

Digital
STEM

Exploration with
FlowLogic 6
and
Arduino UNO
Prototype activities
with Sample Projects

Teachers and Student Guide
First Edition

RESOURCES for Students & Educators

Excitement in Learning & Teaching



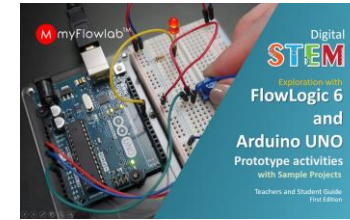
FlowLogic 6



FlowLogic 6 – Global award winning Flowchart based Visual Arduino Programming and Algorithm development tool



Arduino Uno MINI Starter Kit for
STEAM & Digital Literacy
Exploration



Teachers and Students Guide

INDIVIDUALLY LEARN & EXPLORE AND BUILD PROJECTS during workshop
Continuous Online Updates and support via www.myflowlab.com

Module #1

Introduction and Setting Up

FlowLogic 6

Flowchart based Algorithm Programming Software tool

FlowLogic 6 Version 3.8



The screenshot shows the FlowLogic 6 software interface. At the top, there is a menu bar and a toolbar with icons for File, Edit, View, and Run. Below the toolbar is a workspace area where a flowchart is being developed. The flowchart includes blocks for digital input, delay, counter, and output. A 'Counter Window' is visible in the center, displaying the number '000005'. To the right, there is a 'Mimic Window' showing a rocket launch animation. On the far right, there is a control panel with buttons for 'Run', 'Stop', and 'Reset', along with a 'Program Speed' slider and a 'Block Edit' panel. The bottom of the interface features a 'Control Command Panel' with various icons for system control.

Lock/ Unlock Workspace
Workspace Center
Connect Line
Delete Line
Delete Block
Widgets
Arduino Uno Control panel
Virtual Project
Communication Port
Open and Reset Port
Flowchart blocks
 The blocks used to code Flowprogram with user defined properties
Flowprogram Algorithm
Counter Window
Mimic Window
 Animate and control virtual project via Flowprogram
Block Edit panel
Recent Files
Control Command Panel
 Command blocks to Animate and control Input /output of virtual projects and Real-time projects via Arduino Uno board
Workspace
 Flowprogram development and editing area
Execution speed
 User can adjust the speed of the Flowprogram execution.

Introduce to student the FlowLogic 6 and Guide them on how to construct a FlowProgram

DIY #1 - Downloading FlowLogic 6 Version 3.8



FlowLogic 6

Download

1. Go to www.myflowlab.com
2. Click **Download** on Main Page
3. Click **Download** on Download Page – FlowLogic 6 Ver. 3.8
4. Click the Downloaded file to install FlowLogic 6 Version 3.6 into your computer

DOWNLOAD

Softwares, Tools and Project Files

- FlowLogic 6 Ver 3.8**
 - Click "Download" to download
 - Disable Anti-Virus during FlowLogic 6 Installation
 - Run as administrator
- ICOMA.DLL**
 - Click "Download" to download
 - Add as reference in Visual Studio
 - Easy to use functions to interface with Arduino board that has been activated using BoardActivator.
- BoardActivator Ver 1.3**
 - Click "Download" to download
 - Software tool to activate Arduino Board to use with FlowLogic 6 and ICOMA.DLL.
 - Install it in your PC.



Google Chrome footer

FlowLogicsSETUP_6...exe ^

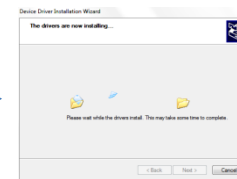
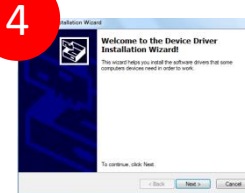
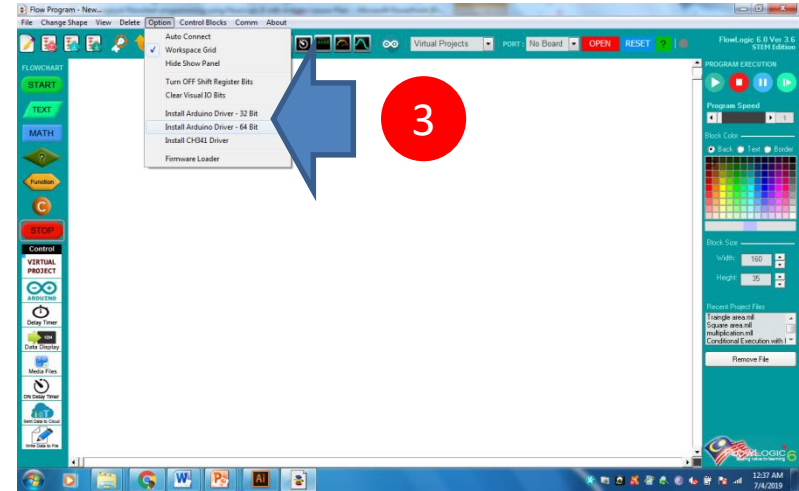
Show all X

FlowLogic 6



Installing Arduino USB Driver

1. Launch FlowLogic 6 Version 3.8 from your PC Desktop
2. *From the menu, click 'Option'*
3. *Select Install Arduino USB Driver*
Select either 32 Bit or 64 Bit
4. *The USB Driver Installation window should appear as shown below, if NOT, Exit **FlowLogic 6** and Run it as Administrator. **Right click on FlowLogic 6 desktop icon and Select "Run as Administrator from the pop-menu***



DIY #3 – Activating Your Arduino Board for FlowLogic 6

FlowLogic 6

Companion Firmware upload

1. Go to www.myflowlab.com
2. Click *Download* from the top menu
3. Click *Download* to download the *The BoardActivator Ver. 1.3*
4. Install the downloaded *BoardActivator Ver. 1.3* on your Computer.

To activate any of your Arduino board

- a. Connect your board to a available USB port
- b. Please ensure your PC is connected to the Internet
- c. Click the Icon on your PC desktop to Launch the *BoardActivator Ver. 1.3*
- d. Fill in your Name, valid email and valid **Access Code** that you have purchased and click *Activate* button

If Activation failed or Invalid Port displayed, please retry by re-connect back your board, Click *Auto Scan* board and *Activate* again. Re-try until successful.

IMPORTANT: DO NOT upload any Arduino sketch into this board once activated.

DOWNLOAD

Softwares, Tools and Project Files

- FlowLogic 6 Ver 3.8**
 - Click "Download" to download
 - Disable Anti-Virus during FlowLogic 6 installation
 - Run as administrator
- ICOMA.DLL**
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 - Easy to use functions to interface with Arduino board that has been activated using BoardActivator.
- BoardActivator Ver 1.3**
 - Click "Download" to download
 - Software tool to activate Arduino Board to use with FlowLogic 6 and ICOMA.DLL
 - Install it in your PC.

Arduino Board Activator For FlowLogic 6 and ICOMA.DLL Ver 1.3

Internet: Connected | List Comm Port: COM28 | Auto Scan For Arduino Board

Board: Your Board Connected to: COM28

Name: Loganathan

Email: logan@myflowlab.com

Key in the Access Code here: 3X36C763M25XXXX

Please key in valid information and click **ACTIVATE**...

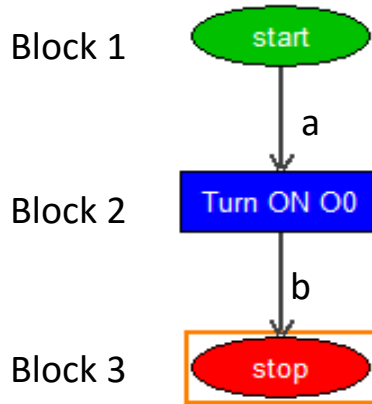
myflowlab™

Activate

Editing Command Blocks

Activity - #1 – Practice Select the Blocks , define the property, Connect Line, Delete Line and Delete block to

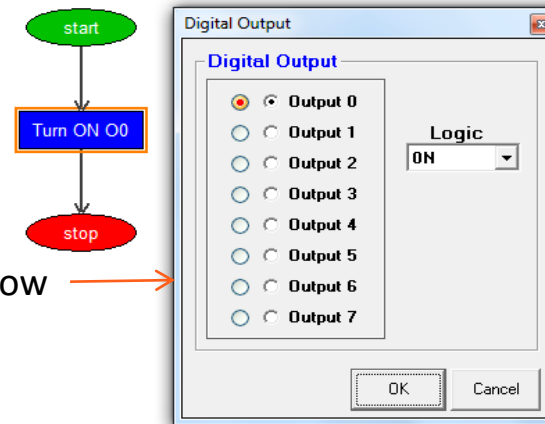
To delete Line and Blocks



To delete line “a”, click on Block 1 and then Block 2, while mouse pointer on Block 2, right click and select “Delete Line” option from the pop-up menu.

To delete Blocks, delete all connecting line, right Click on the block and select “Delete block” option from the Pop-menu.

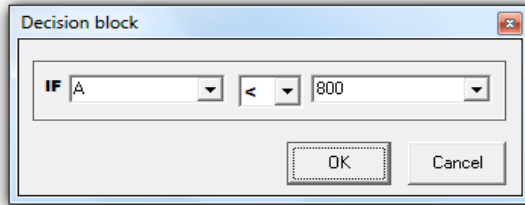
Double click the block to Edit



To edit blocks, double click on the block and make the necessary changes on the pop-up property Windows and click “Ok” when done.

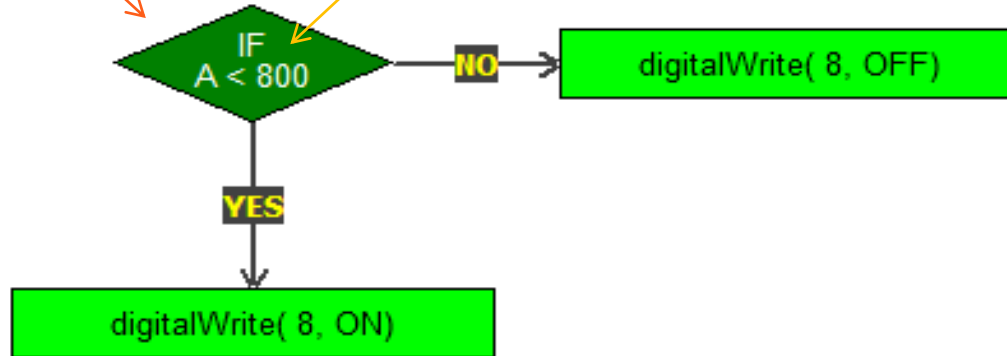
Working with Decision Blocks

Activity - #2 - Practice Select the Blocks , define the property, Connect Line to try out



Decision block
Property Window

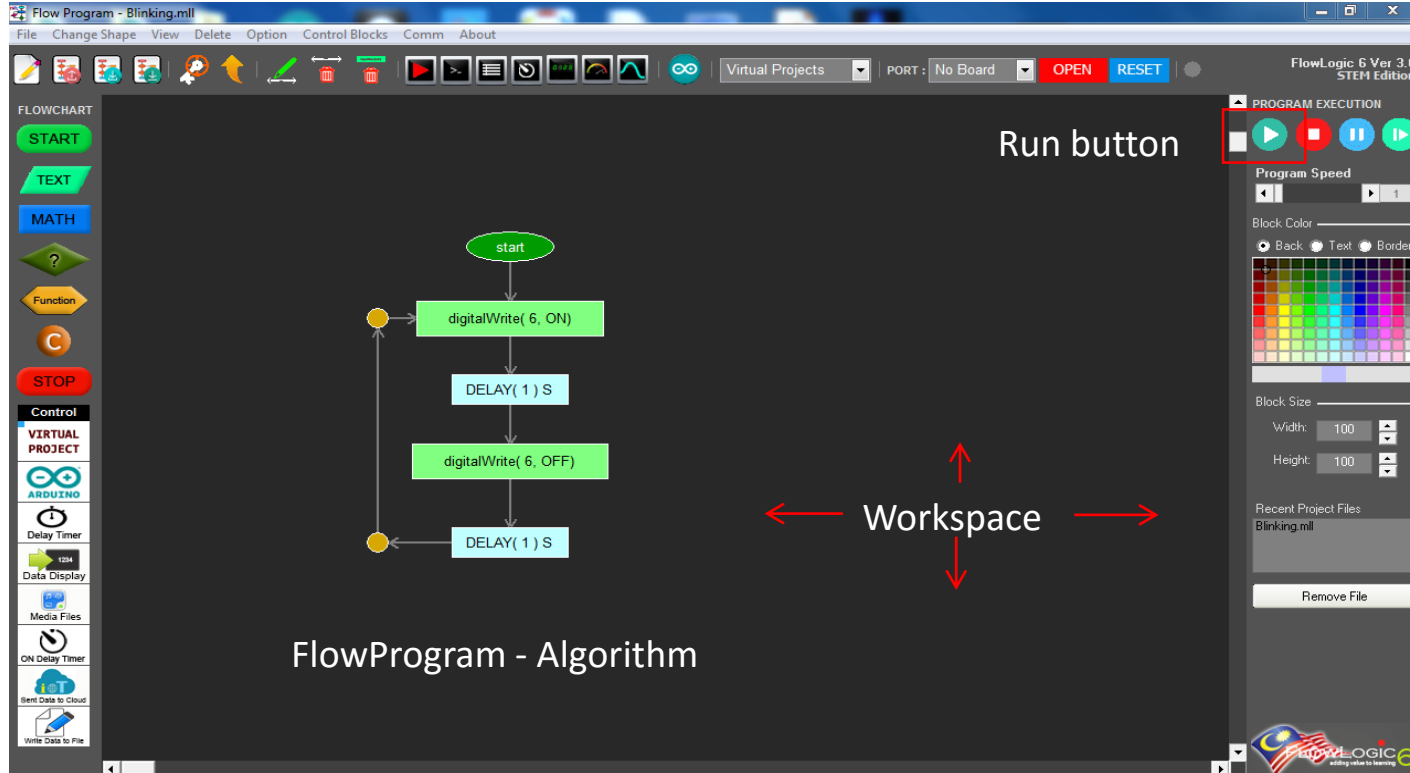
Condition statement as specified
in the property window



Decision block requires two (2) connecting point, the first connection to a block will be "YES" and the next connection will be "NO".

Connect the lines at your discretion based on the condition statement on the decision block.

Running a FlowProgram



The screenshot displays the myFlowlab software interface. The main workspace contains a flowchart algorithm for a blinking LED. The algorithm starts with a 'start' block, followed by a 'digitalWrite(6, ON)' block, a 'DELAY(1) S' block, a 'digitalWrite(6, OFF)' block, and another 'DELAY(1) S' block, which loops back to the start. The interface includes a menu bar, a toolbar, and a sidebar with various block categories like 'Control' and 'VIRTUAL PROJECT'. On the right, the 'PROGRAM EXECUTION' panel features a 'Run button' (a green play icon) and other execution controls like 'Program Speed' and 'Block Color'. The text 'FlowProgram - Algorithm' is overlaid on the workspace area.

Explain to Students the steps required to run a FlowProgram that is loaded into the Workspace.

