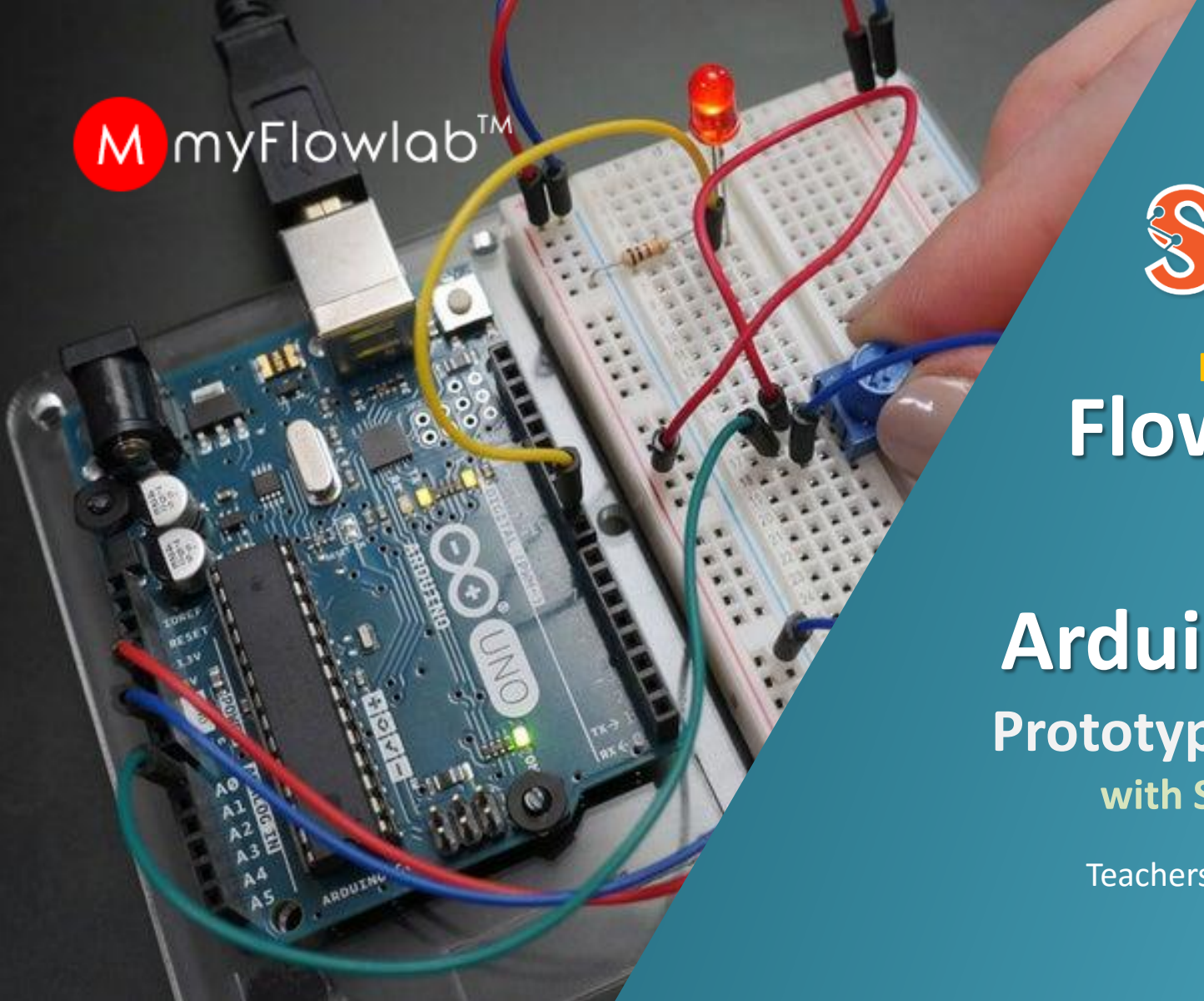


Digital

STEM

Exploration with

FlowLogic 6 and Arduino UNO

Prototype activities

with Sample Projects

Teachers and Student Guide

First Edition

RESOURCES for Students & Educators

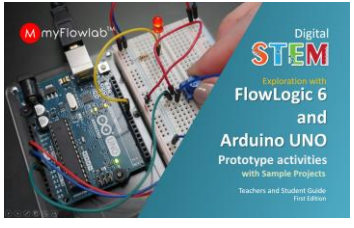
Excitement in Learning & Teaching

myFlowlab™

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

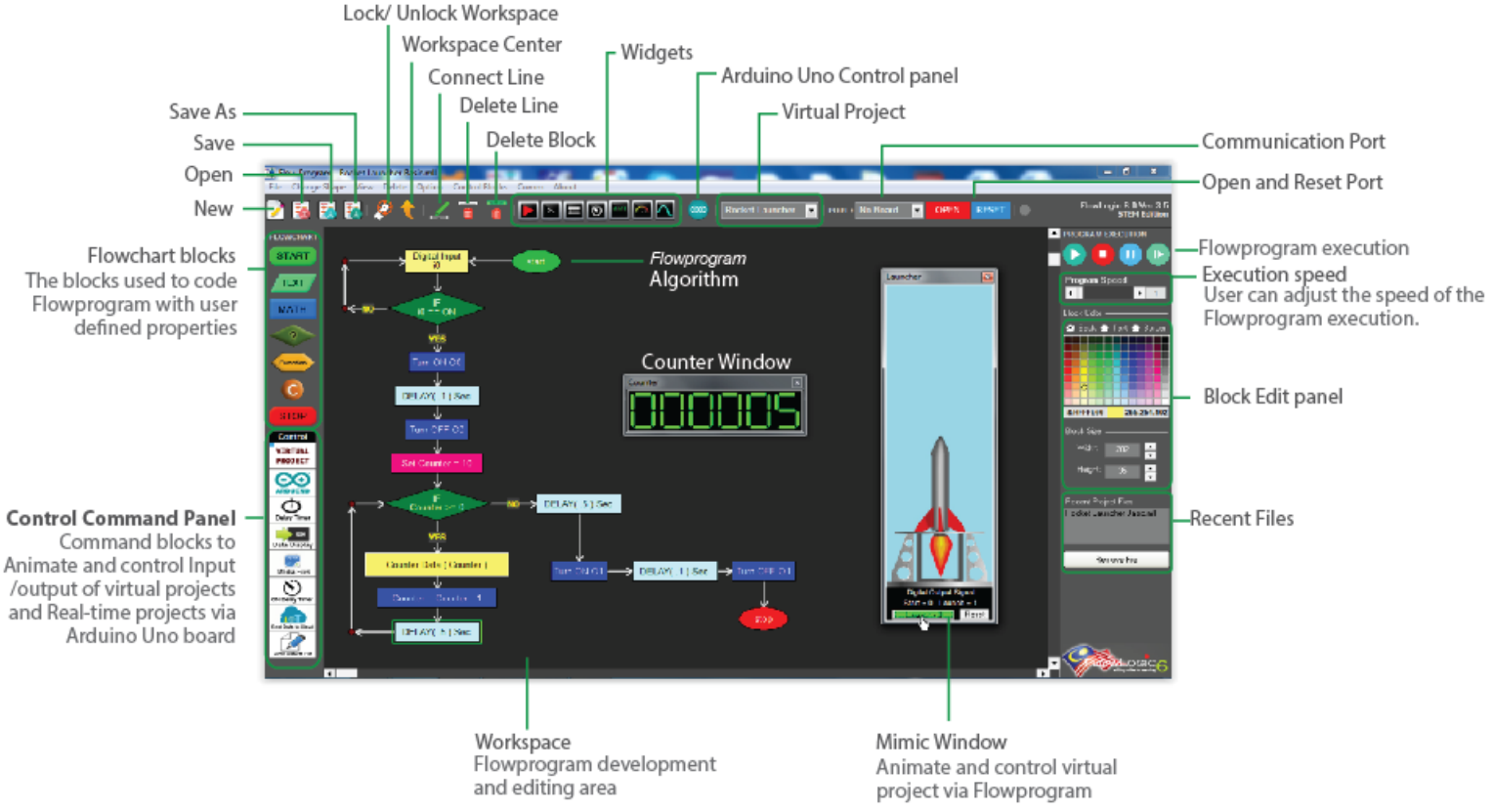
Introduction and Setting Up

FlowLogic 6

Flowchart based Algorithm Programming Software tool

FlowLogic 6 Version 3.8

myFlowlab™



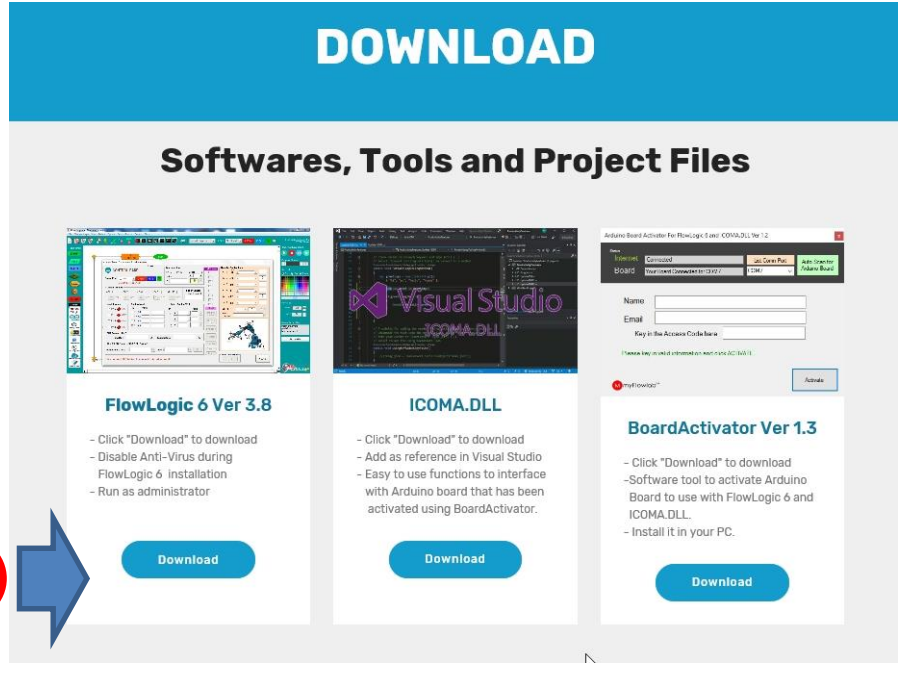
Introduce to student the FlowLogic 6 and Guide them on how to construct a FlowProgram

myFlowlab™

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*



Google Chrome footer

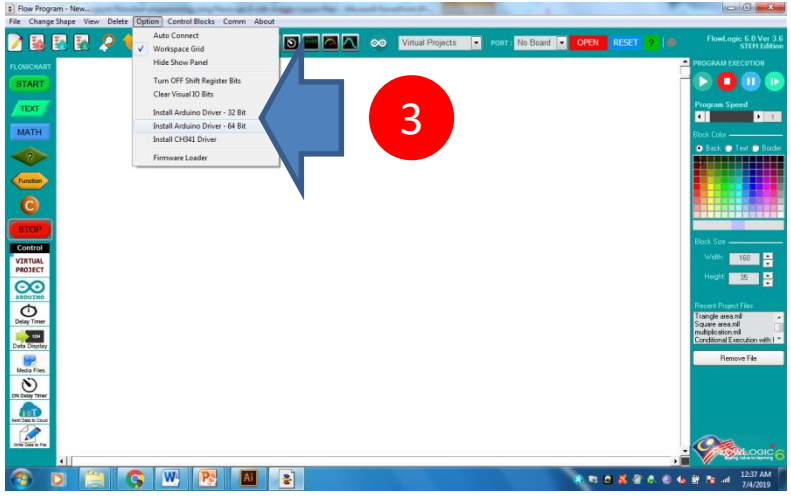
DIY #2- Downloading FlowLogic 6 Version 3.8

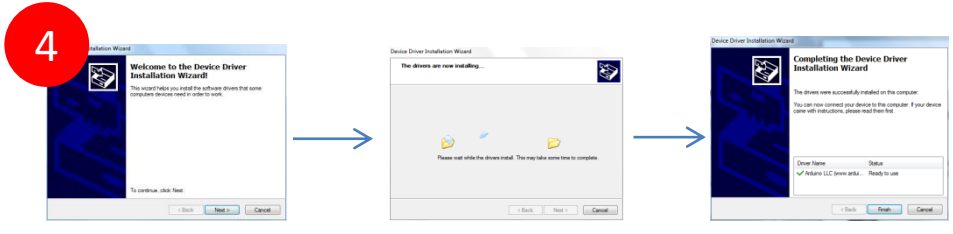
FlowLogic 6

myFlowlab™

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 **Flow**Logic 6 and Run it as Administrator.* *Right click on FlowLogic 6 desktop Icon and Select "Run as Administrator from the pop-menu*





