Embedded System Design with ARM
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Lecture – 29
Experiment with Microphone

Welcome to lecture 29. In this lecture I will be showing you Experiment with Microphone. So, we know how what a microphone does. So, I will be showing you the experiment, how do we interface this microphone along with the STM board and I will show you two experiment. In one experiment it will display the number of claps and if we clap in one experiment so, it will it senses some sound if it senses that it will glow the LED for some time ok. So, let us look into it.

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So, in this lecture I will be discussing about microphone interfacing and some experiments using microphone and finally, I will demonstrate ok.

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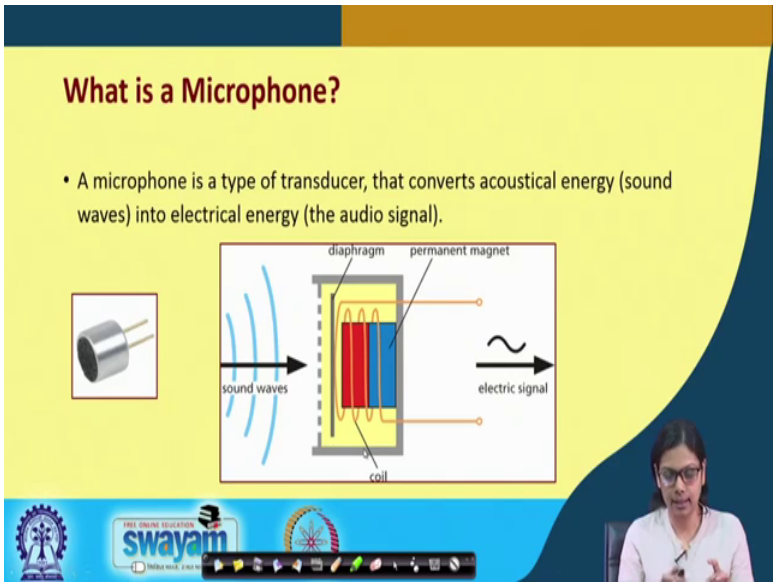

What is a microphone? So, it is a type of transducer that converts acoustical energy that is the sound waves into electrical energy that is the audible signal ok. We see here there is a sound waves coming and there is a diagram here and a permanent magnet. So, some operation happens here and there is of course, a coil and these sound waves actually generate some kind of electrical signal here.

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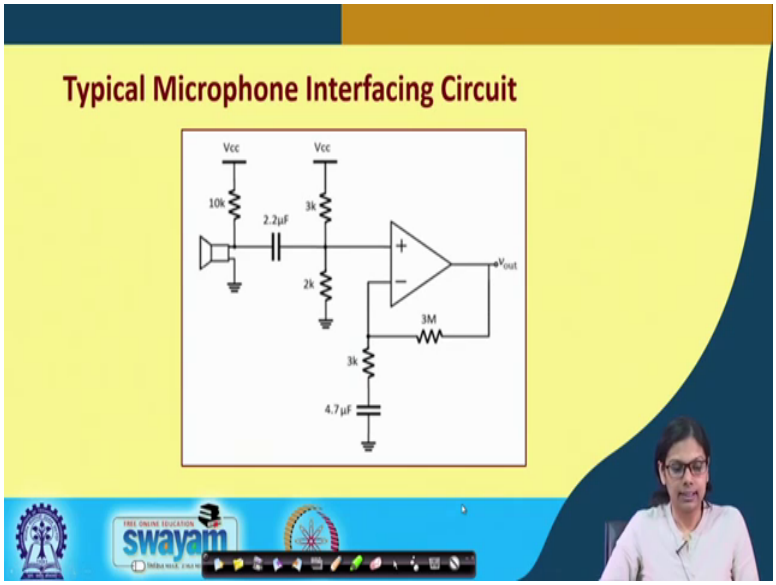

This is the typical microphone interfacing circuit. If you see this you have a number of connection here with some resistance with ground and all other things, but what

generally is done is that the whole set of interfacing that is displayed here is for the ease of interfacing is actually put up inside this particular chip and we can use this particular chip for interfacing.

