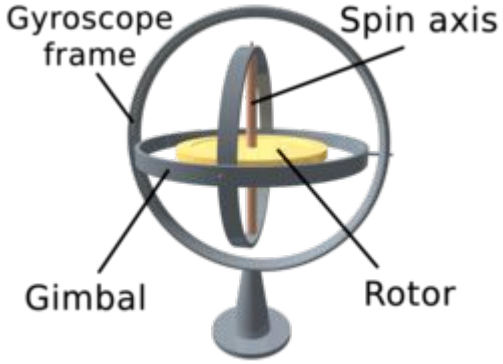
Lesson 4 – Coding Sensors - 2

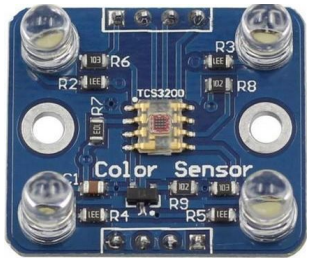


Sensor No 4 – Colour Sensor

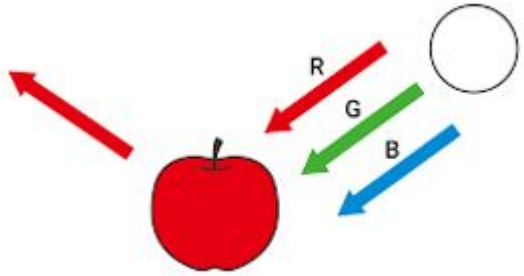
Colour Sensor

It is a "photoelectric sensor“, whose transmitter emits light and then

using a receiver it detects the light reflected to it from the object on which it fell.



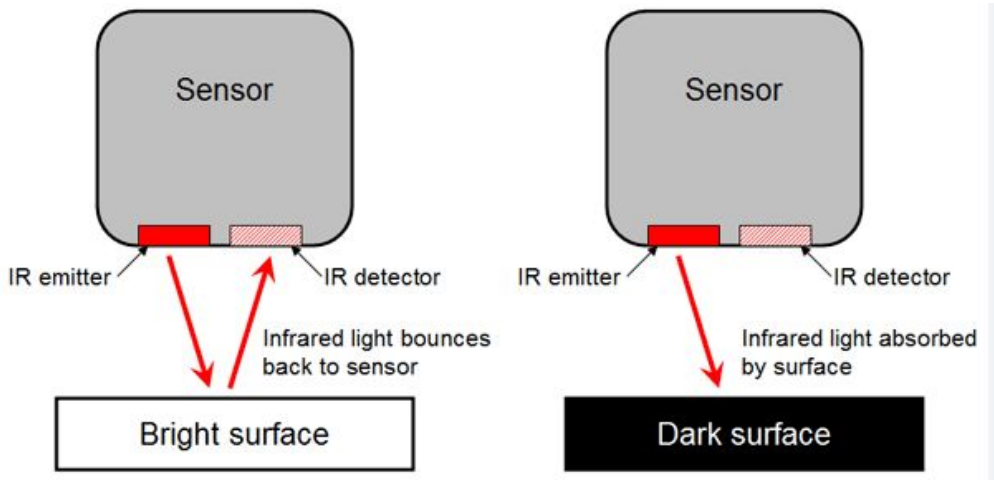
A colour sensor can detect the received light intensity for the three basic colours - Red, Blue and Green (RGB).



Thereafter, using filters it makes it possible to determine the exact colour of the target object.

A colour sensor has two main parts:

- A diode that emits the light (IR Emitter).
- A sensing plate that measures the intensity of reflected light falling on it (IR Detector).