FlowLogic 6

Companion Firmware upload

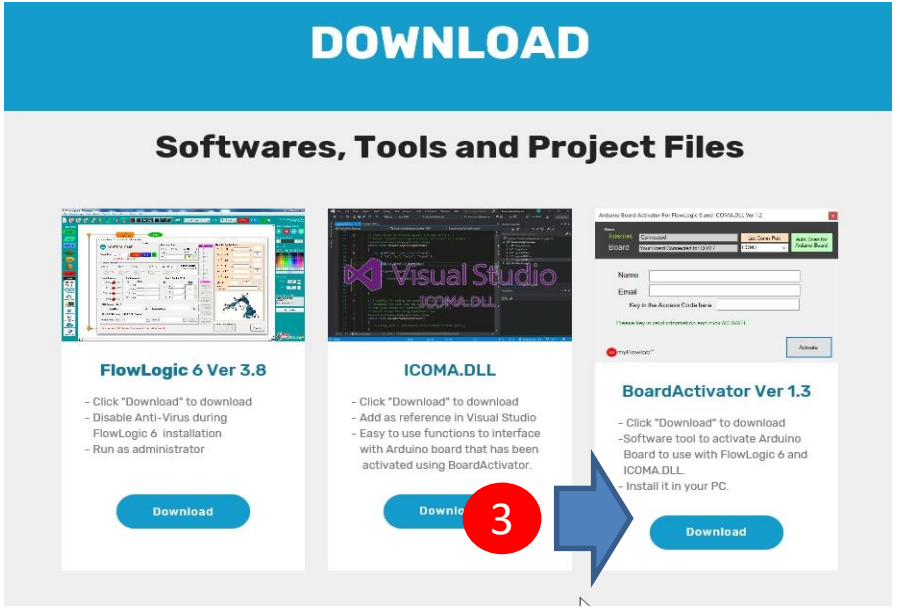
1. Go to *www.myflowlab.com*
2. *Click Download from the top menu*
3. *Click Download to download the The BoardActivator Ver. 1.3*
4. *Install the downloaded BoardActivator Ver. 1.3 on your Computer.*

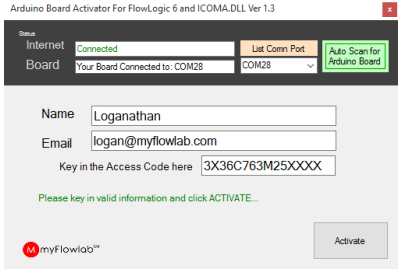
To activate any of your Arduino board

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 BoardAvtivator Ver. 1.3*
d. *Fill in your Name, valid email and valid **Access Code t**hat 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.



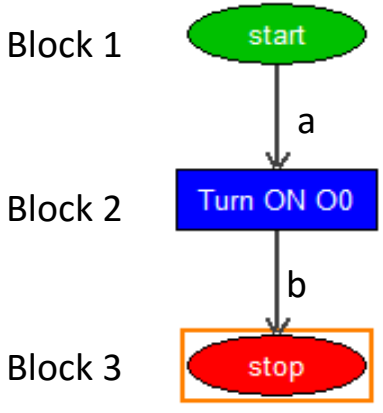


Editing Command Blocks

myFlowlab™

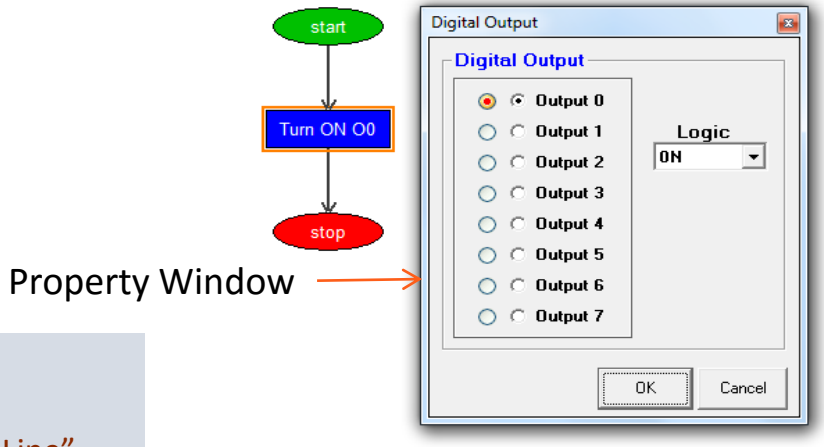
Activity - #1 – Practice Select the Blocks , define the property, Connect Line, Delete Line and Delete block to

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

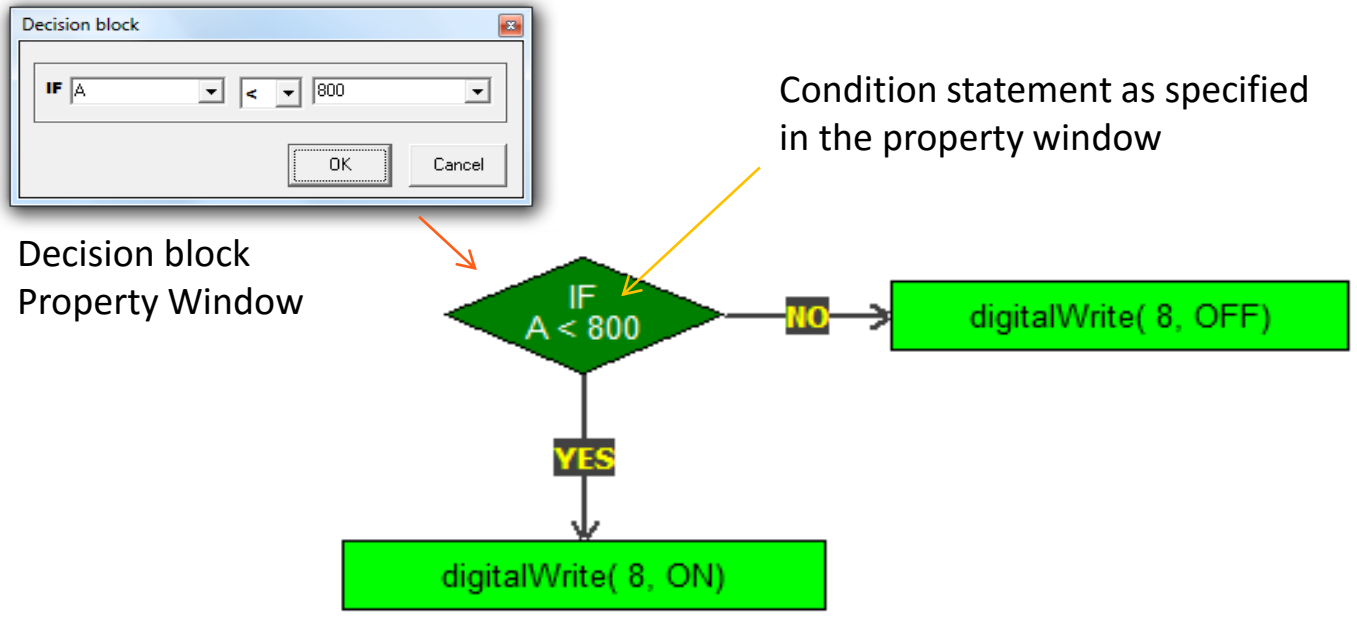


To edit blocks, double click on the block and make the necessary changes on the pop-up property Windows and click “Ok” when done.

Working with Decision Blocks

myFlowlab™

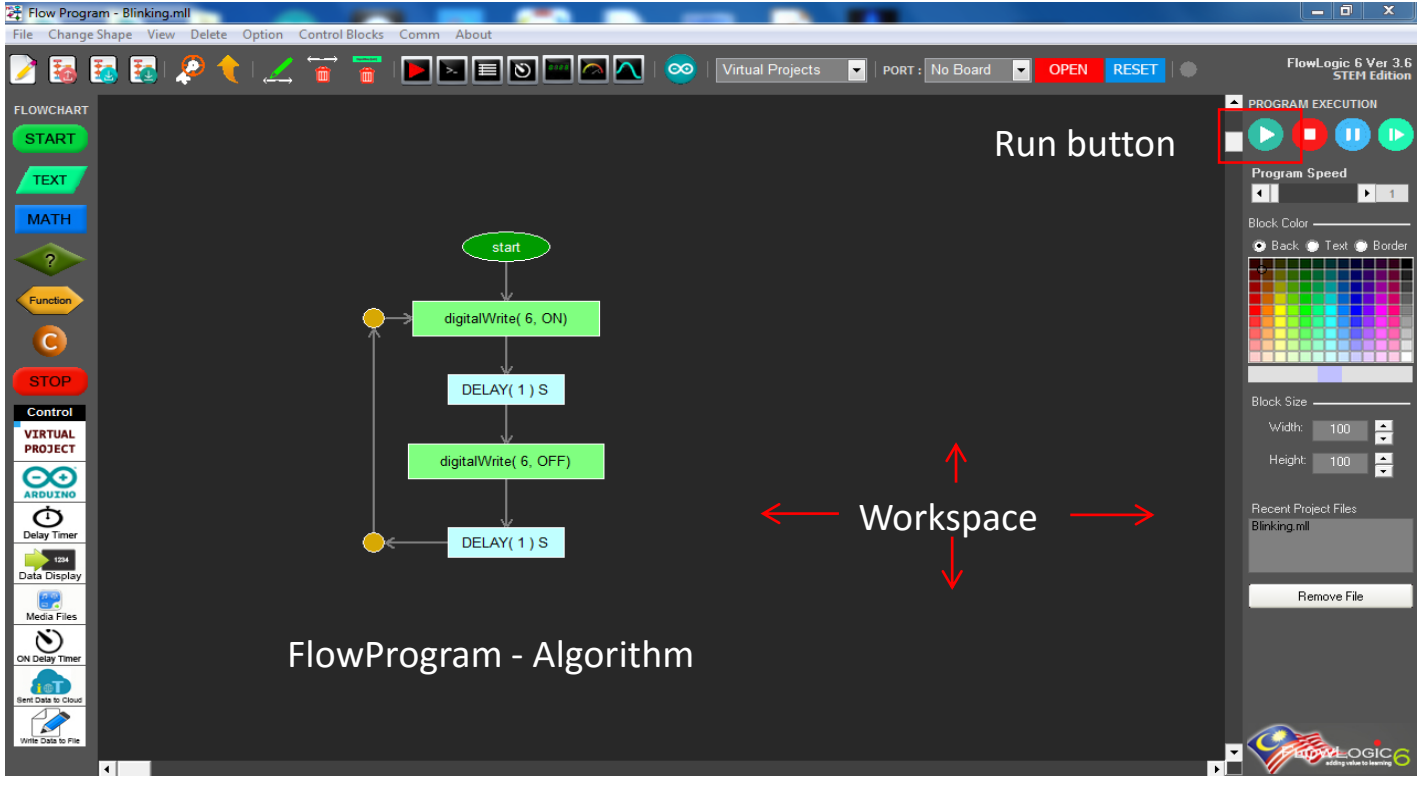
Activity - #2 - Practice Select the Blocks , define the property, Connect Line to try out



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 FlowPogram



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

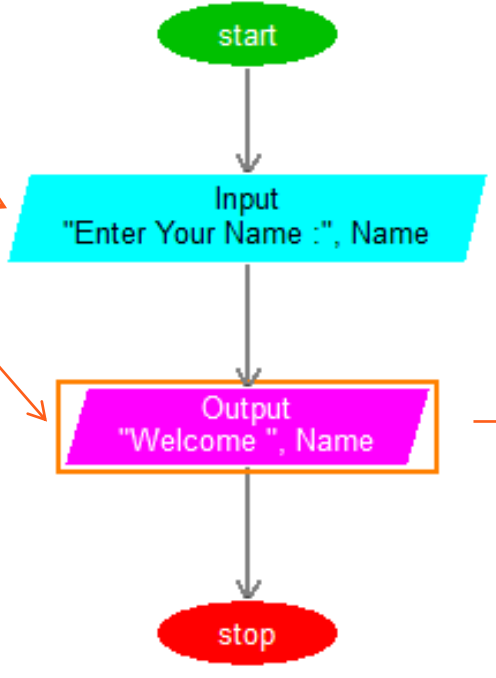
Building Algorithm using Console programming

