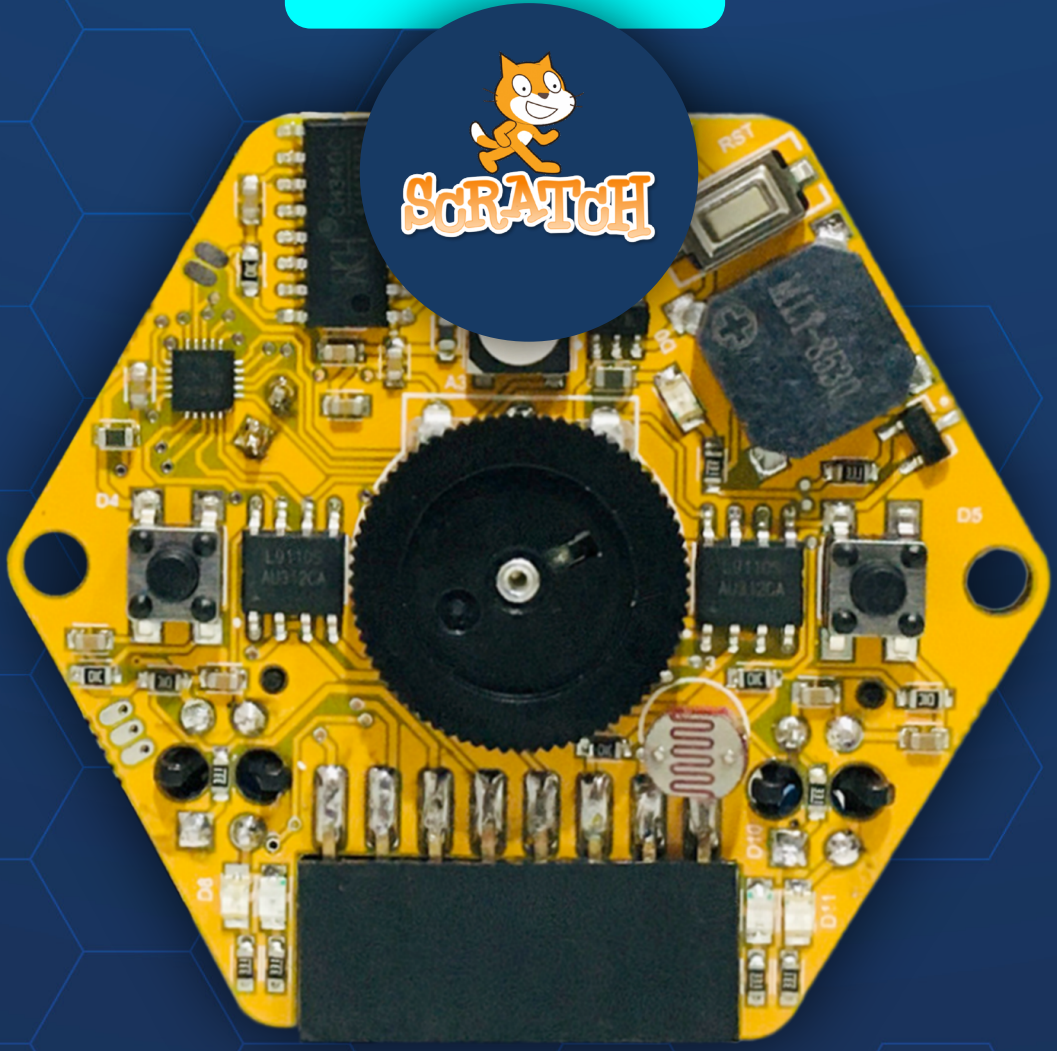
magicbit

TINY

WITH SCRATCH

BASIC



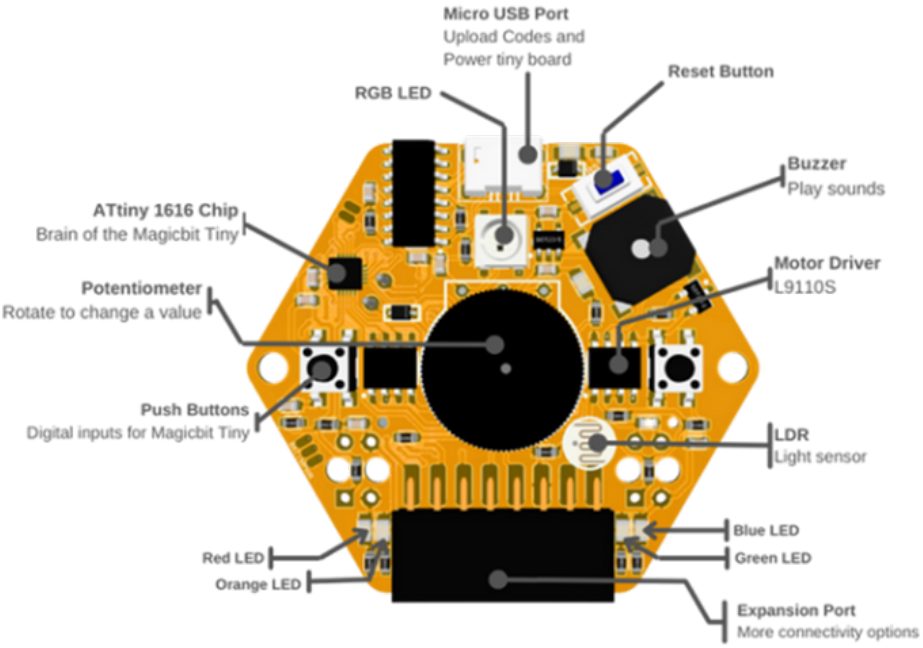
Learning Outcomes

- Basic programming in Scratch
- Magicbit Tiny associated activities
- Creative hands-on projects using simple craft materials

Lessons Outline

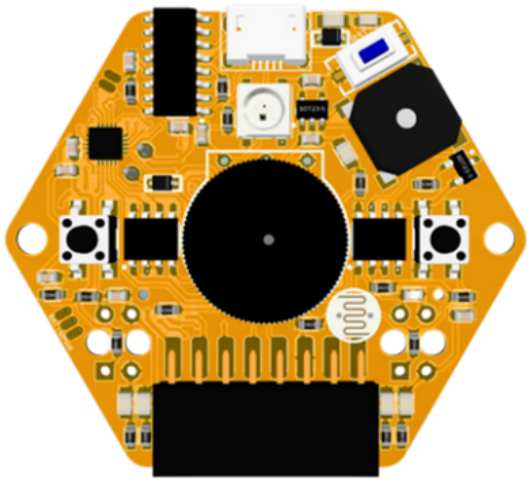
Lesson Number	Lesson Name
01	Introduction to Scratch
02	Light Show
03	Move Sprites
04	Dimmer Magic
05	Secret Message
06	Day - Night Predictor
07	Night Light
08	Anti-theft + fire detector
09	Automatic Rail gate
10	People Count
11	DIY Sensor

