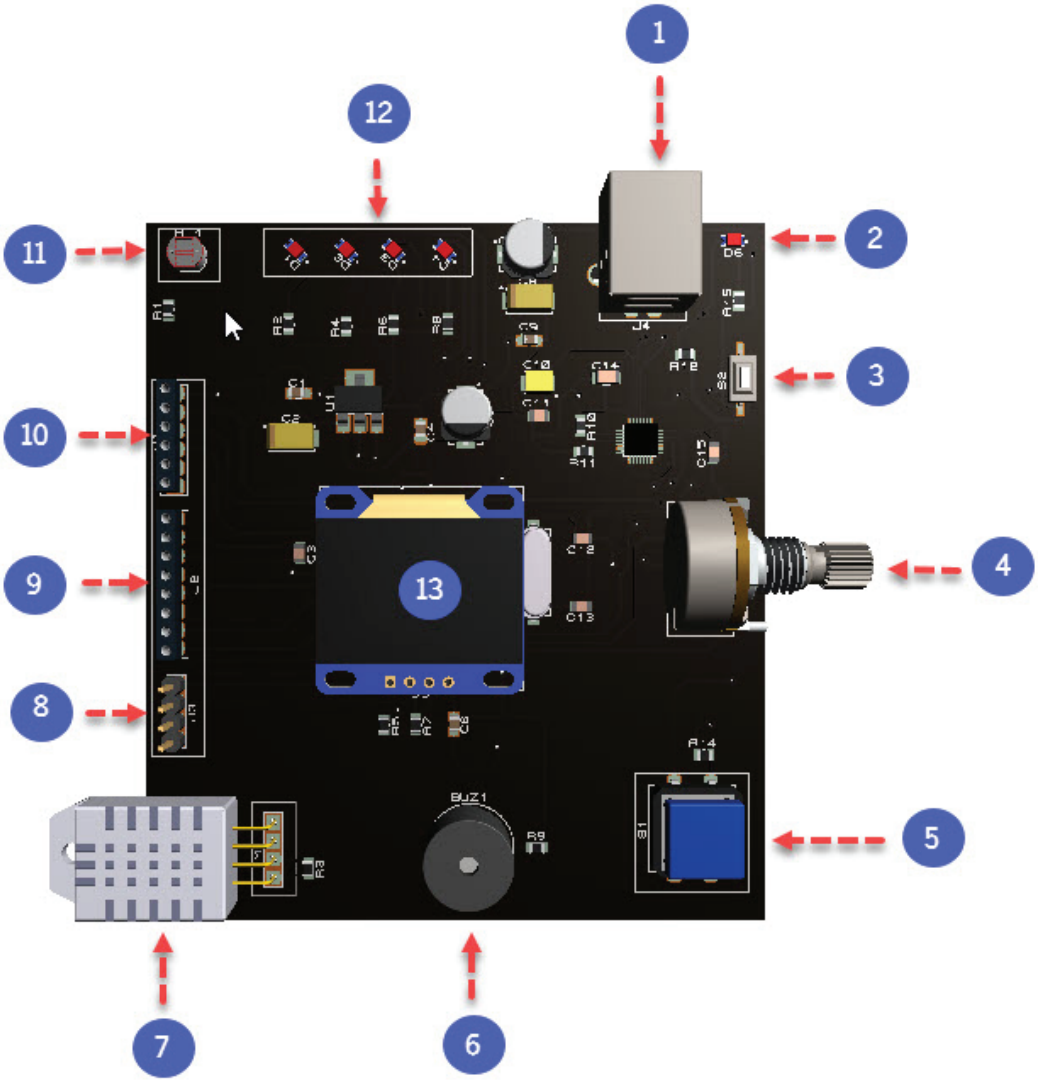
MAKER BOX

MakerBox Platform

MakerBox is a physical computing platform designed to teach STEM to kids aged 6 - 13yrs. It is equipped with sensors, user programmable leds, an oled display and extension port for use with extra sensors and modules.