Practice Algorithm

Design and development thru

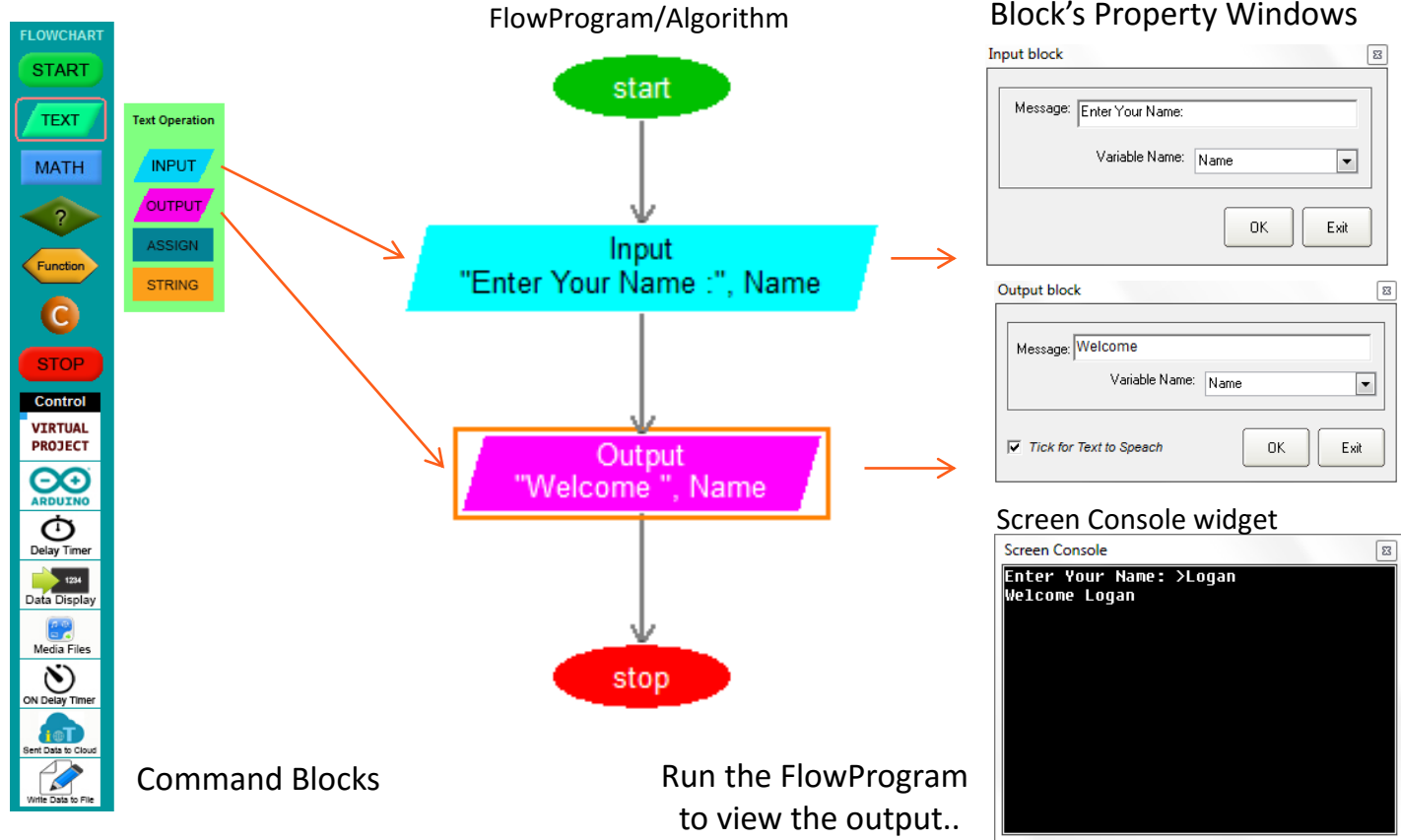
Console programming and using Virtual Models

Module #2

Building Algorithm using Console programming

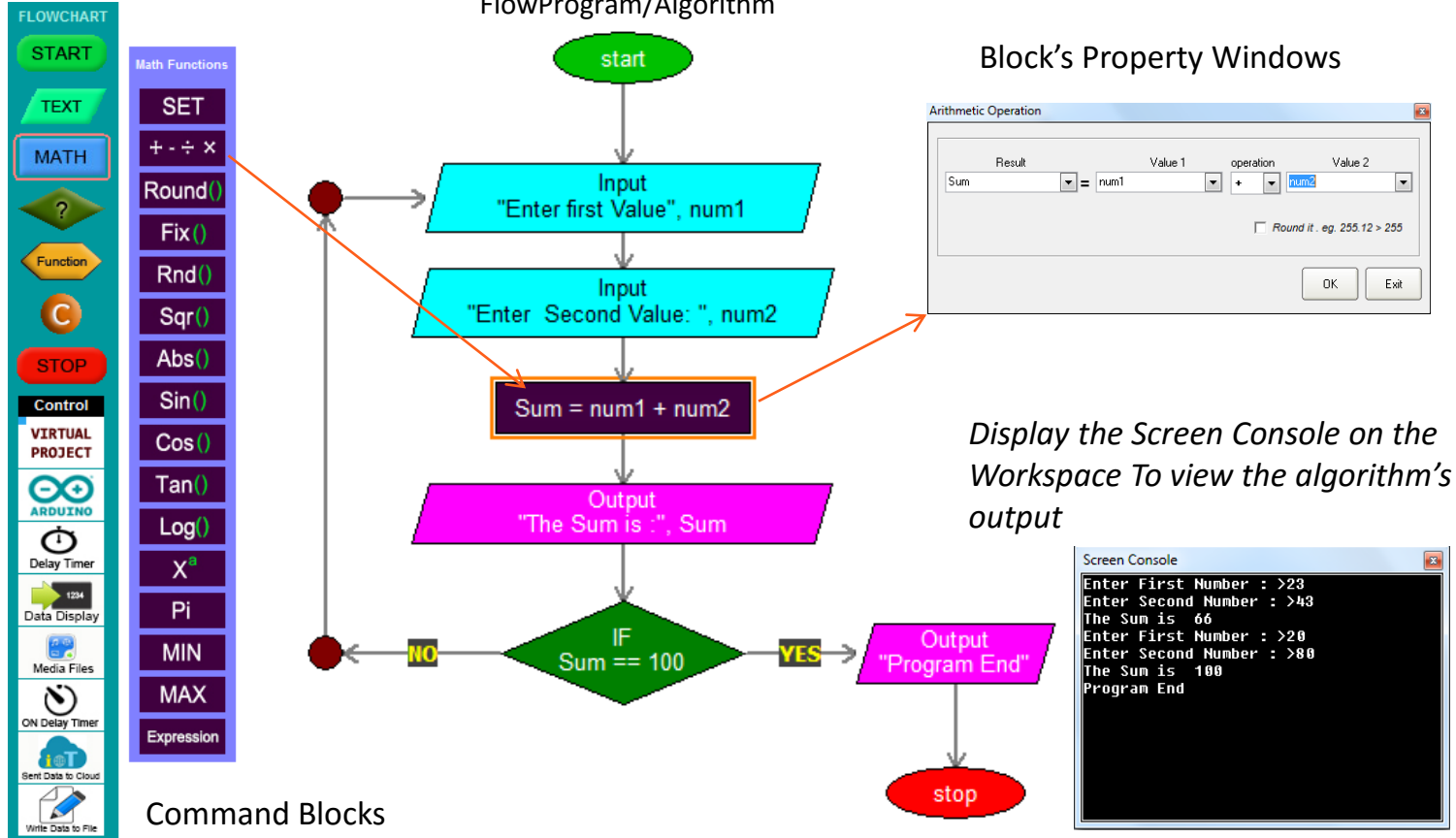
FlowProgram / Algorithm – Activity #3

Console applications



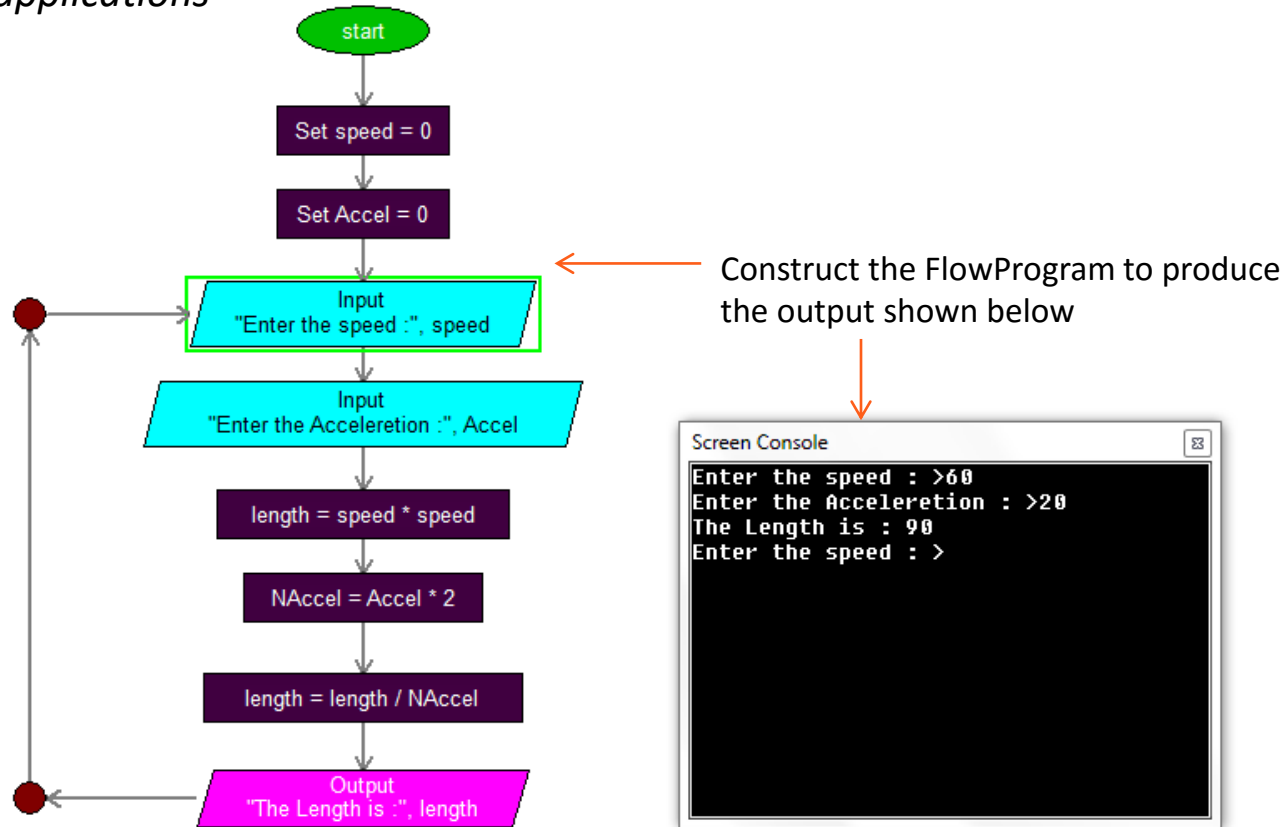
FlowProgram / Algorithm – Activity #4

Console applications



FlowProgram / Algorithm – DIY #2

Console applications



Computational Thinking –DIY #5

Console applications

Aktiviti 1.1

Aktiviti Kumpulan

Implementasi Pemikiran Komputasional dalam Pembangunan Atur Cara

PA K-21

Kaedah Pembentangan Hasil Sendiri

Pada setiap bulan, anda akan menerima bil elektrik dengan jumlah bayaran tertentu. Tahukah anda bagaimana elektrik yang telah digunakan ini dikira? Bina satu atur cara bagi mengira bayaran bil elektrik berpandukan maklumat di bawah. Gunakan teknik-teknik pemikiran komputasional bagi setiap fasa pembangunan atur cara untuk menyelesaikan masalah ini.

Penggunaan elektrik	Kadar (RM)
1-200 kWj (sebulan)	0.218
201 kWj ke atas (sebulan)	0.492

Berdasarkan pernyataan masalah di atas, lakukan aktiviti yang berikut:

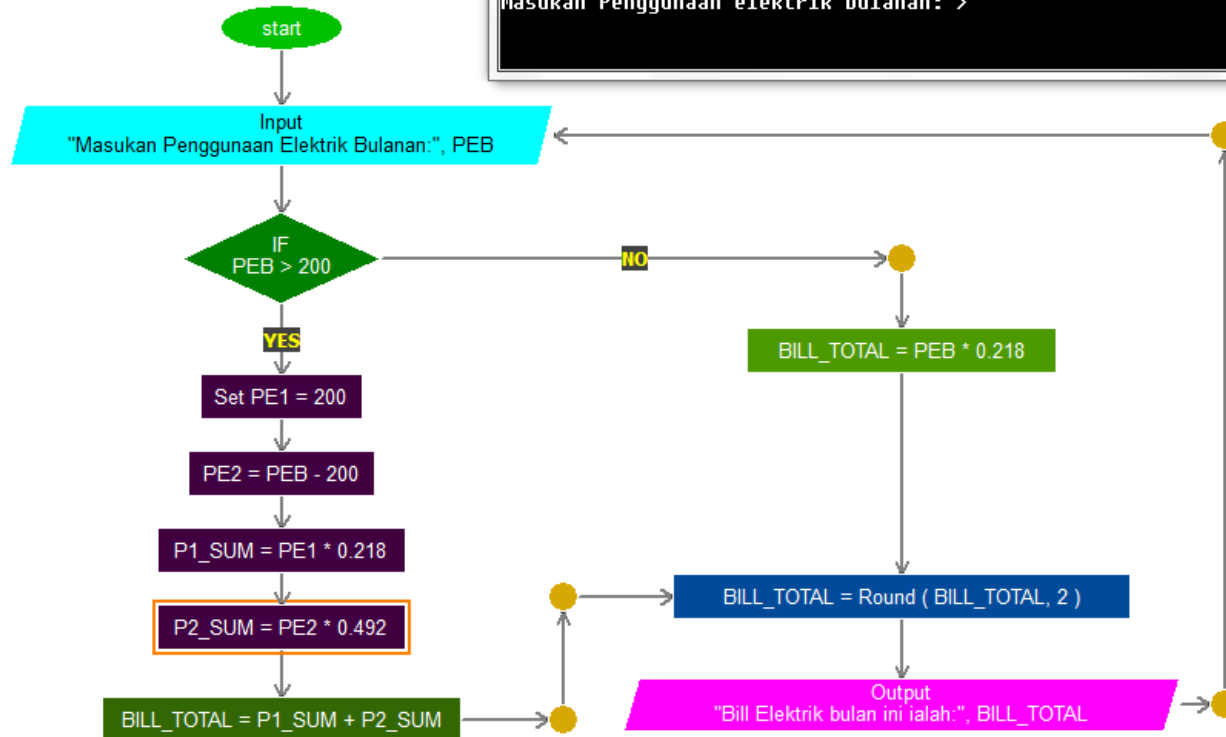
1. Kaji pernyataan masalah tersebut dan bincangkan penggunaan teknik-teknik pemikiran komputasional dalam setiap fasa pembangunan atur cara untuk mengira bayaran bil elektrik.
2. Tuliskan penyelesaian kepada masalah dalam kertas masing-masing.
3. Setiap kumpulan membentangkan penyelesaian di hadapan kelas.
4. Guru membuat rumusan pelajaran dengan murid.

DIY #5 - Solution

Console applications

```

Screen Console
Masukan Penggunaan elektrik bulanan: >340
Bill Elektrik bulan ini ialah: 112.48
Masukan Penggunaan elektrik bulanan: >
    
```



Module #3

Building Algorithm using Virtual Projects

Virtual Projects

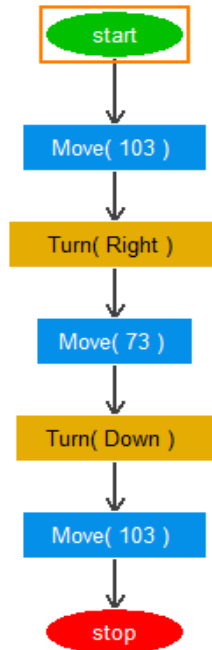
Is a On-screen mimics with Pre-assigned control pins and animations that can be programmed by using the virtual command blocks

The screenshot displays the myFlowlab software interface for programming a traffic light. On the left, a vertical toolbar labeled "Command Block" contains various control elements like START, TEXT, MATH, Function, STOP, and a "VIRTUAL PROJECT" section. The main workspace shows an "Algorithm/FlowProgram" flowchart with steps such as "start", "Turn ON O0", "DELAY(2) S", "Turn ON O2", "Turn OFF O0", "Turn OFF O1", "Turn ON O1", and "Turn OFF O2". A "Virtual Project list" dropdown menu is open, showing options like "Traffic Light", "Light Wheel", "Flashing Tree", etc. A 3D "Traffic Light" simulation window is shown with "Pre-assigned control pins" at the bottom, labeled "Digital Output Signal: Red - 0 Yellow - 1 Green - 2". The right sidebar includes "PROGRAM EXECUTION" controls and a "Block Color" palette.

When running Virtual project programs, select the appropriate project from the list and place it on the Workspace.

Activity #1 : Robot Maze (Virtual Project)

In this project student will construct FlowProgram using FlowLogic 6 to navigate a Virtual Robot thru a maze.



Step 1: Select Robot Maze from the Virtual Project List

Step 2: Click Load Maze to Load Rmaze1 image from the folder

Step 3: Construct the FlowProgram as shown

Step 4: Click Run icon to execute the FlowProgram

Step 5: Click Reset to place Robot to its origin location

Execute again to test again

Activity : Get the students to load other Maze images and construct the FlowProgram to practice their skill in Flowchart programming and Computational Thinking.