FlowProgram / Algorithm – Activity #3

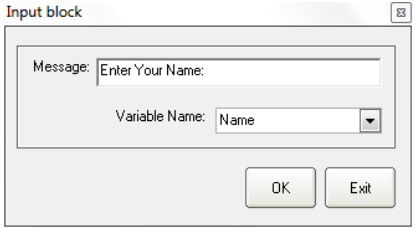
Console applications

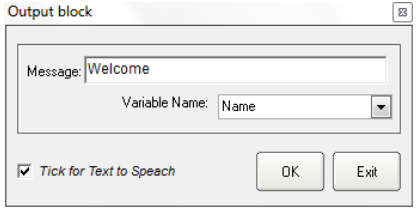
myFlowlab™

FlowProgram/Algorithm

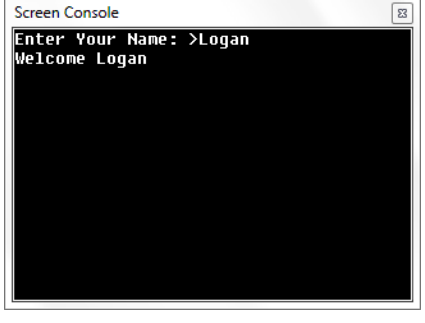


Block's Property Windows





Screen Console widget

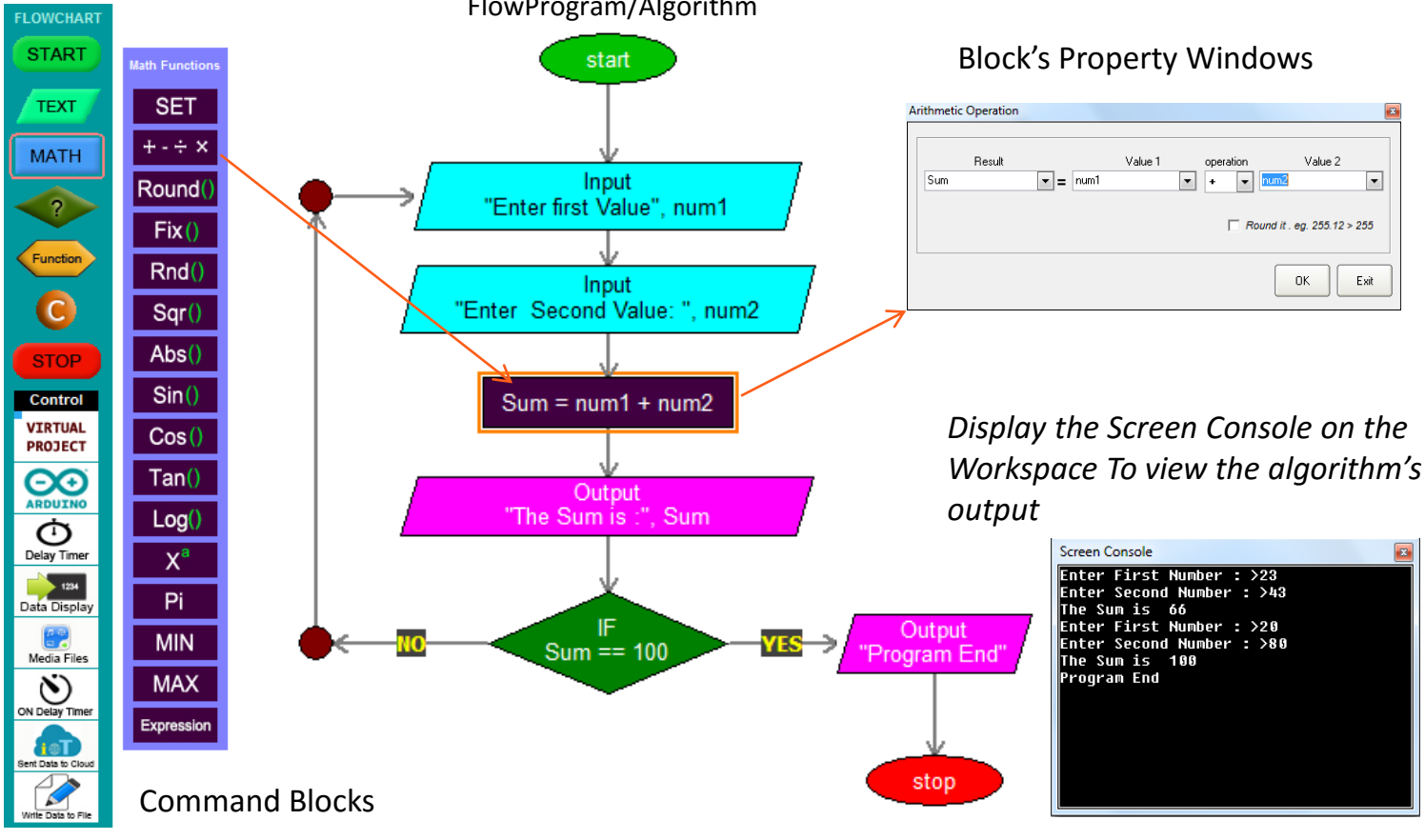


Command Blocks

Run the FlowProgram to view the output..

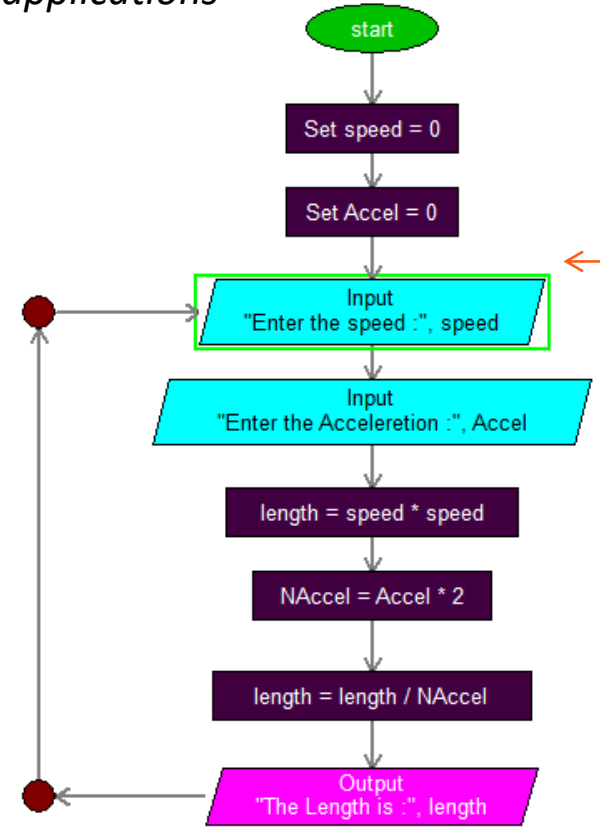
FlowProgram / Algorithm – Activity #4

Console applications

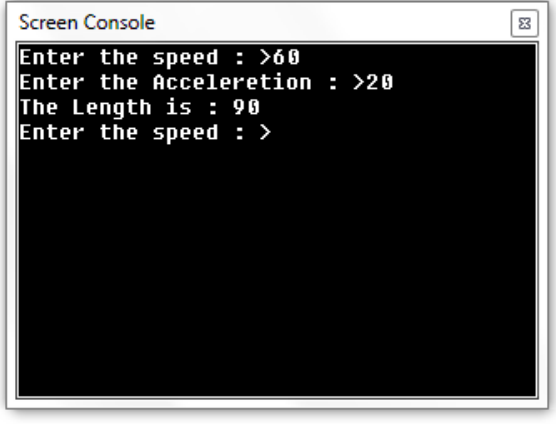


FlowProgram / Algorithm – DIY #2

Console applications

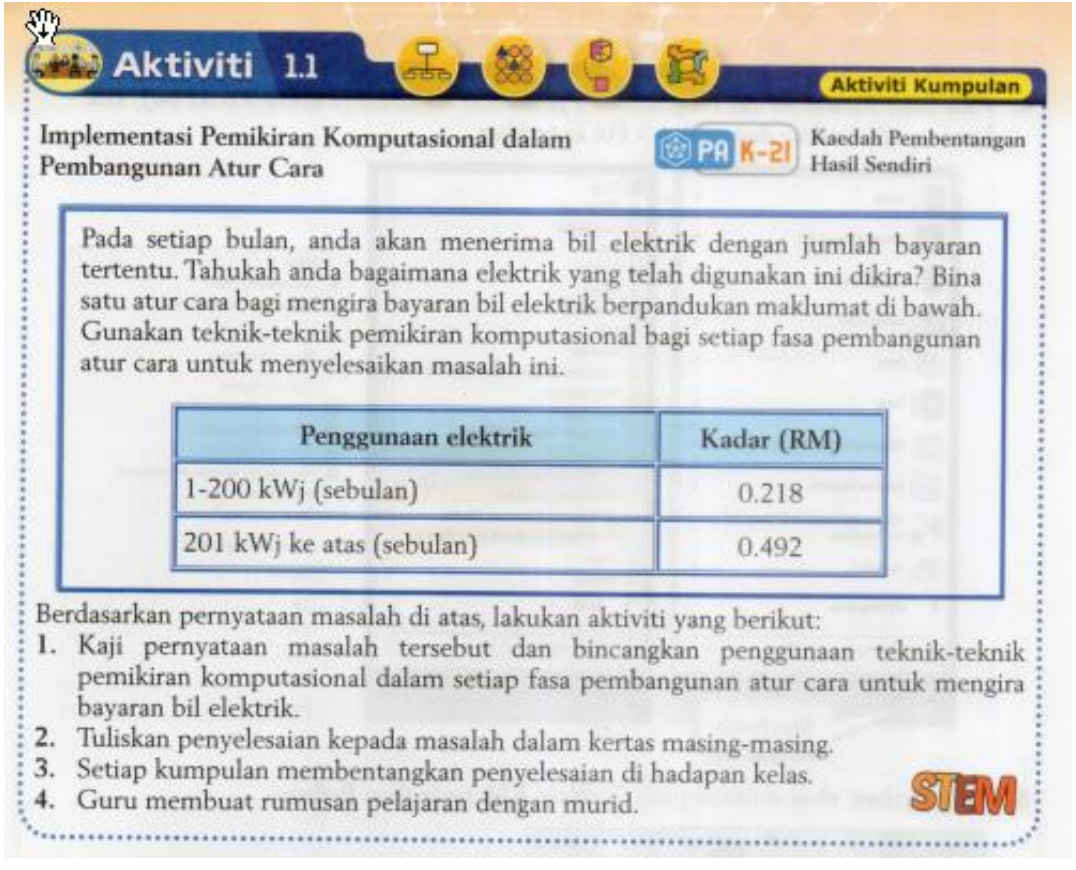


Construct the FlowProgram to produce the output shown below



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

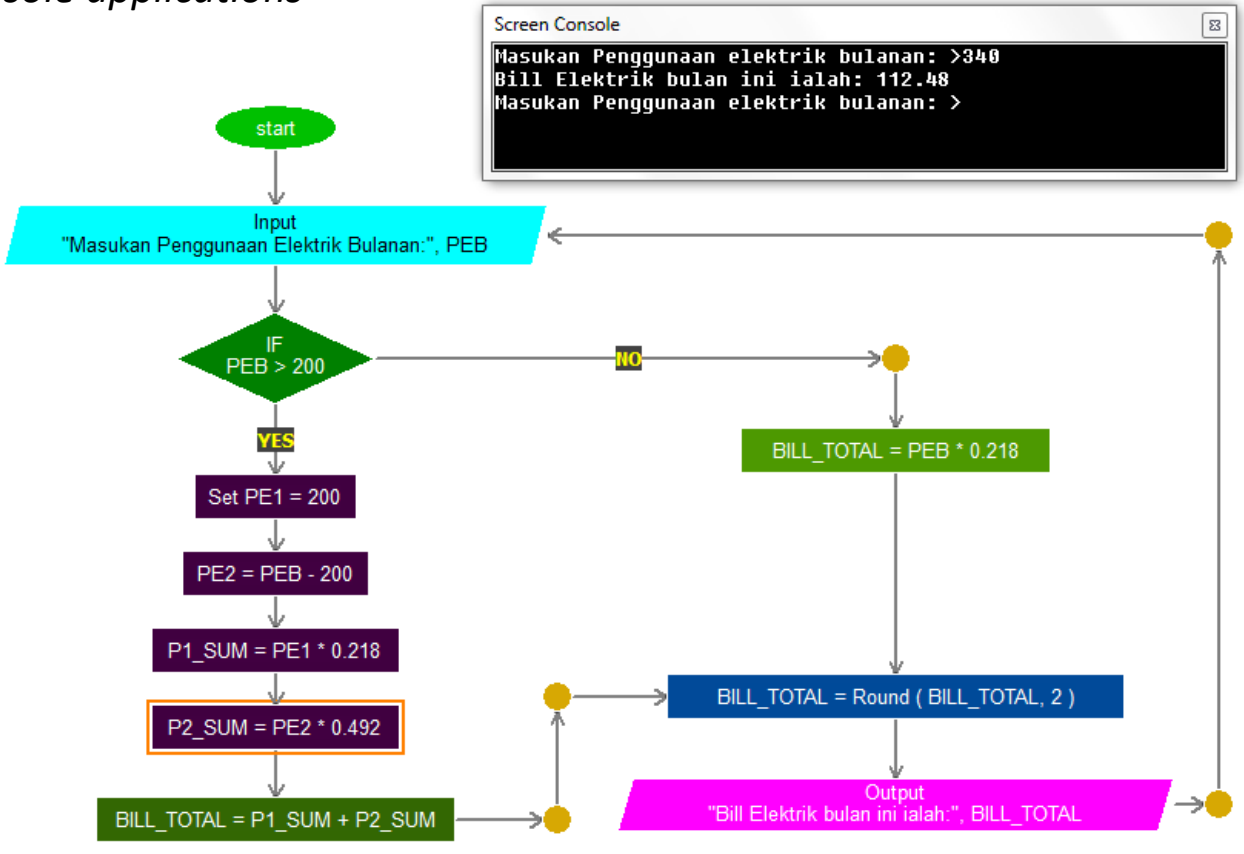
Berdasarkan pernyataan masalah di atas, lakukan aktiviti yang berikut:

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.