1. USB PORT

Connects makerbox to computer, usb is used to
* Debugging
* Transfer Serrial data between makerbox and computer
* Powers makerbox circuitry

2. POWER LED (Yellow Color)

The LED turns ON when MakerBox is powered and turns OFF when disconnected from USB power supply

3. RESET BUTTON

Resets MakerBox, that is, program starts again in its intial state

4. KNOB

Knob is a sensor that provides rotary values between 0 and 1023
* 0 - Min
* 1023 - Max

5. BUTTON

Button is a sensor that gives digital information if either its pressed or released
* Pressed - HIGH status
* Released - LOW status

6. BUZZER

A Buzzer is used to make sounds, user can change the tone/frequency between 0 - 1000

0 - OFF
1000 - Max

7. HUMIDITY and TEMPERATURE SENSOR

Humidity and Temperature sensor is used to provide current enviroment humidity and temperature levels respectively

8. I2C PORT

I2C port is used to connect to external modules e.g servo and motor modules, gas sensors etc

9. EXTENSION PORT 1

Extension port provides a way to interface external digital and analog sensors

* 3.3V - Output power supply - 3.3V
* 5V - Output power supply - 5V
* GND - Ground power rail
* GND - Ground Power rail
* D3 - Digital PIN 3
* D4 - Digital PIN 4
* A2 - Analog PIN 2
* A3 - Analog PIN 3

10. EXTENSION PORT 2

Extension port provides a way to interface external digital and analog sensors

* RST - Reset PIN, a LOW level toggle on the pin will reset MakerBox
* D11 - Digital PIN 11 - MOSI
* D12 - Digital PIN 12 - MISO
* D13 - Digital PIN 13 - SCK
* VCC - 5V output power supply
* GND - Ground power rail

11. LIGHT SENSOR

LIght sensor provides ambient light intensity in form of digital values

* 0 - Min - Dark/No light
* 1023 - Max - Max Light

12. RED, GREEN, BLUE and WHITE LEDS

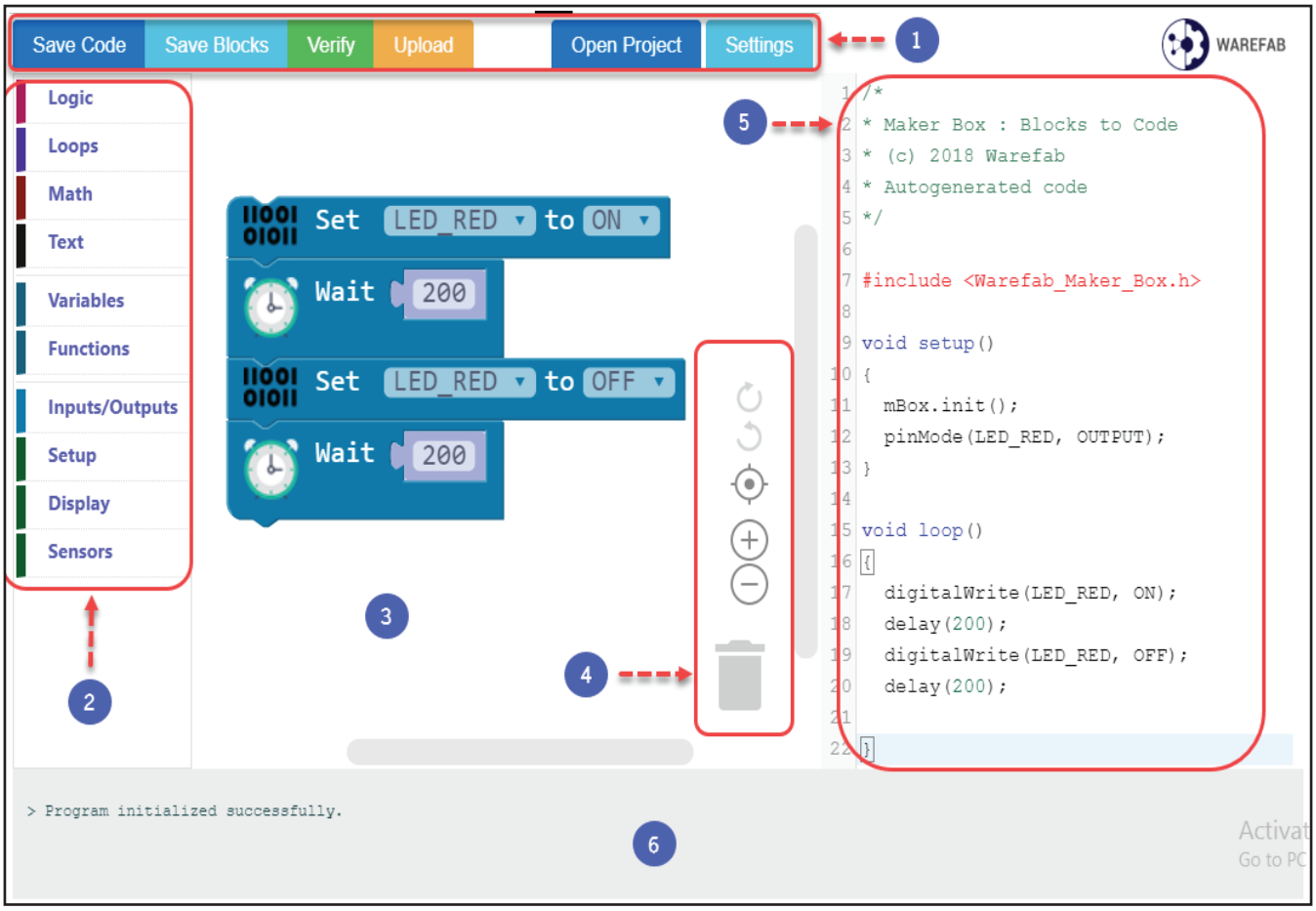
Provides users with programmable LEDS (Red, Green, Blue and White), they can be used to show status e.g when a button is pressed the Red led lights ON.