Magicbit Tiny Layout

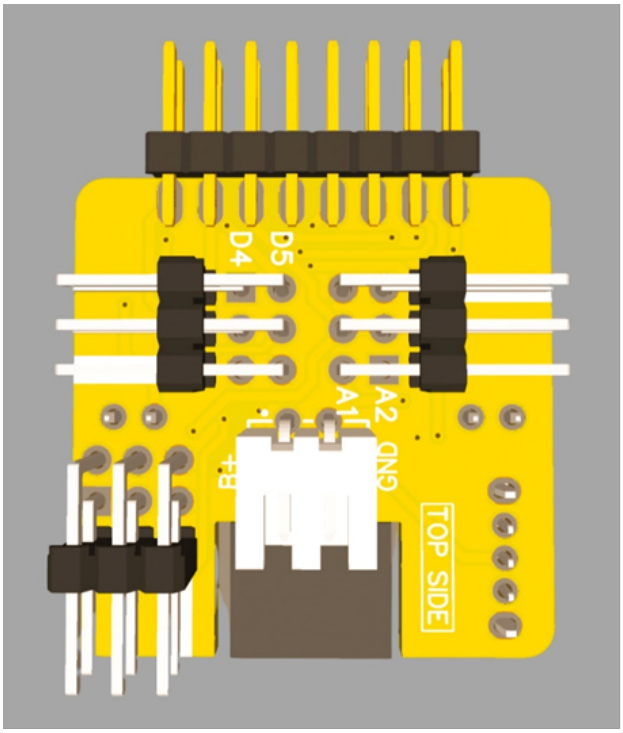


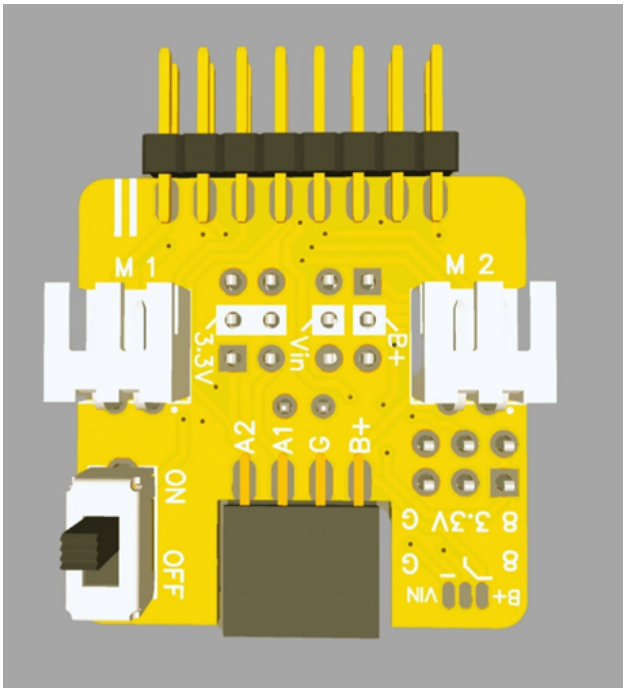
Magicbit Tiny Pinout

IR	A6,A5
RGB LED	0
Red LED	4
Orange LED	5
Green LED	10
Blue LED	11
Left button	12
Right button	9
Buzzer	13
POT	A3
LDR	A7
Motor 1	4/5
Motor 2	10/11



Tiny Extension Pinout





01. Introduction to Scratch

ACTIVITY 01

Simple scratch program to blink LEDs

✦ Learning Outcomes

- Scratch / MagicCode Platform
- Basics of the Scratch programming
- LED controlling with digital signals

✦ Materials Required

- Magicbit Tiny Board
- USB cable
- Computer with Internet Connection
- MagicCode Platform

✦ Steps for the Activity

- Expected Output - https://youtu.be/5diwtSEepAA

STEP 01 Get into the MagicCode platform - MagicCode 3.0

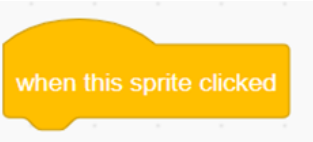
STEP 02 Connect the Magicbit Tiny to the computer and with MagicCode via USB

Help Guide - https://youtu.be/pTwA3AFiCVA

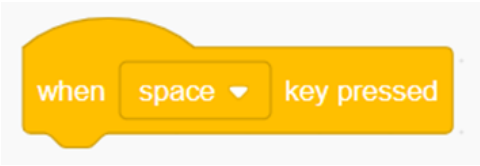
STEP 03 Use one of the program running methods in Scratch **"Events"** category

1. By clicking on the **"Green Flag".**

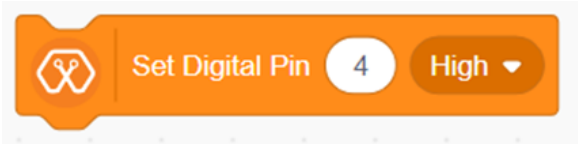
2. By clicking on the **sprite** in the stage.



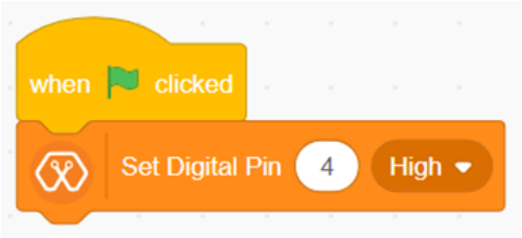
3. By pressing any or specified key in the keyboard

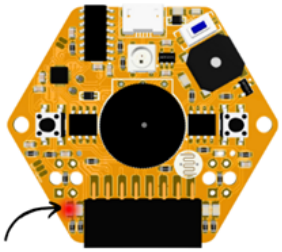


STEP 04 Use the below block in the “Magicbit Tiny” category to blink the LEDs.



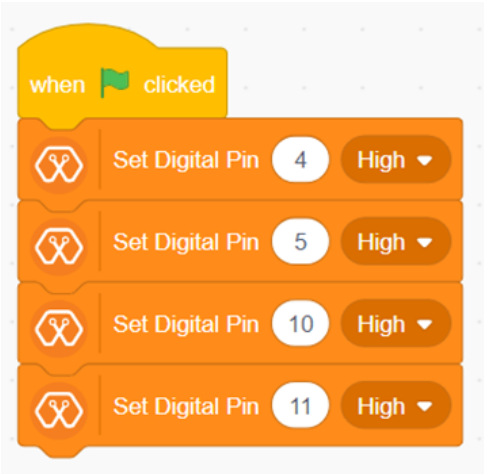
STEP 05 Make the below code to light up the RED LED in the Tiny board.