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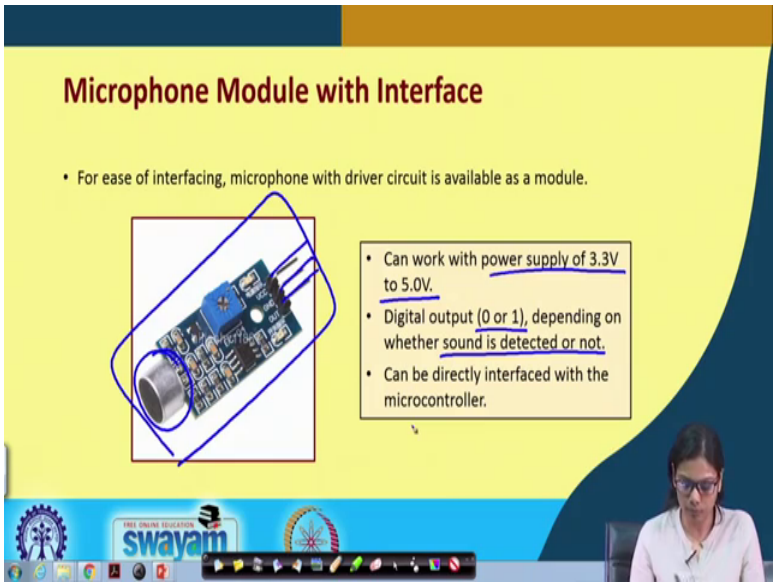

So, this is the microphone, if you use this single microphone you have to connect it with the circuit as I have shown you in the previous slide for the connection. But if you use this particular microphone it comes with driver circuit as a, but as a whole module and there is a BCC ground and an output pin, which is available that through which we will be connecting. So, it can work with power supply of 3.3 volt to 5 volt and the digital output it is 0 or 1 depending on whether the sound is detected or not, and we can directly interface with the microcontroller here we can directly connect it to the microcontroller or we can also use it through analog pin as well.

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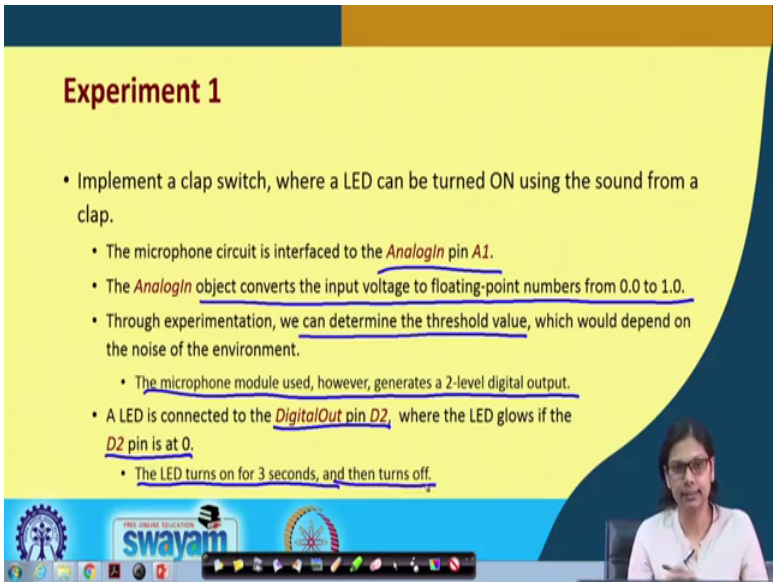

Soon I will directly come to the experiment because the connection is fairly straightforward here. First thing that I will be implementing is implement a clap switch where an LED can be turned on using the sound from a clap. So, here the microphone circuit is first interfaced with analog pin A1, this analog in object converts the input voltage to a floating point number between 0 and 1, we have already seen that and through experimentation we can determine this threshold value when you clap what value you get. So, the same thing you can see we can we have tested using cool term ok.