STEM

DIY #5 - Solution

Console applications



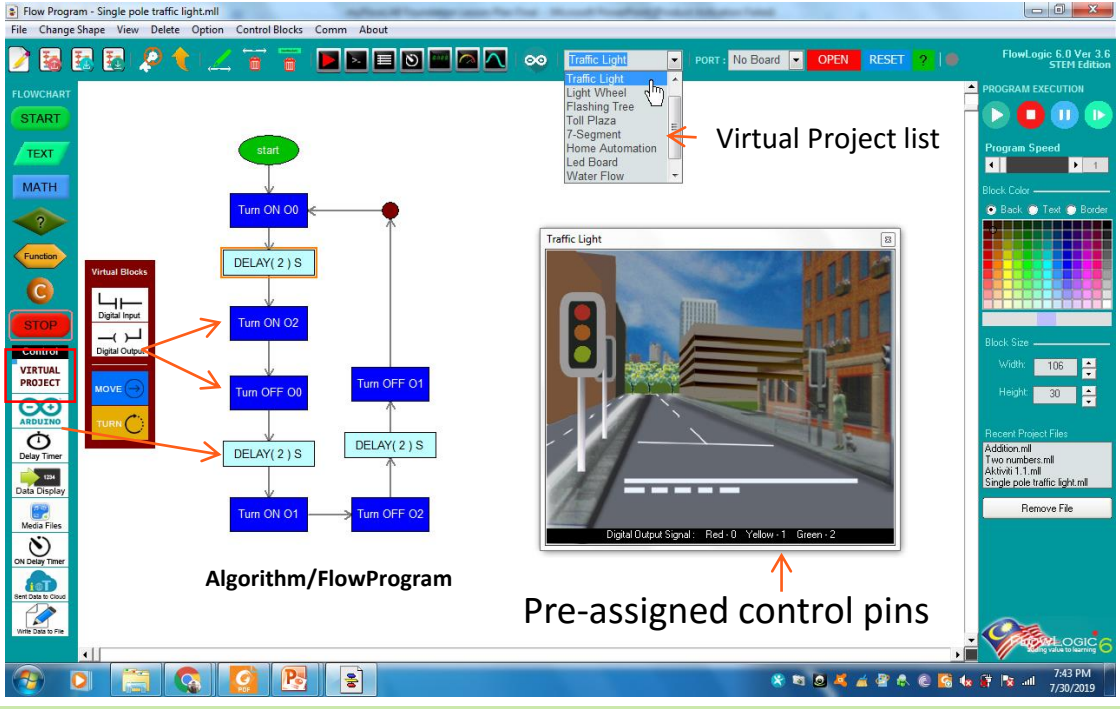
Module #3

Building Algorithm using Virtual Projects

Virtual Projects

myFlowlab™

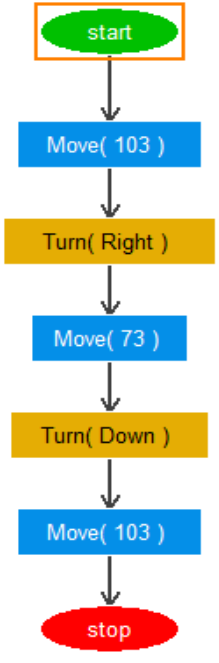
Is a On-screen mimics with Pre-assigned control pins and animations that can be programmed by using the virtual command blocks



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)

myFlowlab™

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

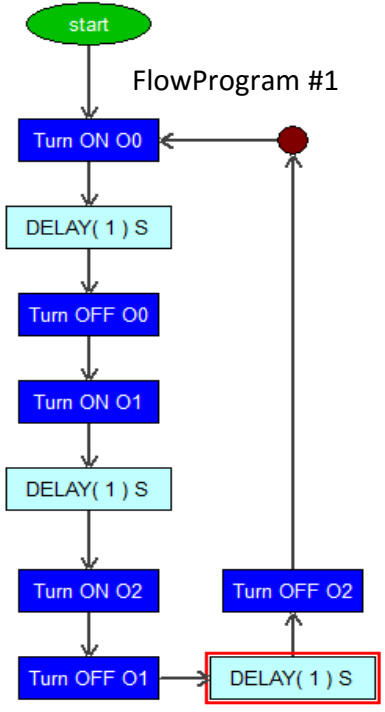
Step 4: Click Run icon to execute the FlowProgram

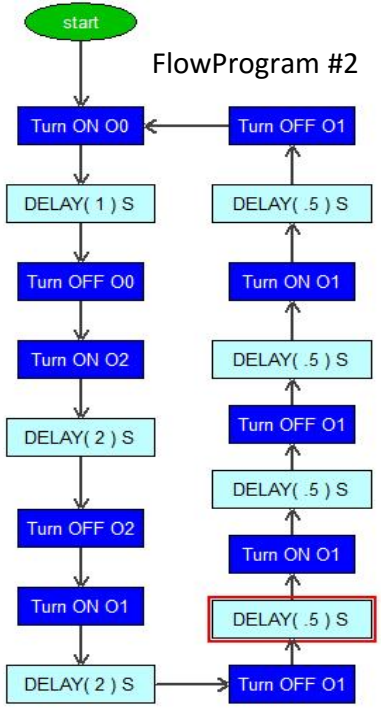
Step 5: Click Reset to place Robot to its origin location

Execute again to test again

Activity #3 : Traffic Light (Virtual Project)

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





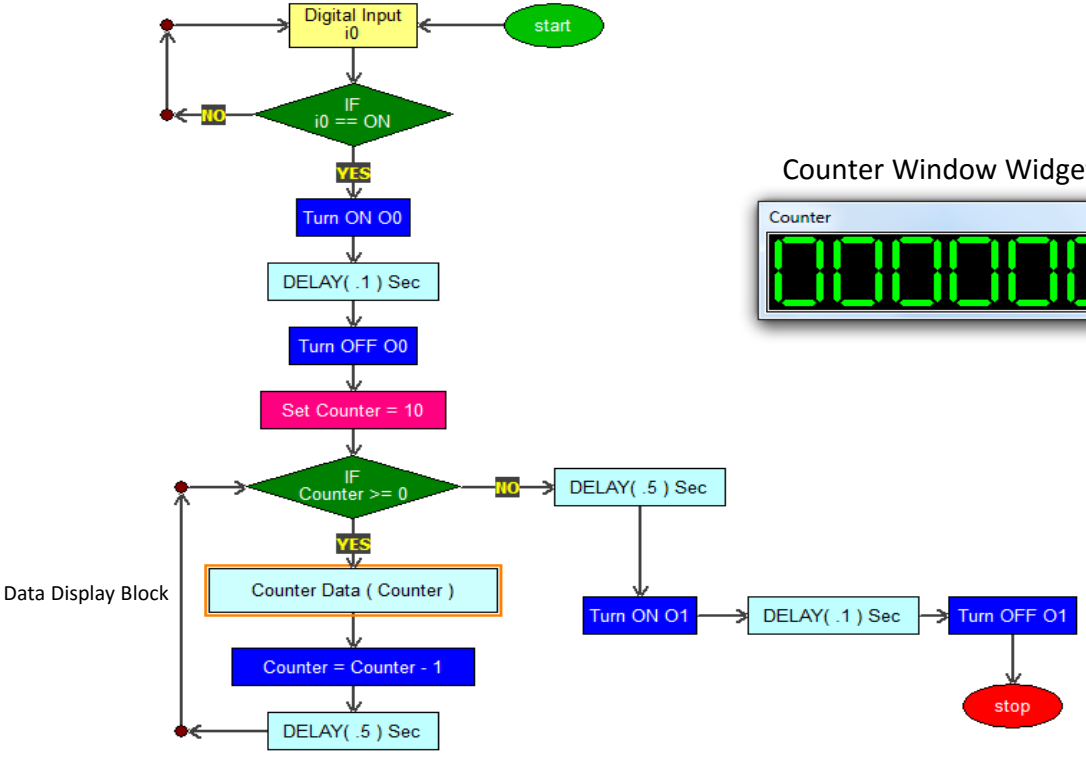
Load Traffic Light Virtual Model from the Virtual project list

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.

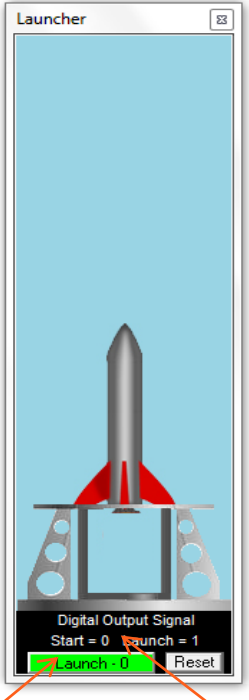
Activity #4 : Rocket Launcher (Virtual Project)

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



Counter Window Widgets

Select from Virtual project list – Rocket Launcher

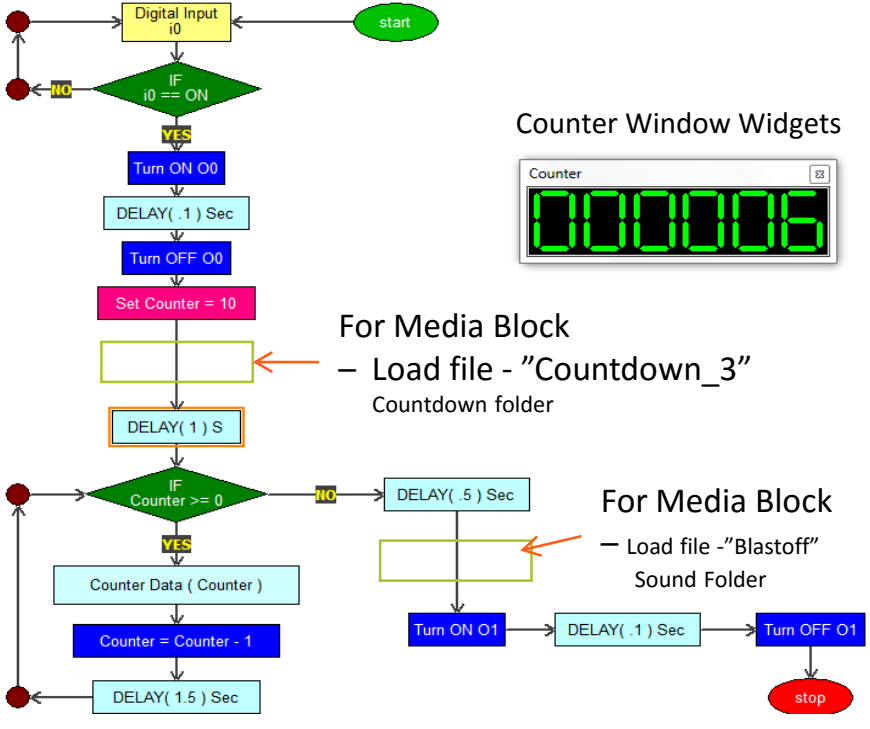


Input Virtual I/Os

Output Virtual I/Os

Activity #5 : Rocket Launcher (Virtual Project)

