Embedded System Design with ARM

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Lecture – 37
Design of a Simple Alarm System Using Touch Sensor

Welcome to lecture 37. In this lecture, I will be showing a Design of a Simple Alarm System Using Touch Sensor. So, let us think of a scenario that you are out of your house during summer vacation for a long time and then you I mean of course, securities are always there in places, but still theft occurs right. So, in anyway if you know that there are certain points in your house through which person can enter one is of course, the door there is a lock and someone has to break that lock and you have to enter or it could be from some windows anyway you have to break that window ok.

So, any vulnerable point anywhere in your house you can consider that for using this particular device which is nothing, but a touch sensor., You can put that touch sensor in those places and if somebody touches there of course, it will it should not work when you are touching it. So, it should run according to you have to make the application in such a fashion that it should work let us say when you are during that summer vacation it should work from this day to that day.

So, accordingly you can have a system where you can put this touch sensor along with the touch sensor you have to make the application where whenever somebody touches that touch sensor then an SMS alert will be sent to your mobile. And then you can make an app if an SMS you are getting from that particular number, an alarm system will glow will be will come from your app. It will send an alarm system let us say some kind of sound can come up or it can also happen that you are staying in a flat where if somebody touches an alarm will be glown and the alarm system will be hearable by any other person around.

Let us say it happens in the night though at least maybe the security is sleeping then also he will be able to know that something wrong is going on through that alarm system. So, I will be discussing about this particular thing here that, whenever and unwanted person touches that your door at some particular point of time when you are not there, then an SMS alert will be sent. So, in the previous example what we did we were sending an

SMS from a mobile to your system and that is making the bulb glow on and off, but here what we are doing? Here if the system analyzes that there is a theft or something like that then the system will send the SMS to a particular number.

So, let us see that what is there.

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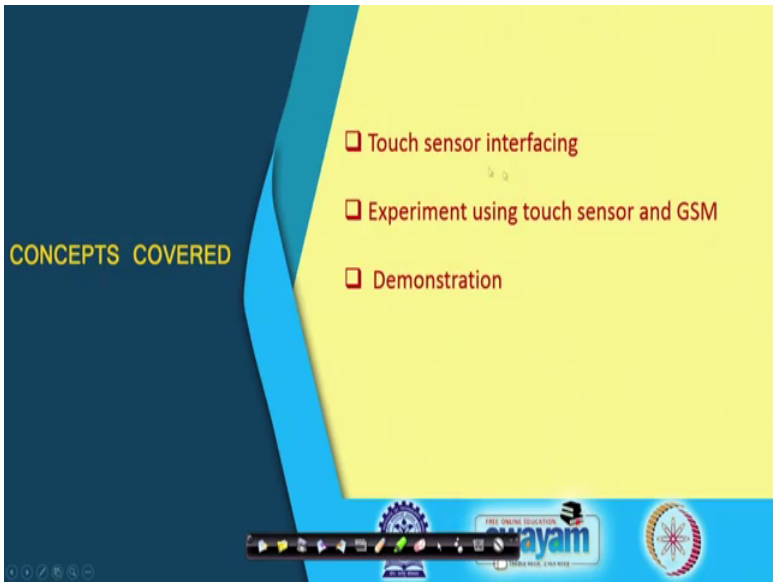

So, we will talk about the touch sensor the sensor interfacing will be straightforward we have been working with so many sensors. So, this is fairly straightforward. The experiment using this touch sensor and GSM module will be doing this and finally, I will demonstrate.

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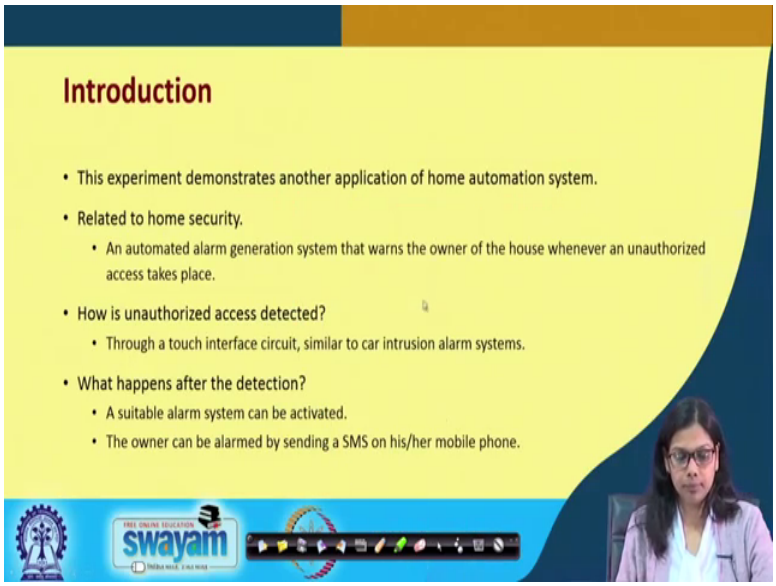