Which would depend on the noise of the environment of course, the microphone module used; however, generated two level digital output here. An LED is connected to the digital out pin D2 where the LED will glow if D2 pin is at 0 and whenever it detects that sound through clap, that we make it will make the LED turn on for 3 seconds and then it is turned off ok. So, this is all about this experiment.

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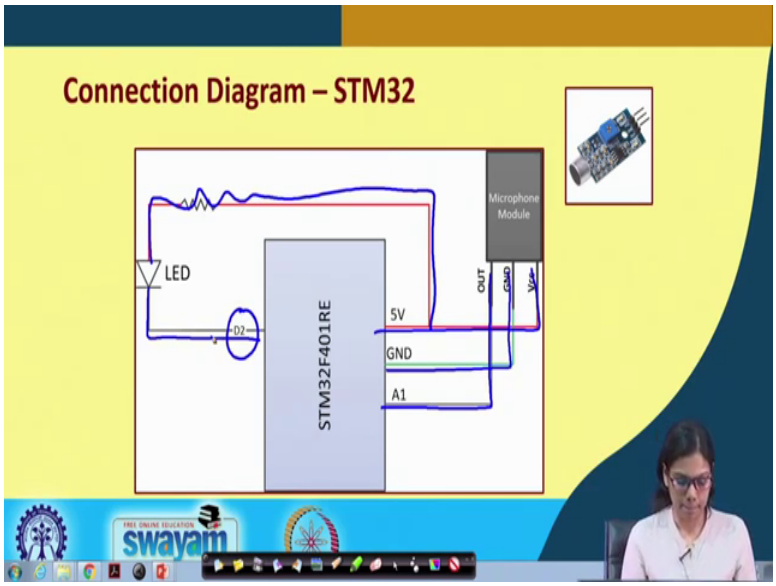

This is the connection diagram. So, this out is connected with the analog pin A1 this ground is connected to the ground and this is connected to the 5 volt and this LED the anode is connected through a resistance to BCC and the cathode is connected to pin D2 this is all about the connection.

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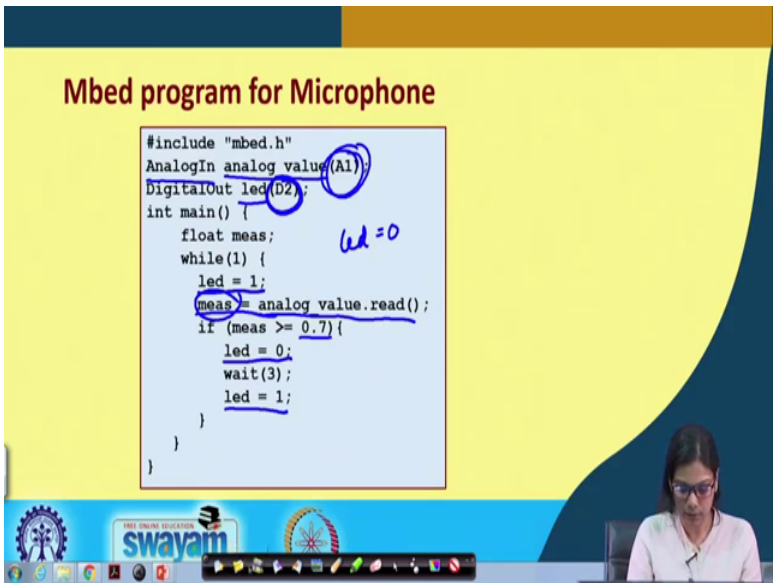

This is the program that is basically used here analog in we have given the name analog underscore value this is the A1 value this is the digital out we call it LED, which is connected to D2. And in the main program in the while loop initially we are sending

LED value 1; LED will glow when LED equals to 0, but we are making initially LED value of and then we read this value this analog value analog underscore value dot read from port A1 and which is stored in meas. We have seen that this is what is again the calibration we have seen that, when we clap then the value that we receive is greater than or equal to 0.7 ok.