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

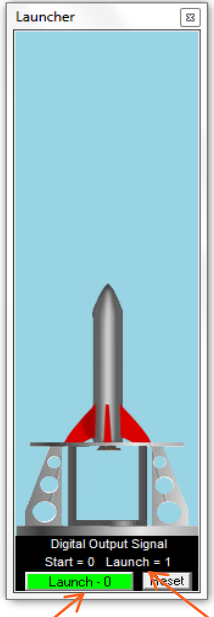


For Media Block
– Load file - ”Countdown_3”
Countdown folder

For Media Block
– Load file -”Blastoff”
Sound Folder

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

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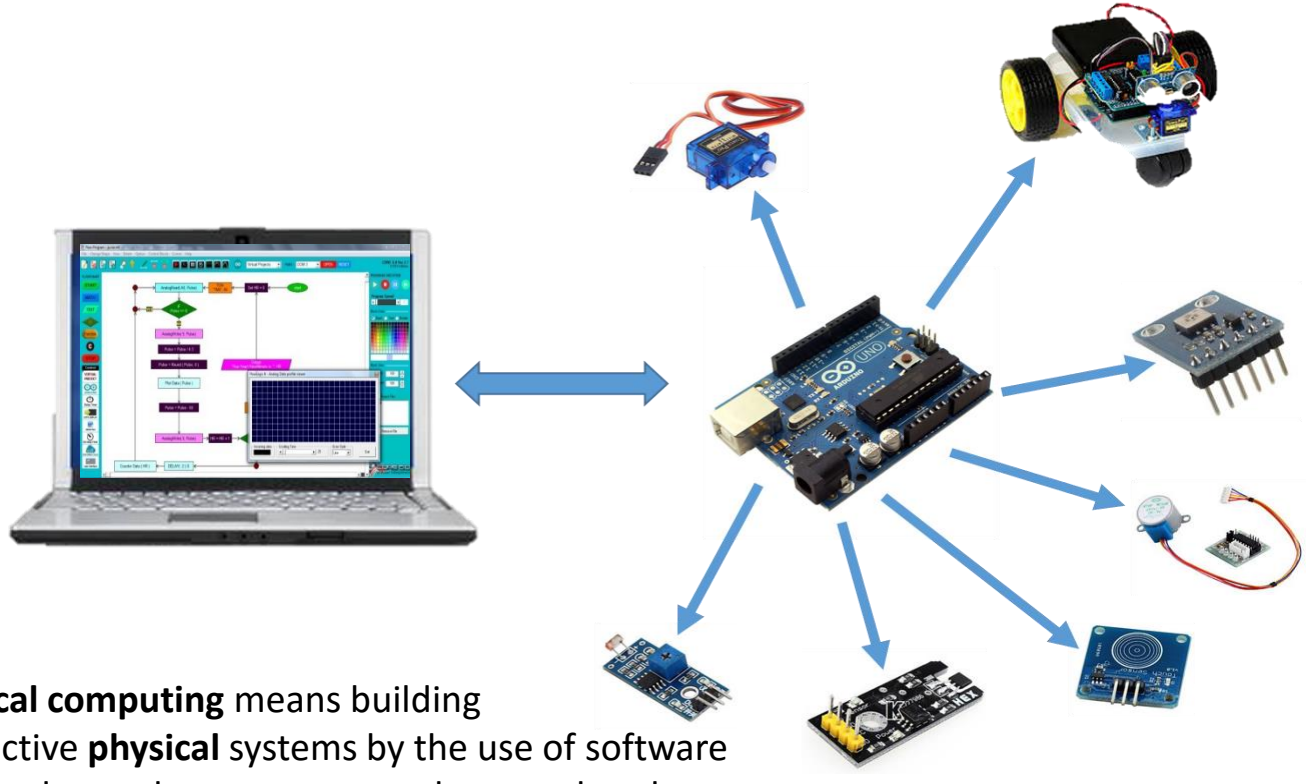


Physical computing means building interactive **physical** systems by the use of software and hardware that can sense and respond to the Real-World

Starter Kit Components

myFlowlab™

Arduino UNO R3

USB Cable

170 Breadboard

Jumper Wires

220 ohm

Resistors

10K ohm

1M ohm

Blue Led

Green Led

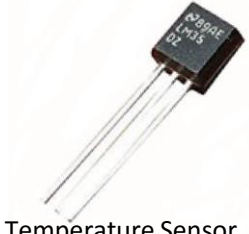
Red Led

Yellow Led

Push Button

Pezio Buzzer

LDR light Sensor



LM35 Temperature Sensor

RGB LED

Ultrasonic Sensor

Bonus Free Gift

Arduino UNO Pins & Power Source

myFlowlab™

Digital Input / Output Pins

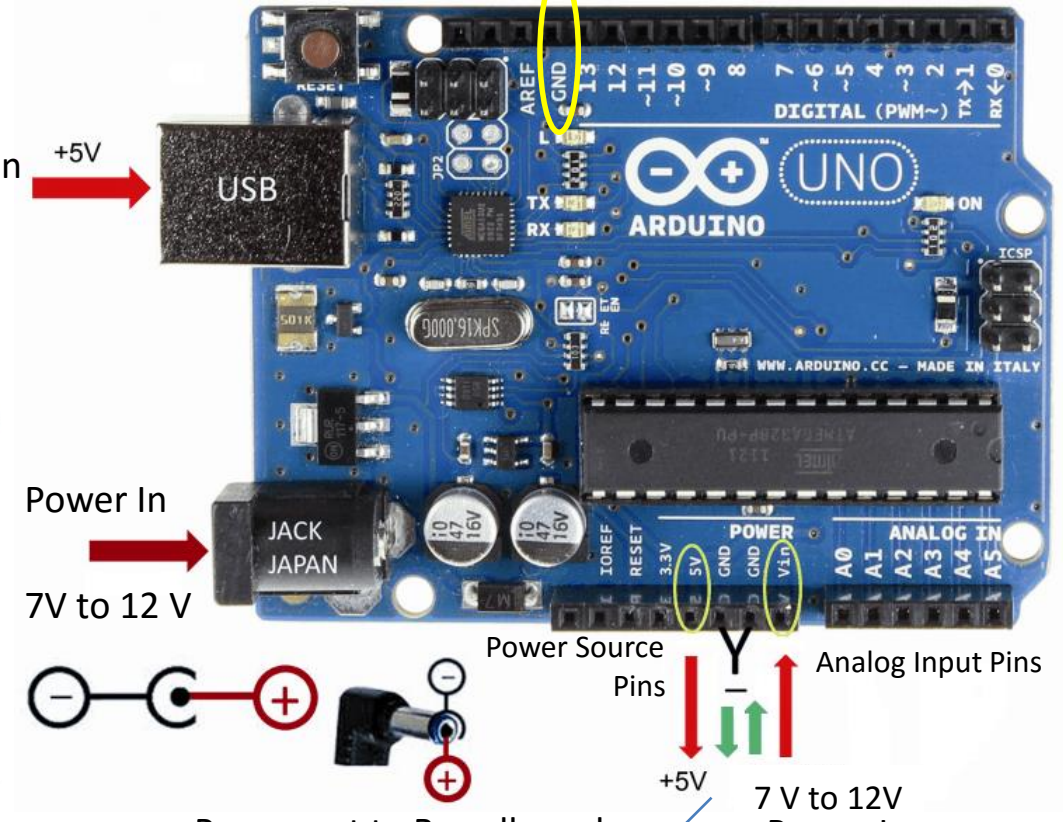
USB Cable

TO Arduino Board

To Computer

Communication and Power In

+5V



Battery

Power In

7V to 12 V

Power Source Pins

Analog Input Pins

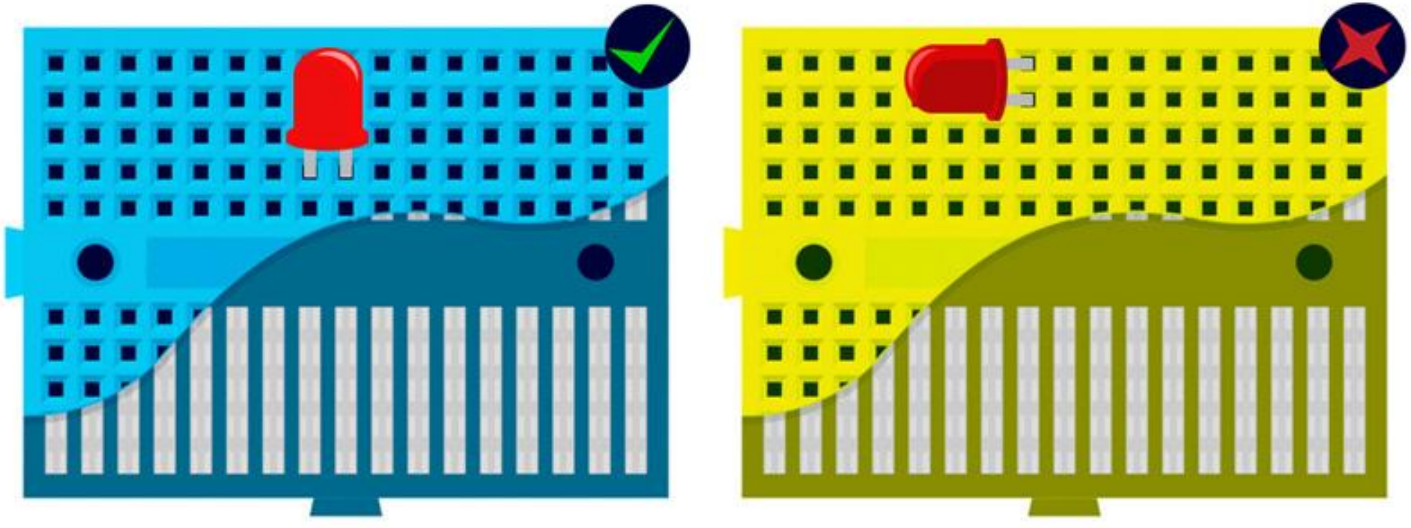
+5V

7 V to 12V Power In

Power Adaptor

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

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

Positive Terminal

+9V, VCC

+5V , VCC

9 volt battery

5 volt battery

Output

Negative Terminal

GND

Circuit Connections

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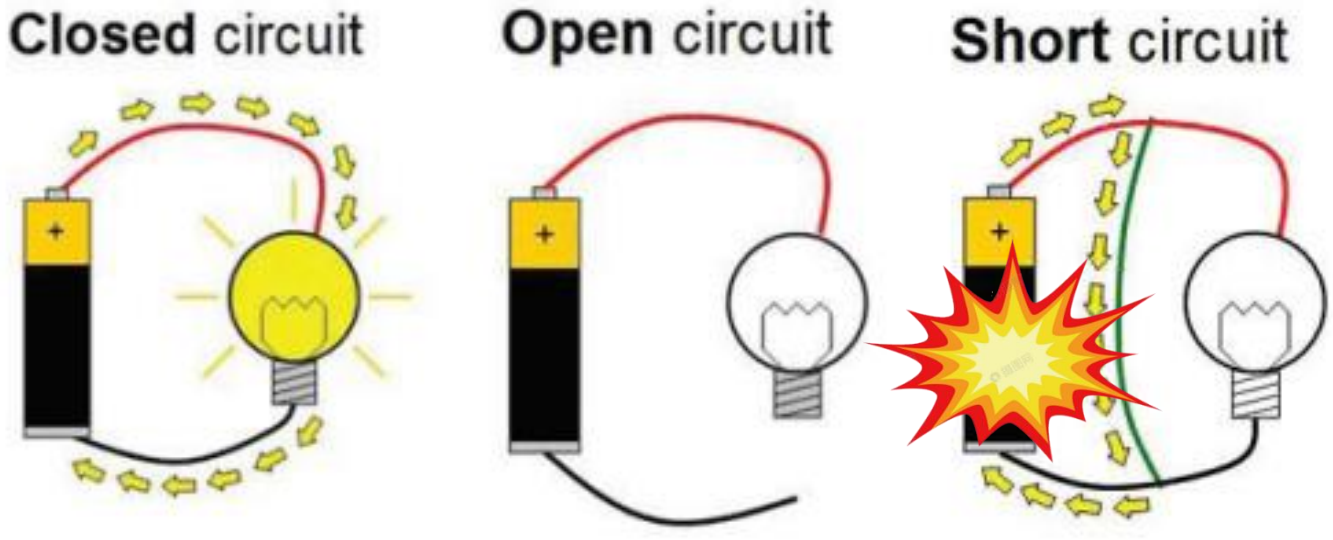

REMEMBER : To test your circuit for components functionality before building Algorithm using the FlowLogic Control Panel. Refer to page 35

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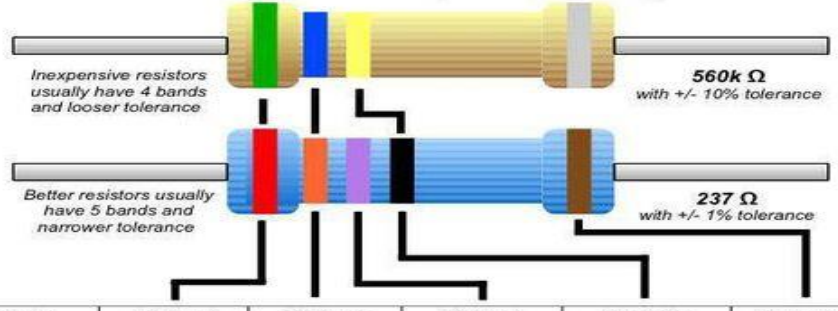
Resistor

Resistor Identification

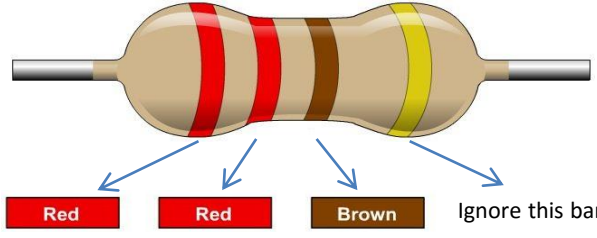
The end with more bands should point left when reading colors.



