Introduction to Internet of Things
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Lecture – 25
Integration of Sensors and Actuators with Arduino- II

Hello, now after completing the integration of various sensors with arduino, and we have completed integration of basic actuators like lights, LEDs and the external LEDs, inbuilt LEDs. So, we will now in this lecture we will now move on to integration of a motor based actuator.

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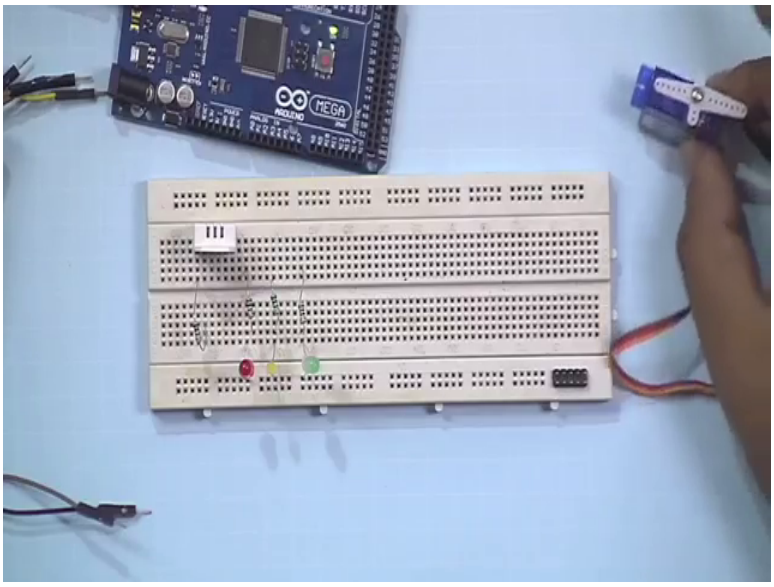

So, over here I have got a small servo motor. So, this one particularly is use for controlling the wings and tail adders of remote control planes or RC planes see. So, this is just a there is a geared mechanism inside. I do not know whether it is visible or not. So, there is a motor and you when you send pulses of various widths, the motor rotates to just that bit. So, there are various gears inside ok.

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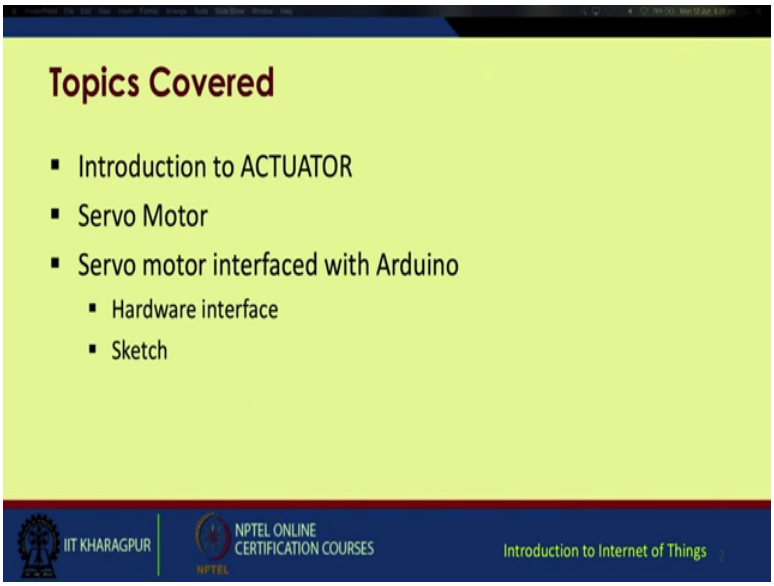

So in this lecture we will learn how to integrate this motors and make it perform according to our requirements. So, here we are going to cover the following topics, introduction to actuators, servo motors and interfacing of this servo motor with arduino. So, will first deal with hardware interface and then the actual sketch we are going to which you are going to upload on the hardware.

