experiment with sensor. So, let me move on.

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Firstly, I will show you how I will be interfacing the MQ2 gas sensor to the STM32 board, and then I will demonstrate the experiment.

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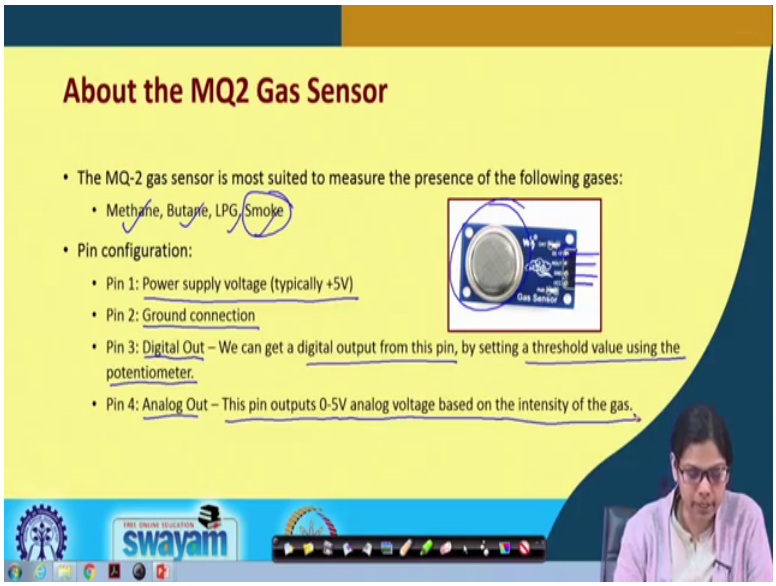

Firstly about the MQ2 gas sensor it looks like somewhat like this ok. And you can see there is a V cc, ground, analog out and a digital out. So, MQ2 gas sensor is most suited to measure the presence of the following gases. It can detect gas like methane, butane, LPG or smoke. When we say a gas sensor generally it could be any gas sensor which could be kept in a kitchen or in any room as well. So, we are mostly concerned with the smoke that we will be sensing through this particular sensor, although it could sense many other kind of gas as well.

So, the pin configuration goes like this. The first pin is the power supply voltage which is typically 5 volt that is V CC, then the ground connection. Then there is a digital out pin. In this digital output pin, this is the digital out pin we can get a digital value from this pin basically and by setting the threshold value using the potentiometer. We have already seen the use of potentiometer in LCD display as well. So, here also if you want to use the this digital out value, this digital value, then we have to use the potentiometer to adjust this threshold value and then the analog output. The analog out pin we are mostly concerned with. So, this pin outputs 0 to 5 volt analog based on the intensity of the gas sensor which will be connected to analog port which internally will give some digital value to us ok. So, these are the following pins of this MQ2 gas sensor.

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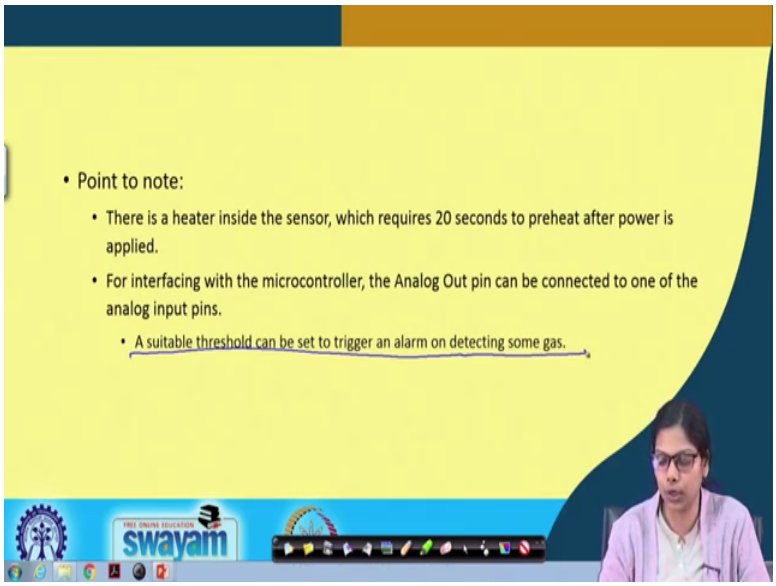