Color	1st Band	2nd Band	3rd 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%

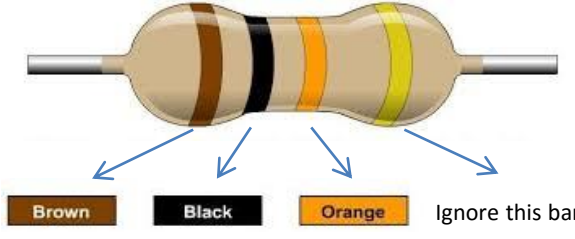
Resistor value calculation

220 Ohm 4 band resistor



2 2 x 10 = 220 ohm

10K Ohm 4 band resistor



1 0 x 1k = 10K ohm

LEDs – Output Devices

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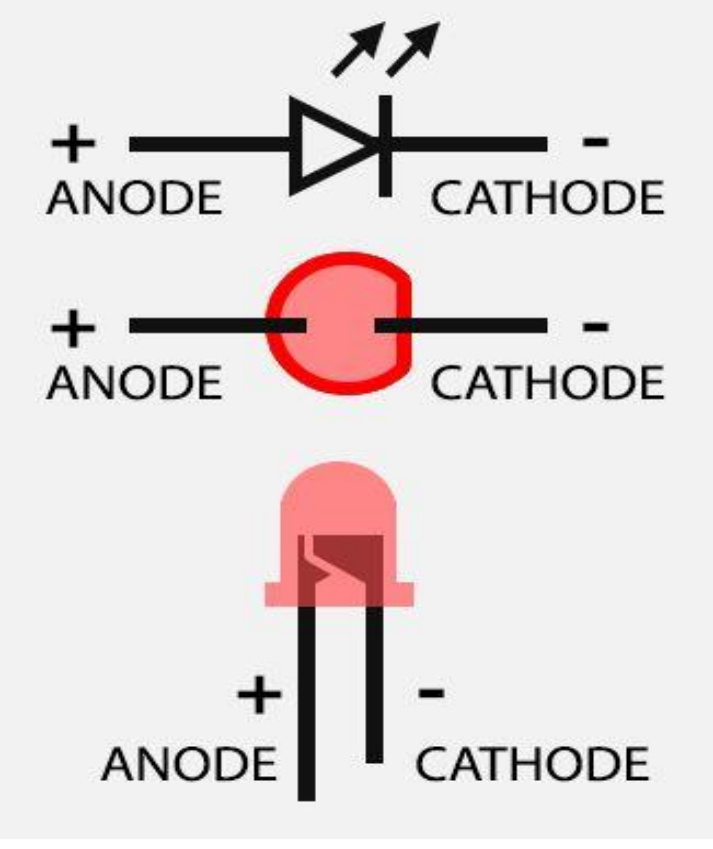

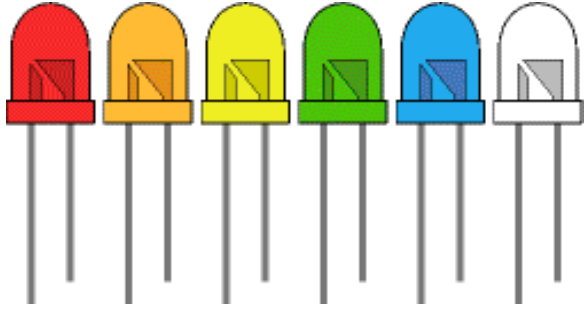

Multiple colored LEDs

Jumper Wires

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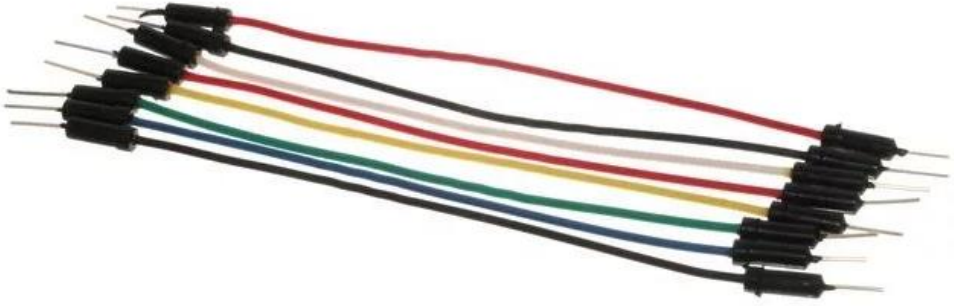


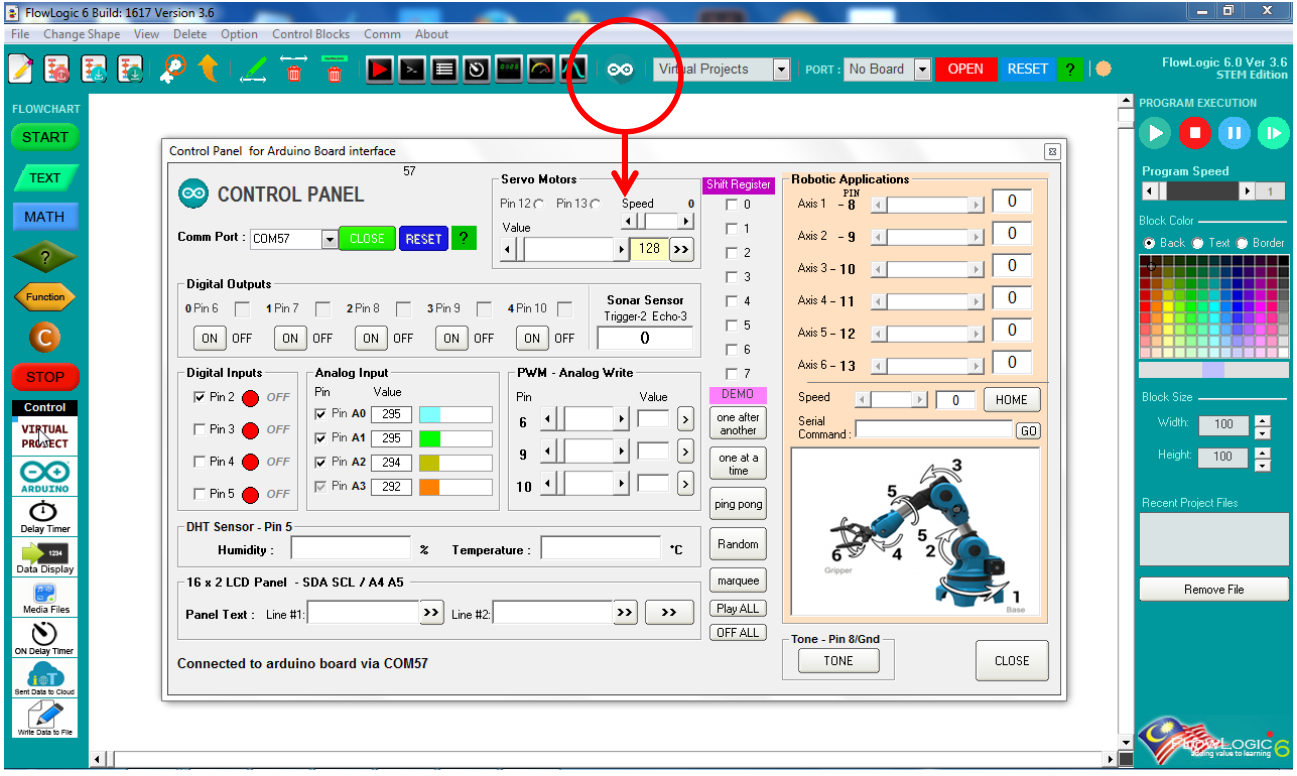
Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards in order to make it easy to change a circuit as needed.

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

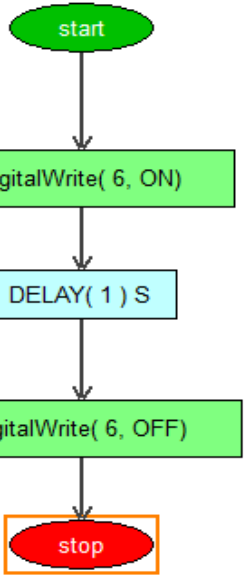
Prototype activities using

Digital Input and Output

Command Blocks

LED ON/OFF (Digital Output)
Single Loop

myFlowlab™

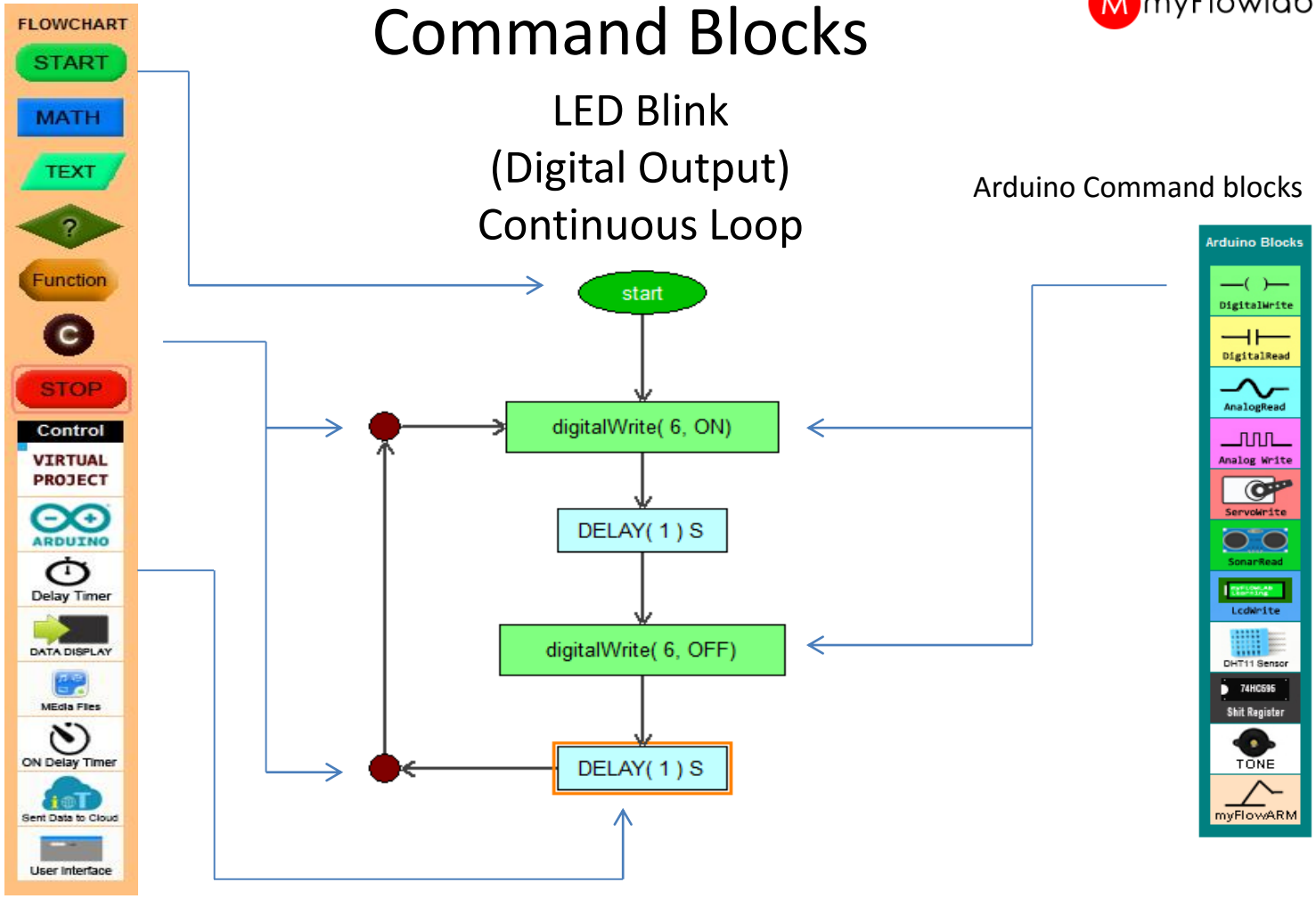


Arduino Command blocks

Command Blocks

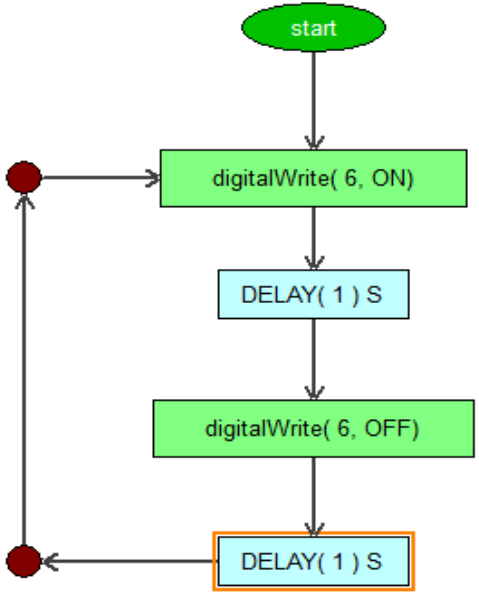
LED Blink
(Digital Output)
Continuous Loop

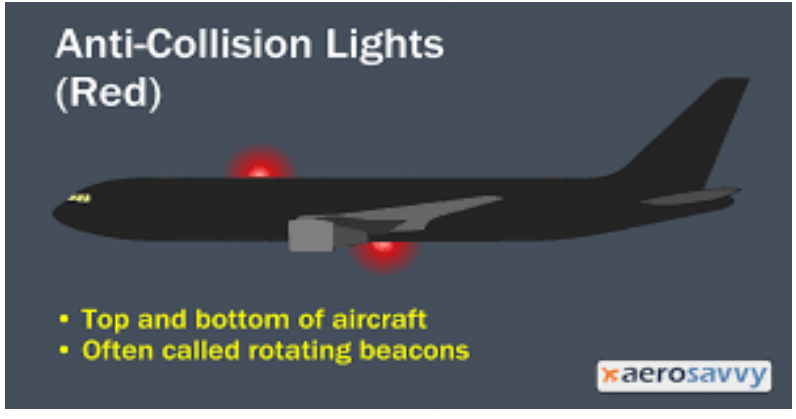
myFlowlab™



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

myFlowlab™





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.