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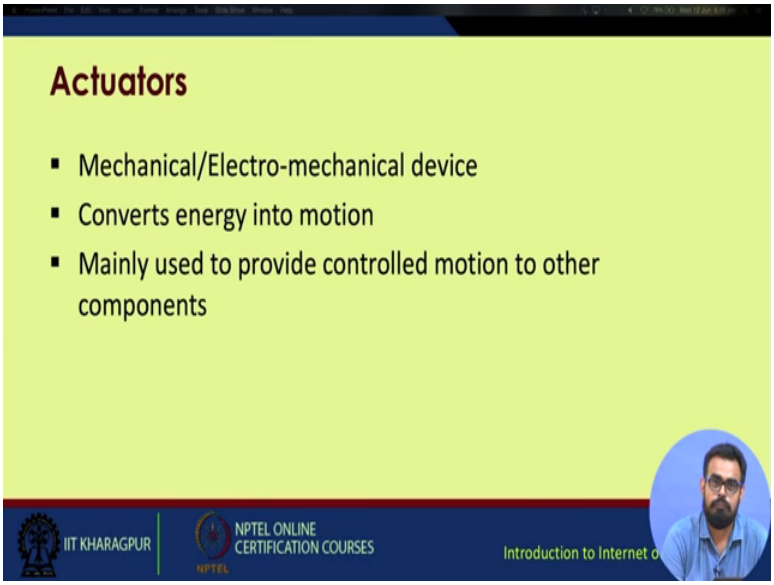

So, actuators are basically mechanical or electro mechanical devices. They convert energy or signals into motion. And mainly use to provide controlled motion to other components of various mechanical structures or devisors.

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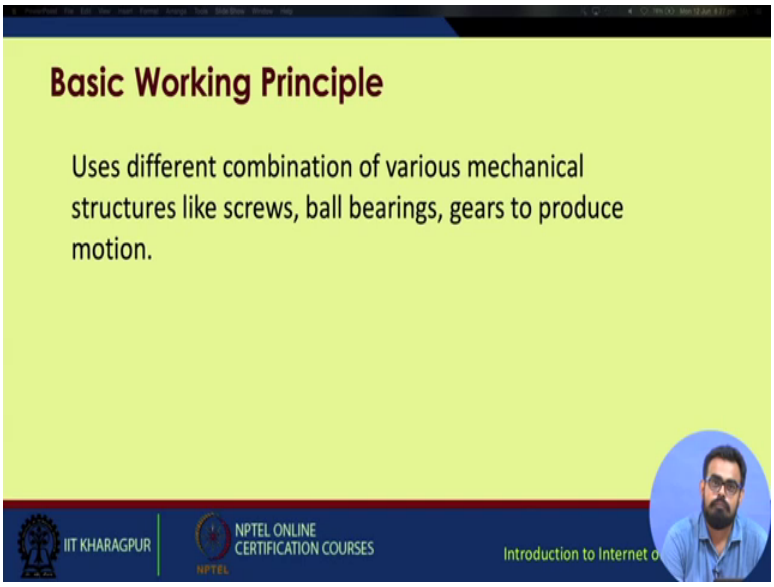

So, basic working principle is, in the servo motor you have various mechanical structures like gears and screws and ball bearings, which interfaced with a small motor over here, and this produces very control motion, but is able to perform much more efficiently then this motor alone would have been able to. So, like generally for servers the top requirements are high as compared to normal dc motors. So, this is what is known as micro servo in the market. So, while purchasing you look for micro servo motors there are servo motors of various ranges and sizes. So, this one is this can be directly integrated with our arduino board without much interfacing or external circuitry.