There are certain points to be noted here that in that MQ2 gas sensor there is a heater inside the sensor. And it requires some time to preheat after the power is applied. So, when we start the system, it might require some time to initiate or to preheat the particular sensor, so that it can work accordingly. For interfacing with the microcontroller, the analog out pin can be connected to one of the analog input pins, so that we have already done for most of the experiment we have connected the analog port of any of those sensor or the signal output port of any of those sensor to the analog input port of the microcontroller. The same way we will be doing that.

And a suitable threshold can be said to trigger the alarm on detecting some gas. Now, this is something you have to think upon like at what level you want to generally sense want your system to get activated either it be an alarm system or you can connect a GSM that will directly send a message to fire brigade ok. So, it depends on that particular condition. But generally the level of the smoke you can understand, you have to again calibrate, you have to do something such that smoke get generated and then you have to see that what value you are receiving through cool down and accordingly you write your program. So, for that reason this is very important. A suitable threshold can be set to trigger an alarm on detecting some gas.

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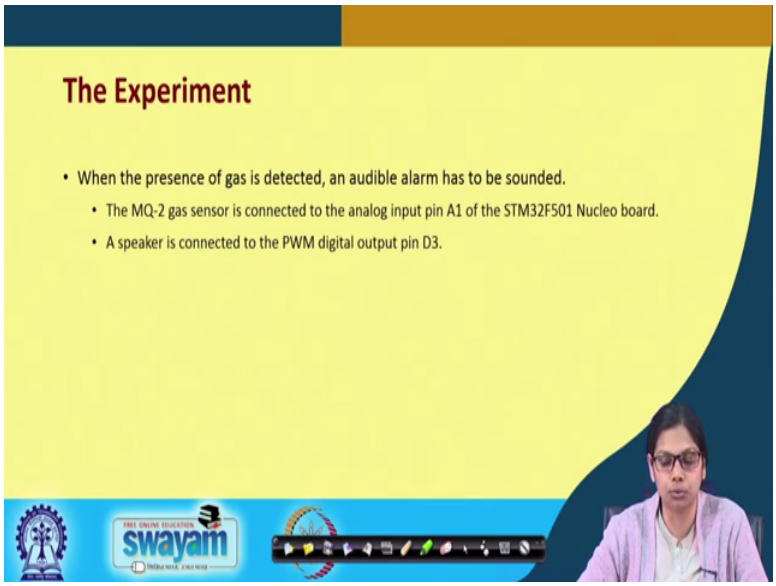

So, in this experiment what we will be doing when there is a presence of gas, then an audible alarm will be activated ok. So, the MQ2 gas sensor is connected to the analog input pin A 1 of STM board and a speaker is connected to the PWM output pin D3. There are other PWM output pin as well, but we have connected it to PWM digital output pin D 3.

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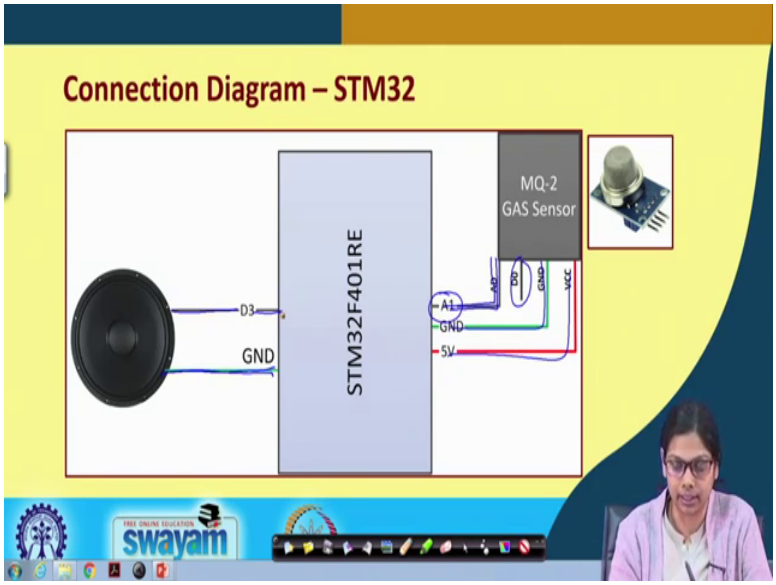

