Sensors and Actuators
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Lecture - 36
Demonstration of IR Based Sensor using Arduino

Hi, welcome to this particular experimenting class. In this class, we will show you one particular sensor which is called infrared sensor is also called IR sensor. And, here we will be showing the actual application of IR sensor by looking at the distance that it can measure and which properties on which kind of surfaces it will not be useful. For example, if you take a black surface, whether you can use a IR sensor or not.

In this experiment class, you will see that when the student is moving his end, the variation will be changing depending on the what is the distance between the source and the reflection boundary. And, like I said we will also show you if you change the kind of material the reflection property would change right. So, enjoy this lab class. I will see you in the next module.

Bye.

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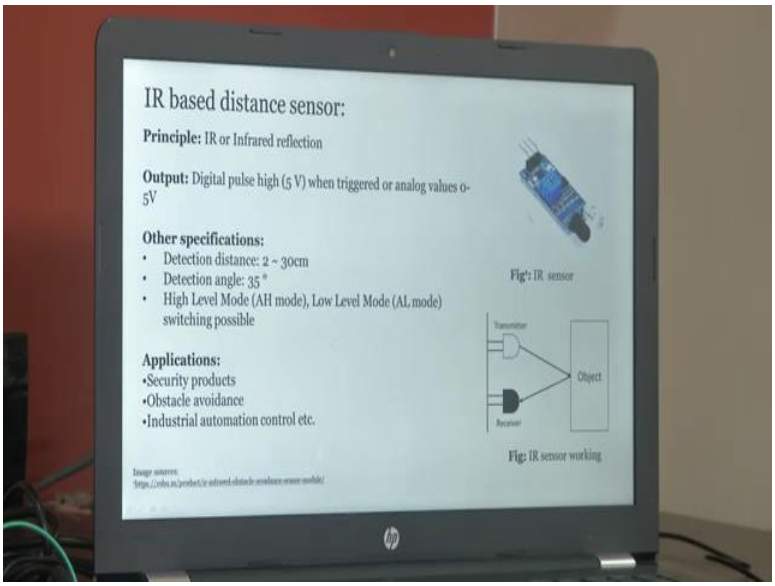

Now, we are going to discuss about a IR based distance sensor. So, this is another sensor that we have got here. We will be discussing about this now ok. So, you can see on the right hand

side, I will be showing the working principle of it. So, what happens is you can see two LEDs over here, one coat with black and another one over here that is transparent white ok. So, this is a together forms the transmitter and the receiver.

So, you can see the IR sensor working over here that the white one is the transmitter and the black one is the IR receiver. So, what happens is you know that the light undergoes refraction right. So, when the transmitter sends IR signals, if an object is there to reflect it, it will come back to the receiver. So, based on this reflection, the receiver will get this IR light back, and it will sends it that is what happens in this sensor.

So, you can see that the object is very critical here if the object is not here, it is this light rays going to go to infinity, and now reflection will happen. But at the same time, if the object moves towards it, then the receiver will be take some reflection, and will detect that the IRs bouncing back or an obstacle or object is close to it. And, another main property of the object here should be that it has to be white or it should have, it should be some reflecting surface ok. So, a white surface will reflect the light that is coming to it.

So, a white object will reflect the light. At the same time if you are keeping a black body or a perfect black object over here, then the light ray coming from here or the IR rays coming from here would not reflect back to the receiver. I will be demonstrating both of these examples. So, this is about the working principle of the IR. So, you can see a trimmer over here. This is to adjust the range at which we should detect. So, this sensor module is here.

This is a working principle, but this is the sensor module or the commercial sensor we have go to show you the working demo ok, it has a differential comparator onboard, so LM 393. So, what happens is when the receiver detects the reflected light, it will measure its intensity. And based on this intensity a comparing is done with the threshold that we have said using the trimmer ok. So, based on this value, edge digital output will be given out as either high or low. So, this is it.

So, this sensor module can either work in a high level mode or a lower level mode or active mode or passive mode. So, in the active mode, what happens is that when there is no reflection, you will be getting a high output; and in passive mode when you get reflection only you will be receiving a high output ok. This can be used for different application. So, it can be used for some intruder detection that is like if a person walks in your house without your knowledge if

that person cuts the transmitted light ovesr here, then it will make a noise or we can trigger a buzzer or something ok.

Similarly, for you must have seen the obstacle avoid robots and other things, it will have a sensor like this onboard. So, if it move towards the wall or another obstacle, the light will be reflected and based on which the robot will be understanding that there is an obstacle I had and it can change its course ok. So, there is a maximum detection angle that is 35 degree beyond which it cannot detect that is it. So, I will be showing you the working of it.