13. OLED DISPLAY

OLED display is used to display info on the screen e.g it can be used to show KNOB sensor values

MakerBlocks Program

MakerBlocks is a Drag and Drop software enviroment that runs on windows pc and is used to create Code, Verify and Upload code to a MakerBox platform.



1. Menu Bar

2. Blocks ToolBox

3. Workspace

4. Quick Icons (Undo, Redo, Zoom fit, + and -, Delete/Bin

5. Generated Code

6. Debug Terminal

Menu Bar Buttons

SAVE CODE

Save the autogenerated code to your computer

SAVE BLOCKS

Save MakerBlocks to your computer

VERIFY

Check if your code has errors before uploading to MakerBox

UPLOAD

Verify and Upload code to your MakerBox, the code is executed once upload is done

OPEN PROJECT

Open saved blocks, current blocks are deleted and new ones loaded

SETTINGS

Set COM port (communication port) your MakerBox is connected to, this allows successful communication between MakerBox and Computer.

* You can check COM port in computer's Device Manager

Logic

IF BLOCK

Logic if block, can be extended to if-else by clicking the small gear icon and attach else-if or else block

EQUAL/NOT EQUAL/LESS THAN/LESS THAN or EQUAL TO/GREATER THAN/GREATER THAN or EQUAL TO

test if two values are; Equal, Not Equal, Less Than, Less Than or Equal to, Greater Than, Greater Than or Equal to.

AND or OR BLOCK

Used for logic AND (&) or OR (|)

NOT BLOCK

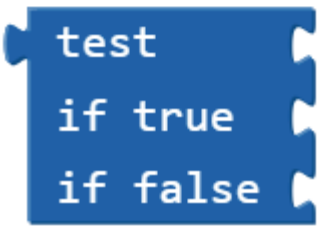
Used to negate a value e.g NOT TRUE = FALSE (!true = false)

TRUE/FALSE BLOCK

Provide true or false states

NULL BLOCK

Provide null value



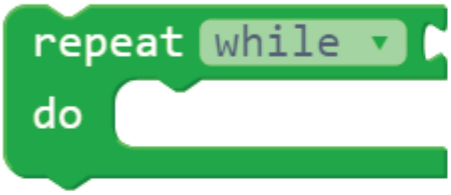
TEST BLOCK

Test if a logic block/statement and execute actions attched to true or false blocks

Loops

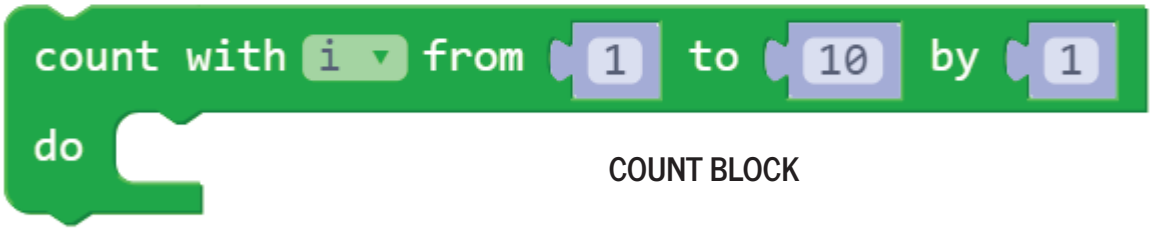
REPEAT BLOCK

Repeat actions (based on blocks attached) a number of times specified e.g 10 times