DIY #2 : Robot Maze (Virtual Project)

Step 1: Select Robot Maze from the Virtual Project List

Step 2: Click Load Maze to Load Rmaze2 image from the folder

Step 3: Construct the FlowProgram to navigate the Robot thru the Maze

Step 4: Click Run icon to execute the FlowProgram

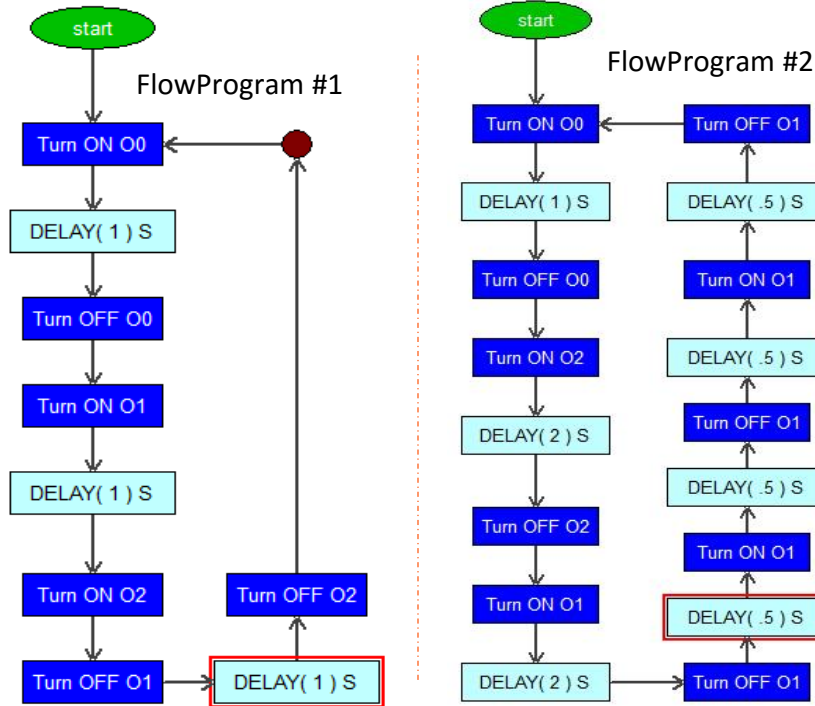
Step 5: Click Reset to place Robot to its origin location

Execute again to test again



Activity #3 : Traffic Light (Virtual Project)

Develop FlowProgram / Algorithm to control a Virtual Traffic Light system.



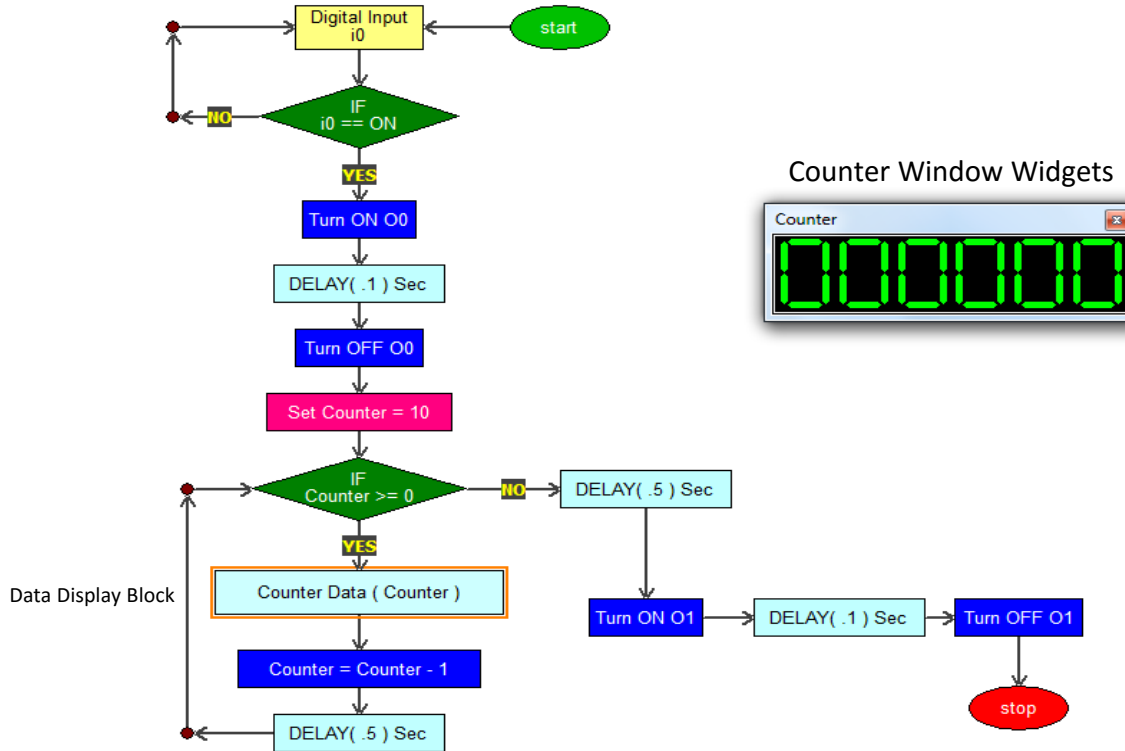
Load Traffic Light Virtual Model from the Virtual project list

Get Student to construct the FlowProgram #1 Using virtual IO pin, Test and Present.

Variant : Get the students to construct a new FlowProgram (FlowProgram #2) to Blink the Yellow Light to enhance their skill in Flowchart programming and Computational Thinking.

Activity #4 : Rocket Launcher (Virtual Project)

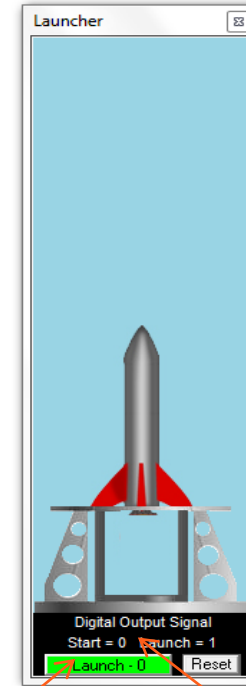
Develop FlowProgram / Algorithm to Launch a Virtual Rocket. (BASIC operation)



Counter Window Widgets



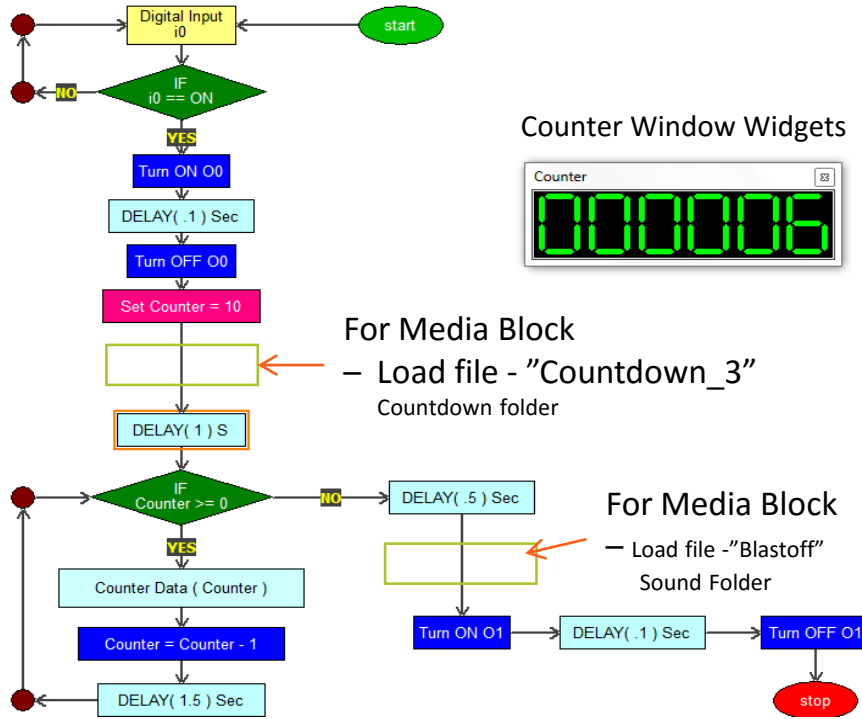
Select from Virtual project list
– Rocket Launcher



Input Virtual I/Os Output Virtual I/Os

Activity #5 : Rocket Launcher (Virtual Project)

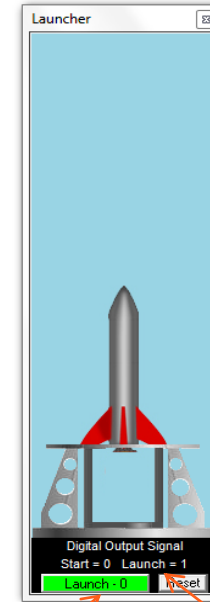
Develop FlowProgram / Algorithm to Launch a Virtual Rocket with background audio using Media blocks



Counter Window Widgets



Select from Virtual project list
– Rocket Launcher



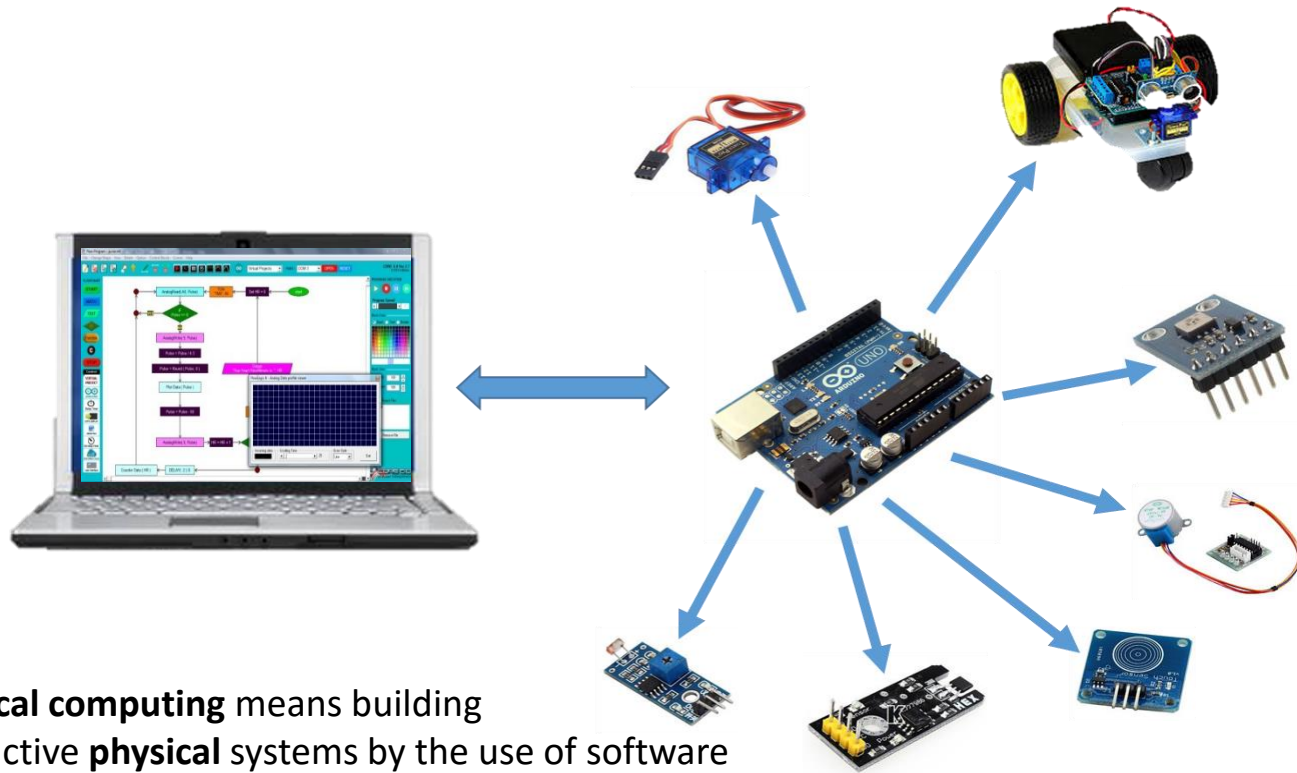
Input Virtual I/Os

Output Virtual I/Os

Physical Computing
Controlling, Monitoring,
analyzing real-world applications
using Arduino UNO board

Module #4
The Essential
Components and Knowledge

What Is Physical Computing



Physical computing means building interactive **physical** systems by the use of software and hardware that can sense and respond to the Real-World

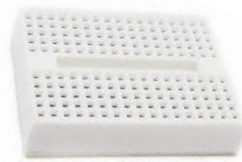
Starter Kit Components



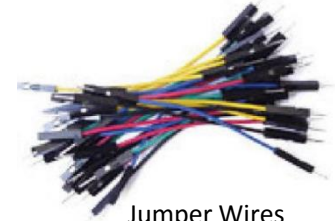
Arduino UNO R3



USB Cable



170 Breadboard



Jumper Wires



220 ohm



10K ohm

Resistors



1M ohm



Blue Led



Green Led



Red Led



Yellow Led



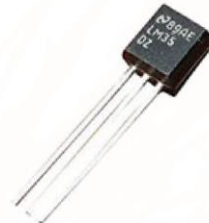
Push Button



Pezio Buzzer



LDR light Sensor



LM35 Temperature Sensor



RGB LED



Ultrasonic Sensor
Bonus Free Gift

Arduino UNO Pins & Power Source

USB Cable

To Arduino Board



To Computer

Communication
and Power In



Battery



Power Adaptor

Power In



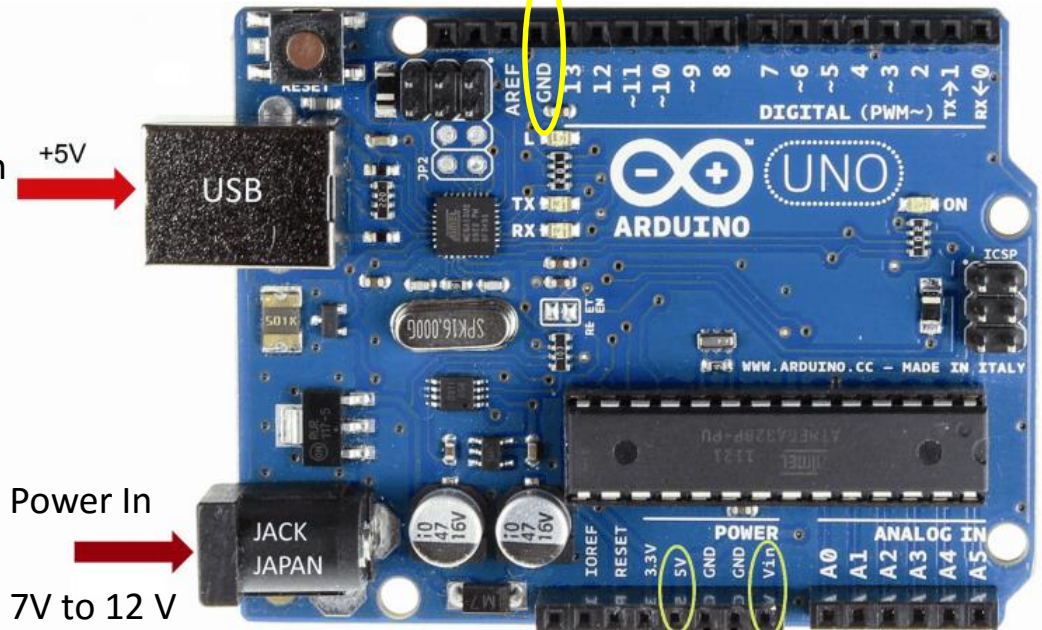
7V to 12 V



Power out to Breadboard or
Components LED, sensors, Motor....