So, this is about the experiment. Let us move on. So, this is the connection diagram which is fairly straightforward. So, if you see this analog, we are not concerned about the

digital pin, we are connecting the analog out to A 1, then this ground is connected, V CC is connected. And then with the speaker the alarm system when it will get activated depending on the percentage of gas present in the in a room we use this D 3 pin ok. So, this is the simple connection diagram that is required.

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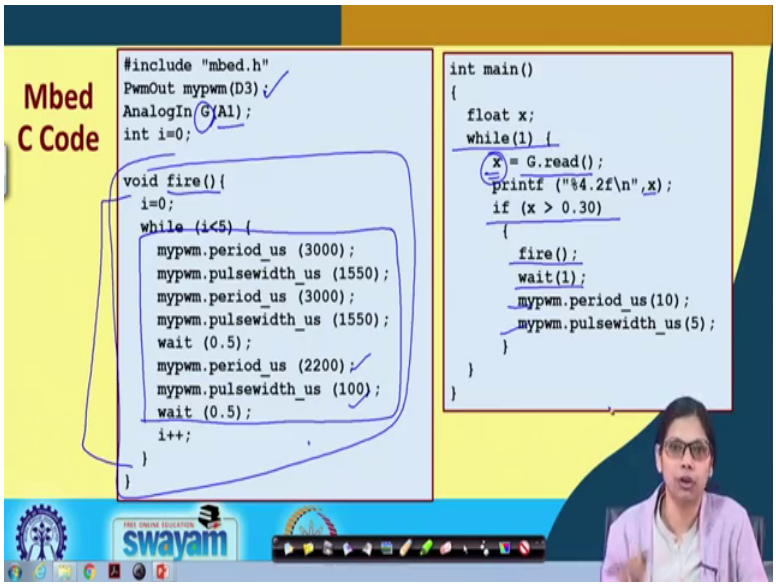

Now, let us look into the PWM the Mbed C code basically where recall what we have done to generate a siren like sound. We have written this particular code. My PWM dot period underscore in microsecond 3000 and the pulse width 1550 and again 3000 and 1550, and wait for some time and again we are doing 2200 and pulse width of 100. So, basically if you see this void fire, so fire is a function that we have written and this particular function is very similar to what we were doing for the speaker generating a siren like sound through speakers ok. This is what you have to do.

Prior to that these are again straightforward thing this is PWM out my PWM is for connecting with the speaker and analog in G that is the gas sensor name we are giving G we are connecting it to analog port A 1. So, this is all about this connection and this part of the code is for the fire alarm. Now, in the main function, what we need to do is that while one that means, this will be repeated we are reading the value of the sensor that we are doing for most of the code.

Here we are doing we are writing G dot read is x. And at this point what I expect you to do you use some kind of serial communication method like (Refer Time: 08:57) so to

display this value what value it is you are getting when there is no smoke, what value you are getting when there is little smoke, what value you are getting where there is full smoke ok. So, you have to understand it that you need to do this calibration for your program ok. So, this is printer we are printing it out. We have seen if the value is greater than 0.30, then we are calling this allow alarm system. We wait for 1 second and we again set some period and this goes on. If it is again greater than 30, the 0.30, again the alarm system will be put on ok. So, this is a sample code that we have written for the inter for interfacing gas sensor along with the alarm system that is using the speaker.

So, we have come to the end of lecture 41. And this actually ends formally the experiments that we have shown you in this particular course. So, now I will be showing you how I will actually demonstrate you the interfacing part with the gas sensor which I have talked about just now.