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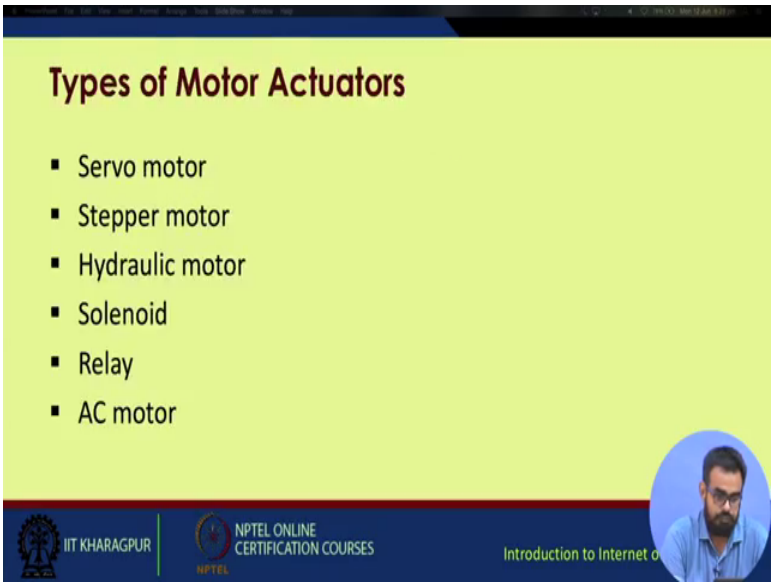

So we have various types of motor based actuators. Actually servo motor is just one of them. You have servo motors, stepper motors, hydraulic motors, solenoid relays AC motors. One point to note here is solenoid and relays are not actually motor based actuators, but sometimes solenoid may be used to drive motors and relays may be used to integrate various multiple motors with any kind of programmable circuit. So, relay is something like a electro mechanical switch, where as solenoid works on the principle of magnetism. Whenever you pass there is a coil there is a coil surrounding an iron coal whenever you pass current through the coil the whole set of magnetizes, you can use it as a magnet.

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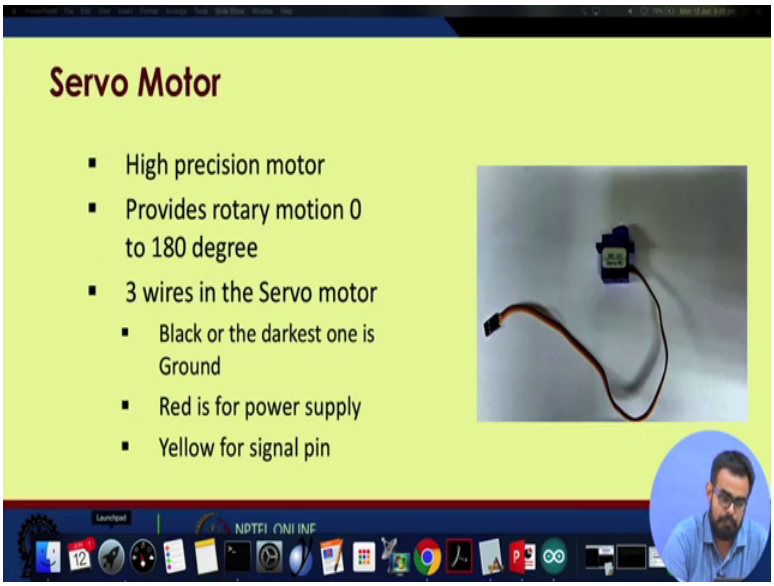

So, various uses of solenoid and solenoid walls for controlling water in pipes electronic locks and so on. So, will focus only on the servo motor part. So, it is a high precision motor and it is able to provide a rotary motion between 0 and 180 degrees. And as you have seen it has got 3 wires one black, one red and one yellow. So, many are times you may have you may see that the black wire may be replace with brown ones also. So, the motor I have got does not have a black wire, but it has got a brown wire, but nothing to worry about this darkest wire is actually kept for browned. Then red one is for the power supply I am actually going to provide 5 volt power supply from the arduino board and the yellow one is the signal pin which is going to provide the signal for control motion to the motor, not from the motor to the device it is going to provide signals from the board to the motor.