Digital Input / Output Pins



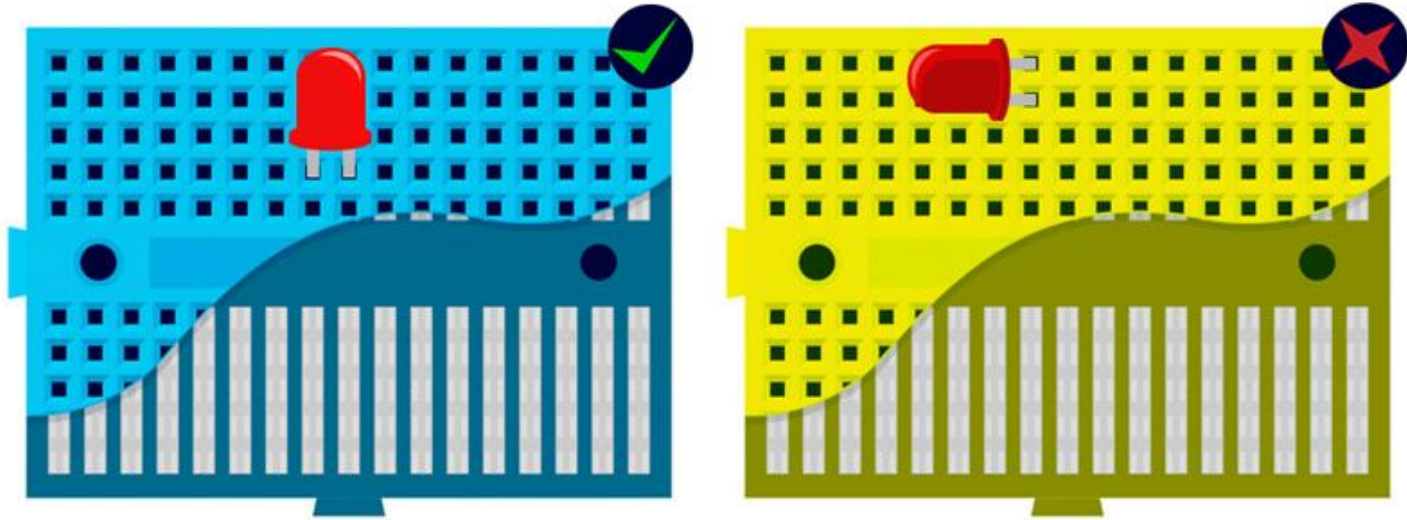
Power Source
Pins

+5V

Analog Input Pins

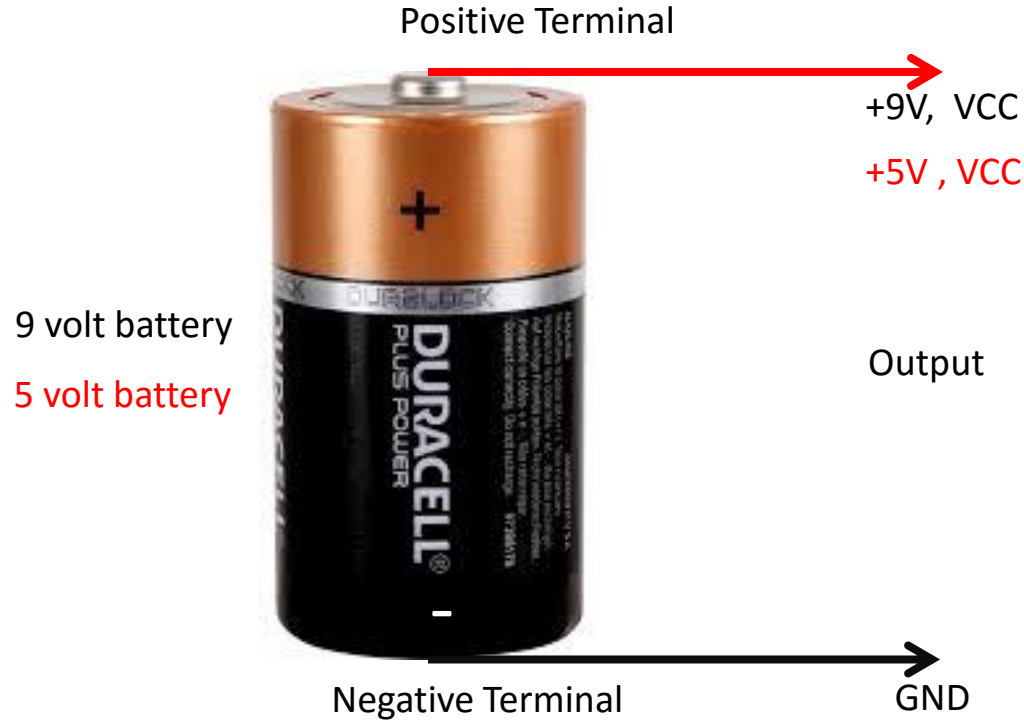
7 V to 12V
Power In

170 Breadboard for Circuit prototyping



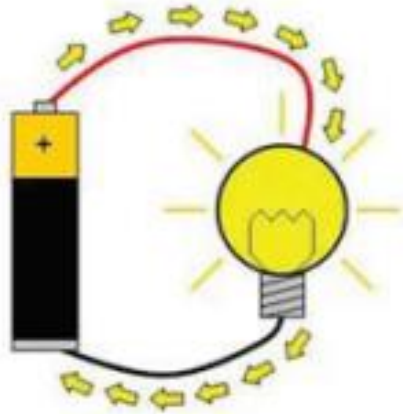
Two (2) components sections are separated by center slot. The Holes on the components section are internal connected vertically as shown

Power Source

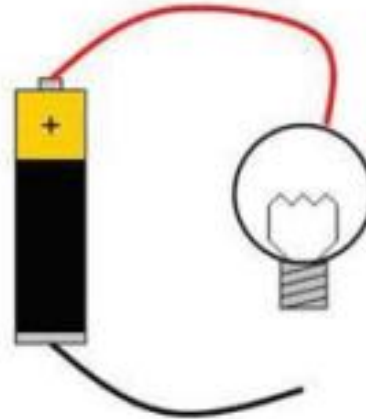


Circuit Connections

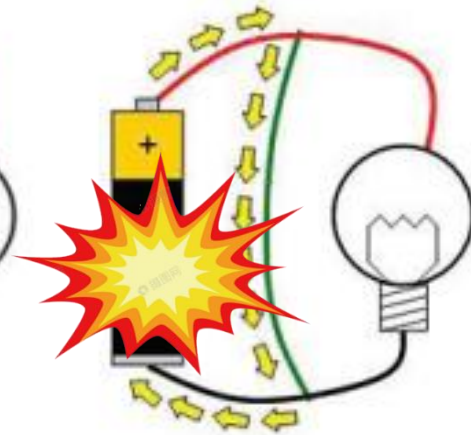
Closed circuit



Open circuit



Short circuit

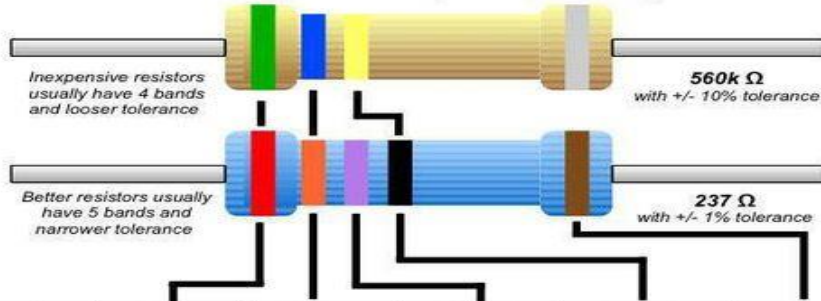


REMEMBER : To test your circuit for components functionality before building Algorithm using the FlowLogic Control Panel. Refer to page 35

Resistor

Resistor Identification

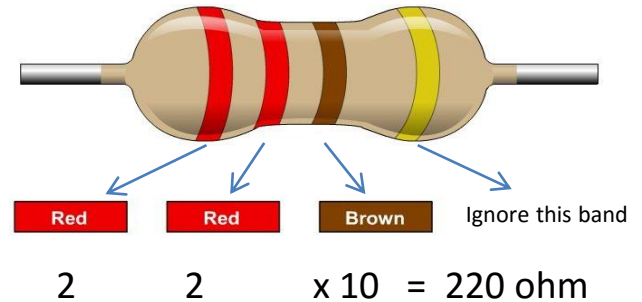
The end with more bands should point left when reading colors.



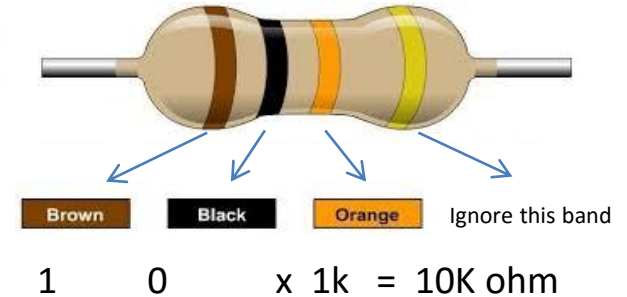
Color	1 st Band	2 nd Band	3 rd Band	Multiplier	Tolerance
Black	0	0	0	x 1 Ω	
Brown	1	1	1	x 10 Ω	+/- 1%
Red	2	2	2	x 100 Ω	+/- 2%
Orange	3	3	3	x 1K Ω	
Yellow	4	4	4	x 10K Ω	
Green	5	5	5	x 100K Ω	+/- 5%
Blue	6	6	6	x 1M Ω	+/- .25%
Violet	7	7	7	x 10M Ω	+/- .1%
Grey	8	8	8		+/- .05%
White	9	9	9		
Gold				x .1 Ω	+/- 5%
Silver				x .01 Ω	+/- 10%

Resistor value calculation

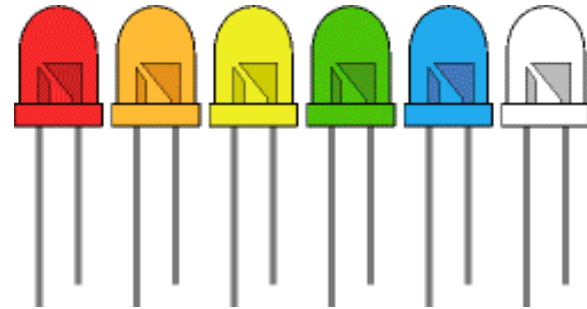
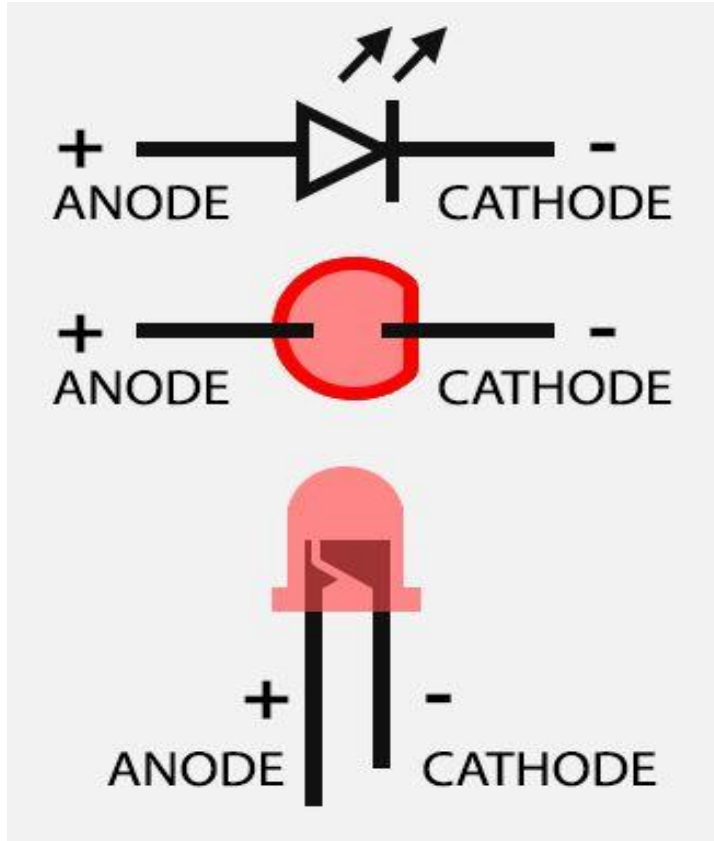
220 Ohm 4 band resistor



10K Ohm 4 band resistor



LEDs – Output Devices

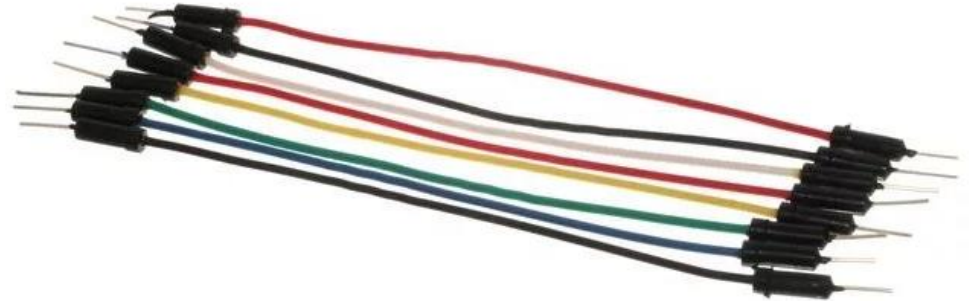


Multiple colored LEDs

Jumper Wires



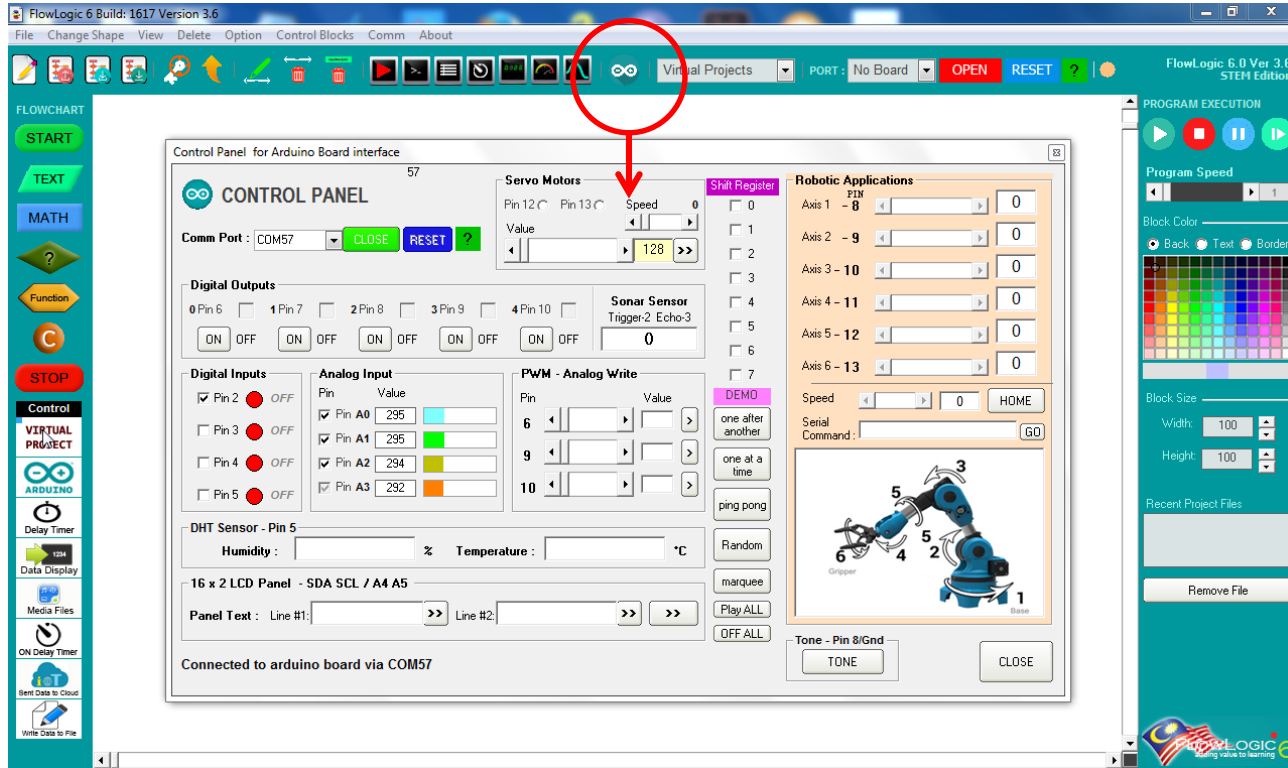
Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with [breadboards](#) in order to make it easy to change a circuit as needed.



Though jumper wires come in a variety of colors, the colors don't actually mean anything. This means that a red jumper wire is technically the same as a black one. But the colors can be used to your advantage in order to differentiate between types of connections, such as **Black** ground or **Red** power.