So, as I said this experiment demonstrate another application of home automation system it could be integrated for the security aspect. So, this is related to home security where an automated alarm generation system that wants the owner of the house whenever an unauthorized access takes place.

So, whenever an unauthorized access takes place it will SMS it and again you have to make your system accordingly that if you are sitting or sleeping in the night you receive an SMS and you do not respond then you have to make something or the other such that it should just the alarm system should make other person know that something is happening in your house.

How is unauthorized access detected? So, here the unauthorized access is detected through a touch interface circuit which is similar to a car intrusion alarm system somebody touches your car and that alarm will glow some sound will come up.

So, what happens after the detection? So, often the detection a suitable alarm system can be activated and the owner can be alarmed by sending an SMS for on his or her mobile phone.

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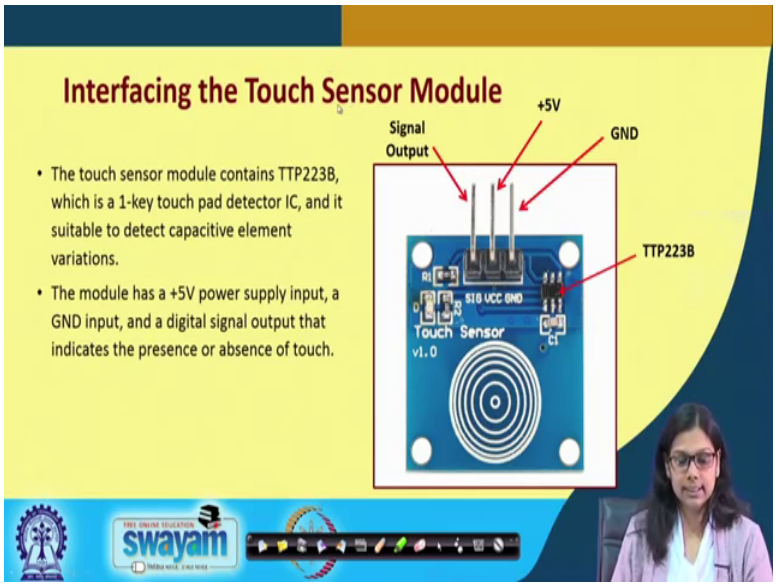

So, this is the touch sensor that we have used there is a VCC this is ground and this is the signal output that is coming here and this is TTP223B this is this is there and this is the area if you touch either this part or if you touch from below also it will work. So, the touch sensor module contains this TTP223B which is a 1- key touch pad detector IC this is an integrated chip which is a one key touch pad detector and it is suitable to detect capacitive element variations.

The module has a 5 volt power supply input and a ground and a digital signal output that indicates the presence or absence of the touch. So, the digital signal output is there which indicates the presence of this or absence of this touch.

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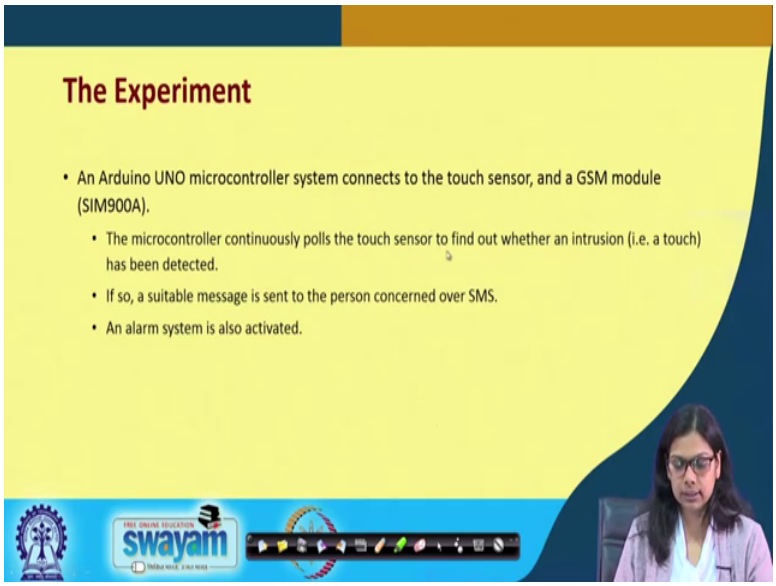