REPEAT WHILE BLOCK

Repeat actions (based on blocks attached) forever if still a logic condition attached is met



COUNT BLOCK

Repeat actions (based on blocks attached) number of times specified from - to values, count is incremented by value

BREAK BLOCK

Block is used to break/ get out of a loop and continue with normal program execution

Math

NUMBER BLOCK

Set a number, interger or decimal numbers supported

ADD/MINUS/MULTIPLY/DIVIDE/POWER BLOCK

Perform arithmetic operation on two numbers

SQUARE/ABSOLUTE BLOCK

Find the square root or absolute value of a number

SINE/COSINE/TANGENT/ASINE/ACOSINE/ATAN BLOCK

PI BLOCK

Return Pi – 3.14

EVEN/ODD/PRIME/POSITIVE/NEGATIVE BLOCK

Check if a number is Even, Odd, Prime, Positive or Negative

ROUND BLOCK

Round, Ceil or Floor a decimal number

REMAINDER BLOCK

Get remainder value resulting from a divide equation

CONSTRAIN BLOCK

Limit a number between the MIN and MAX values specified

RANDOM BLOCK

Return a number thats between MIN and MAX values specified

Text

TEXT BLOCK

Return a string values specified e.g “MakerBox”

Functions

NO-RETURN FUNCTION BLOCK

Create a no return function, specify function name and place inside blocks to execute

CALL NO-RETURN FUNCTION BLOCK

Use this block to call a no return fuction created earlier.

RETURN FUNCTION BLOCK

Create a return function, specify function name and place inside blocks to execute

IF -RETURN BLOCK

Block is used to jump out of function is a logic condition specified is true

Inputs/Outputs

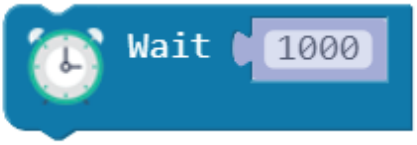
SET BLOCK
Set LEDS on/off, digital Pins HIGH/ LOW

READ BLOCK
Check if a button is pressed or released and status of digital pins

HIGH/LOW BLOCK
Returns a HIGH / LOW value

PULSE BLOCK
Write a PWM value to a pin, this block can be used to dim LEDS
Values range = 0 to 255

ANALOG READ BLOCK
Returns an analog value from an analog pin or sensor, 0 - 1023



WAIT BLOCK
Pause program for specified delay specified in milliseconds

PLAY TONE BLOCK
Play or set a tone/frequency on a buzzer or a specified pin

STOP BLOCK
Stop playing a frequecy or a tone on a buzzer or specified pin

SERIAL BLOCK
Serial print a number or a string to the computer

Setup

NOTES/COMMENT BLOCK

Create comments/notes on your code

SETUP BLOCK

Use this block to place seetup blocks/code
* The blocks/code is executed once

Display

PRINT BLOCK

Print data on the display, block attached can be a math number, text, sensor value etc.

DISPLAY BLOCK

This blocks is causes the data specified by the print block to be shown/displayed on the screen

CLEAR BLOCK

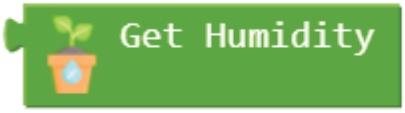
Clears display. Display block should be called after this block

Sensors

TEMPERATURE BLOCK

Return temperature sensor value

Range 0 - 150 celcius



HUMIDITY BLOCK

Return humidity sensor value

Range 0 - 500 – moisture level

LIGHT SENSOR BLOCK

Return ambient/light sensor value

0 - Dark
1023 - Max Light

KNOB BLOCK

Return knob sensor value
0 - MIN
1023 - MAX

BUTTON BLOCK

Return button status value
HIGH - Pressed
LOW - Released