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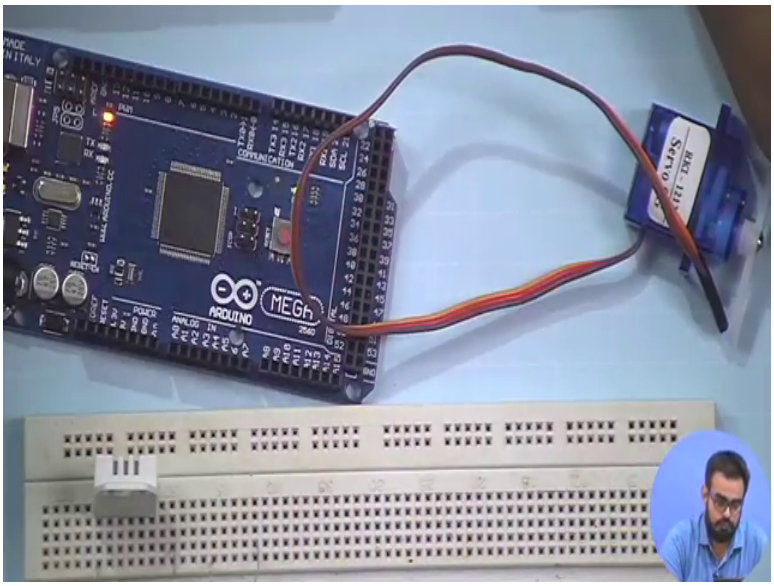

So, at again we have to install a special library. So, following the process we follow during the GHT library installation. Just have to update

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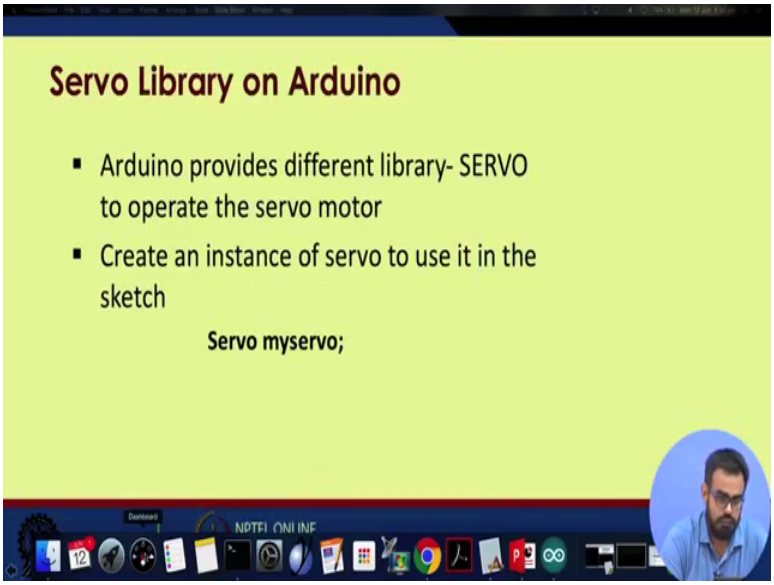

Your library if not already updated to include the servo library. And within the sketch we have to create instance called servo, servo myservo for enabling this use of this particular servo.

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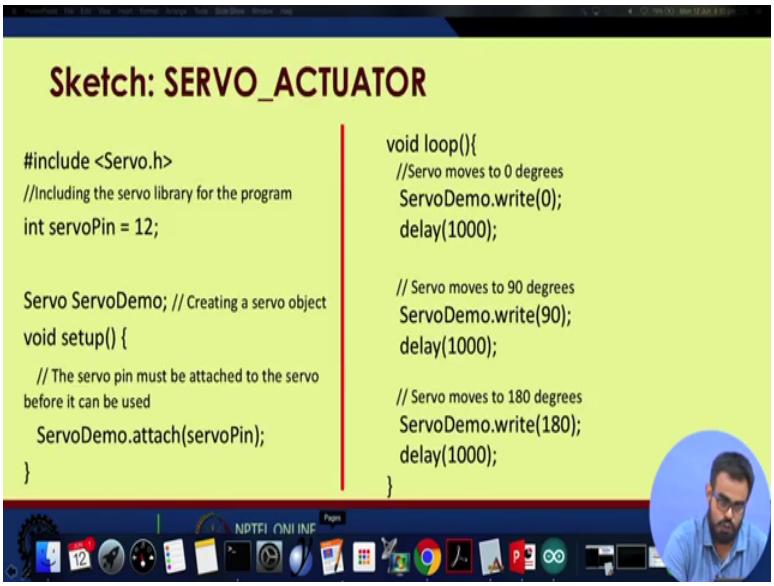

So, before moving any further let us just take a look in the library. Will just search for servo over on the library manager as you can see there are many options for servos, but I have just choosing the adafruit PWM servo driver library. So, it is already installed.