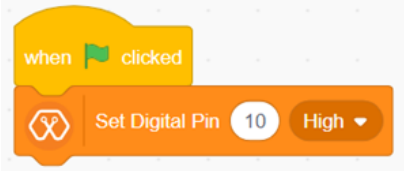


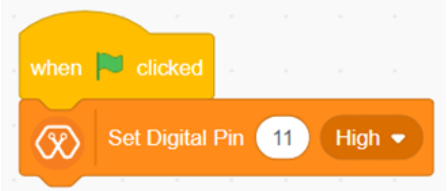


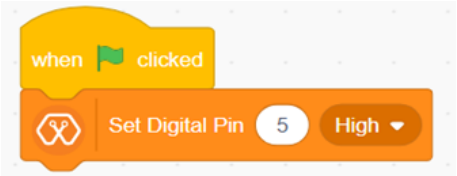
STEP 06 Change the pin numbers for other LEDs.

- Yellow/Orange - 5
- Green - 10
- Blue - 11

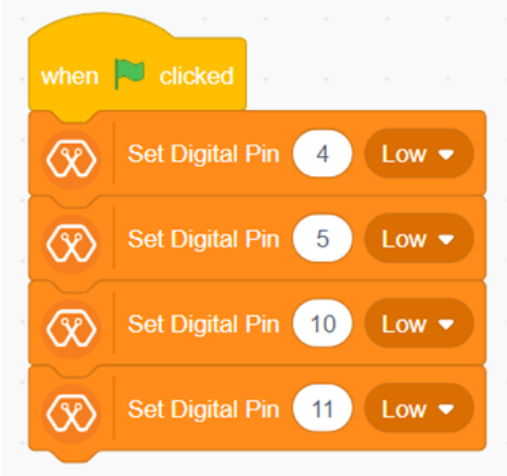








STEP 07 Change the status to off the LEDs



02. Light Show

ACTIVITY 02

Scratch programming to create light patterns

Learning Outcomes

- “Loops” in programming
- Patterns from LEDs

Materials Required

- Magicbit Tiny Board
- USB cable
- Computer with Internet Connection
- MagicCode Platform

Steps for the Activity

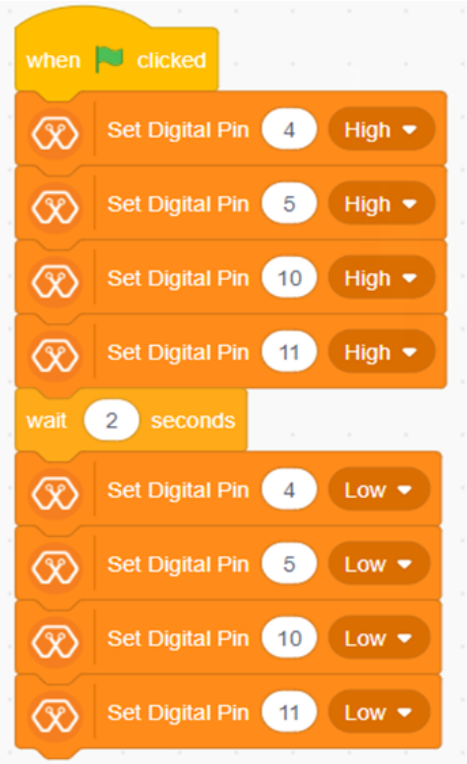
- Expected Output - https://youtu.be/ZYS_e6YxRCg

STEP 01 Get into the MagicCode platform - MagicCode 3.0

STEP 02 Connect the Magicbit Tiny to the computer and with MagicCode via USB

Help Guide - https://youtu.be/pTwA3AFiCVA

STEP 03 Make the program to turn on all 4 LEDs and then turn off them after few seconds



STEP 04 Try different Patterns - https://youtu.be/J8UhgEjXZqg

03. Move Sprites

ACTIVITY 03

Simple scratch program to control sprites with Magicbit Tiny push buttons

✦ Learning Outcomes

- Functioning of the push buttons
- Handling sprites in scratch with push buttons

✦ Materials Required

- Magicbit Tiny Board
- USB cable
- Computer with Internet Connection
- MagicCode Platform

✦ Steps for the Activity

- Expected Output - https://youtu.be/vCxX03kPwR4

STEP 01 Get into the MagicCode platform - MagicCode 3.0 and connect Magicbit Tiny

STEP 02 Push buttons in Magicbit Tiny

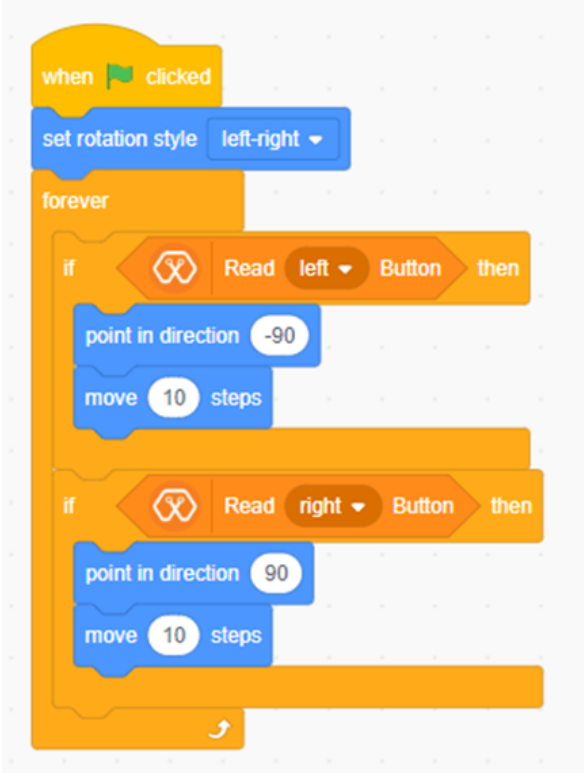
Pin numbers

- Right button - pin 9
- Left button - pin 12
- The block which uses to handle the push buttons in tiny

STEP 03 Run block and see how the readings vary with the button pressings

- When the button pressed - True
- When button is not pressed - False

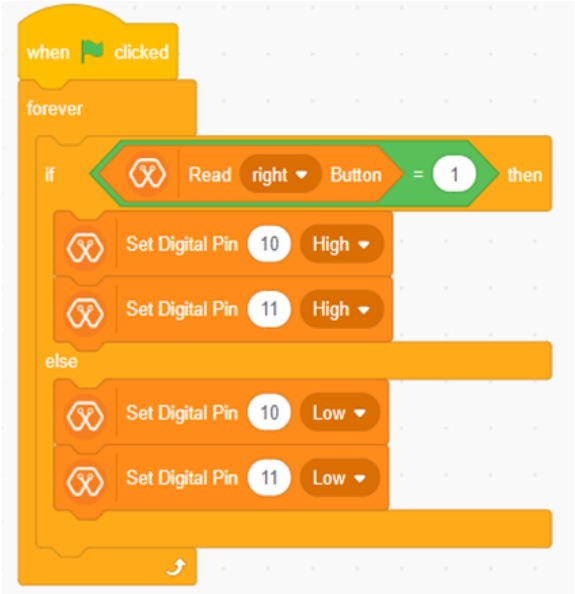
STEP 04 Make the below code for any sprite to move it along the stage using push buttons in the Magicbit Tiny



STEP 05 Create a program to control the LEDs using push buttons

- LEFT side LEDs (Red and Orange) when the Left Push button is pressed.