How Does a Colour Sensor Work

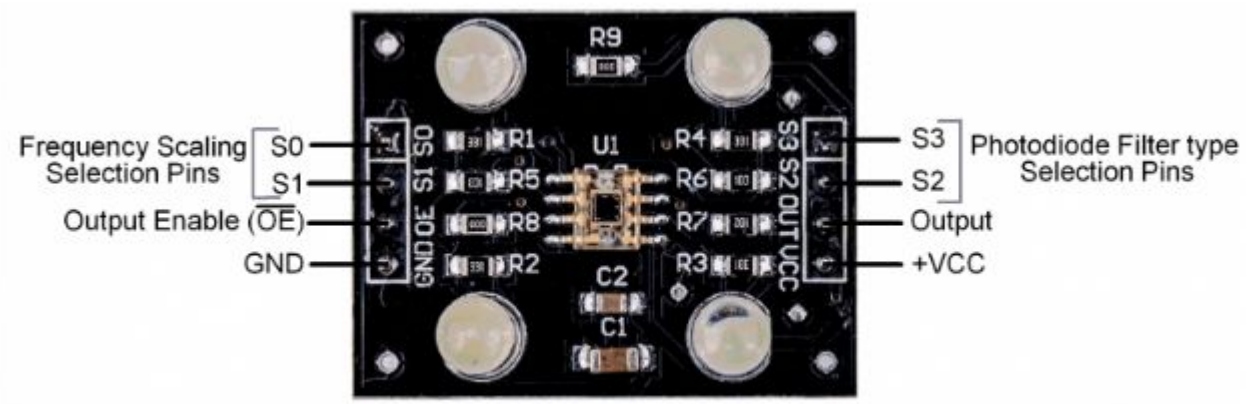
To detect the colour of material five main things come into play.

- A white light source to illuminate the material surface.
- A surface whose colour has to be detected.
- A receiver which can measure the reflected wavelengths.
- Filters.
- A light to voltage converter.

The receiver has three filters with wavelength sensitivities at 580nm, 540nm, 450nm.

These measure the wavelengths of red, green and blue colours respectively.

TCS 3200 is a typical Colour sensor



Color Sensor TCS3200 Pin Description

Project with Colour Sensor

Our Robot Codey Rocky can not only recognise colours
but it can convert the detected colour frequencies to those of music.

The story line of the project is:

When button A is pressed, Codey starts moving forward.
As it moves, it recognises the colours & converts them
in to corresponding musical note like Sa, Re, Ga, Ma, etc.

It also changes facial expressions as per the colour.
When it encounters white colour, it stops.

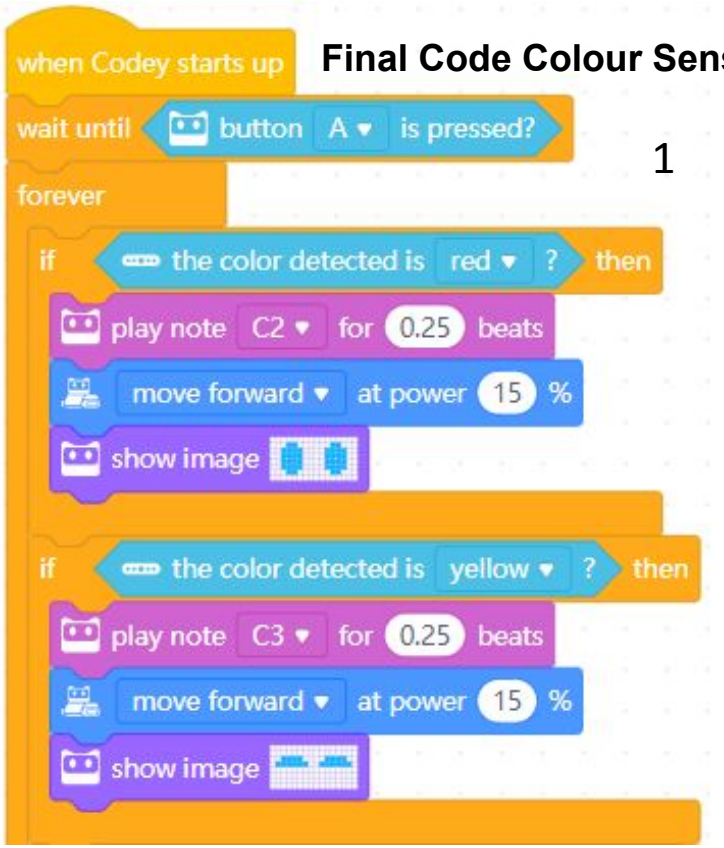
Try out more as per your imagination.