TESTING AND DEBUGGING ARDUINO UNO board

Use this tool to test your prototype to ensure connections and Components functionality are corrects before building algorithm/ Programming



Control Panel

Module #5

Prototype activities using

Digital Input and Output

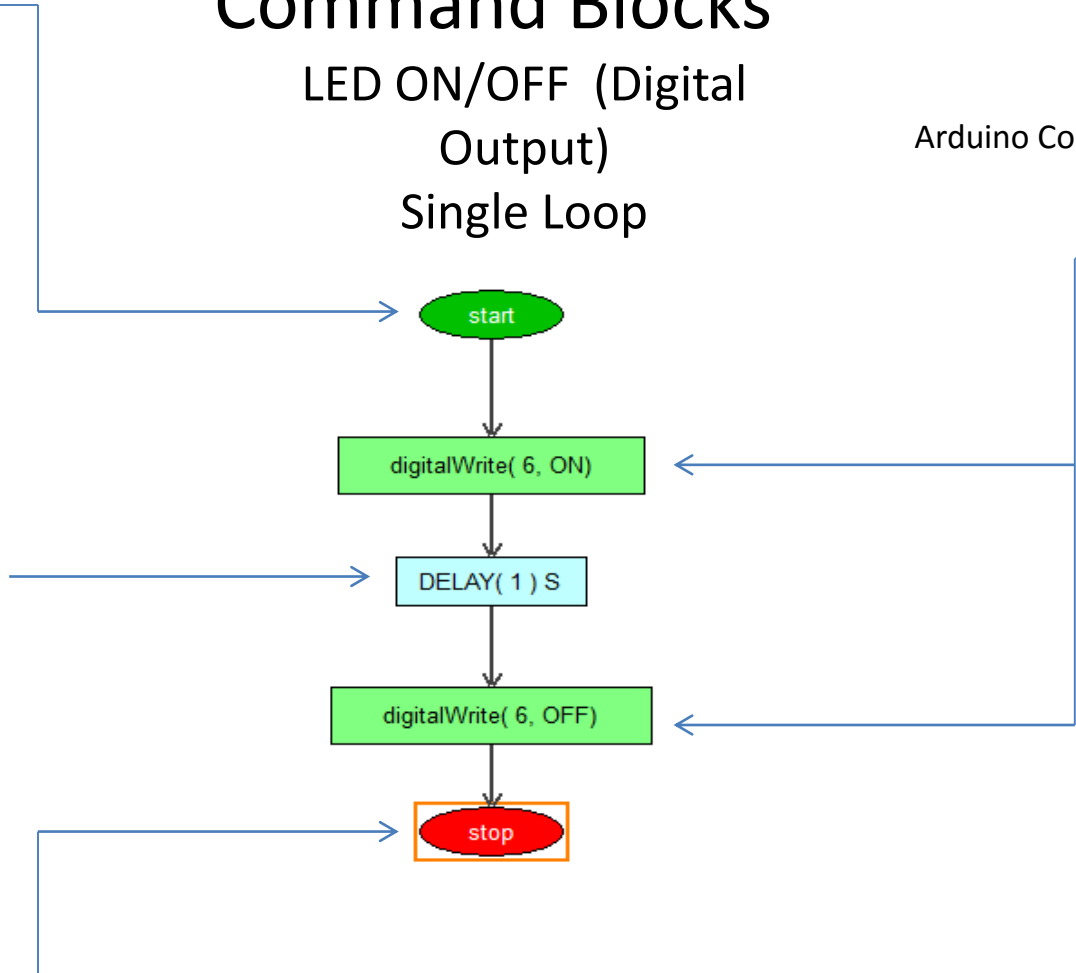
Command Blocks

LED ON/OFF (Digital Output)
Single Loop

Arduino Command blocks

FLOWCHART

- START
- MATH
- TEXT
- ?
- Function
- C
- STOP
- Control
- VIRTUAL PROJECT
- ARDUINO
- Delay Timer
- DATA DISPLAY
- MEta Files
- ON Delay Timer
- Sent Data to Cloud
- User interface



Arduino Blocks

- DigitalWrite
- DigitalRead
- AnalogRead
- Analog Write
- Servowrite
- SonarRead
- LcdWrite
- DHT11 Sensor
- 74HC096
- Shift Register
- TONE
- myFlowARM

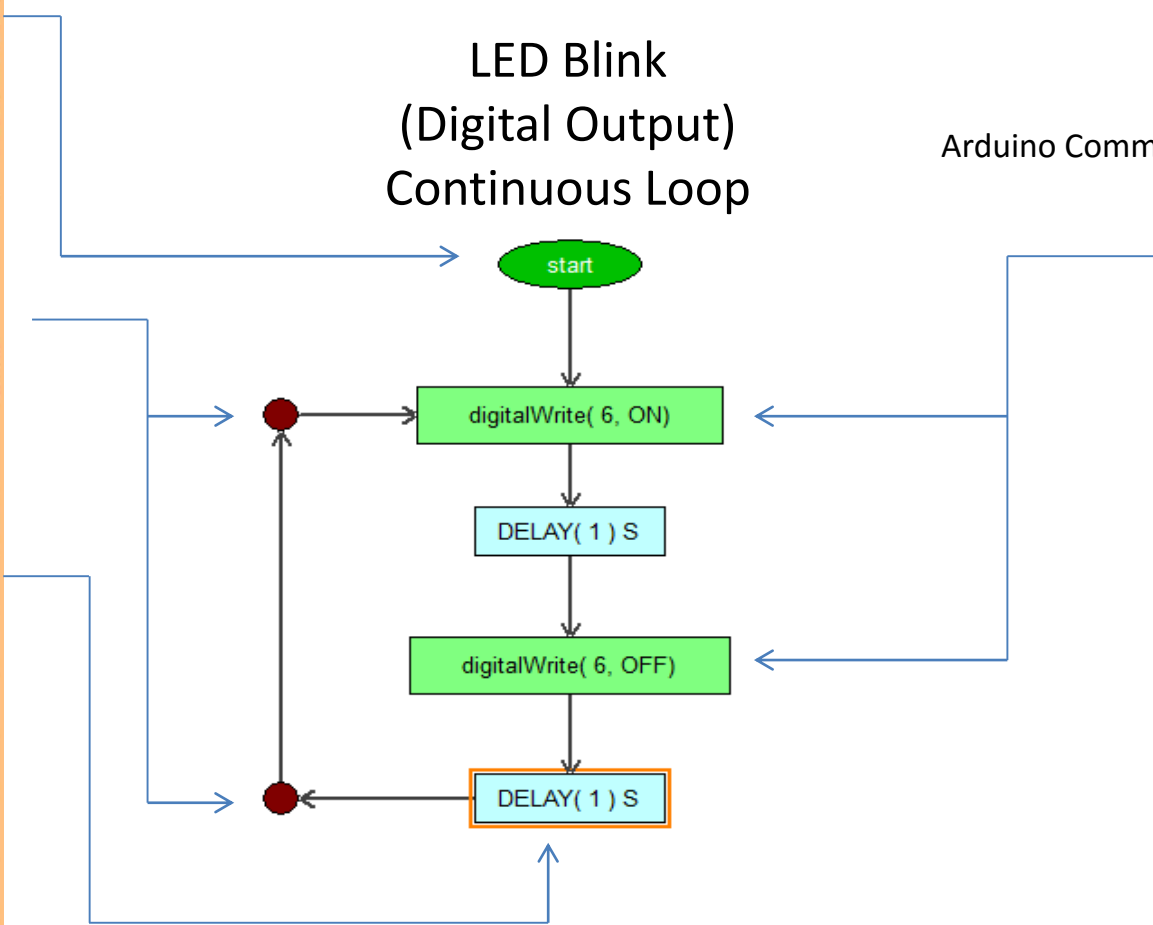
Command Blocks

LED Blink
(Digital Output)
Continuous Loop

Arduino Command blocks

FLOWCHART

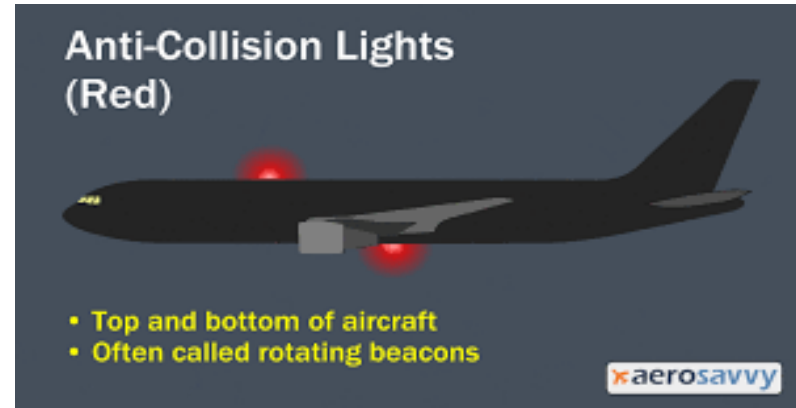
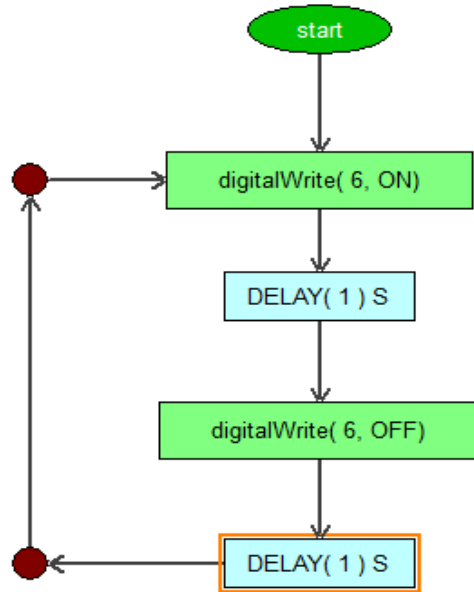
- START
- MATH
- TEXT
- ?
- Function
- ⌂
- STOP
- Control
- VIRTUAL PROJECT
- ARDUINO
- Delay Timer
- DATA DISPLAY
- Media Files
- ON Delay Timer
- Sent Data to Cloud
- User Interface



Arduino Blocks

- ()
- DigitalWrite
- DigitalRead
- AnalogRead
- Analog Write
- ServoWrite
- SonarRead
- LcdWrite
- DHT11 Sensor
- 74HC595
- Shift Register
- TONE
- myFlowARM

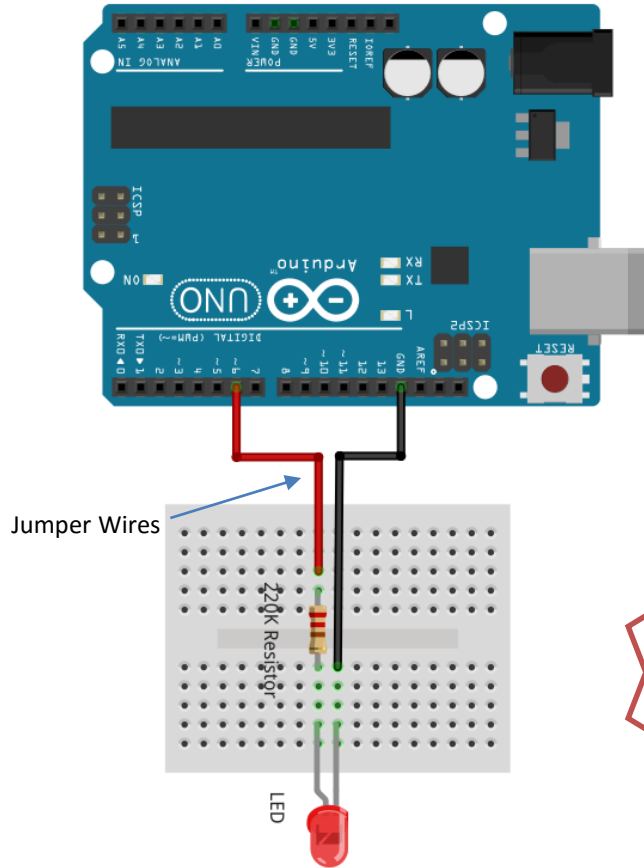
Challenge Sample- Modify the Algorithm / FlowProgram for Aircraft Anti-Collision Strobe Light



Let the students watch the Aircraft Beacon strobe light video before attempting this project

Explain the aircraft anti-collision light project, get them to change the first delay value to 0.02 sec and second delay value to 2 sec and Run it.

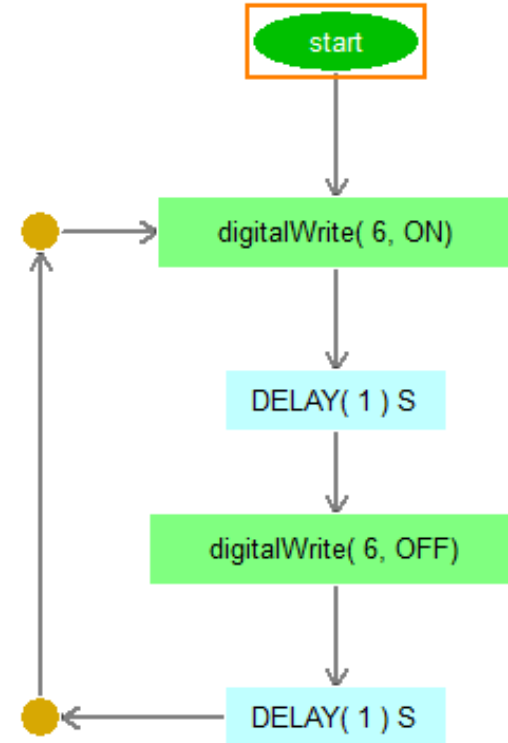
Arduino & FlowLogic 6



1. Construct the Single LED Circuit as shown
2. Test the circuit using Arduino Control panel

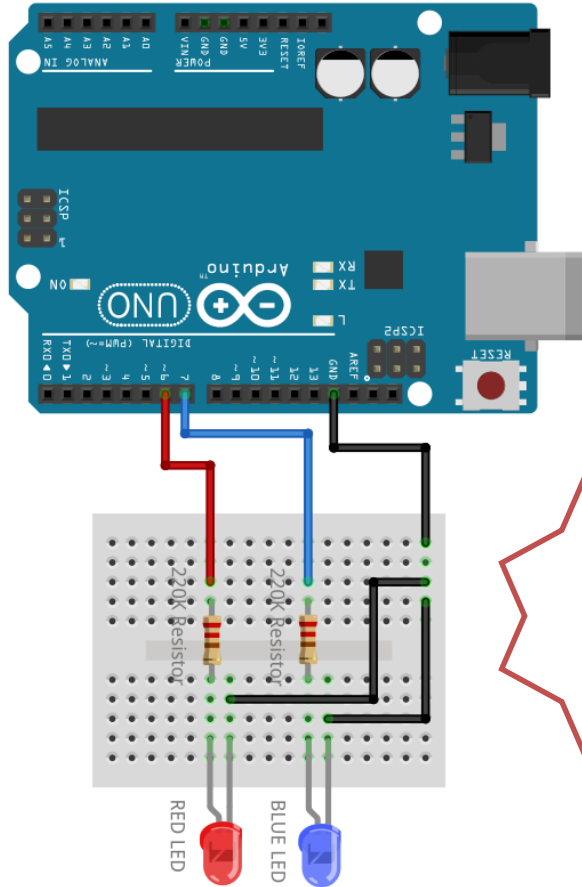
Prototyping activity #1 – Single LED Blink