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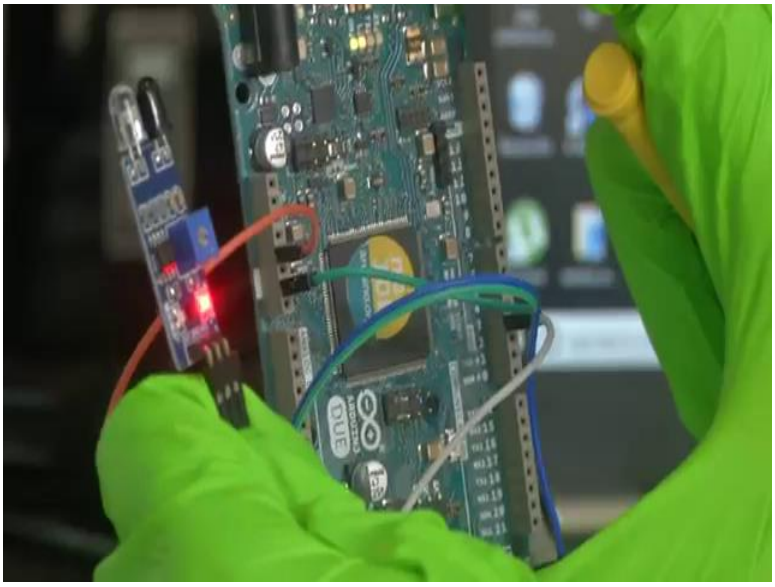

You can see here the sensor I have talked about ok. So, this is this is the trimmer that I showed you to adjust the threshold. And this is the receiver LED and this is the transmitter. And here you have the LM 393 differential comparator ok. And you can see a three pin out that is one is output digital value, and one is ground and one is B CC. So, this is the LED we have to show that it is working ok. So, this is the sensor and I have connected to arduino due and a buzzer also. I will be explaining the pins and other things on the code.

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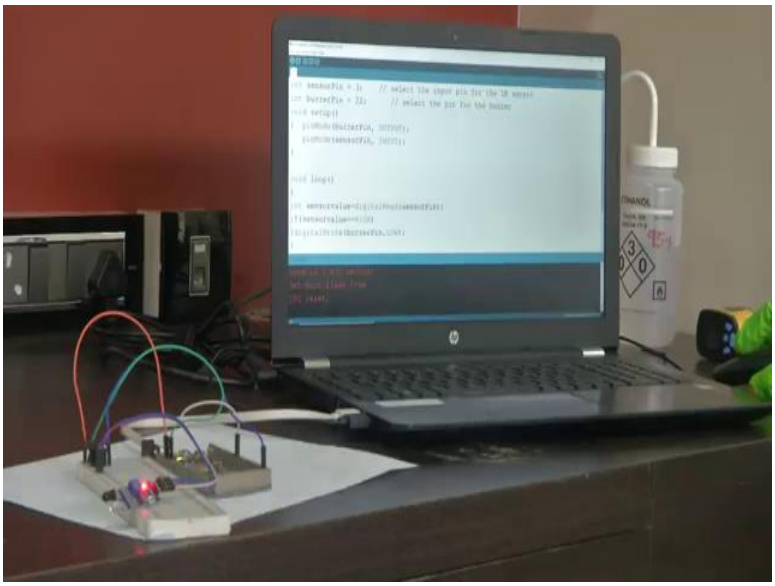

So, in the arduino code, you can see that I have define the sensor pin as three; that means, the digital output of the IR sensor have been connected to the pin number 3 and the buzzer is connected to pin number 22. And, in the setup I have define the buzzer pin as output means the buzzer is going to give an output that is the sound beep sound. And the sensor pin is the input, and I have defined it because the sensor pin is connected to a digital input pin that is pin number 3 ok.

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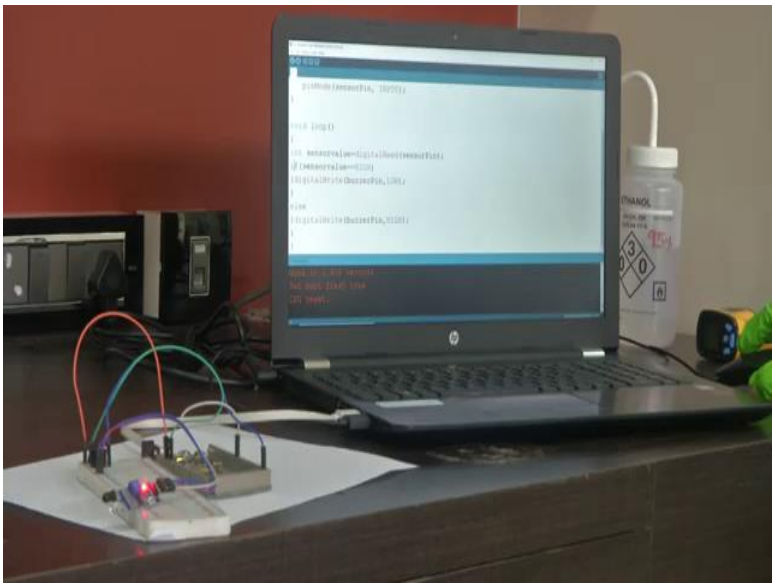

In the void loop I have set the an integer sensor value is equal to digital read of sensor pin, because we are taking a digital value input from the sensor pin that is pin number 3. And you might be thinking that why I have kept integer and what is the value that is going to be stored in the sensor value. So, it is a digital read operation, that means, it can only have two states either high or low. So, what value get stored in sensor value is corresponding to high the sensor value will store 1, and according you corresponding to sensor value sensor value low, it means the sensor the integer sensor value will be storing the value 0 ok.