In this experiment, I will be connecting a smoke sensor along with STM board. And what the smoke sensor will do whenever there is a smoke, whenever it senses smoke in the surrounding, it will actually alarm, it will make an alarm, you can make anything you can alarm you can make an alarm. In this experiment I will be showing it using the speaker that we have already interfaced. But you can also do something like this whenever smoke is sensed and SMS should go to the fire brigade ok. So, some kind of interfacing also you can do. In that interfacing what you have to do apart from connecting this gas sensor, you also will be requiring a GSM board. So, what the GSM board will be doing, whenever a smoke is detected any time it will send an SMS alert to the fire brigade ok.

So, we can do many possible thing, but here what we are doing essentially is will be interfacing this smoke sensor. And whenever there is a smoke inside this room specifically it should sense a the smoke should come close to that sensor that is also one criteria, then the speaker will make a siren kind of sound ok. So, let us see how do I interface this gas sensor along with the speaker and with a STM board.

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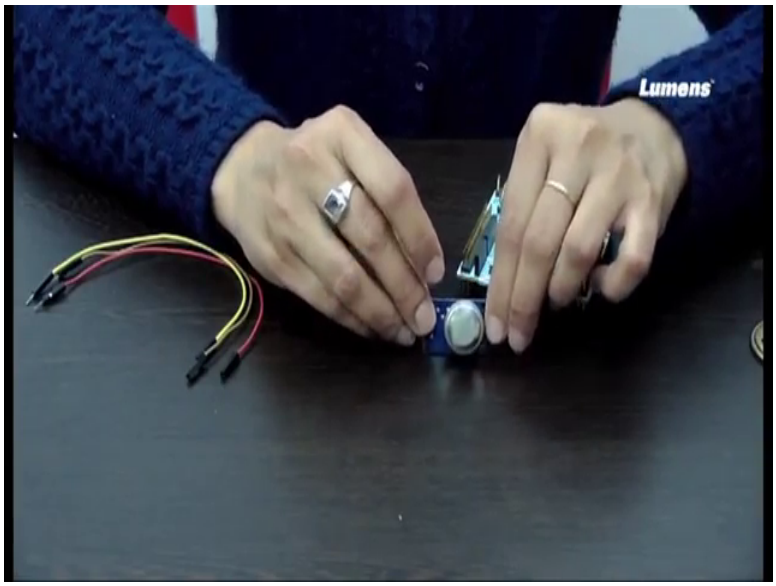

So, this is the gas sensor ok.

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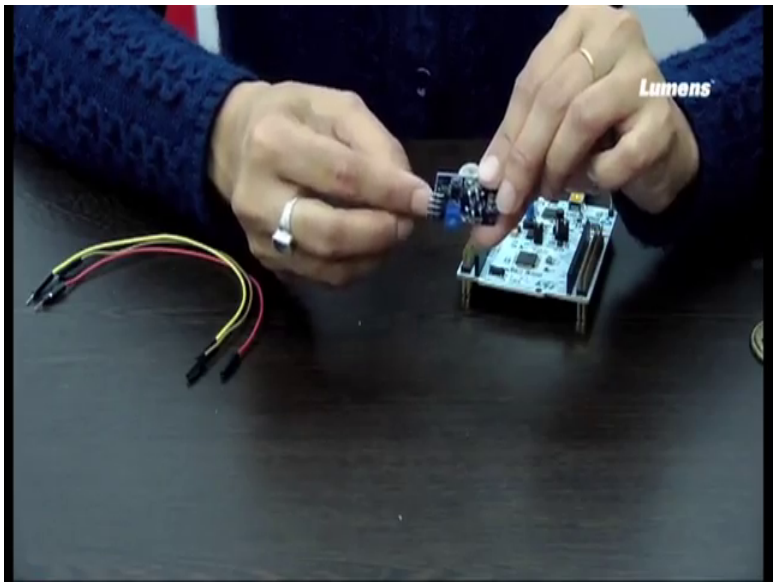

This is the gas sensor that we will be using. You can see there are four pins that are connected ok. So, what are those pins? One is AD; another is DD, another is your ground and another is your BCC ok. These are the four pins. So, I will be connecting the ground the BCC and I will be taking the analog output ok. So, I am not concerned about the digital output, I am concerned more about the analog output. So, I will be taking the

analog output and I will be connecting it to pin a 1 of my STM board pin a 1 of my STM board the board which I will be using ok.

