COMPUTATIONAL THINKING

UNDERSTANDING SENSORS & ACTUATORS
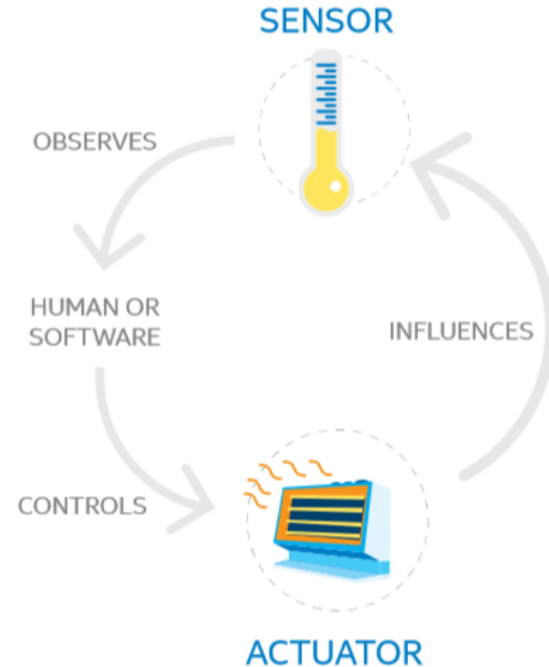
नीति आयोग
National Institution for Transforming India

AIM
ATAL INNOVATION MISSION

WHAT ARE SENSORS AND ACTUATORS ?

Sensor is an electronic component whose purpose is to detect events or changes

Actuators are basically things that produce an action.

SENSOR

OBSERVES

HUMAN OR SOFTWARE

INFLUENCES

CONTROLS

ACTUATOR

Various types of Sensors and Actuators

Sl. No.	Sensor Type	Image	Brief Description
01	POTENTIOMETER		A potentiometer, informally a pot, is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider.
02	LDR SENSOR		A Light Dependent Resistor (LDR) or a photo resistor is a device whose resistivity is a function of the incident electromagnetic radiation. Hence, they are light sensitive devices.

Various types of Sensors and Actuators

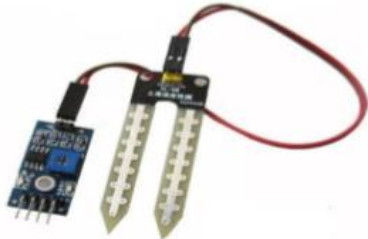| Sl. No.	Sensor Type	Image	Brief Description
03	FORCE SENSITIVE SENSOR		This sensor is basically a force sensitive resistance . It is commonly used in applications where we need to measure how hard something is pressed or squeezed.
04	FLEX SENSOR		Flex sensor is used to measure how much something is bending. Basically this sensor can be used for gesture recognition which can be applied in a variety of ways. They can also be used to control intensity of something, for example the brightness of an LED, the speed of a DC motor etc.

Various types of Sensors and Actuators

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05	AIR/ WATER FLOW SENSOR		This sensor sits in line with the water line and contains a pinwheel sensor to measure how much water has moved through it. There is an integrated magnetic Hall-Effect sensor that outputs an electrical pulse with every revolution.
06	WATER LEVEL SENSOR		The sensor works on the principle of conduction. So when the sensor is immersed in water or any other conductive liquid, the resistance of the sensor changes. This in turn produces an analog voltage signal which is dependent on the level of water.

Various types of Sensors and Actuators

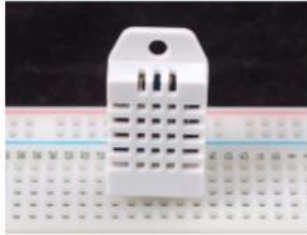| Sl. No.	Sensor Type	Image	Brief Description
07	**RAIN WATER SENSOR**		This sensor is used to detect the rainfall. The alternating pattern on the sensor is a highly resistive circuit, and when water falls on the circuit, it provides a less resistive path for the current to flow. This causes an overall decrease in the resistance of the circuit.
08	**SOIL MOISTURE SENSOR**		This sensor helps in determining the value of moisture in the soil. The way this works is that the sensor has two probes, and the resistance between the two probes is determined by the moisture in the soil. More the moisture, less is the resistance and vice-versa.

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Sl. No.	Sensor Type	Image	Brief Description
09	MQ GAS SENSOR		MQ gas sensors are a family of sensors which are used to detect a wide variety of gases like alcohol, smoke, methane, LPG, hydrogen, NH3, Benzene, Propane etc. They are widely used in homes and industries as alarm systems and detectors.
10	BAROMETRIC PRESSURE SENSOR		This sensor can measure temperature and air pressure, and that data can be used to determine the altitude from sea level, since we know that the air pressure decreases as height above sea level increases

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Sl. No.	Sensor Type	Image	Brief Description
11	HUMIDITY AND TEMPERATURE SENSOR		It is a sensor that gives digital values of temperature and humidity with good accuracy. It consists of a Capacitive humidity sensor, a thermistor and a microchip that takes the analog data and converts it into digital format.
12	MICROPHONE SENSOR		The microphone inside your mobile phones, laptops, earphones etc uses this sensor. This sensor enables us to not only measure the amount of sound, but the frequency and pitch too. And its signal is accurate enough to replicate that sound with good accuracy.