Challenge
Build an Anti Collision system



2. Build the above Algorithm/FlowProgram and Execute
3. Change the Delay for various Blinking type

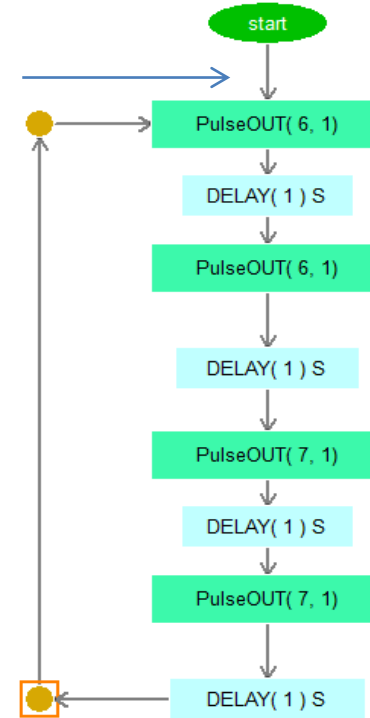
Arduino & FlowLogic 6



1. Construct the Double LED Circuit as shown
2. Test the circuit using Arduino Control panel

Prototyping activity #2 – Police Car siren

Add media file here

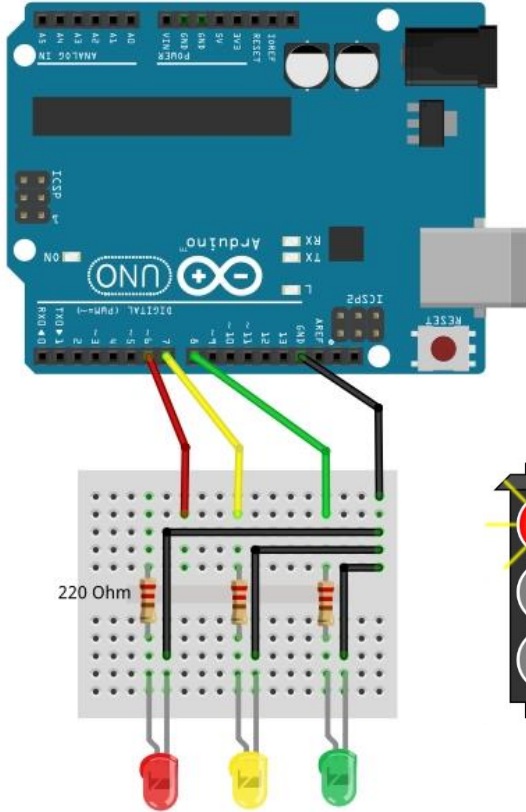


Challenge
Build a Real
World Police Car
Siren with
background audio

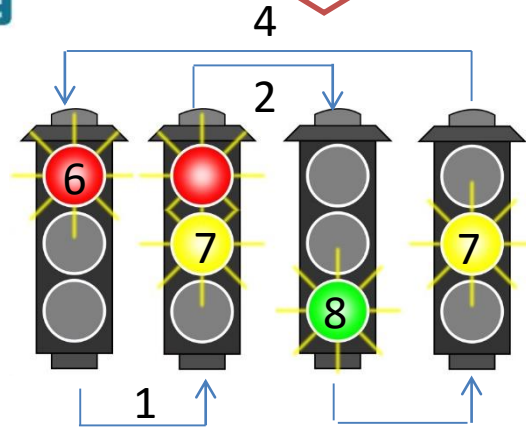
3. Build the above Algorithm/FlowProgram and Execute
4. Change the Delays and PulseOUT timing to animate the LEDs to work like actual Police car siren
5. Add the Police Car siren media file

Arduino & FlowLogic 6

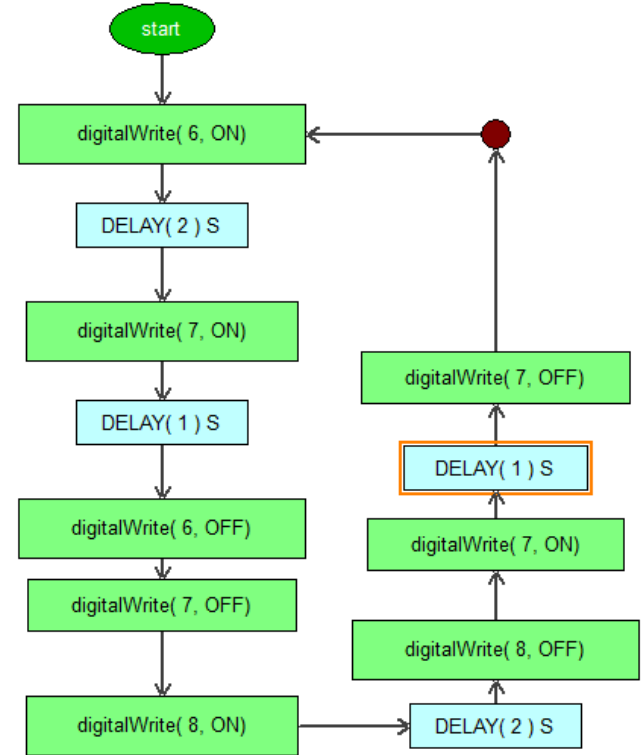
Prototyping activity #3 – Traffic Light system



Challenge
Design an Algorithm to Blink the Yellow for 5 section



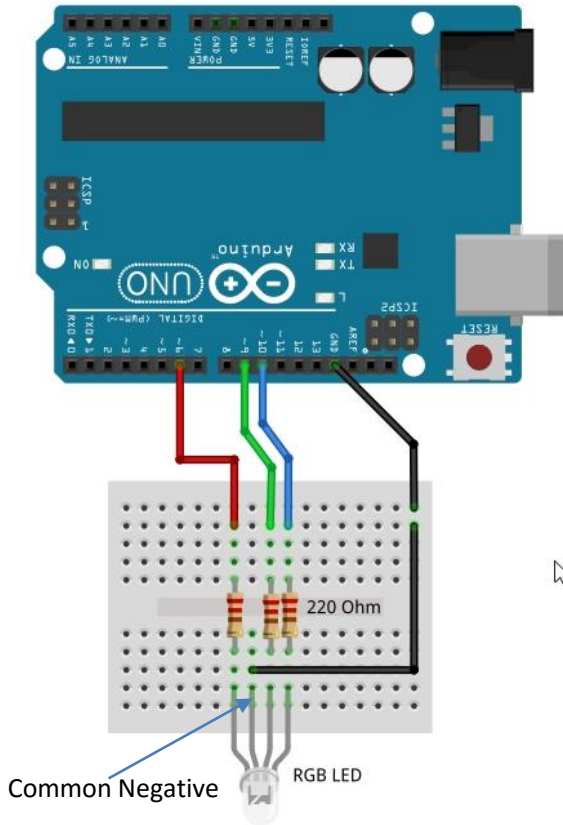
The UK Standard Traffic Light Sequence



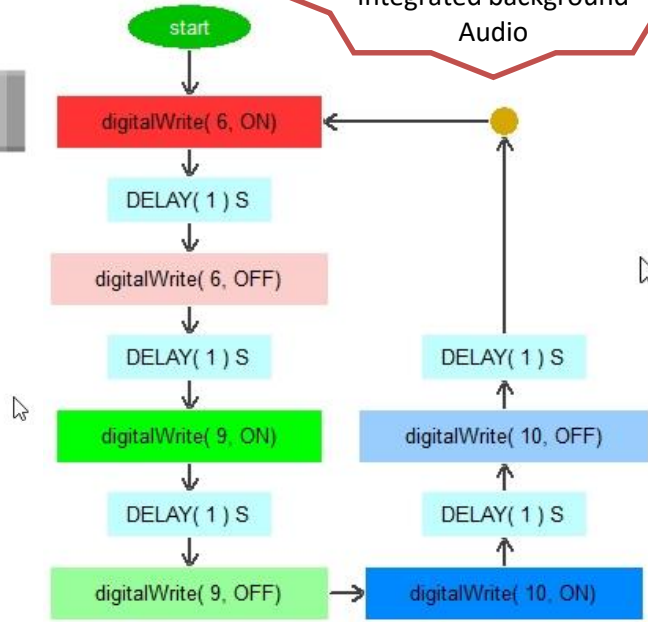
1. Construct the Traffic Light LED Circuit as shown
2. Test the circuit using Arduino Control panel
3. Build the above Algorithm/FlowProgram and Execute
4. Complete the Challenge

Arduino & FlowLogic 6

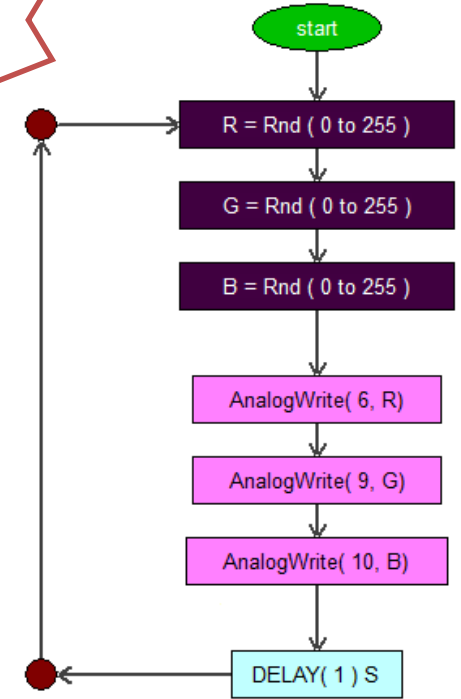
Prototyping activity #4 – RGB LED Digital Color Mixing



Challenge
Design an Color Mixing Algorithm with integrated background Audio



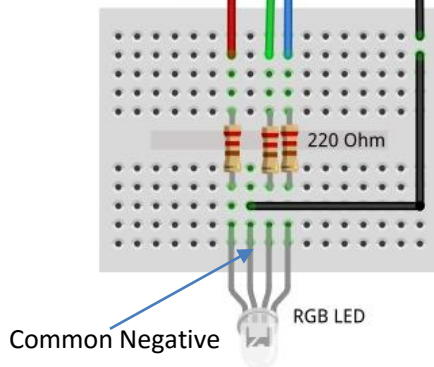
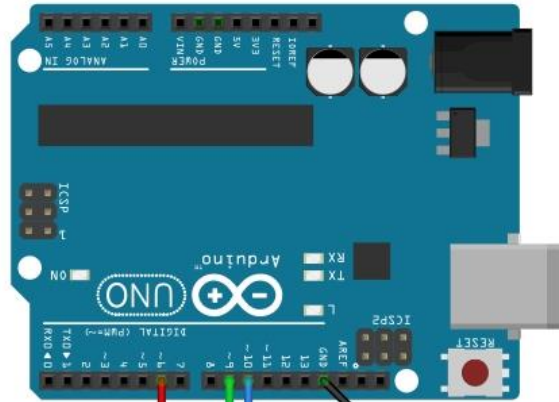
Color Mixing using Digital Write block



Color Mixing using Analog Write block

1. Construct the Traffic Light LED Circuit as shown
2. Test the circuit using Arduino Control panel
3. Build the above Algorithm/FlowProgram and Execute
4. Complete the Challenge

Arduino & FlowLogic 6



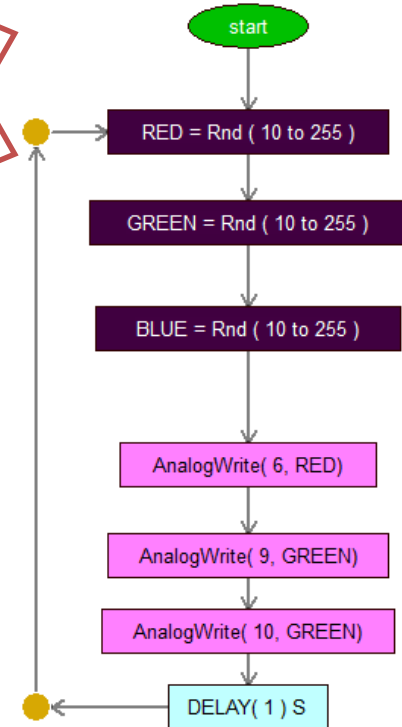
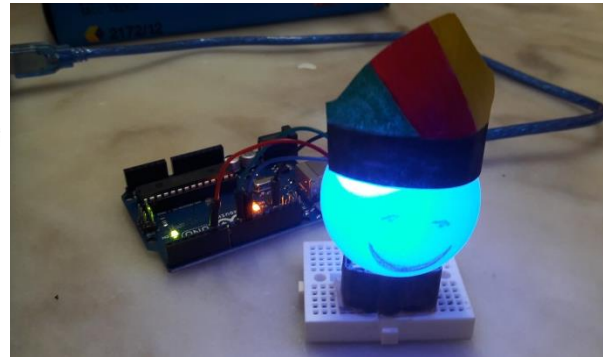
1. Construct the RGB LED Circuit as shown
2. Test the circuit using Arduino Control panel

Prototyping activity #5 – Digital Color Mixing & Mood Lamp Project

Challenge

Use Google to do a brief research on Traditional hats of the World - Design and build the selected Hat for your final project. Capture your project in action and upload to YouTube.

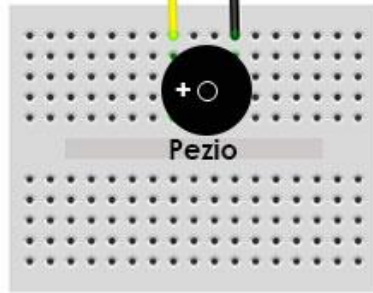
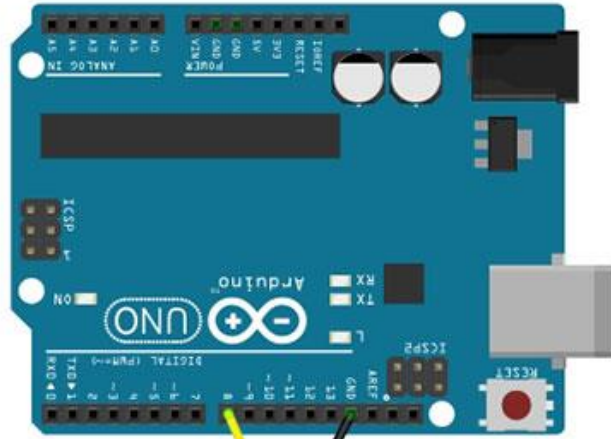
Basic Mood Lamp Model Project using ping Pong Ball



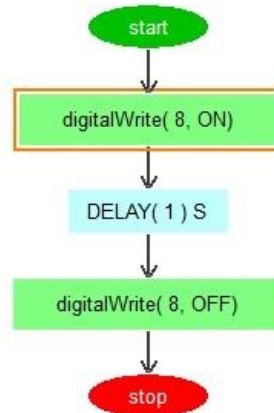
3. Build the above Algorithm/FlowProgram and Execute
4. Complete the Mood Lamp Project creatively

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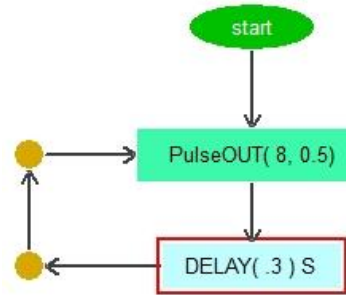
Prototyping activity #6 – Pezio Buzzer



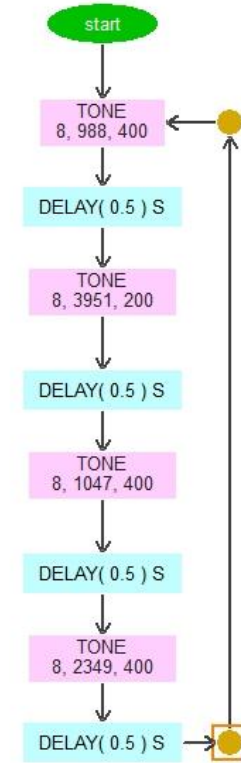
Pezio Buzzer



Buzzer ON/OFF sample using Digital Write



Pulsating sample using pulseOUT

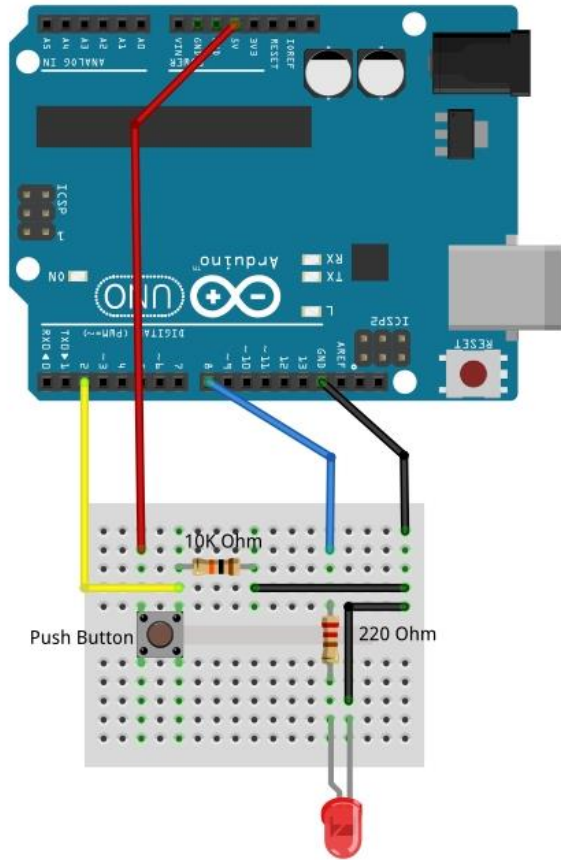


Play Music sample using TONE

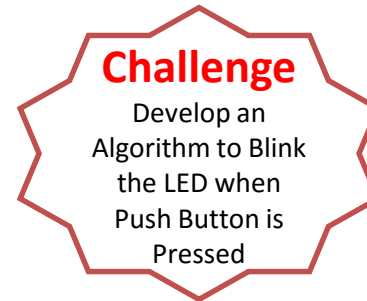
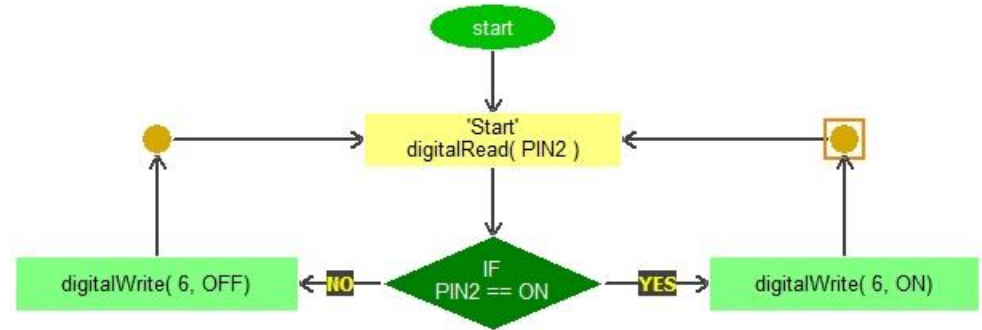
1. Construct the Pezio Buzzer Circuit as shown
2. Test the circuit using Arduino Control panel