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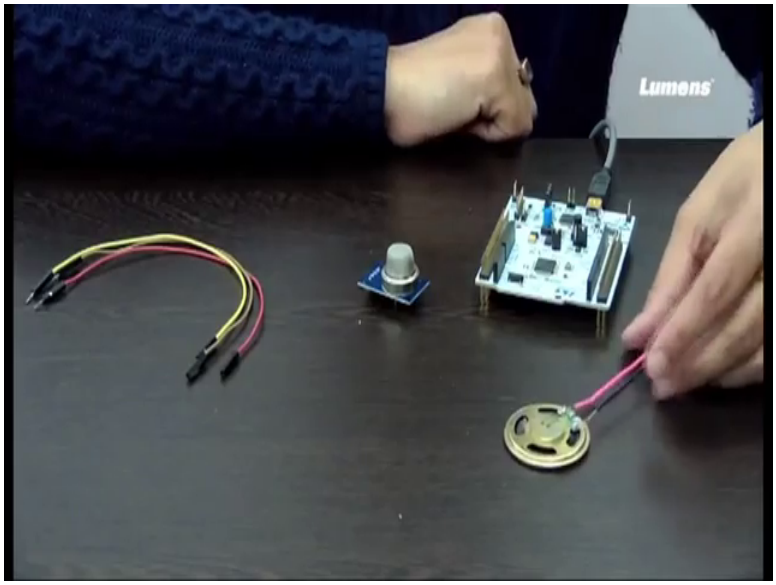

So, this connection I will make and this is the speaker the speaker I will be connecting one to ground and another to one of the PWM port. In this case we have used D 3 port as the PWM port ok. So, let us first make the connection.

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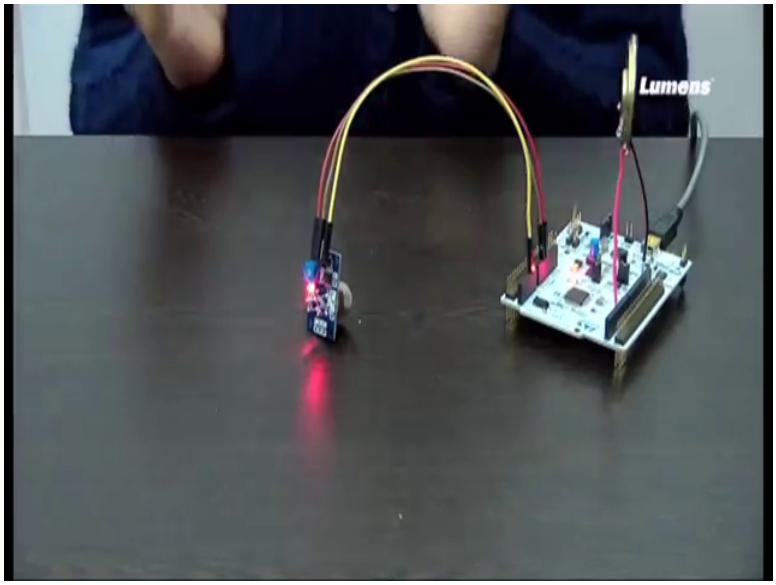

So, first one is BCC. The next one is ground, next one is ground and then the last one is that analog which I will be connecting with the a 1 pin of STM ok. This is a simple

connection with the sensor with the smoke sensor that I have done. Now, I will be connecting this speaker with D 3 and one with ground which is the fourth pin from this side ok. So, this is all about the connection that we have made ok. The code I have already discussed with you. So, I will now dump the code the code is already dumped.

Now, I will use a matchstick. I will just blow this matchstick and use the smoke of this after it is off ok. So, just a second I have to. So, whenever it senses the smoke, the siren will be on for sometime ok. So, I will just repeat this once more. So, it should receive a good amount of smoke, then only it will sense and that is also true that see it is working ok.

So, the connection is fairly simple. We have connected the smoke sensor. We have integrated with just with the speaker, but we can do it with any other thing. And in an home automation system, you can always have for security purpose, this smoke sensor integrated in your ok. So, this is all about the experiment with the smoke sensor. We will move on and we will see that what all experiments we can do next.

Thank you.