So, if it is that then meas is greater than equals to 0.7 then we are making LED equals to 0, we wait for 3 seconds and then we make the LED off again by making LED equals to 1, which is connected to port D2. This is all about the good that we are doing for connecting for lighting the LED on through a clap will see in the interfacing experiment how it is done.

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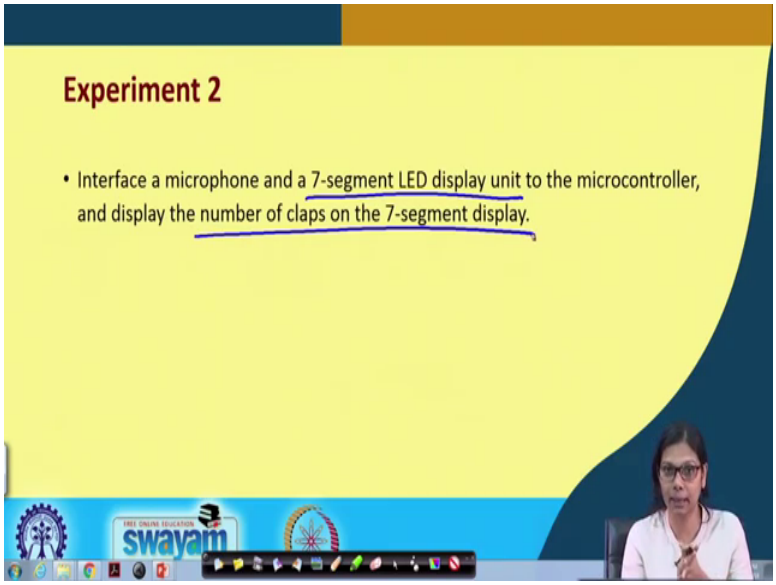

Next the next experiment is we interface this microphone and a 7 segment display which we already have seen to the microcontroller and display the number of claps on the 7 segment display ok. So, whenever I make a clap the LED the 7 segment value will get incremented and when it reaches 9 again the same way it will turn back to 0 again. So, it whenever we make number of claps it will go on incrementing the value detects the clap sound and it displays in the 7 segment LED.

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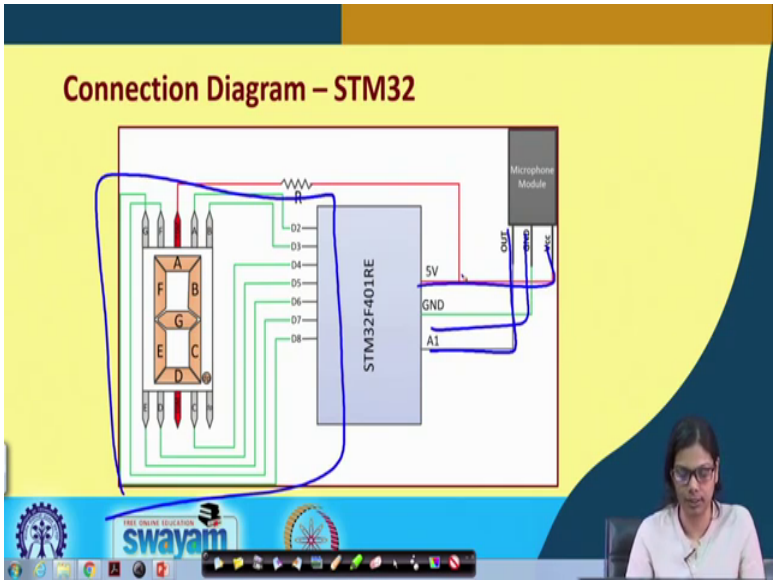

Let us now see the circuit diagram. This is the circuit diagram, the circuit diagram of this part is clear here this microphone module is again connected out to A1 this is to ground, this is to BCC and this is a common anode which is connected through this resistance to 5 volt. So, this is all about the connection.