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Sl. No.	Sensor Type	Image	Brief Description
13	BUZZER MODULE		The sound when you turn a TV on and off, the sound of a camera click when we take pictures from a mobile phone, the sound of a beep when you dial a number on the telephone. It works on the principle of piezoelectricity.
14	ULTRASONIC DISTANCE SENSOR		This sensor sends out an ultrasonic pulse, and then detects the echoing wave. It then measures distance by taking the time taken for the echoing wave to return, multiplied by the speed of sound.

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Sl. No.	Sensor Type	Image	Brief Description
15	IR SENSOR		The sensor has an IR transmitter and a receiver. The mechanism is quite similar to an ultrasonic sensor. The transmitter sends out a pulse of light, the receiver calculates the time taken for the light to reflect back, and that's how it detects an obstacle.
16	PULSE SENSOR		Pulse Sensor Amped responds to relative changes in light intensity. If the amount of light incident on the sensor remains constant, the signal value will remain at (or close to) 512. In case of presence of more light the signal goes up and with less light, the opposite happens.

Various types of Sensors and Actuators

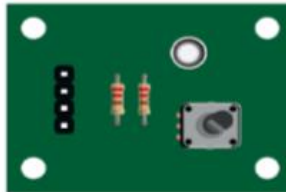| Sl. No.	Sensor Type	Image	Brief Description
17	**PIR MOTION SENSOR**		The Passive Infra-Red motion sensor or just PIR sensor is a widely used sensor. These are used to detect motion and come in a vast variety of sizes and ranges, from 120 degrees to 360 degrees. They can detect motion in a large area and a long range.
18	**TRI-COLOR LED**		These LEDs can be used to produce virtually every colour in the spectrum. The reason is that the brain cannot separate two overlapping colours and so it creates the illusion of a new colour. The Tri-colour/RGB does that by mixing different amounts of red, green and blue. This is similar to mixing to water colours.

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Sl. No.	Sensor Type	Image	Brief Description
19	LASER MODULE		Lasers are one of the coolest inventions made by man. They are also a light source, like an LED, but with many special features. For example, if you light an LED, and point it at an object which is very far, the light may not even reach that object. But if you do the same with a Laser, then you can point to very faraway objects very easily. In fact, scientists have made lasers that can reach the surface of the moon from earth.
20	LCD KEYPAD SHIELD		For a microcontroller, sometimes it is necessary to indicate data in a human readable manner. This shield is designed for that sole purpose. It is a 16x2 character LCD with a few buttons which can be used for scrolling or navigating. There are also some Analog pins available to connect to different sensors.

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Sl. No.	Sensor Type	Image	Brief Description
21	**CAPACITIVE TOUCH MODULE**		A capacitor works when two parallel plates store opposite charge and do not allow DC current to flow (forming an open circuit). If we remove one of these plates and cover the other with an insulator, and then touch it, we are basically creating a capacitor using our hands. A controller is attached to the fixed plate that detects a change in the capacity of the instant capacitor and sends out a signal. This signal tells us that the sensor has been touched.
22	**LED AND TAP SWITCH MODULE**		This is a custom made sensor for understanding Arduino coding. It contains an on-board 5mm LED and a tap switch. The tap switch can be used as an input device, and the LED can be used to indicate response of different sensors, or they can be used together as one module, where the LED lights up when the button is pressed.

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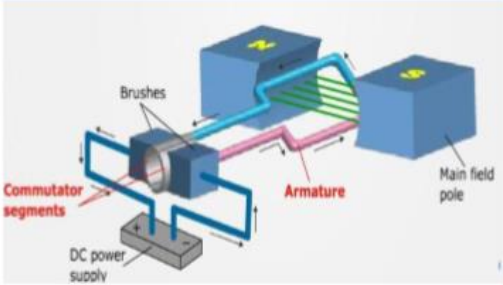| Sl. No.	Sensor Type	Image	Brief Description
23	HALL CURRENT SENSOR		This sensor is based on a very interesting physics phenomena. It is known as the hall effect. So when a thin, flat, current carrying conductor is placed in a magnetic field, a voltage is generated on either side of this conductor perpendicular to the direction of the current flow.
24	JOYSTICK		The PS2 style joystick is a thumb operated device, that when put to creative use, offers a convenient way of getting operator input. Its fundamentally consists of two potentiometers and a push button switch.

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Sl. No.	Sensor Type	Image	Brief Description
25	RELAY MODULE		A relay is simply a switch, with only one point of difference. The opening and closing of the switch is controlled by a signal. The relay has a SPDT switch inside, and one terminal is Normally Connected(NC) to the Common Connection(CC) and another terminal is Normally Open(NO).
26	MOTOR DRIVER SHIELD		The shield provides control over a variety of motors. It can be used to control Servo motors, stepper motors and DC motors and operate stepper motor for precision applications. It can be used to drive high torque servos, such as the ones used in humanoid robots.

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Sl. No.	Sensor Type	Image	Brief Description
27	SERVO MOTOR		Servo motors are special type of motors used in various robotic and hobby electronics projects. They can move by a certain amount of angle that can be decided by a microcontroller like the Intel Genuino 101, and they will stick to that angle
28	DC MOTORS		A DC motor's mechanism is quite simple. It uses the magnet's property that like poles repel and unlike poles attract. DC motors find applications in a very large variety of projects. They can act as wheels of your robot, open your curtains, drive gears in a custom made clock.

THANK YOU