So, the experiment we have done using the Arduino board where we connect this touch sensor and the GSM module and the microcontroller continuously, it pulls the touch sensor to find out whether there is an intrusion or not.

And if so, a suitable message is sent to the concerned person over SMS, an alarm system is also activated. So, we have simulated the alarm system using the buzzer using the speaker that we have already discussed earlier a siren like sound will come in and we have also sent an SMS with a some code like kept alert.

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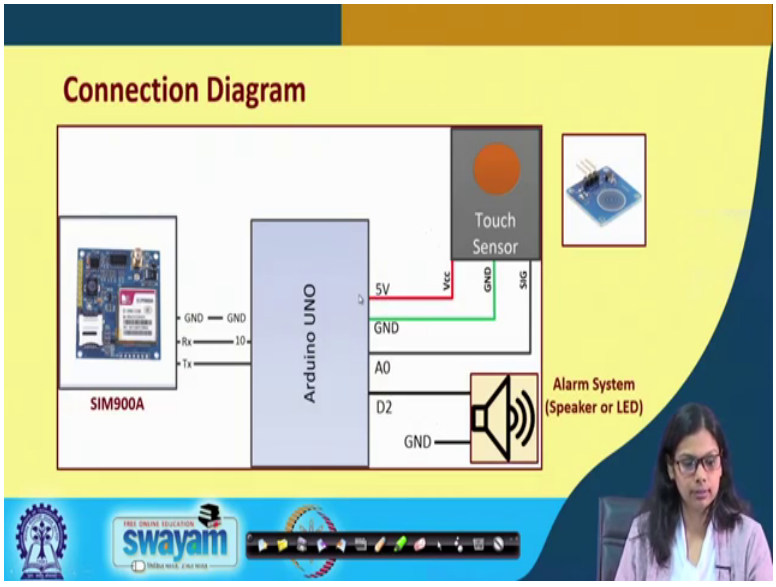

This is the circuit diagram. So, this is ground this is R x this is T x which is connected to Arduino pin 10 and 11 and we have connected the signal to A 0 pin and this VCC to 5 volt and ground to the ground of the Arduino, this is the touch sensor and we have also connected an alarm system to simulate the alarm system here we have used our speaker, the speaker is connected to pin D 2 and this is connected to the ground.

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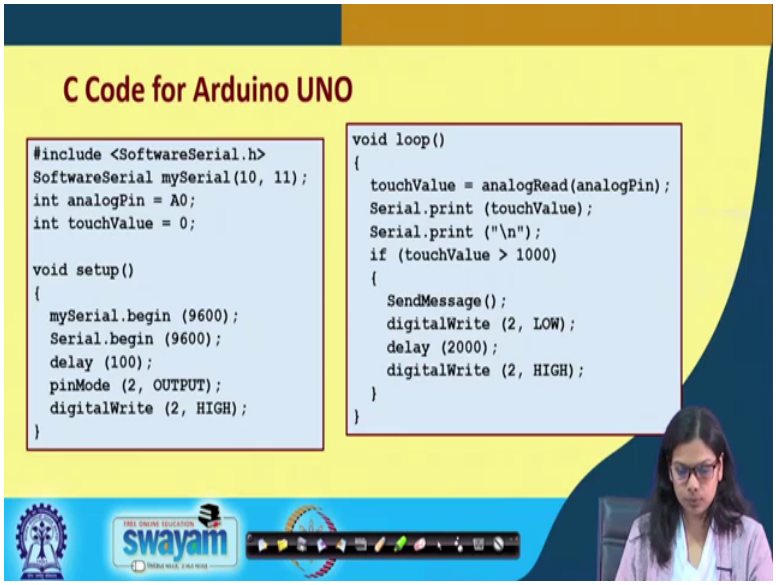

Now, here goes the code for Arduino UNO, for Aduino UNO we already know how we have to make the software serial connection.