So, corresponding to low the value stored here it will be 0, and corresponding to the digital read of a high value, we will be storing here 1. And instead of integer you can use Boolean operation also bool ok. So, I have use integer only here. And you can see that I have use the function. So, if sensor value equal to equal to high, then digital write buzzer pin comma low, because I already told you that the sensor is active actively low, that means that by default the sensor if detects nothing it will be high only.

So, if it is not detecting anything we need not have the need the buzzer to make any sound. So, I did it like that. So, it is by active, that means, it is if it detects nothing it will be giving a high output. So, I have define the buzzer pin as low and otherwise that means, the if the sensor value is low then I am turning the buzzer pin high.

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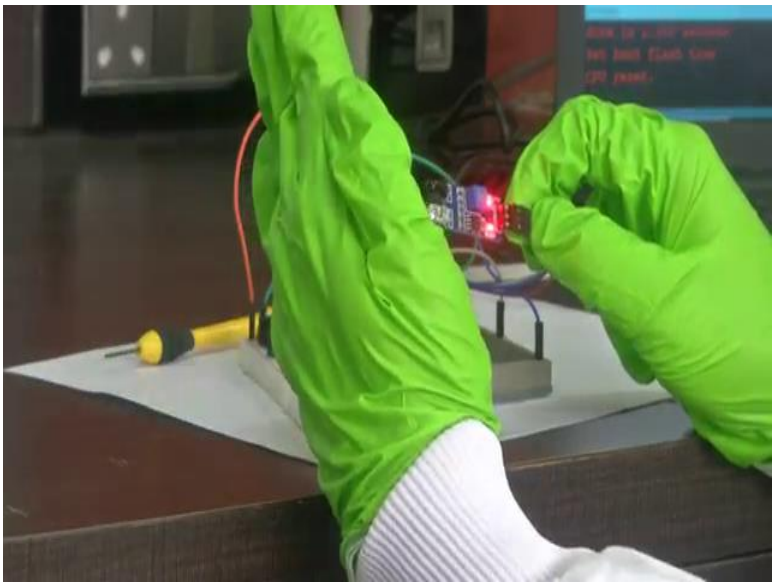

So, I upload the code to the arduino due. So, you can see here I am just showing my hand over here. We can see that a light is blinking that means it is detecting something that the same time

the buzzer is making the sound ok. So, this is work. Now, this is the distance at which it is sensing it. So, I can just adjust a potentiometer or the trimmer. So, when I reduce the value too low, it is making the sound because we had adjusted it to a very low value. If I increase the range, it is not detecting at all it went too high. So, it you have to adjusted to a intermediate value for it to detect. See, I have reduce a value now. Initially, it was somewhere here ok.

And one more example I have to show is I told you the colour of the object also is important. So, I have a black phone over here the surface is black now. If I show here it is not detecting because of the black surfaces not reflecting. The green gloves I am using is still reflecting, and the white here surface here also is reflecting, but the mobile phone which is black is not reflecting ok.

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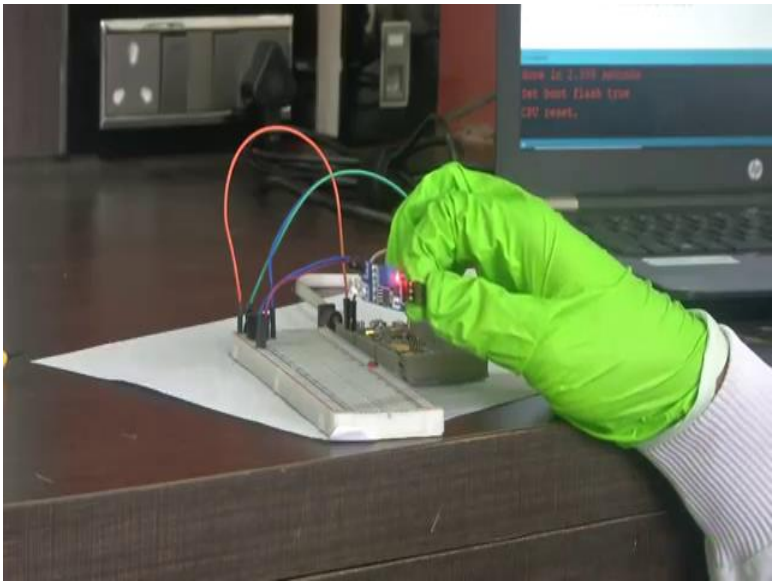

So, this shows that the IR can only be used when it comes to a obstacle or an object that is white or have a reflecting surface ok. So, this is about the IR sensor.