Colour – Sound Corelation, put Colour Strips of Codey Rocky in sequence:

- Red – Sa (Do).
- Yellow – Re (Re).
- Black – Ga (Me).
- Purple – Ma (Fa).
- Blue – Pa (Lo).
- Green – Dha (Sa).
- Cyan – Ni (Te).
- Red – Sa (Do).
- White – Stop Moving.

As Codey moves over these it creates Music

Final Code Colour Sensor



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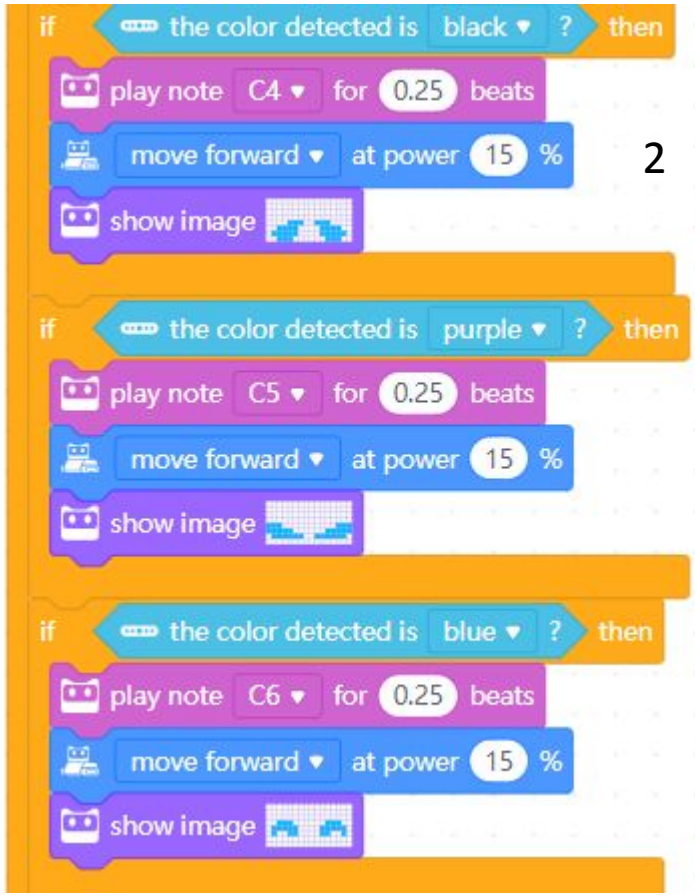