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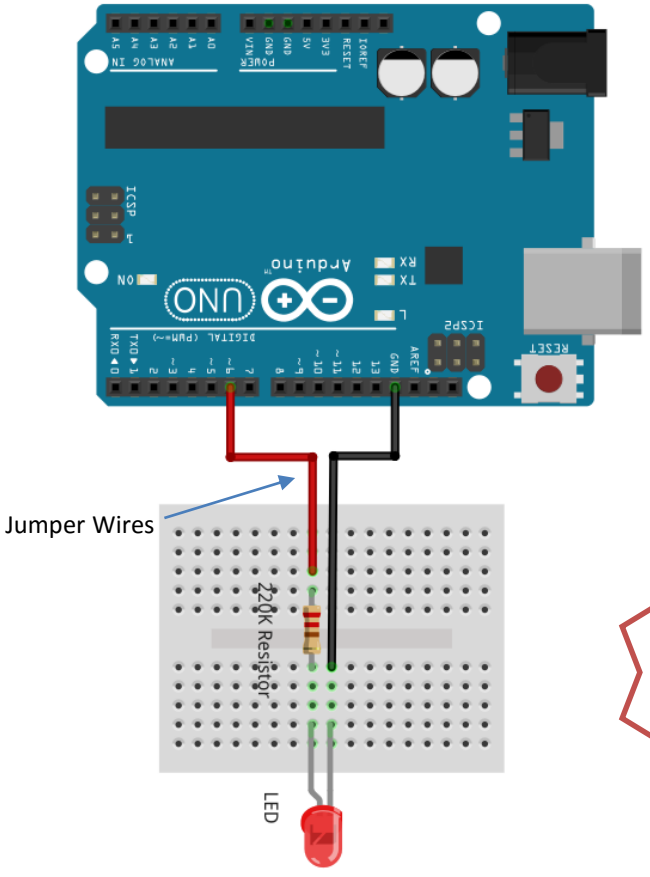
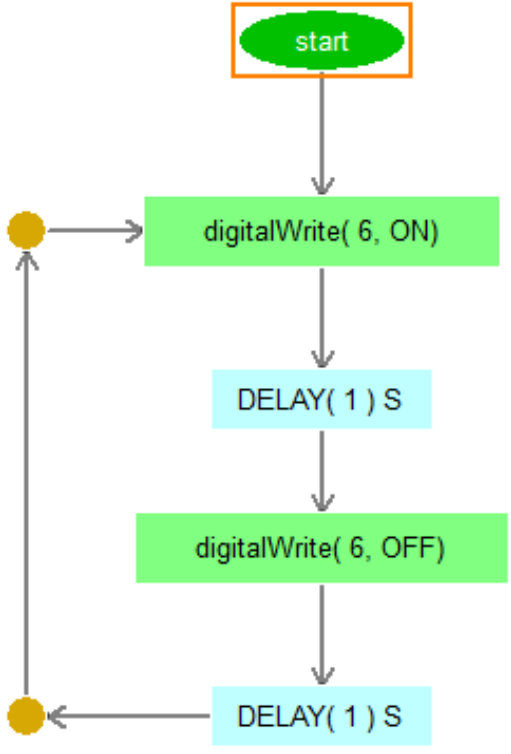
Prototyping activity #1 – Single LED Blink



Challenge

Build an Anti Collision system



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

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

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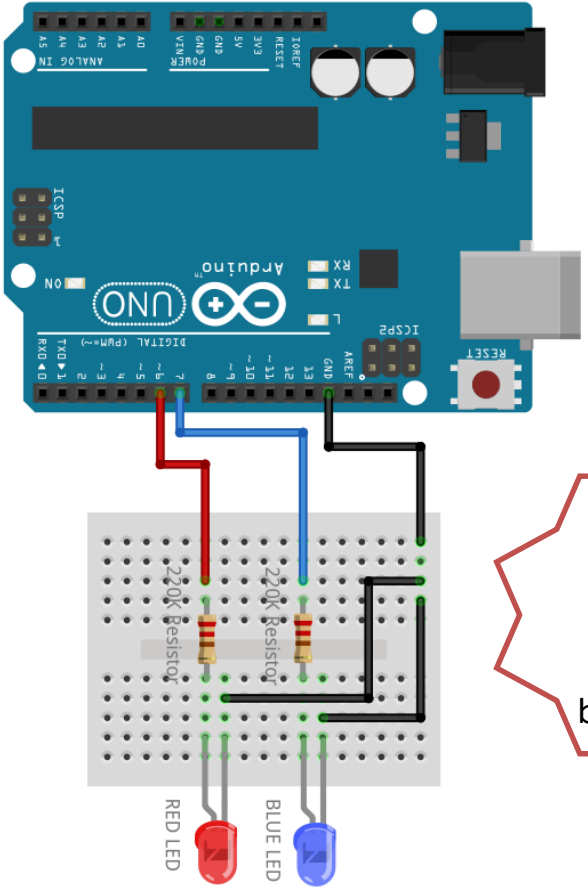
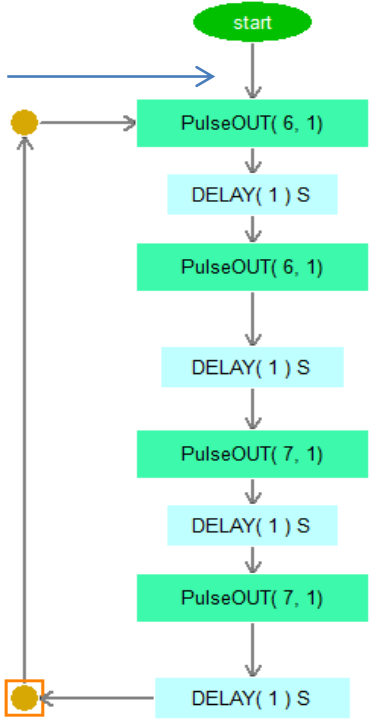
Prototyping activity #2 – Police Car siren



Challenge

Build a Real World Police Car Siren with background audio

Add media file here



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

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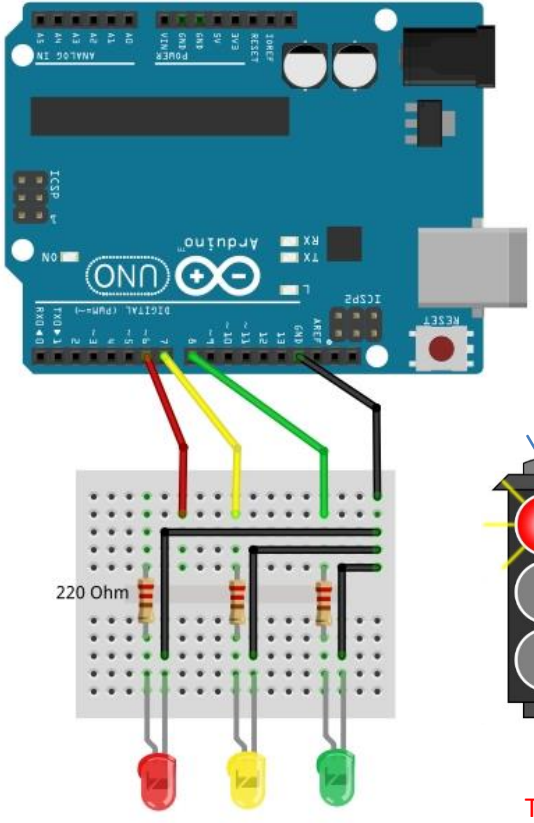
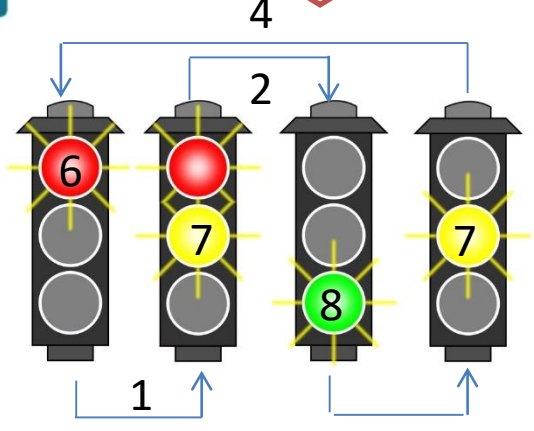
Prototyping activity #3 – Traffic Light system