3. Build the above Algorithm/FlowProgram and Execute
4. Complete the Challenge

Arduino & FlowLogic 6



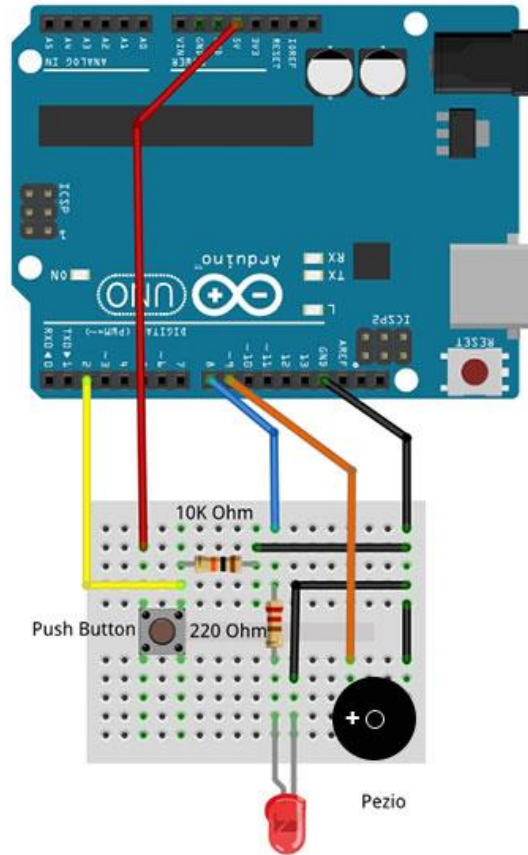
Prototyping activity #7 – Push Button



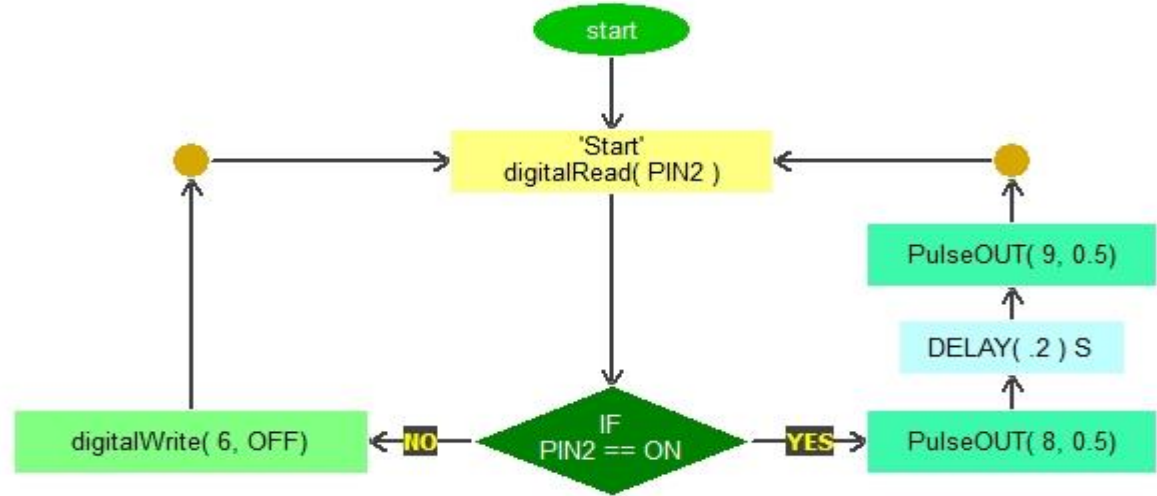
1. Construct the Push Button Circuit as shown
2. Test the circuit using Arduino Control panel

3. Build the above Algorithm/FlowProgram and Execute
4. Complete the Challenge

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Prototyping activity #8 – Panic Button With Visual and Audio Alert



Challenge
Enhance the above algorithm with Text to Speech Alert

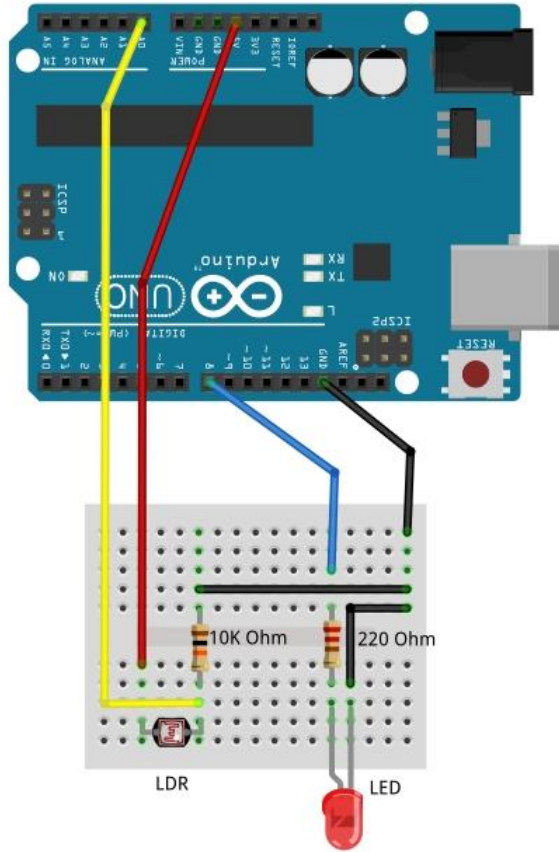
1. Construct Push Button Circuit and Pezizo as shown
2. Test the circuit using Arduino Control panel
3. Build the above Algorithm/FlowProgram and Execute
4. Complete the Challenge

Module #6

Prototype activities using

Analog Input and Output

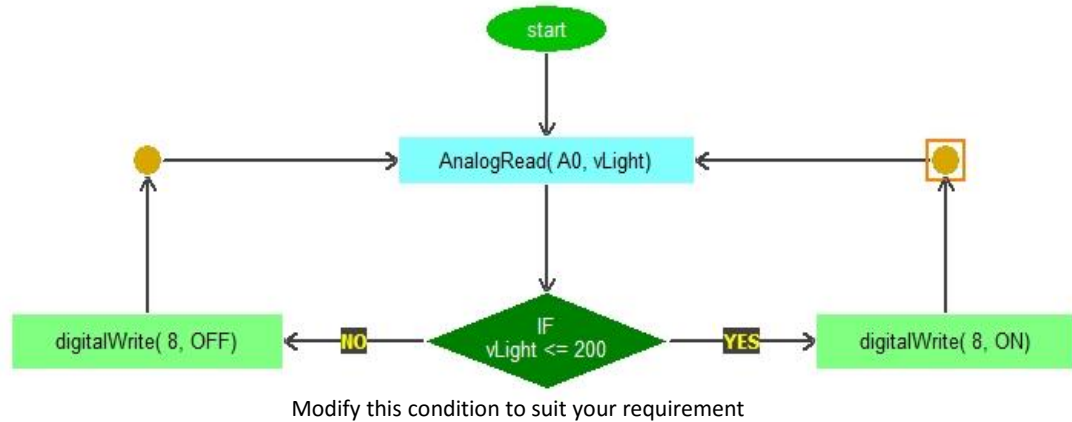
Arduino & FlowLogic 6



1. Construct LDR Light Sensor Circuit as shown
2. Test the circuit using Arduino Control panel

Prototyping activity #9 – LDR Light Sensor

Algorithm to read LDR value to Turn ON and OFF The LED Project
Example : Turn ON the Light when it is Night time and OFF when its day time..



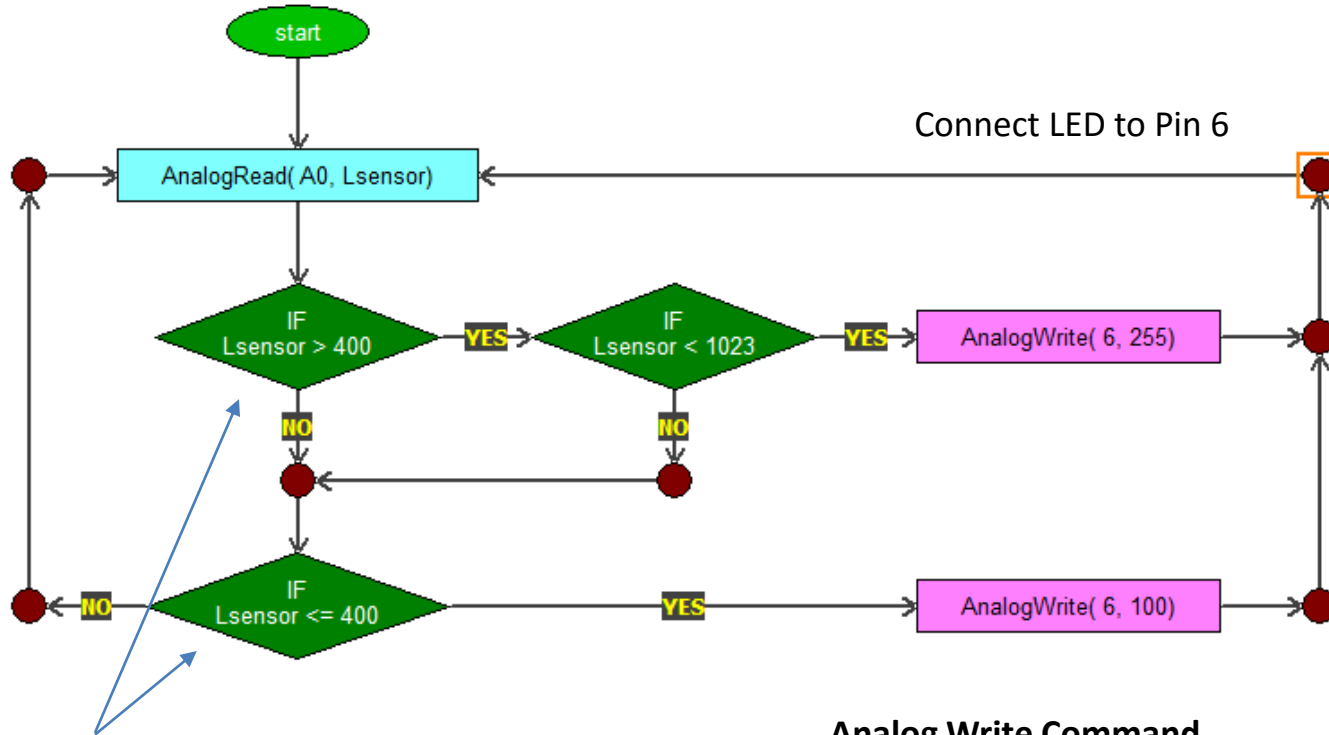
Task : Read ambient light value From Pin A0 that was produced by LDR light Sensor and store the value dynamically into *vLight* variable

Use Control panel to check the correct Value for Day and Night. Use your palm to cover the LDR Light Sensor to emulate night.

3. Build the above Algorithm/FlowProgram and Execute
4. Complete the Challenge

Energy Saving project

Activity #10 : Using Light Sensor to Fade the Led Based on ambient brightness



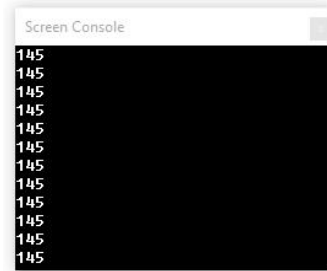
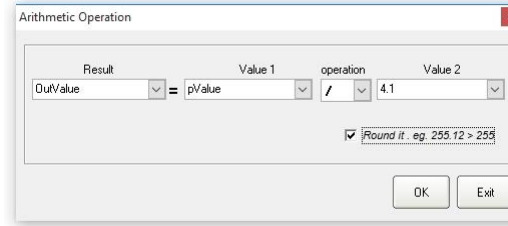
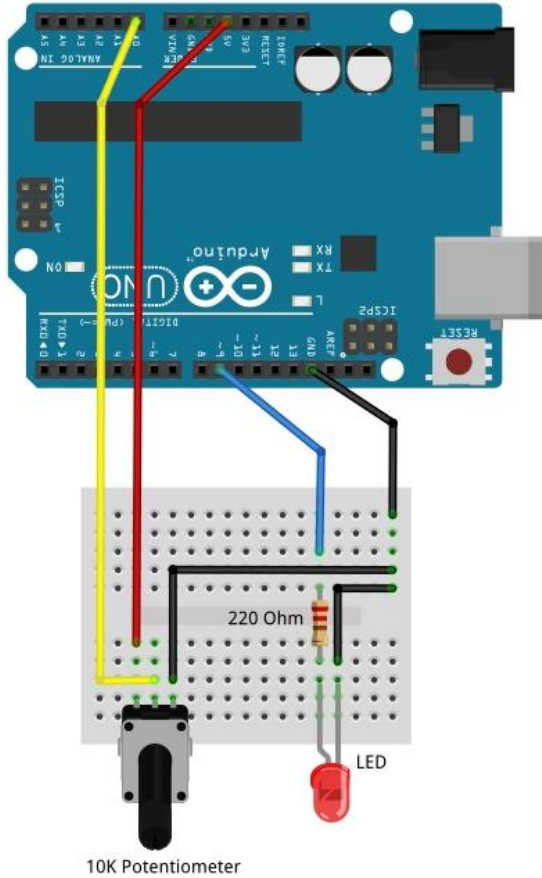
Modify this condition to suit your requirement

Analog Write Command

Value : 0 > LED OFF 255 > LED very Bright

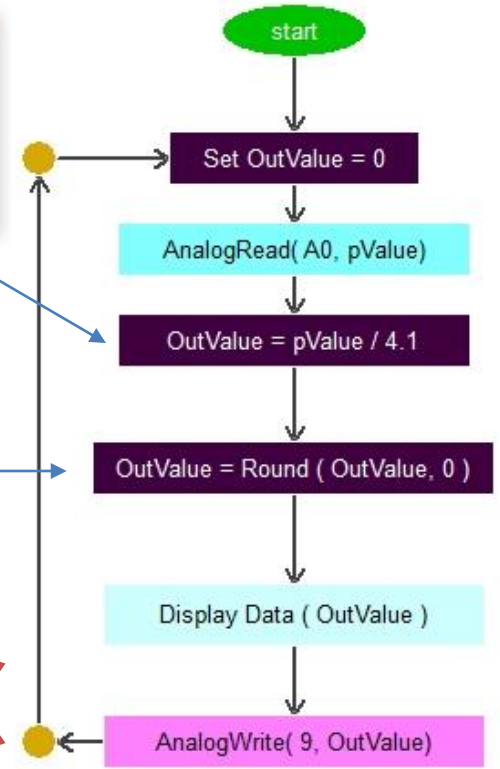
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Prototyping activity #11 – Potentiometer