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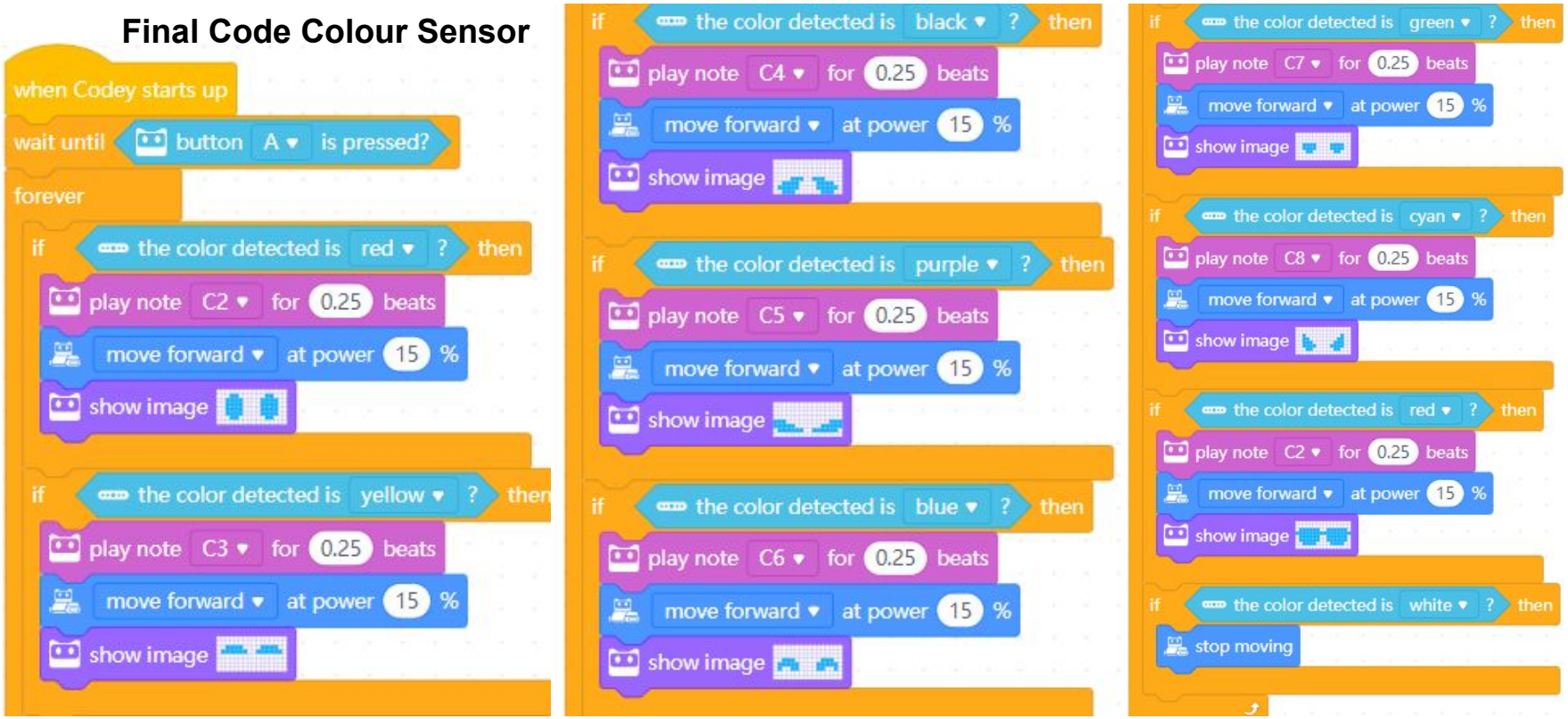
Code has three parts
Place one below the other

Final Code Colour Sensor



Sensor No 5 – Light Sensor

Light Sensor

A light sensor is a photoelectric device that converts light energy (photons) detected to electrical energy (electrons).

They convert light energy to an electrical signal output.
Thus, they **indicate the intensity of daylight or artificial light**.

Light sensors have several uses in industrial and everyday consumer applications. For example they can:

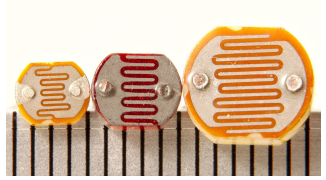
- Detect the amount of light in a room and raise / lower the blinds.
- Switch on / off the lights automatically to improve comfort level in a room.
- Automatically turn on lights in streets, business or at homes.

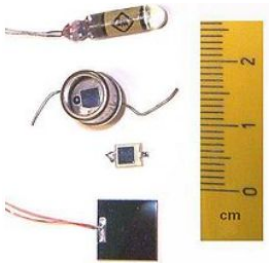
Along with coding they can do wonders. The applications are endless.

Types of Light Sensors

Primarily there are three types of light sensors:

- Photoresistors.





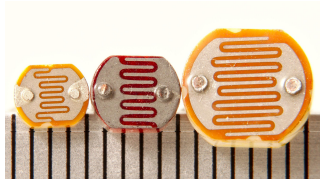
- Photodiodes.

- Phototransistors.

Photoresistors

Photoresistors work similarly to your regular resistors, but the resistance change depends on the amount of light it is exposed to.

High light intensity will cause a lower resistance between the cadmium sulphide cell, while low light intensity results in a higher resistance between the cadmium sulphide cells.



This working principle can be seen in applications such as street lamps, wherein during the day, the high light intensity results in lower resistance, and thus they are not lit up when the sun is still shining brightly.

Photodiodes

Photodiodes are mainly made from silicon and germanium materials and comprise optical filters, built-in lenses, and surface areas.

Photodiodes work on the working principle called the inner photoelectric effect. When a beam of light hits, electrons are loosened, causing electron holes that result in the electrical current flowing through. The brighter the light, the stronger the electrical current will be.

