**Sensors**

1. Relay Module: is a switch that is operated by an electromagnet. The electromagnet in turn is activated by a signal from a microcontroller. It contains a solenoid and an iron yoke. It also has a movable armature and contacts. When the relay module is de-energized, there is a gap that doesn’t allow current. However, when current passes through it, the armature activates due to magnetic field, and the contacts meet. So it activates and forms a full circuit. Reverse happens when de-energized.
2. LED Light Module: LED’s work on the principle of semiconductors. When voltage is passed through, electrons are loosened from their lattice and photons emitted. LED’s generate light from this process. LED modules are devices that contain several LED’s when connected to a power source which powers them collectively, make a wide variety of colors. They can be RGB configured to be multi-colored and emit various shades of light.
3. Vibration Sensors: are piezoelectric accelerometers that sense vibrations. Since vibrations are basically changing accelerations and speeds, they can be sensed by these devices. They have a certain vibration frequency range and sense only up to that. Has a seismic vibration sensor to detect weak vibrations, then amplifiers that amplify that signal and report the value.
4. Tilt Sensors: allow you to detect orientation or inclination. It has a cavity and in it a conductive fluid such as mercury. The end of the cavity has poles on it and when the device is tilted and mercury flows over the poles, it shorts them and conducts.
5. Push Button: is a switch activity to control some process or machine. They are made of hard plastic or metal.
6. Capacitive Touch Sensors: use the concept of capacitance and the fact that a human finger conducts electricity to measure the change in capacitance periodically and maps the trigger to the grid of area it was activated on.
7. Magnetic Sensor: detects the magnitude of magnetic field generated by a magnet. Switches on and off based on the presence of a magnet. Is based on the Hall Effect. If there is magnetic field and current, EMF is induced perpendicular to the surface.
8. Infrared Motion Sensors: detects changes in temperature of a still room and provides an image. Has an IR photodiode which is sensitive to IR light of the same wavelength of the IR emitting diode. The resistance and output voltages vary according to the proportion of received IR light.
9. Grayscale sensor: measures the intensity of light from black to white. Has a photocell and integrated white LED which will help you compare and provide reflective feedback on the light change.
10. Linear temperature sensor: by using the characteristics of a diode that when temperature increases, voltage increases, we can build a linear temperature vs. voltage characteristics and amplify the voltage to make an analog sensor.
11. Ambient light sensor: is a photodetector that is used to sense the amount of light in the area. Has a light dependent resistor that changes values based on the ambient light level. It will change the brightness of the LCD display accordingly.
12. Sound sensor: module that detects sound waves and converts them to electrical signals. Has a microphone, peak detector and an amplifier. As the sound moves through the device, it vibrates causing a change in capacitance which is converted to a voltage value and amplified.
13. Flame sensor: detects the presence of flames in a furnace. If no flame is detected, it will turn off the furnace to avoid dangerous gas leaks. It has a thin metallic rod that sends electricity to detect heat. If there is no heat after gas pump releases it closes the pump.
14. Voltage divider: is a device that uses resistance ratio to determine ratio of voltage that is distributed to multiple resistances (devices). Higher resistance device gets higher voltage and lower resistance device gets lower voltage. It detects supply voltage until a certain threshold.
15. Steam sensor: senses humidity on a sensor pad. There are exposed lines connected to GND and when there is humidity, short circuiting the exposed lines, the voltage value will change, causing a trigger that will detect level of steam.
16. Carbon monoxide sensor: electrochemical sensors contain reactive elements inside them which when react to the expected compound, create a proportional amount of voltage. This voltage is sent to a device that beeps when energized. So as long as the air contains CO, the beeping continues.
17. Piezo disk vibration sensor: responds to strain changes by generating a measurable output voltage proportional to the amount of vibration. It can also measure the extent of vibration (strain amount).
18. Rotation sensors: are devices that measure the amount of rotary displacement in any direction. Based on multi-turn precision potentiometer. Rotates up to 10 laps. The small change of voltage per lap can help us determine the amount of rotation it went to in laps, which are proportional to degrees.
19. Distance sensors: uses IR beam to reflect off a body so that it can measure its distance. It uses triangulation method to measure the distance. It has a position sensing device that will detect changes in angle of movement and has a built in processor.
20. Soil Moisture Sensor: uses the relationship between resistance and water content to determine the moisture content. It has two probes and it sends electrical current from one probe to the other which are connected with soil in between so it measures the resistance of the soil. Higher water content means more conductivity.
21. Joystick module: has a joystick at its pivot. When rotated it sends a message to the module. It has a potentiometer which varies in resistance as the joysticks are rotated. This changes the voltage values sent to the module.
22. Triple Axis Accelerometer: measures the vibration or acceleration in all three axes. The piezo material mass will be squeezed producing a charge proportional to the force.