Screen Console Widget

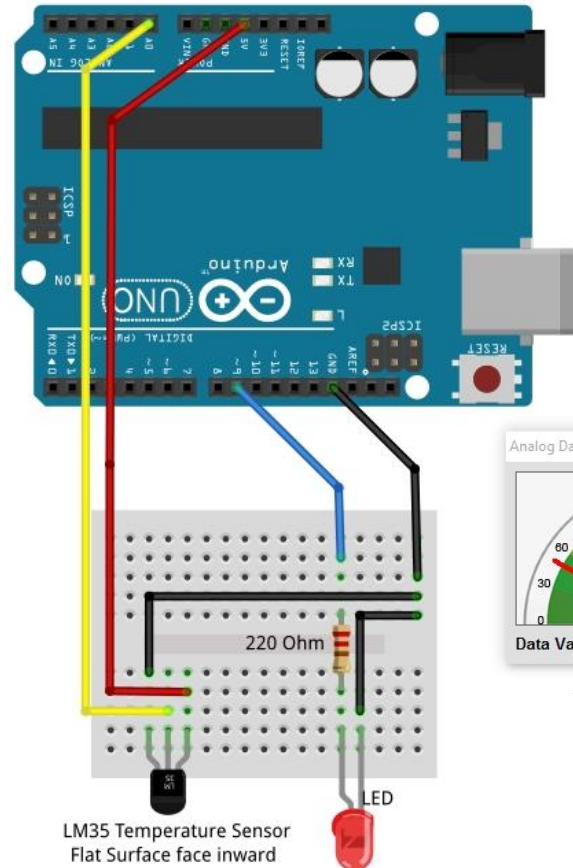
Challenge
Connect 3 potentiometer to digitally mix RGB LED color



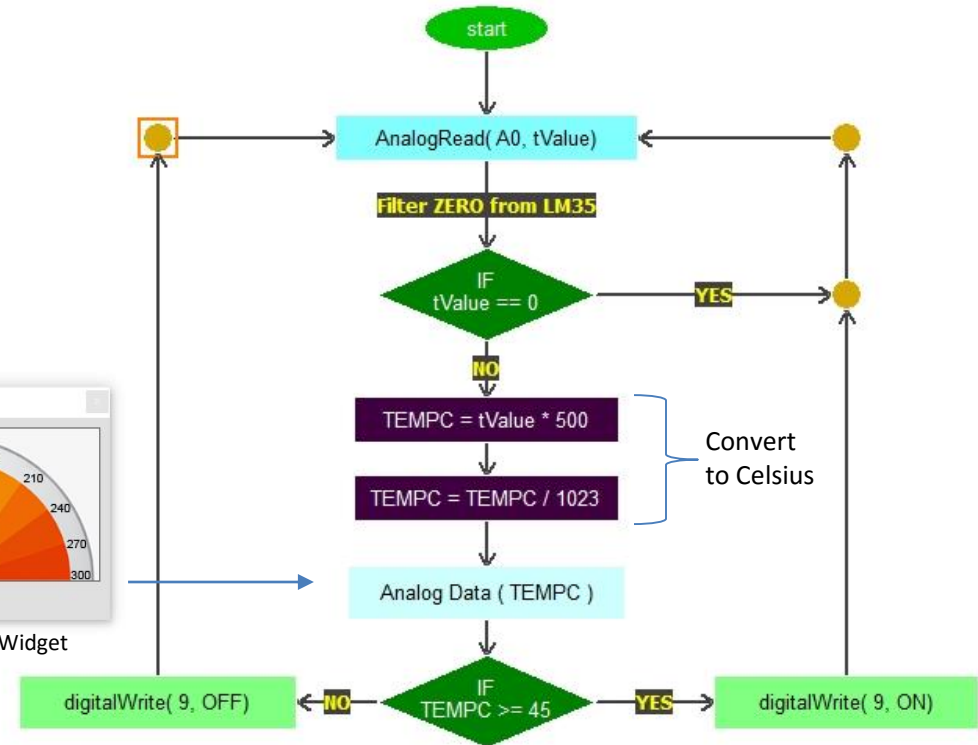
1. Construct Potentiometer Circuit as shown
2. Test the circuit using Arduino Control panel

3. Build the above Algorithm/FlowProgram and Execute
4. Complete the Challenge

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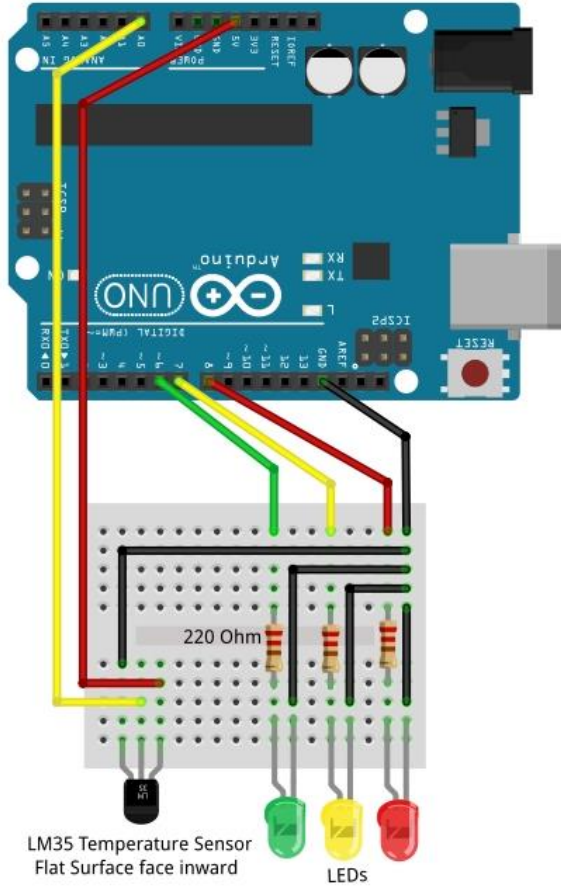
Prototyping activity #12 – Temperature Sensor LM35



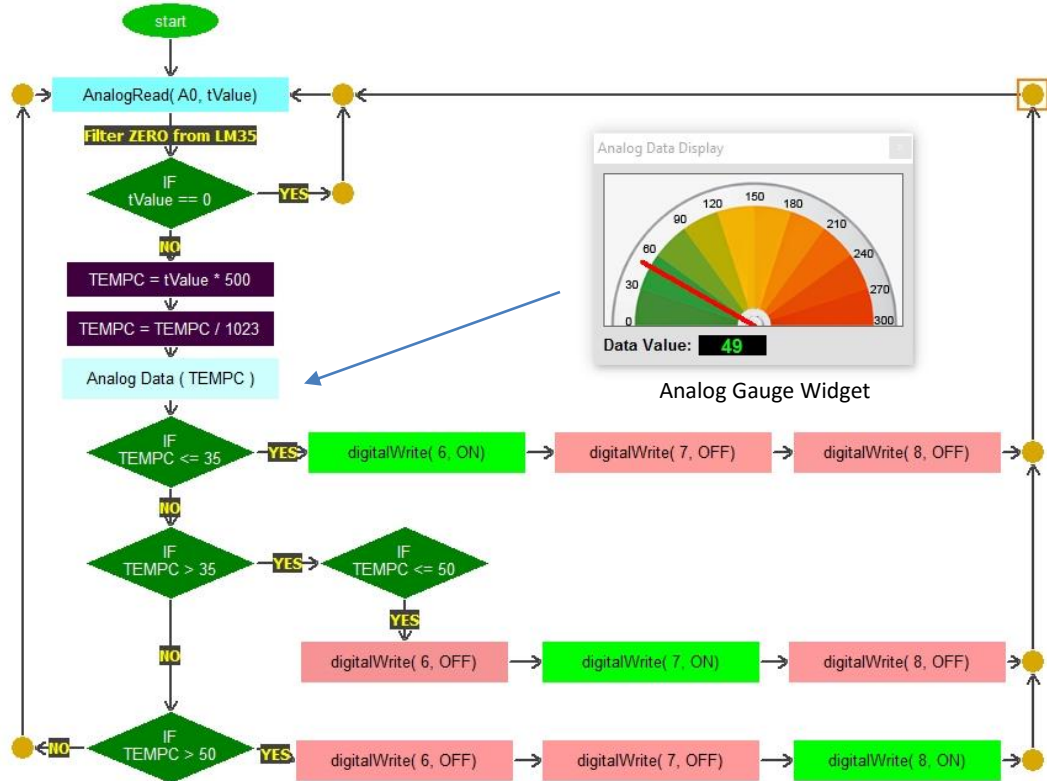
1. Construct LM35 Sensor Circuit as shown
2. Test the circuit using Arduino Control panel

3. Build the above Algorithm/FlowProgram and Execute
4. Design a Challenge and complete it

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Prototyping activity #13 – Heat Range Detection project Using Temperature Sensor LM35



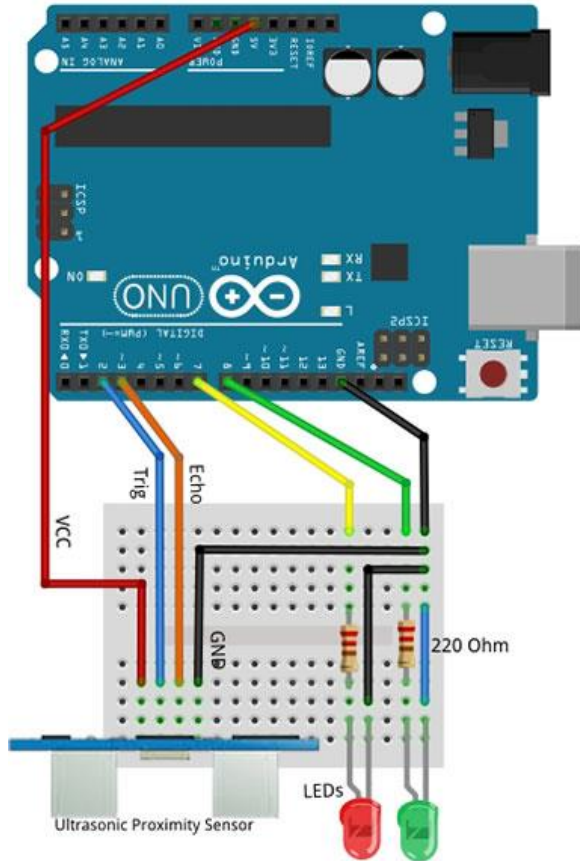
- Construct LM35 Sensor and LED Circuit as shown
- Test the circuit using Arduino Control panel
- Build the above Algorithm/FlowProgram and Execute
- Design a Challenge and complete it

Module #6

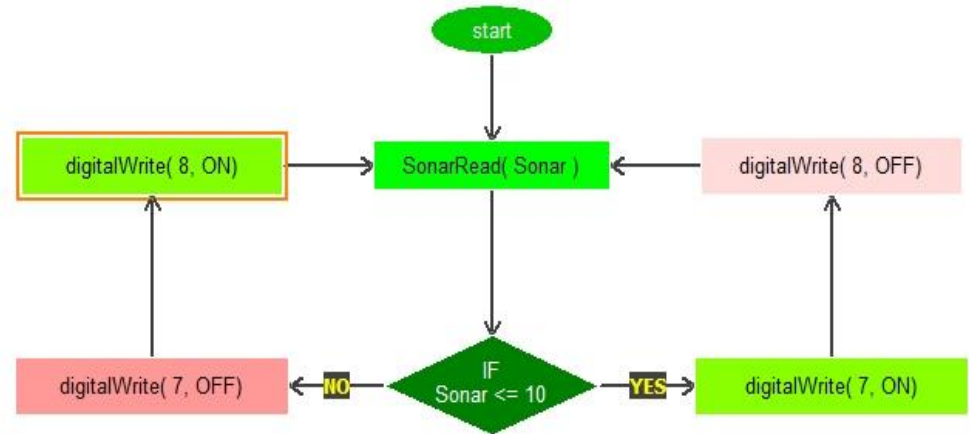
Prototype activities using

Data Sensors

Arduino & FlowLogic 6



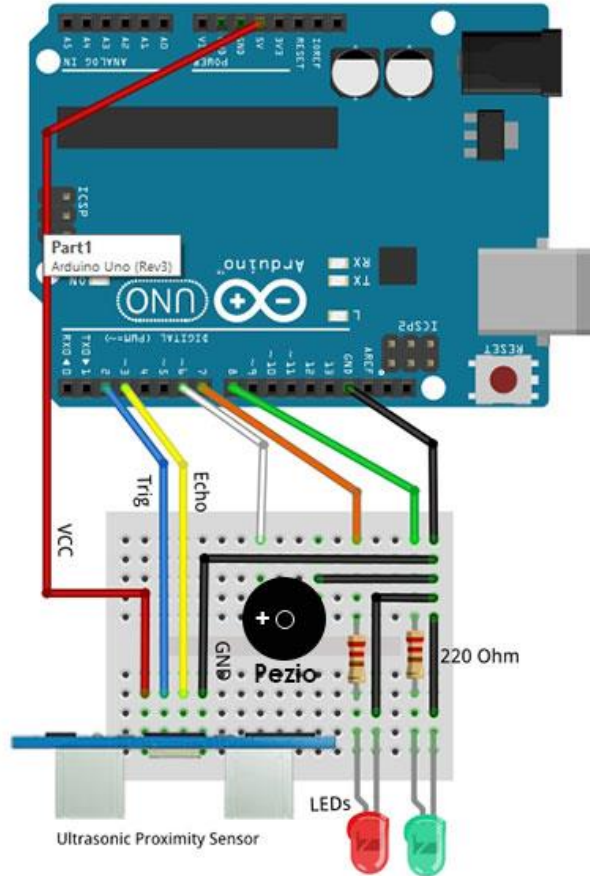
Prototyping activity #14 – Ultrasonic Proximity Sensor Or Sonar Sensor



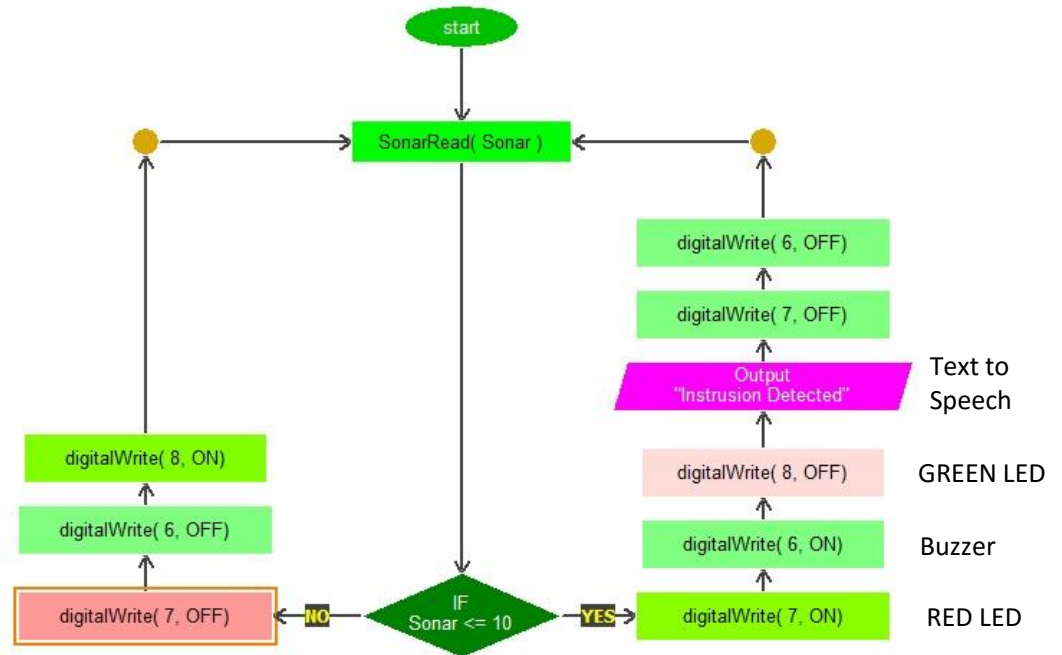
Task : When obstacle detected at proximity of less the 10 cm the GREEN LED Will be turn ON else RED Led will be ON.

1. Construct Sonar Sensor and LED Circuit as shown
2. Test the circuit using Arduino Control panel
3. Build the above Algorithm/FlowProgram and Execute
4. Design a Challenge and complete it

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Prototyping activity #15 – Ultrasonic Proximity Sensor Intrusion Detection project



1. Construct Sonar Sensor and LED Circuit as shown
2. Test the circuit using Arduino Control panel
3. Build the above Algorithm/FlowProgram and Execute
4. Design a Challenge and complete it

END OF

Teachers and Students Guide

FlowLogic 6 and Arduino UNO

Prototype activities

Visit www.myflowlab.com for continuous learning via video tutorials

Contact us for examples