So, we are making with pin number 10 and 11 and the analog port we are using A 0 initially the touch value we are assigning it to 0. In the setup phase we use my serial dot begin for this particular serial communication with the GSM and this is for the serial communication with the screen that is there with a particular delay and we are making the spin mode 2 to the output we are making pin number 2 as an output port and we are writing high digital value here in port 2 in this setup phase. So, setup phase is fairly straightforward which we have already seen for the home automation. So, it is quite similar here.

Now in the loop phase what we have to do? In the loop phase will read the value from the analog pin through which that signal is connected to the touch sensor and then we are printing the touch value what value we are getting, you can see that in the serial monitor in the Arduino it is already there you can have to just connect serial dot print then the

touch value will come in and then we are giving a backslash n. Now if the touch value is greater than some some value that is 1000 here then we send the message and then we are writing in digital right to 2 LOW and we provide a delay of let us say 2000 milliseconds that is 2 second basically and then again we digital right 2 to low after that.

So, let us now this is all about the code that we are sending SMS now, what does send SMS function will do we will see in the next part.

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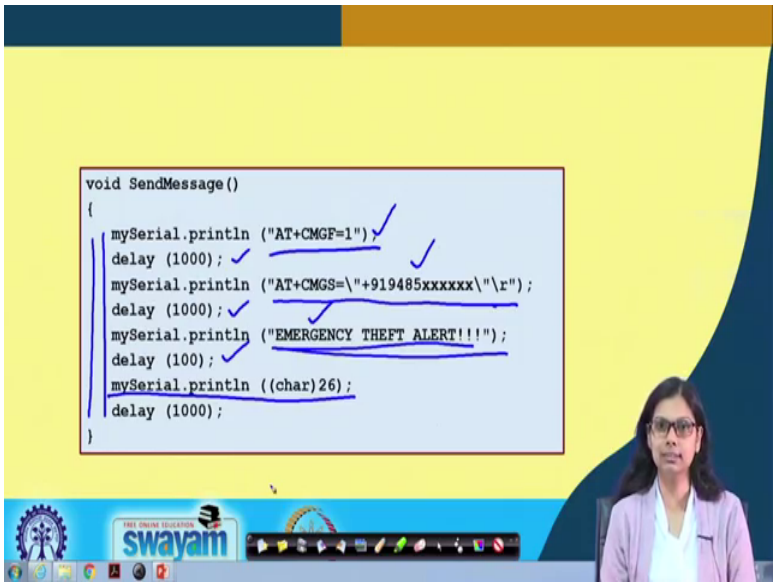

So, this is the send in a part. So, in the previous example what we did we received the SMS. So, we received the SMS then we cut out some part and then we did the needful, now here we have to send the SMS to a particular number. So, in that case you have to use this particular AT command that is necessary. So, the AT command that is necessary sorry. So, the AT command that is necessary is 80 plus CMGF equals to 1.

Then we give a delay of one second and then again with my serial dot print ln we are sending another AT command where we are providing the mobile number to which the SMS will be sent. So, you have to provide that mobile number here then the again give a delay of 100 millisecond and we send the SMS. First we initialize for sending SMS, then we need set the number to which we have to send SMS and then we send the exact SMS. The exact SMS here emergency theft alert it will be sent to your mobile and again with the delay we are providing print ln this total characters if you count this, this is the characters we are sending and with this delay this goes on ok.

So, this goes on means this is the send message function where the following codes must be executed for sending a message from the microcontroller system from that application that you have built to another mobile number. So, this is all about the code now we will look into the interfacing part. So, how do I interface this? So, let us see that ok.

So, in today's experiment we will be interfacing a touch sensor, I have already discussed about the feature of this touch sensor that I will be interfacing today, but I will again tell you little more about like where you can use this touch sensor.

So, one example could be like let us say you are again not there in your house for a long period and there is always a possibility that theft occurs in places ok. So, you can actually keep this touch sensor in number of places especially in the place of the lock. So, whenever a person will have to take out your lock or have to break your lock that person will have to touch those portions right. So, in some way or the other if he can do this that the touch sensor is properly, properly implemented in that way then it will be very much convenient.