- RIGHT side LEDs (Blue and Green) when the Right Push button is pressed.



04. Dimmer Magic

ACTIVITY 04

Create a simple program to control the brightness of the LEDs using the Potentiometer

Learning Outcomes

- Practical applications of basic electronic circuits
- Creativity and Innovation

Materials Required

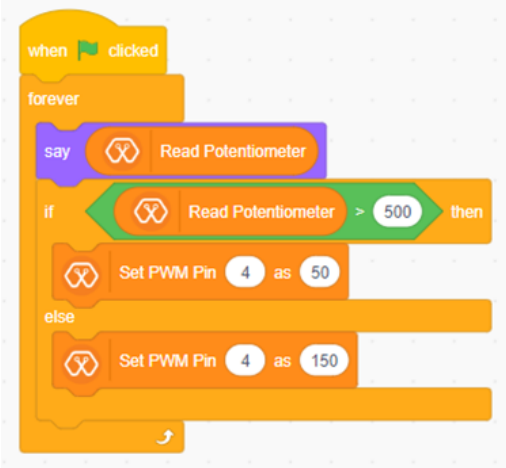
- Magicbit Tiny Board
- USB cable
- Computer with Internet Connection
- MagicCode Platform

Steps for the Activity

- Expected Output - https://youtu.be/LWfj0KK7BGE

STEP 01 Get into the MagicCode platform - MagicCode 3.0 and connect Magicbit Tiny

STEP 02 Make the below program to control the brightness of the on-board red LED according to the Potentiometer value



STEP 03 Update above program to control all 4 LEDs

05. Morse Code Messaging

ACTIVITY 05

Create a simple program to control the brightness of the LEDs using the Potentiometer

Learning Outcomes

- Practical applications of basic electronic circuits
- Creativity and Innovation

Materials Required

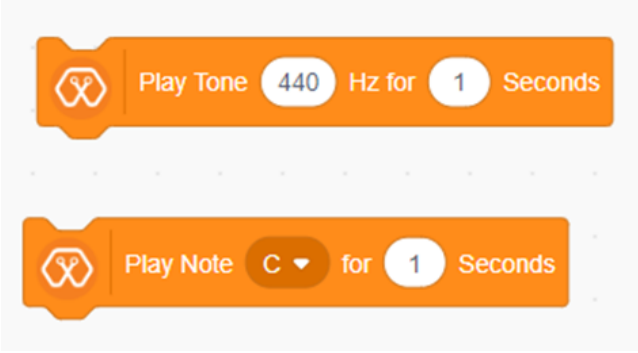
- Magicbit Tiny Board
- USB cable
- Computer with Internet Connection
- MagicCode Platform

Steps for the Activity

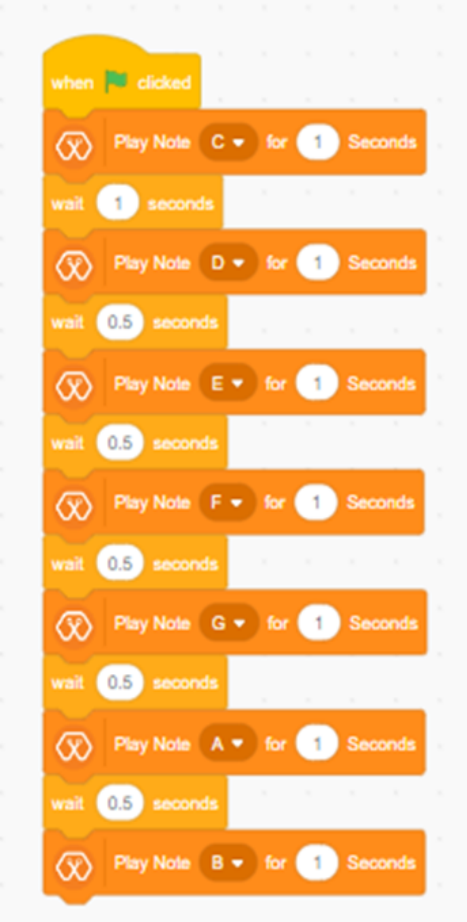
- Expected Output - https://youtu.be/J1nFBHAuzAg

STEP 01 Get into the MagicCode platform - MagicCode 3.0 and connect Magicbit Tiny

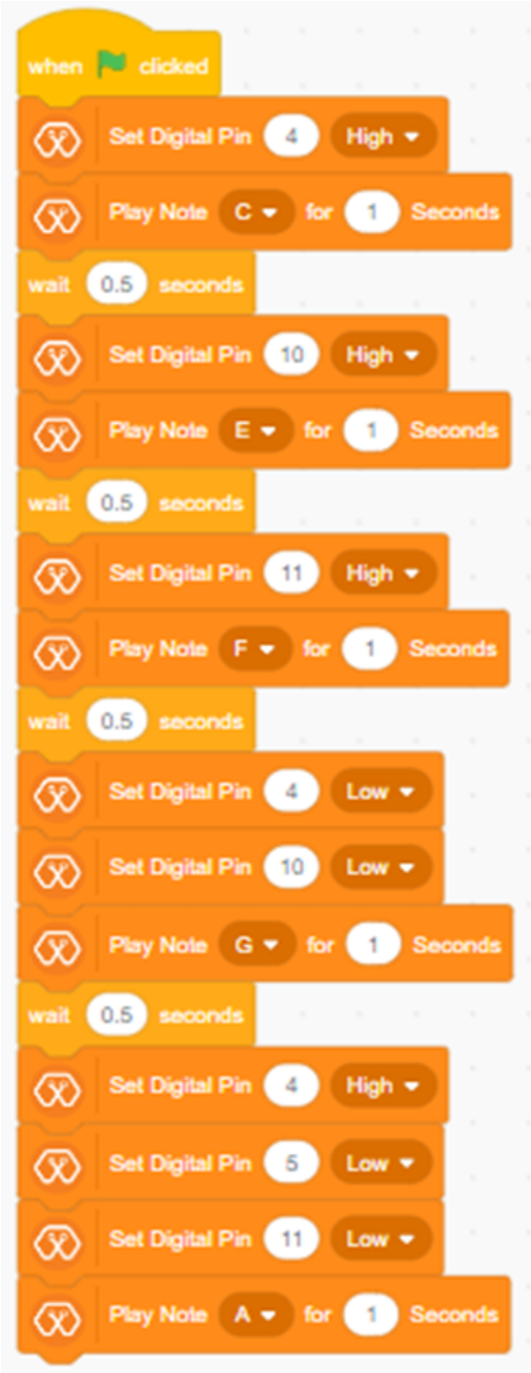
STEP 02 These are the blocks which can be used to function the buzzer