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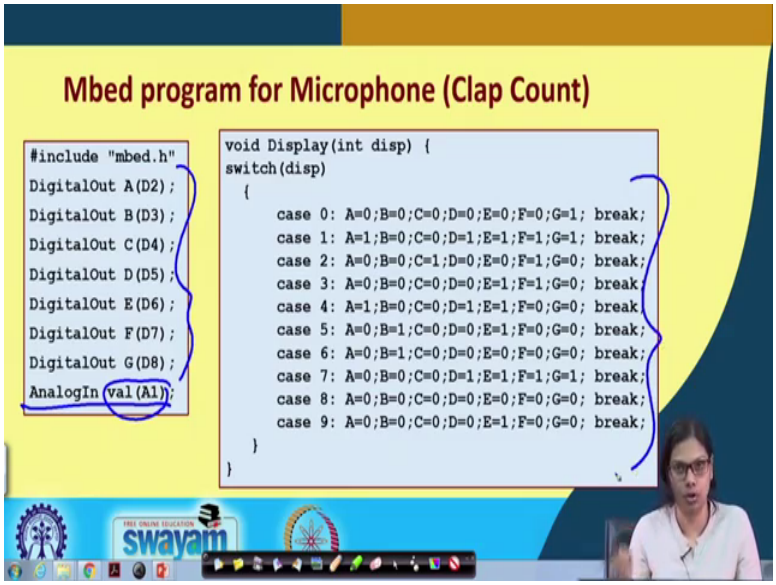

Now, this is the code this code I am not discussing which is straightforward code what I will discuss here is this one analog in val that we have taken is A1. And this is the connection for the 7 segment which we already know this is also the part of the code which we are have already discussed.

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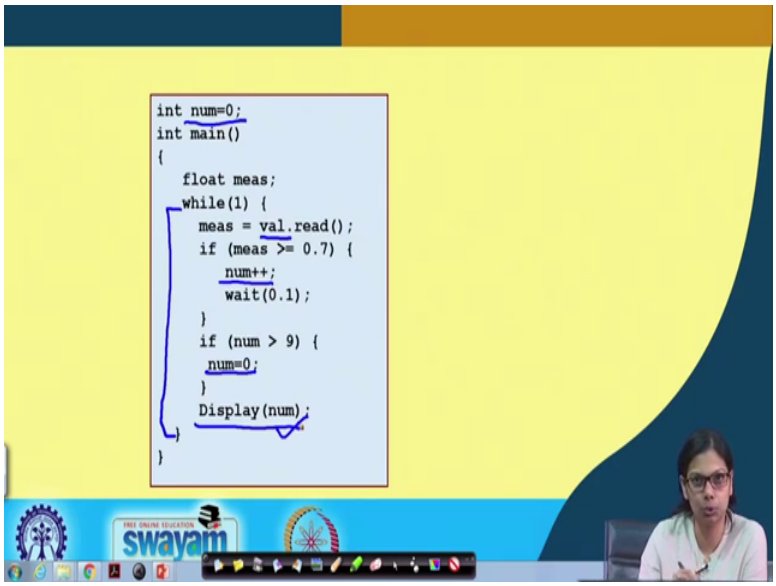

Now, look into this code in the main what we are doing in this while 1 we read the well through port A1, if the value is greater than equals to 0.7 it that we have initialized num which gets incremented. We wait for 0.1 second and then we again then I mean this while loop ends here so, after this incrementing we wait.

If the num becomes 9 greater than 9 then num means me to 0 otherwise, we display the num ok. So, each time the num gets incremented it is also getting displayed using the 7 segment display ok. So, this is all about the two codes that are there with the microphone that we have performed. Now we will move on and we will show you the interfacing experiment that is there basically with the two codes ok.