Since the current generated by photodiodes is directly proportional to light intensity, it makes it favourable for light sensing that requires fast light response changes. Also, they are very responsive to infrared light.

Some of the applications of photodiode are:

- Compact disc players
- Smoke detectors
- Remote control devices
- Solar panels
- Medical applications

Phototransistors

The phototransistor light sensor can be described as a photodiode + amplifier.

With the added amplification, light sensitivity is far better on the phototransistors. However, it does not fair better in low-light detection than in photodiodes.

Working principle, is similar to that of photo diode.

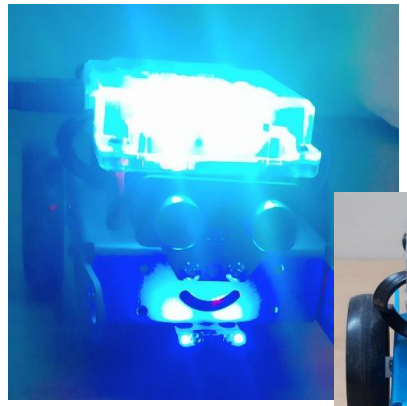
Project with Light Sensor

The aim of this project is to understand How this along with coding, can help us achieve automation in the world of lights

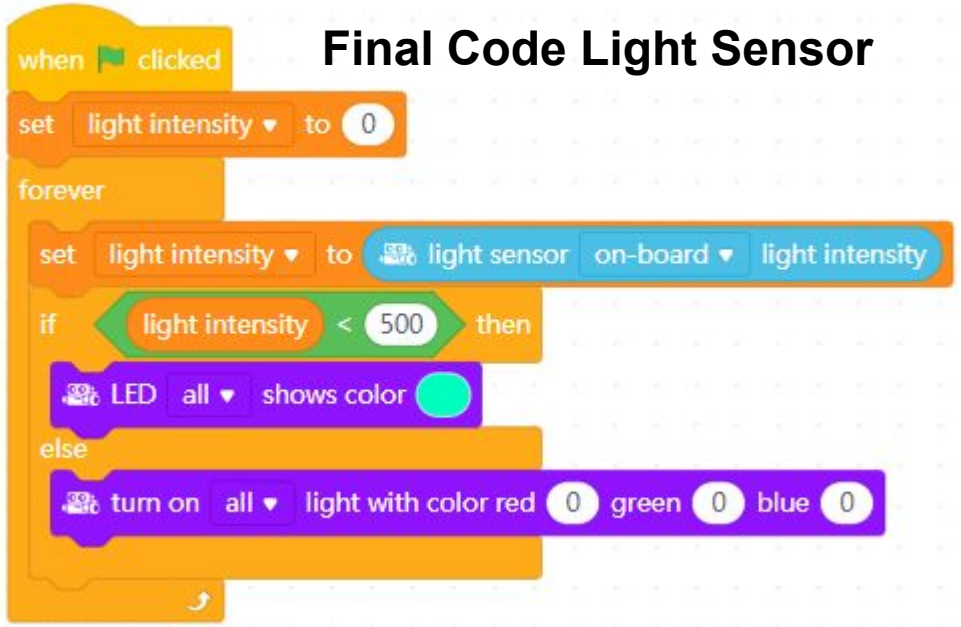
The story line is:

When mBot starts up:

- It starts sensing the intensity of light falling on it.
- If Light Intensity falling on mBot is less than 500 then mBot will light up its LED's ie lights.
- If Light Intensity falling on mBot is greater than 500 then mBot will turn off its LED's.



Final Code Light Sensor



Sensor No 6 – Gyro Sensor

MEMS & Gyro Sensors

Micro electromechanical systems, popularly known as **MEMS**, is the technology of very small electromechanical and mechanical devices.

Many of the mechanical devices such as Accelerometer, Gyroscope, etc… can now be used with consumer electronics.

This is possible only because of MEMS technology. These sensors are packaged similarly to other IC’s.

Accelerometers and Gyroscopes

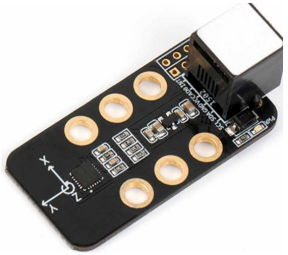
The two compliment each other so, they are usually used together.