So, nothing else to worry about and one more thing, when you install a new library you can see whatever examples you had package with the normal ID when you first downloaded it. So, whatever library is you install you get some sample demo programs. So, for this adafruit PWM servo driver library. We have something called a PWM test and we are something called servo. So, we click on it a new sketch will appear. So, this is a what we called company provided sketch, just you check whether your code is working whether your hardware is working fine or not whether there is any problem with your board or whether there is any problem with your motor or other such things.

So it is a pretty big code. We actually will be doing something very simple not this complicated, so will take a look at the code. Now again we include the servo.h library function library file. So, once this has been included here we are choosing a servo pin as the pin number 12 on the at mega board. Then instance of a we create a instance of the servo as servo demo then within the setup we write servodemo dot attach. These are some of the functions associated with servodemo. So, within attach it would expect the pin number to which the servo is being attached, the pin number of the processor board your using, or the arduino board you are using.

So ones this setup is done we move on to the looping function. So, you have servodemo the instance of the servo servodemo dot write if we write 0 it will move 0 degrees it reposition itself to 0 degrees then we put a delay for thousand milliseconds or one second then we again write value as 90 to move the servo 90 degrees again a delay of 1 second again after this we try to move the servo to 180 degrees. So, if you recall in the previous slides I have said the servo the servo is able to move between 0 and 180 degree. So, this is the code out line.

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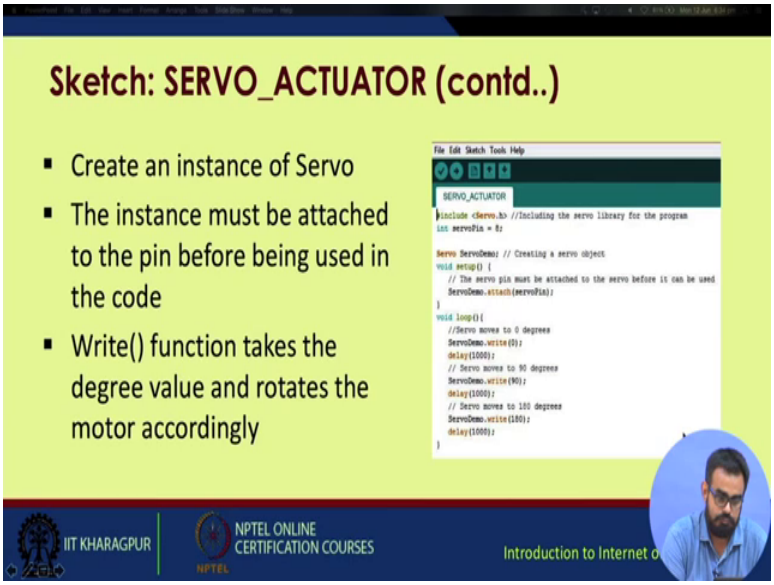

So, we have already covered these what will go through it. Create an instance of the servo the instance should be attached to the pin before it can be used in the code then; that means, within setup you write that servo instance dot attach and the pin number. If you just call that servo instance dot write it will not function you have to actually attach the servo with the coding part. Then the write function takes the degree values and rotates the motor accordingly.