STEP 03 Create a program for a simple musical piece using above blocks as follows



STEP 04 Make the code to display a pattern in the LEDs while making a different tone for each output.


when clicked
Set Digital Pin 4 High
Play Note C for 1 Seconds
wait 0.5 seconds
Set Digital Pin 10 High
Play Note E for 1 Seconds
wait 0.5 seconds
Set Digital Pin 11 High
Play Note F for 1 Seconds
wait 0.5 seconds
Set Digital Pin 4 Low
Set Digital Pin 10 Low
Play Note G for 1 Seconds
wait 0.5 seconds
Set Digital Pin 4 High
Set Digital Pin 5 Low
Set Digital Pin 11 Low
Play Note A for 1 Seconds

06. Day / Night Predictor

ACTIVITY 06

Create a simple program for an scratch animation to indicate day and night according to the environmental light condition

Learning Outcomes

- Creativity and Innovation
- Functioning of the LDR
- Animations in scratch

Materials Required

- Magicbit Tiny Board
- USB cable
- Computer with Internet Connection
- MagicCode Platform

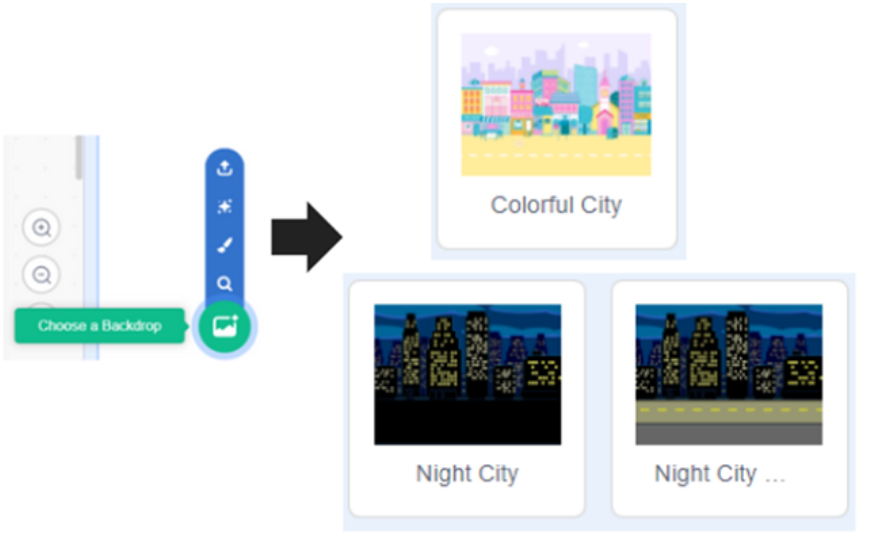
Steps for the Activity

- Expected Output - https://youtu.be/0czwEVSYptU

STEP 01 Get into the MagicCode platform - MagicCode 3.0 and connect Magicbit Tiny

STEP 02 Make the scratch animation background which looks like a day time and night time

- Add any backdrop which looks like Day Time (Eg:- Colorful City)
- Add any backdrop which looks like the Night time (Eg:- Night City)

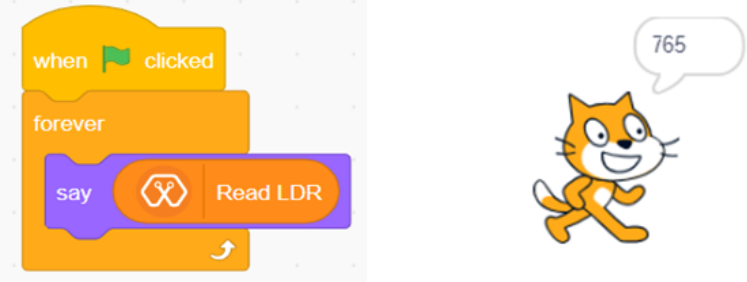


- Delete the default sprite and select a suitable sprite

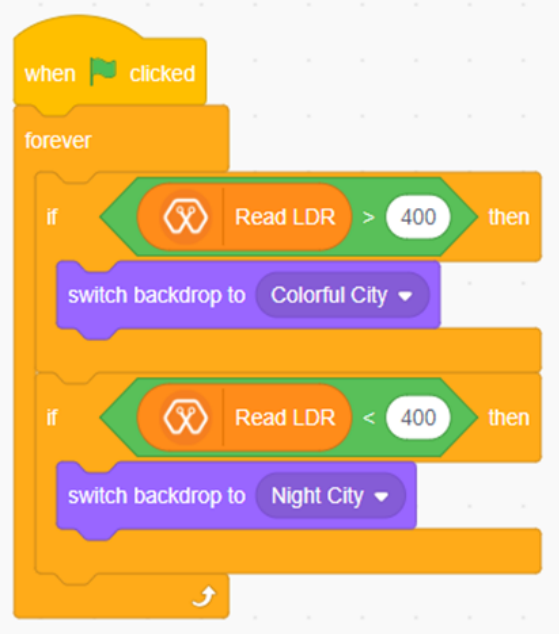
About the LDR

- What is LDR - LDR (Light Dependent Resistor) is a sensor which can be used to measure the light intensity in the environment.
- The below block in the “Magicbit Tiny” category can be used to get the readings from the Magicbit Tiny LDR.

STEP 03 Make a simple program to get the reading from Magicbit Tiny LDR and display it on the MagicCode stage.



STEP 04 Update the above program to switch between the backdrops selected earlier according to the LDR reading.



07. Night Light

ACTIVITY 07

Create a simple program to activate a light bulb (LED / RGB) according to the environmental light condition

Learning Outcomes

- Practical applications of basic electronic circuits
- Creativity and Innovation
- Functioning of the LDR

Materials Required

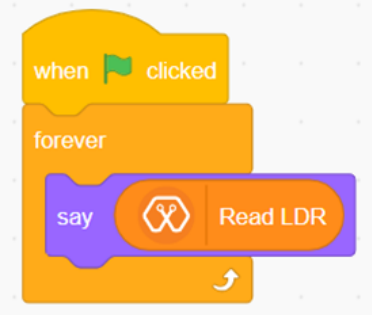
- Magicbit Tiny Board
- USB cable
- Computer with Internet Connection
- MagicCode Platform

Steps for the Activity

- Expected Output - https://youtu.be/g1bGuv1lukQ

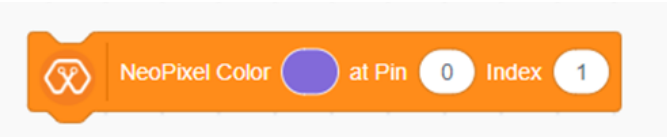
STEP 01 Get into the MagicCode platform - MagicCode 3.0 and connect Magicbit Tiny