So, now today I will be showing you the experiment using the microphone. Using the microphone what experiment I will be showing I have already discussed what is the experiment? The experiment is that when you make a clap depending on that an LED will glow ok. So, this microphone will be sensing some physical parameters that is sound in terms of some voltage or whatever inside the circuit it has got and then it will do what it has got certain pins that will give you some analog value.

It will be connected to the analog port and using those analog port internally it can get converts and do get converted into some digital value and that digital value you have to read. So, prior doing this as I have already shown you this using a software that is cool to what you have to do? You have to first check that when there is no sound what value you

are receiving and when there is a sound what value you are deceiving ok? So, depending on that it will work again there will be some noise in the environment etcetera that also you have to take care accordingly you will get the value.

So, I will now show you the experiment using this microphone and with along with STM board let us see how the circuit works ok.

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So, this is the microphone ok. So, this entire thing is the circuit this itself is the microphone you can actually have this microphone with you and then if you know how to make the circuit you can make it and then you can have your own circuit with this single microphone. But sometimes it becomes difficult to actually do everything properly that is why it is better that we do with some kind of device like this. So, this is the microphone this is this particular chip. So, we see that it has got three lines BCC then ground and then out.

So, this one is VCC this one is the next one is ground and this one is out. So, this out will be connected to the analog port and this will be connected to VCC this will be connected to ground let us see the connection now.

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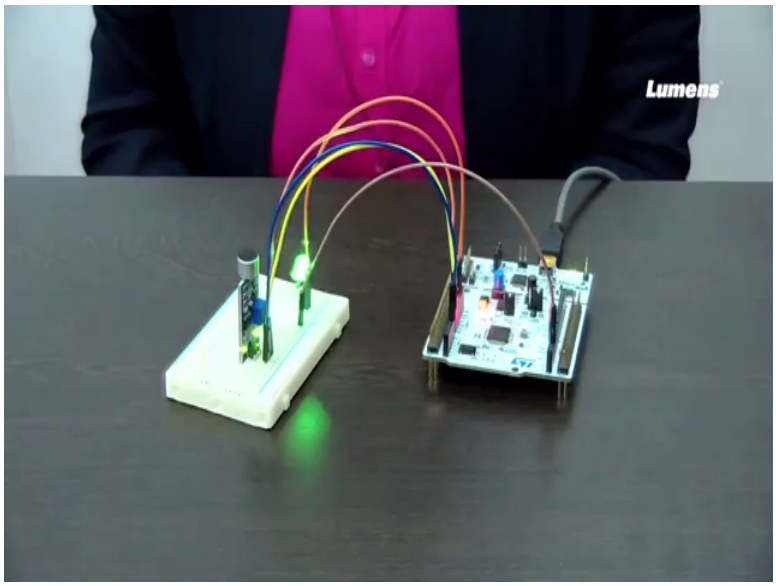

So, I put this like this as I said the left signal is BCC I will be connecting this to 5 volt the next one is ground connecting it to ground and the next one I will be connecting with analog output here I am using the port the pin A1 so, I am connecting it with A 1 ok. So, this is what I have made the connection with microphone, as I said whenever this microphone will receive a sound it will glow an LED.

So, I have to connect this LED ok, we already know the connection of LED. So, how we are making it here is like this is the anode. So, anode is directly I am connecting this to 3.3 volt that is present in this STM board and cathode I am connecting it to port D 2, the way I have program you can connect to any port you want. So, as I have programmed it in this fashion. So, this is how I make the connection, I just repeat this connection once more as I said there are three signals that are coming out. So, 3 points are there in this microphone one is BCC, another is how one another is ground and another is out. So, the out is connected this is the out which is connected to port analog port A2 this one is connected to ground.