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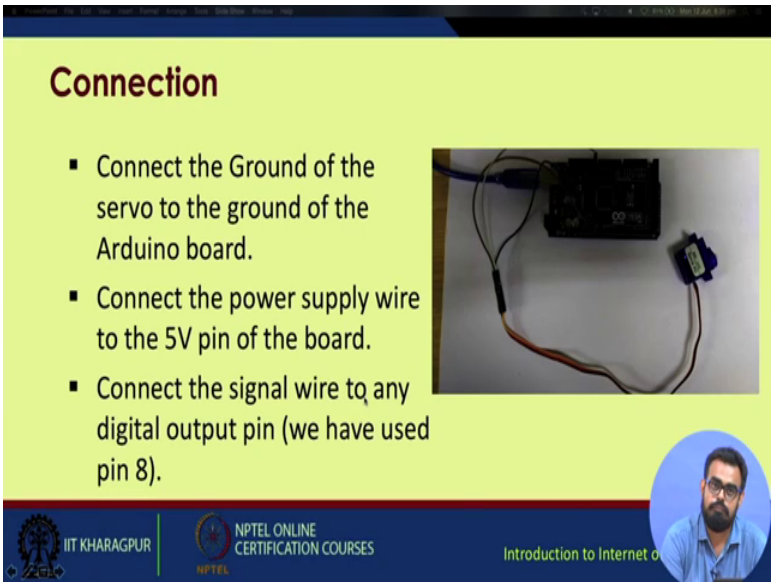

A connection is pretty simple, connect the ground of the servo that is the dark wire to the ground on the arduino board we connect the power supply wire that is generally the red wire to the 5 volt pin on the board and signal wire to anyone of the pins we may used pin 8 or pin 12 or any kind of digital input output pins.

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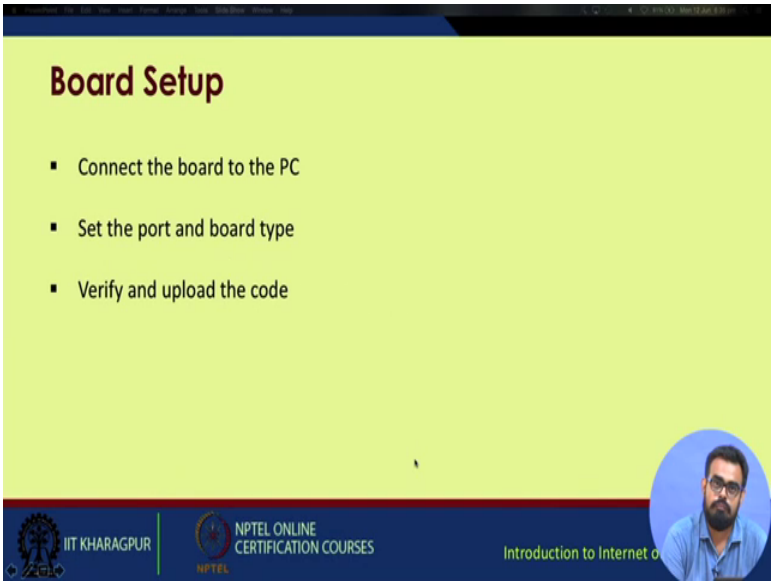

Now, try to using the board we connect the board to the PC we set the port number and the board type we verify and then upload the code.

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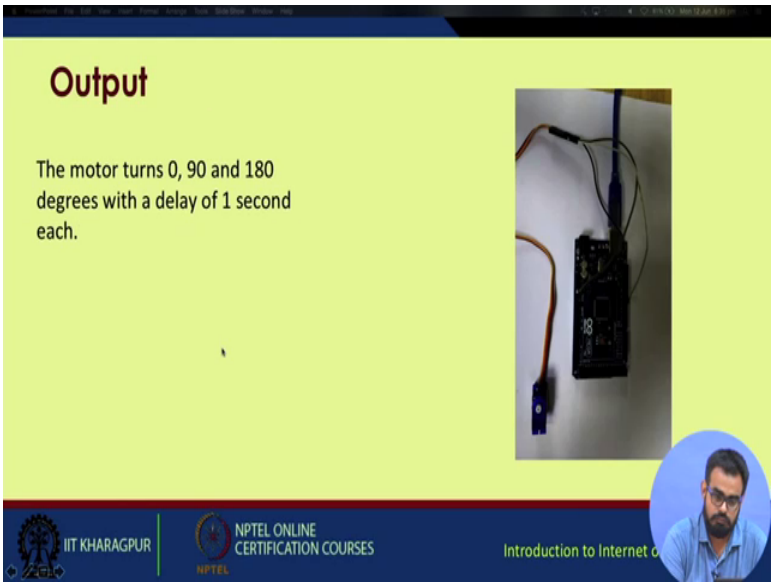

So, the code we just discuss few slides back it will give you an output of first will turn 0 degree. It will a line itself to 0 degree then it will wait for 1 second then will go to 90 degrees, then wait for one second and finally, it will go to 180 degrees and this thing will keep on looping over and over again.