STEP 02 Make a program to read the light condition inside your room

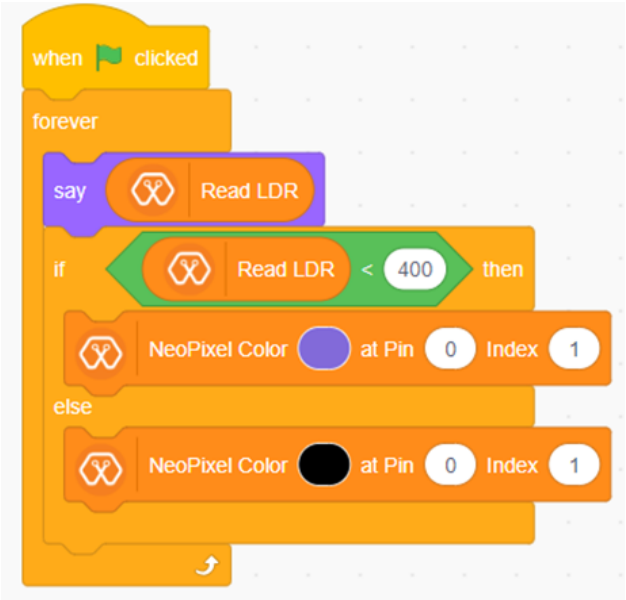


STEP 03 Update the program to activate the RGB LED in the Magicbit Tiny according to the measured LDR value.

- These are the blocks used in MagicCode to activate RGB LED



- Make the program and test



- Adjust the program for different colors in different LDR reading ranges

08. Anti-Theft

ACTIVITY 08

Create a simple program to activate an alarm from the buzzer when a movement is detected by the IR sensors

Learning Outcomes

- Practical applications of the concepts
- Creativity and Innovation
- Functioning of the proximity IR sensors

Materials Required

- Magicbit Tiny Board
- USB cable
- Computer with Internet Connection
- MagicCode Platform

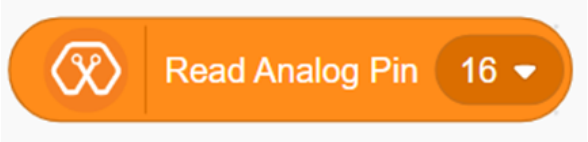
Steps for the Activity

- Expected Output - https://youtu.be/NEFo_9V7h3s

STEP 01 Get into the MagicCode platform - MagicCode 3.0 and connect Magicbit Tiny

Proximity IR sensors

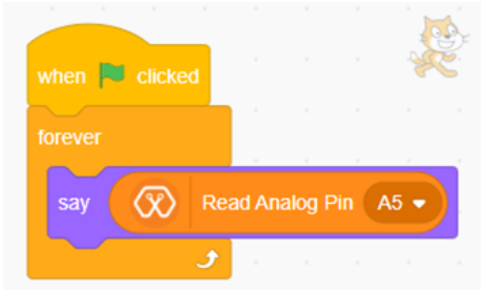
- In back side of the Magicbit Tiny
- Connected to pin A5 and A6
- The block used in MagicCode for IR sensor reading is,

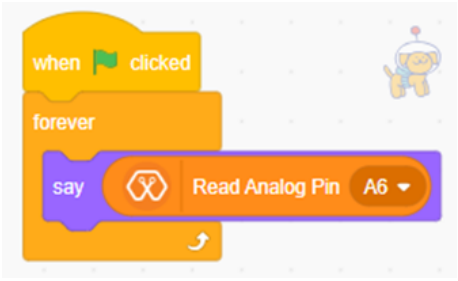


STEP 02 Make a program to get the readings from both IR sensors in the Magicbit Tiny

- Add two sprites

- Make the program as one sprite to display the reading from one IR sensor

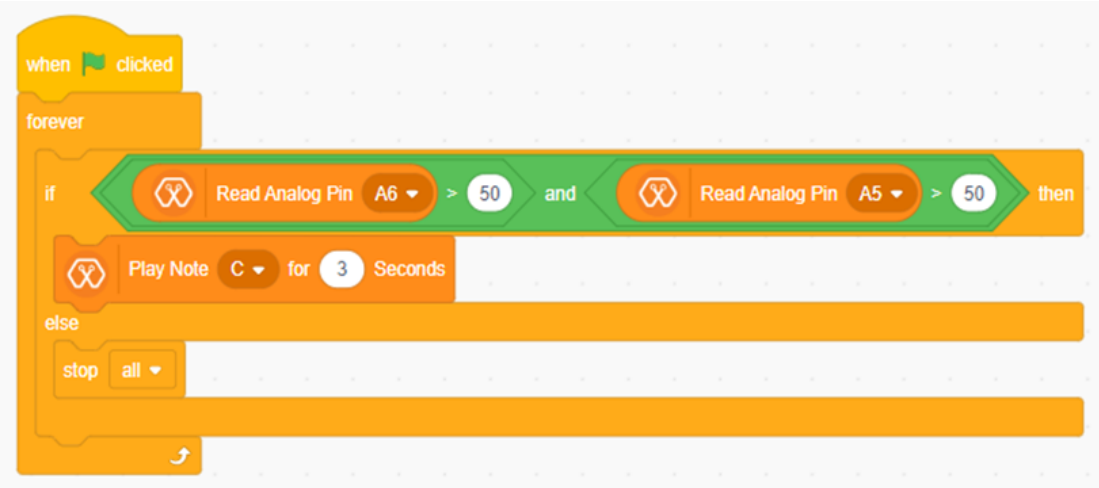




STEP 03 Update the above program (use only one sprite) to activate the buzzer according to the readings from IR sensors

- Here the “AND” and “OR” operators can be used.