So, let us see how I can interface this sensor prior to that what I will be doing in today's experiment is that when I will touch the touch sensor then an SMS alert will go from the GSM board to my mobile ok. This is the first thing that will happen and at the same time when the message is sent to make sure that the message has been sent I have also kept an LED, the LED will glow ok. So, now, I will do the connection for this experiment.

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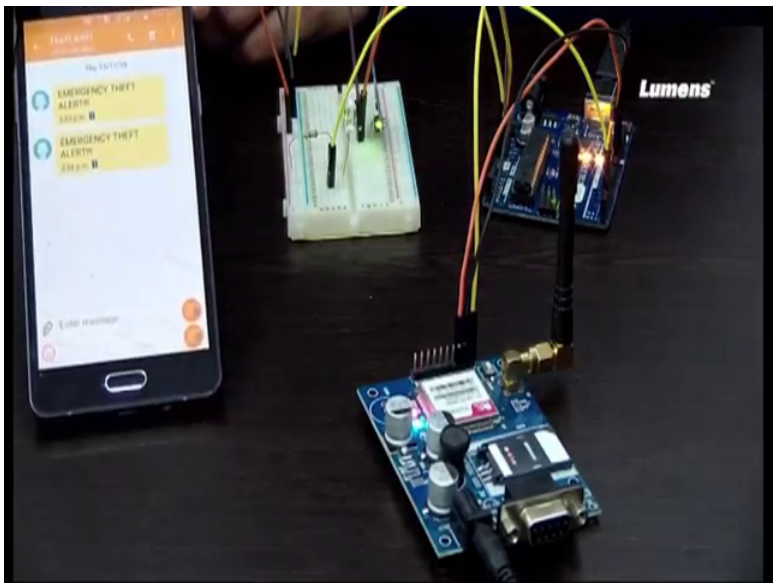

This is the touch sensor ok. So, similar to other sensor this also has got 3 pins one is ground, next one is VCC and the next one is the output signal that is the analog signal.

So, this is basically the touch sensor and this touch sensor works from both side if you touch from this side as well if you touch from this side. So, I will be first connecting this touch sensor. So, one I will be connecting to VCC and one to ground and one to the analog port analog port that I will be using is 8 e 0. So, let me and this from the board I have already taken this common point one is my VCC, another one is my this point is my VCC with this pin through the board I have taken and this one is the ground.

So, let me first connect this. So, the left one is the ground, then the next one is VCC and the next one is to analog put A 0 is the connection clear. So, these are the 3 things that I am connecting to the common points these are the common points. Now as I said I have also connected an LED. So, LED this is the anode and from this point I will connect to pin 2 of this digital pin. So, this is just for the checking purpose that the message has been sent or not and now how the message will be sent that will that is through the GSM module we have already worked upon how this GSM module works.

So, this is connected to the ground and the other 2 pins the first one is the T x which will be connected to pin number 10 accordingly the way we have done this T x will be connected to pin number 10 and R x is connected to pin number 11 please recall in that bulb on and off through SMS control what we were doing we were sending an SMS from our mobile to this GSM and then whatever we received based on that this microcontroller was operating right.

But now it is just the opposite whatever data or this touch this is the touch sensor when I touch this if I touch this an SMS alert from this GSM will be sent to my mobile number. So, now I will just do the needful I will just dump the code first and this is the mobile where I will be receiving an SMS if I touch this touch sensor let me dump the code first ok.

The code has been dumped now let us see now I will touch this touch sensor. So, the green light is on meaning that the SMS has been sent from this particular GSM module through this SIM to my mobile and let me see what I receive; I have received an SMS theft alert emergency theft alert ok. So, I have saved this number this GSM module number which is being displayed in this. So, I will do once more ok. So, the led has

glown and probably I will receive an SMS. So, you can see I have received another SMS have received another SMS that emergency theft alert is there ok.

So, the entire process is fairly straightforward, but the point is like we can have variety of application with this touch sensor the touch sensor is of really very good application you can think of and make use in various practical applications basically. So, this was the experiment that we did with this touch sensor and were in the previous SMS control we have received the data from mobile number to this GSM and here we are sending a data from this GSM number to another mobile number.

Thank you.