And this one is connected to 5 volt BCC and this particular LED is one end is connected with BCC another end is connected to port D2. So, we will send some values through this port D 2, if the we have experienced some sound here and then only this LED will glow let us see how it works ok. So, now, I have already discussed with you the code now I will be dumping the code into this board ok.

So, we have already dumped the code now I will clap you see when I clapped the LED is glowing for 3 second I will do it once more ok. So, this is the experiment that we did with this microphone. So, the experiment is very straightforward we just have to make sure that the connections are all right and then depending on the sound level the LED will close. So, where is the application of this small thing. So, you can think of a notice board where you do not have to put light during the night time ok. So, when somebody comes near to the notice board you can actually make a clap.

And with that you can see that the light inside the notice board will glow and you can actually see what is written there in the notice board this is one. Also we can do this with some kind of motion sensor whenever somebody passes through it through the notice board or it senses that a person is there during that time also and the light can be switched on and you can read the content what is there in the notice board.

So, we can I mean we can use this kind of devices or this kind of small microphone etcetera in many other applications. So, in continuation of my previous experiment using this microphone I will be showing you one more experiment where I have already made all the connection we already know the connection of this 7 segment.

And you already know that using this microphone you have a BCC you have a ground you have a BCC and A 1 analog input which is coming in ok. So, what I will do in this experiment basically is that I will clap and it will display the number of claps in a 7 segment ok, this is the experiment that I will be doing ok. So, I have the microphone with me I have 7 segment display and the microcontroller hood I will be I have already integrated in the previous experiment. So, it is all the same I have not taken it off I will just now display it in the seven 7 display ok.

Let us see here.

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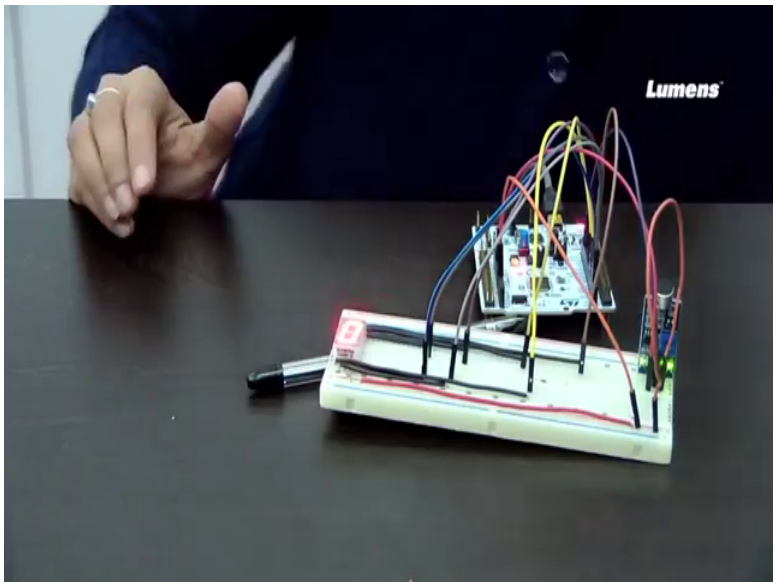

So, I will first let me connect it this is the microphone and let me just take this out otherwise if you take the input ok. So, this is the microphone I am talking about we already did that experiment where whenever there is a clap a light is LED was glowing. Now what I will do? Whenever I will clap the number of claps will be displayed in this 7 segment display and when the clap reaches 9 again it will be reset to 0 ok. So, I the corrections are straightforward with 7 segments with microphone the analog input is connected to this port A 1 and BCC ground for this microphone and for common anode 7 segment from the common point it is connected to BCC ok. So, now, I will connect.

So, we will dump the code now I have made one clap you can see it is showing 1 and after 9 it will become 0 again ok. So, I just repeat the same thing. So, this experiment was fairly simple that I was just counting the number of claps that I am making using this microphone and I was just displaying it in this 7 segment. So, these are the two experiments that we have done with microphone you can try out doing many other examples if you wish to.

Thank you.