An accelerometer measures the linear acceleration or directional movement of an object, whereas Gyroscope Sensor measures the angular velocity or tilt or lateral orientation of the object.

Gyroscope sensors for multiple axes are also available.

Gyroscope sensor

It is a device that can measure and maintain the orientation and angular velocity of an object.



Gyroscope sensors also measure motion of objects.

There are three types of angular rate measurements:

- Yaw - Horizontal rotation on a flat surface when seen from above.
- Pitch - Vertical rotation as seen from front.
- Roll - Horizontal rotation when seen from frc

Applications of Gyroscope Sensor

Gyroscope sensors are used in the car navigation systems, Electronic stability control systems of vehicles, motion sensing for mobile games, camera-shake detection systems in digital cameras, Robotic systems, etc.

Developers are designing many efficient and low-cost products such as gesture-based control of the wireless mouse, directional control of wheel-chair etc.

Project with Gyro Sensor

The aim of this project is to understand the three dimensional Gyro movements.

We shall use an HaloCode for this.

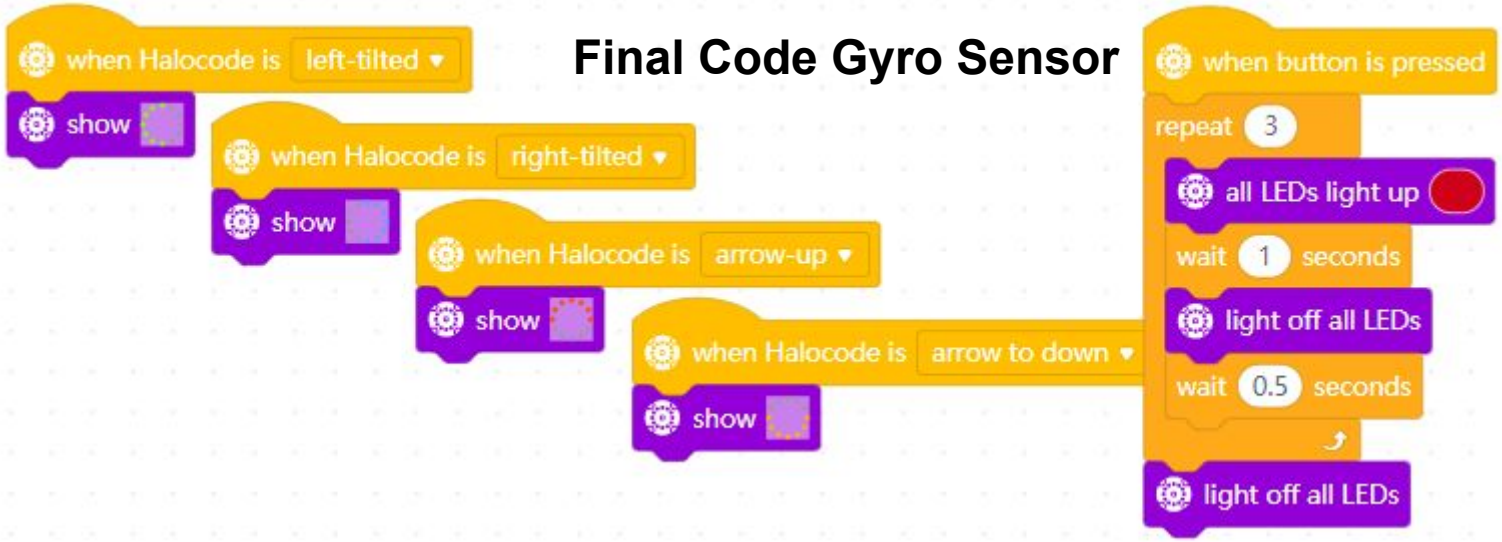
The story line is:

When HaloCode starts up and is tilted in any of the four direction (Leftward, Rightwards, Upward or Downward).

Six LED’s of HaloCode
of that specified direction will light up.

When you press the button of HaloCode it will turn on all its LED’s for 3-Times and then turn off all its LED.

Final Code Gyro Sensor



Code Karega India Badhega