- Use AND operator and make the program



Try - Update the program to make a fire detector

- IR sensors for detection
- Change the conditions for IR readings

09. Rail Gate

ACTIVITY 09

Create a simple program to activate the servo motor as the rail gate when as motion detected by the Proximity IR sensors

Learning Outcomes

- Practical applications of the concepts
- Creativity and Innovation
- Functioning of the proximity IR sensors
- Functioning of the servo motors

Materials Required

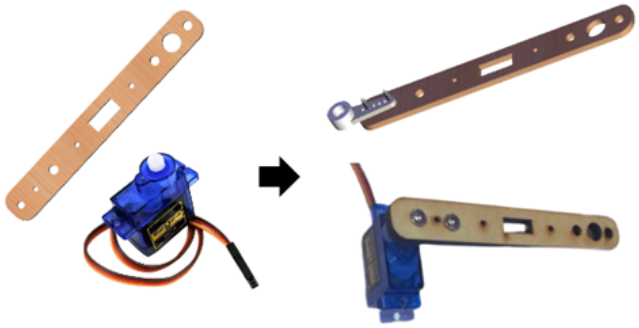
- Magicbit Tiny Board
- Tiny extension module
- USB cable
- Computer with Internet Connection
- MagicCode Platform
- Servo motor

Steps for the Activity

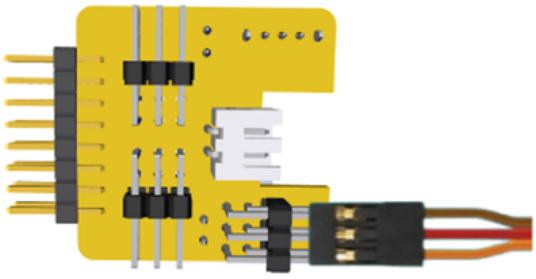
- Expected Output - https://youtu.be/gxgTAXWFNac

STEP 01 Get into the MagicCode platform - MagicCode 3.0 and connect Magicbit Tiny

STEP 02 Fix the wooden servo arm with the servo motor (Here the wooden arm works as the rail gate)



STEP 03 Connect the servo motor cable with tiny extension pin 8

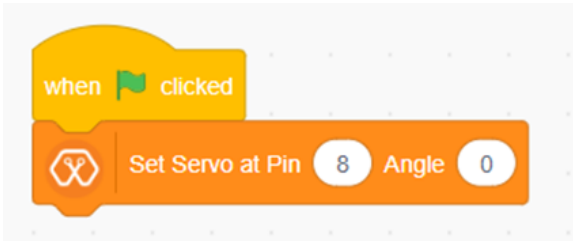


STEP 04 Connect the extension module with the Magicbit

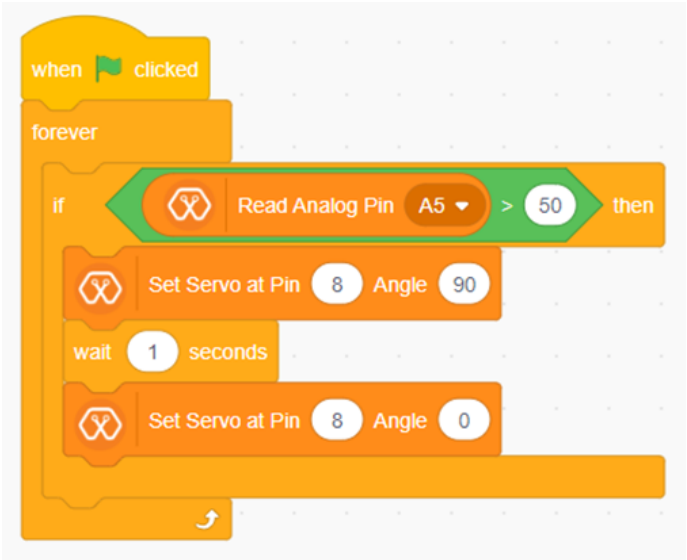
STEP 05 Power the Extension with the battery while the Magicbit Tiny is connected to the computer via USB

STEP 06 Make the below program to figure out the required servo motor angles.

- Enter the pin number as 8
- Check with different angles from 0 - 180



STEP 07 Make the program to operate the servo motor according to the motion detected by the IR proximity sensor in the Magicbit Tiny.



10. People Count

ACTIVITY 10

Create a simple program to count the no.of people (motions) entering through a door and going out from the door when a motion is detected by the Proximity IR sensors.

✦ Learning Outcomes

- Practical applications of the concepts
- Creativity and Innovation
- Functioning of the proximity IR sensors
- Variables in programming

✦ Materials Required

- Magicbit Tiny Board
- USB cable
- Computer with Internet Connection
- MagicCode Platform

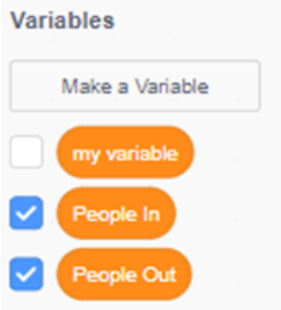
✦ Steps for the Activity

- Expected Output - https://youtu.be/c93mD88_Z3g

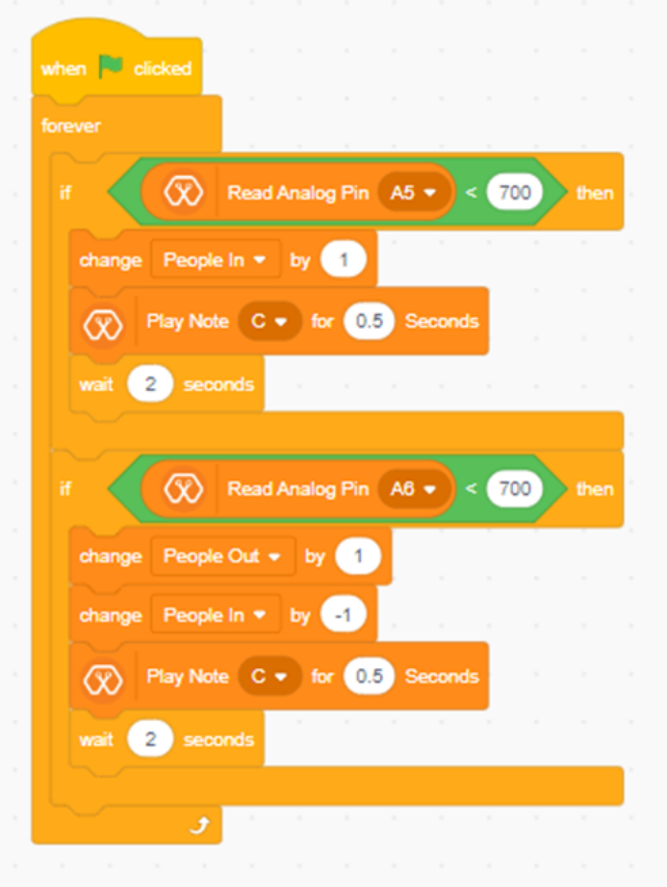
STEP 01 Get into the MagicCode platform - MagicCode 3.0 and connect Magicbit Tiny

STEP 02 Make the scratch interface by adding a suitable backdrop and sprite

STEP 03 Create two variables as “People In” and “People Out”



STEP 04 Make the program to update the created variables according to the motions from IR sensors.



11. DIY Sensors

ACTIVITY 11

Create a simple program to indicate the conductivity of different materials as a Neo-pixel indicator using the Magicbit Tiny.