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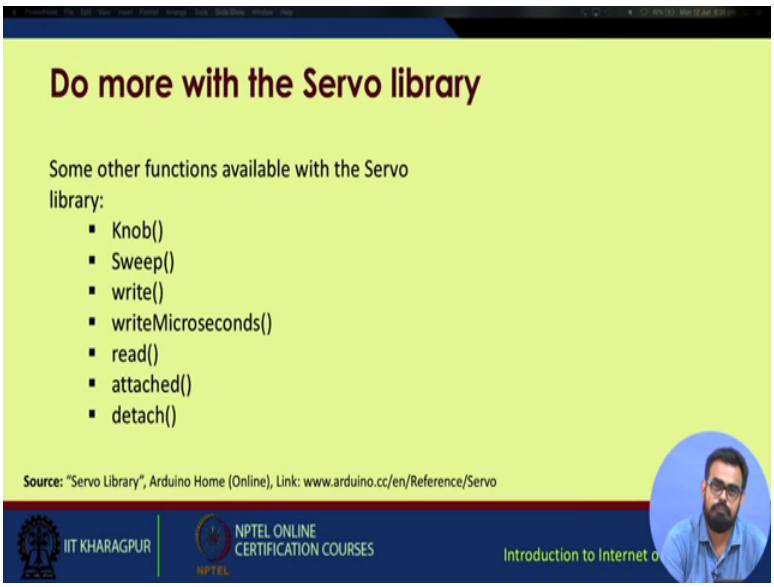

So, we will see a few variations of this code. So, there are lot more functions with the servo library we have we have a knob function, we have a sweep function write microseconds read attached detach and so on.

So, now, focusing back to the IDE. So, the code we discuss just now is already open. So, we have set the servo pin as pin 8. Or may be any one of the pins we can set let us say, we set it to pin 12 or pin 10, right. Now before we do anything will connect the servo. So, we connect the ground wire brown or black wire to the ground pin on the board. Then we connect the Vcc to the power supply pin on the board. And finally, will use a wire of another color yes. So, finally, we attach the signal the yellow wire. So, we are about to set it to pin 10, will attach it to pin number 10. So, that is it, so this is the connection of the servo. We attached the board to the PC.

Now we check of processor is at mega 2560, always verify. We have various variations of at mega board as you can see on the board over here. This is arduino mega 2560 if is zoom in on this region. This is at mega 2560 it is always better to be careful.

So, you see there are 2 variations at mega 2560 and at mega 1280. So, we are selected 2560 the port has been selected we verify our code. So, this seems to be no error in the code now we upload our code. Now if you focus on the motor I will reset it will first align itself to 0 then 90 then 180. Now we can try different variations of this code is take out the output single pin. So, suppose the ID instead of 090 and 180 we give 45, 45 and 45. So, let see what it does. So, it does not seem to be doing anything. So, will try a different variation we give it 0 we give it 90 we give it 90.

So, it seems we have hit upon some error, as you can see it shows (Refer Time: 17:01) do time out, that is the compiler time out. So, will again check what is wrong with it. Let us reverse back to the original code - ports asset, board asset, this something wrong with this. Thing is permanently yellow will do one think we restart the code. So, we again compile the code and upload the code. So, there are various other functions we can try with the servo we have knob, sweep, write. So, it is actually up to the user how you can manipulate these functions these libraries to build a new application. So, I hope you enjoy building IoT services which arduino boards just integrate simple senses and integrate them in various innovative ways.

Thank you.