Learning Outcomes

- Practical applications of the concepts
- Creativity and Innovation
- Functioning of RGB LEDs

Materials Required

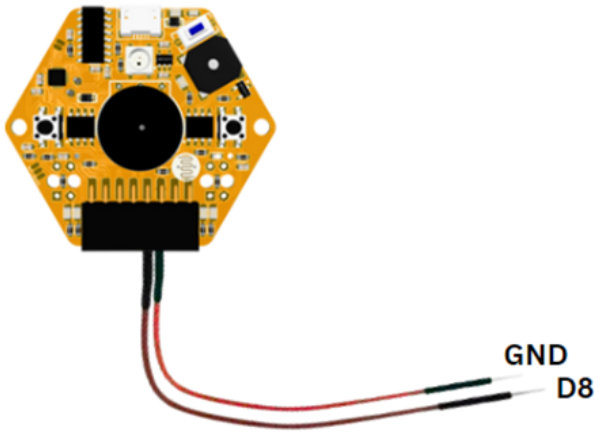
- Magicbit Tiny Board
- USB cable
- Computer with Internet Connection
- MagicCode Platform
- M-M jumper cables
- Different types materials (Paper , rubber , metal , copper)

Steps for the Activity

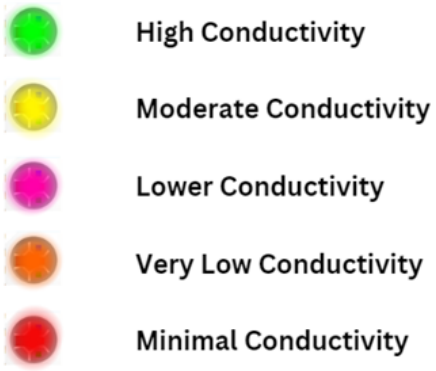
- Expected Output - https://youtu.be/eSGc3KKRuIE

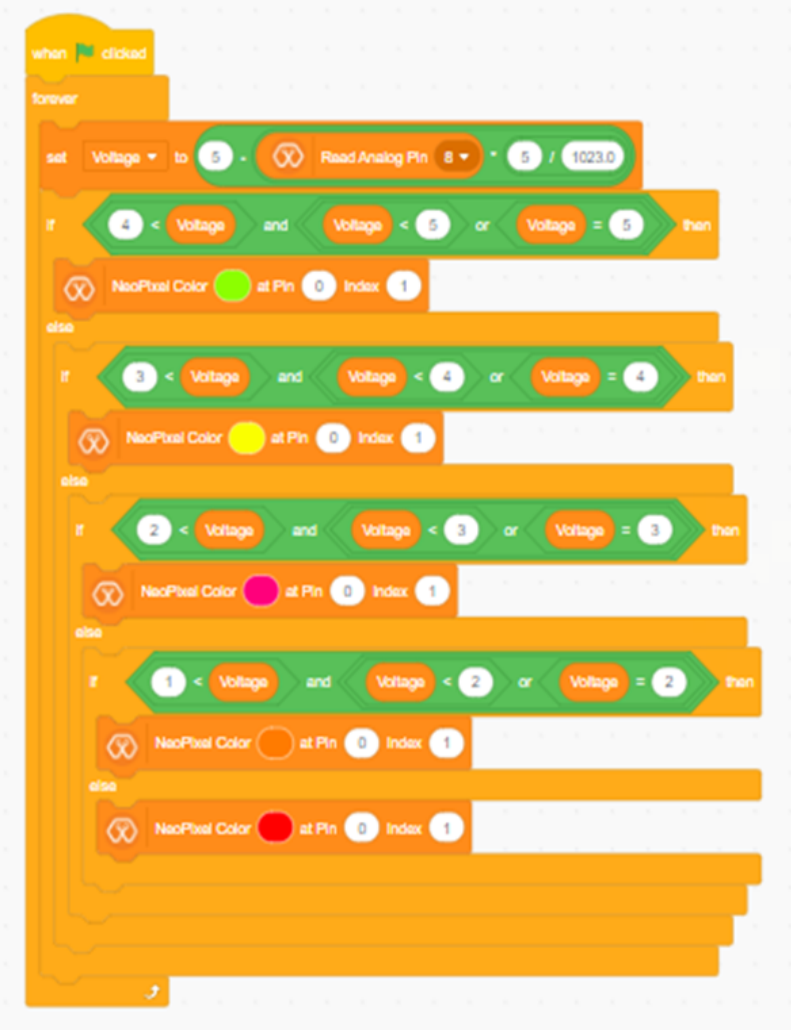
STEP 01 Get into the MagicCode platform - MagicCode 3.0 and connect Magicbit Tiny

STEP 02 Connect one jumper wire to the ground pin and one jumper wire to the D8 pin of the Tiny board.



STEP 03 Make the program to indicate the conductivity level in different colors of the RGB.



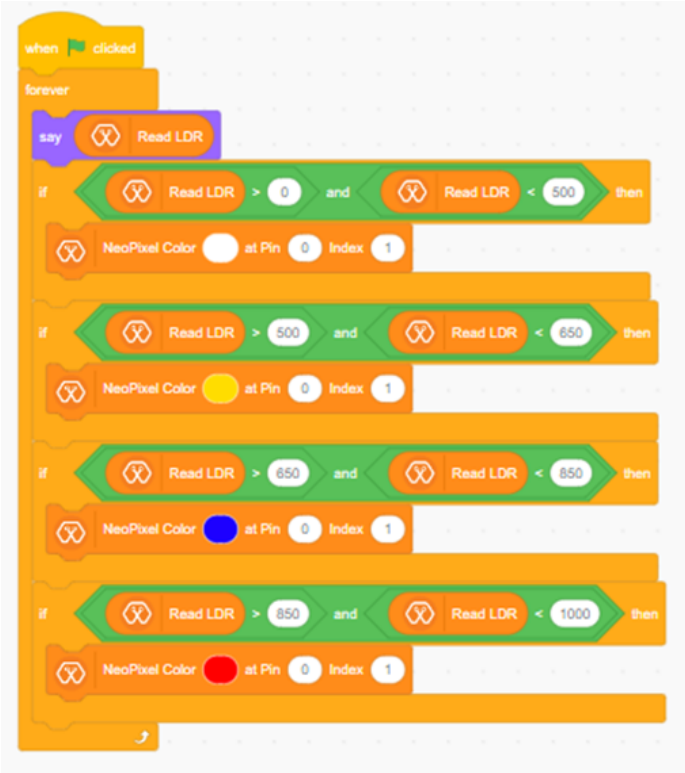


ACTIVITY 12

DIY Soil Sensor

- Create a program to indicate the different moisture levels in the soil using the Neopixel indicator in the Magicbit Tiny.
  - Same program and same set up as in Activity 01 above.
  - Insert the free ends of the jumper cables to a soil sample to get the results through Neo-pixel (RGB) LED.

ACTIVITY 13

DIY Color Sensor

- Create a simple program to detect the ambient light's color using LDR and display it through a Neo-Pixel RGB LED using the Magicbit Tiny.
  - Make the below program to get the ambient light values from the LDR and according to those values, control the RGB color