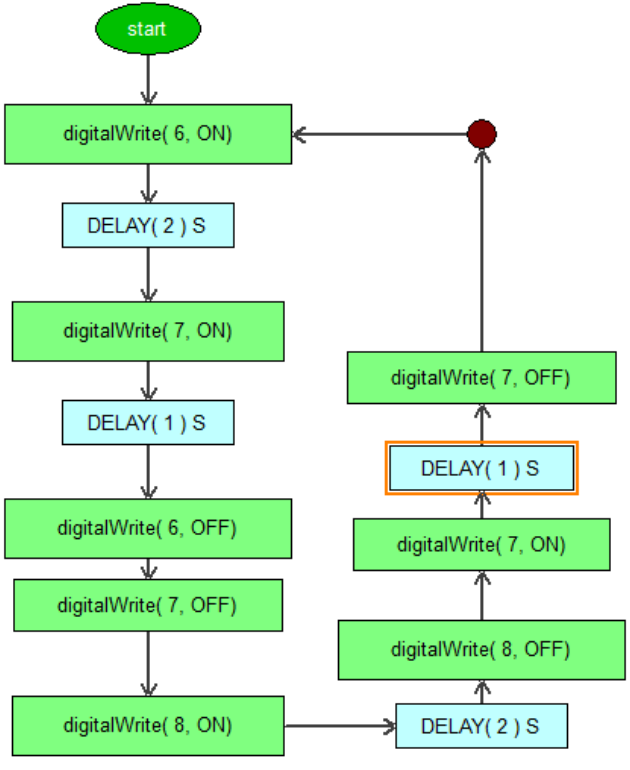


Challenge

Design an Algorithm to Blink the Yellow for 5 section



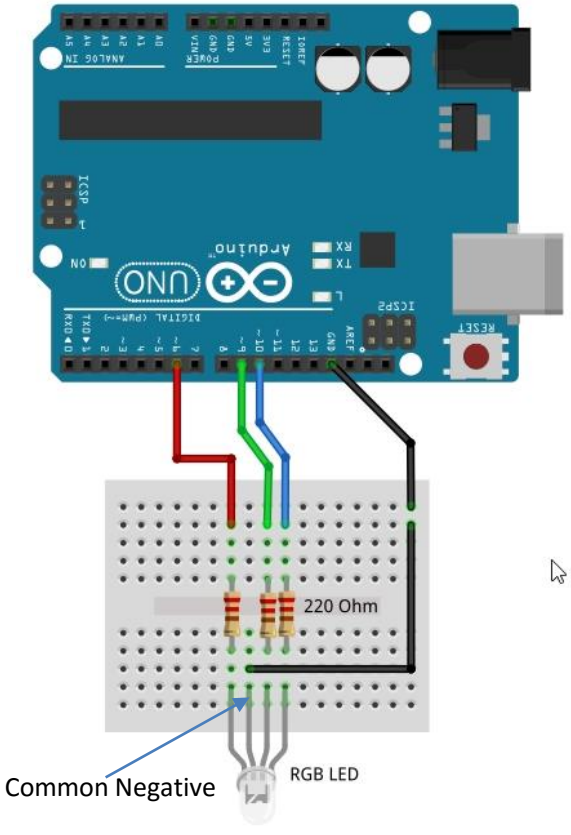
The UK Standard Traffic Light Sequence



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

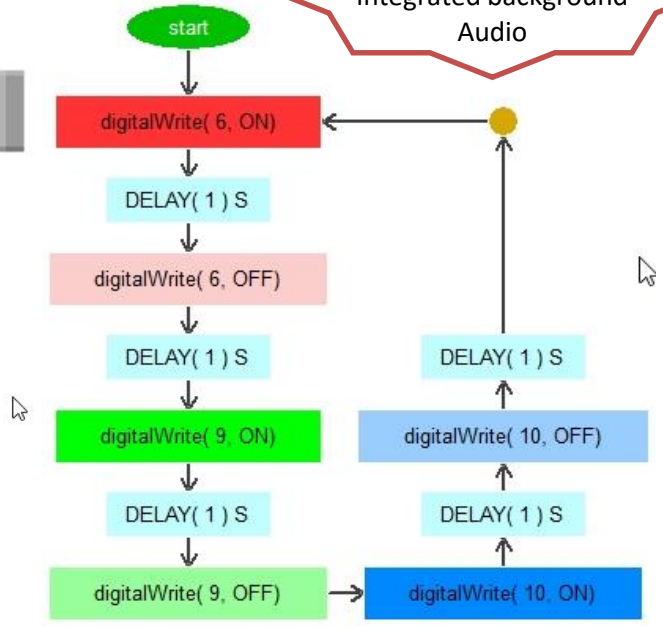
Arduino & FlowLogic 6

Prototyping activity #4 – RGB LED Digital Color Mixing

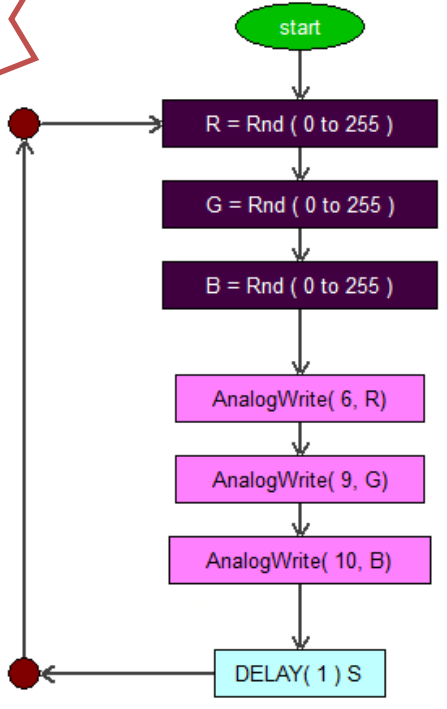


Challenge

Design an Color Mixing Algorithm with integrated background Audio



Color Mixing using Digital Write block

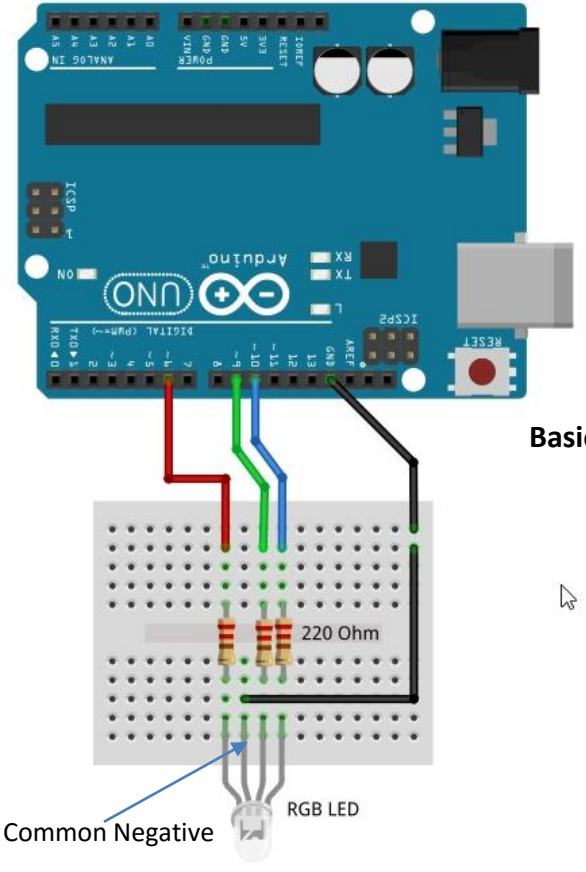


Color Mixing using Analog Write block

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

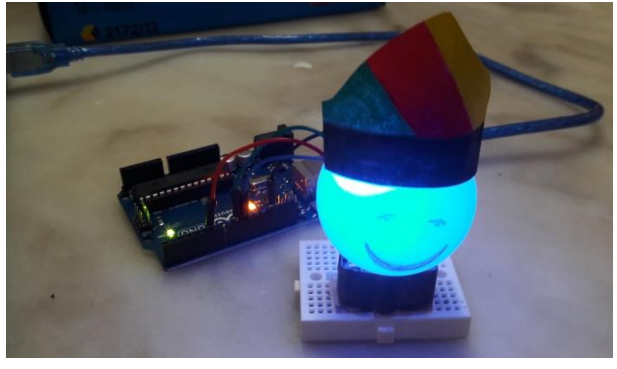
Prototyping activity #5 – Digital Color Mixing & Mood Lamp Project

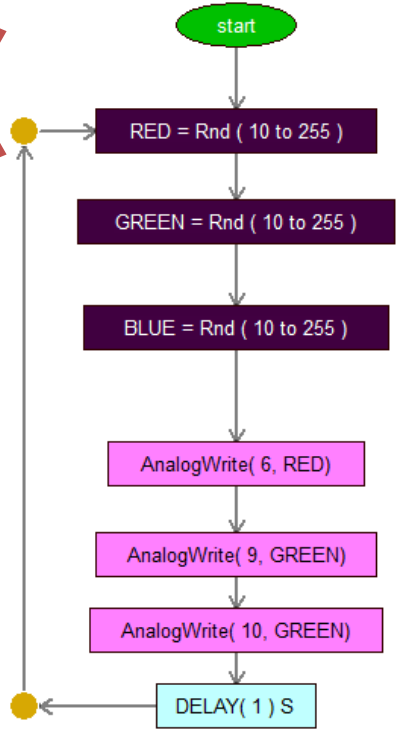


Challenge

Use Google to a do 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





1. Construct the RGB LED Circuit as shown
2. Test the circuit using Arduino Control panel
3. Build the above Algorithm/FlowProgram and Execute
4. Complete the Mood Lamp Project creatively

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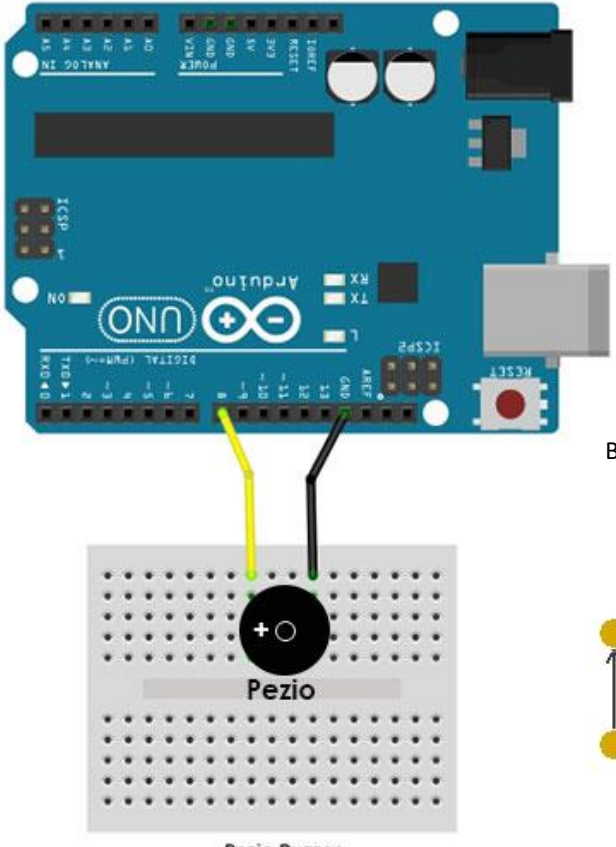
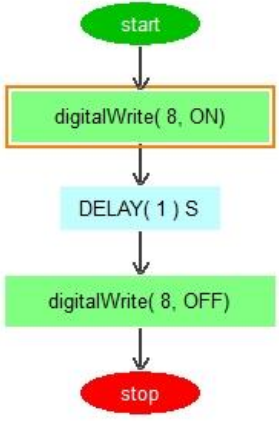
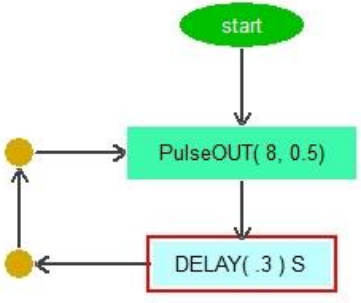
Prototyping activity #6 – Pezio Buzzer



Pezio Buzzer



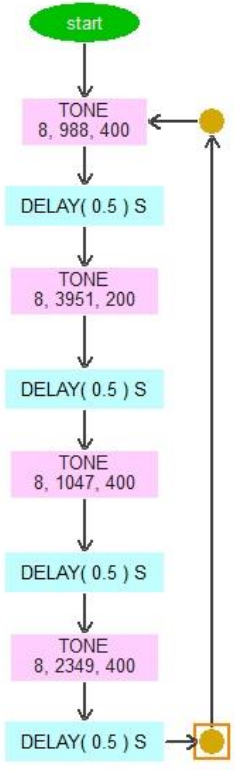
Buzzer ON/OFF sample using Digital Write



Pulsating sample using pulseOUT

Challenge

Develop an Algorithm to compose A Music theme

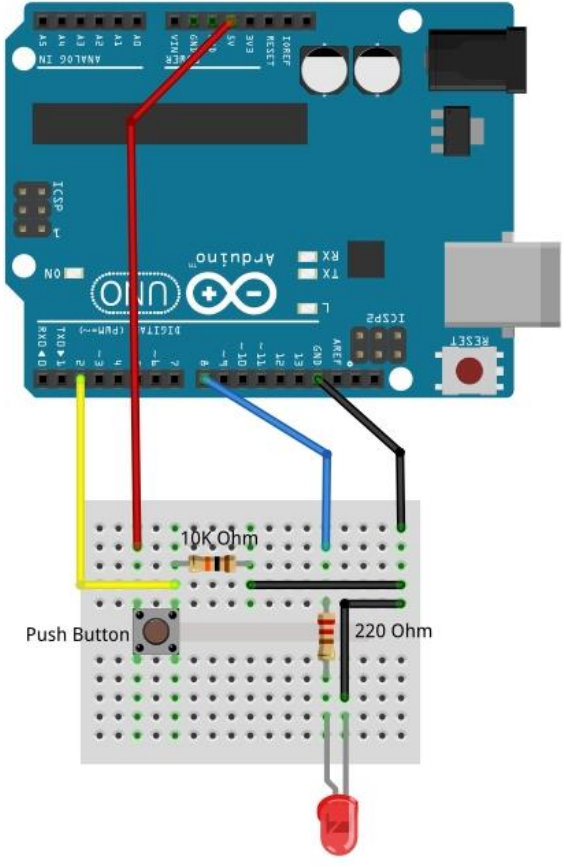


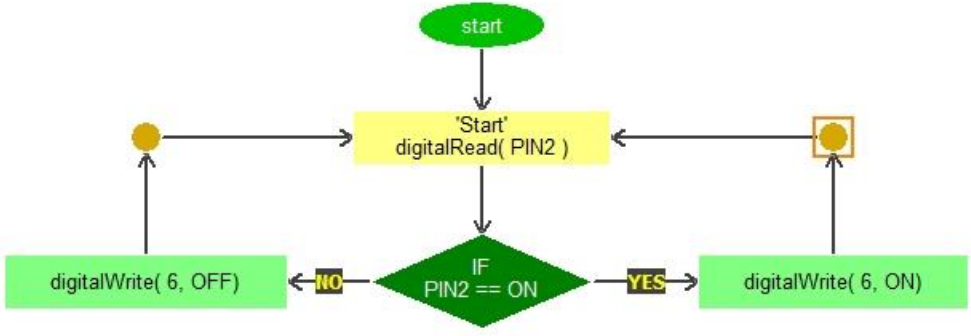
Play Music sample using TONE

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





Challenge

Develop an Algorithm to Blink the LED when Push Button is Pressed

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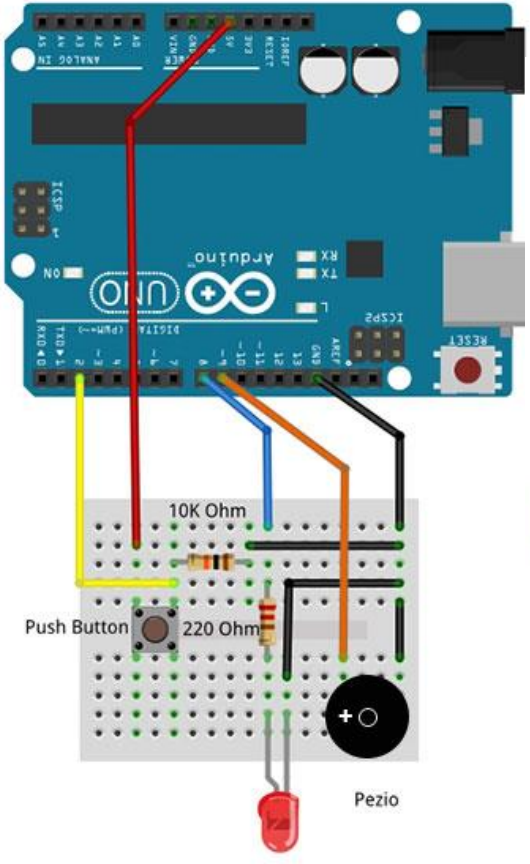
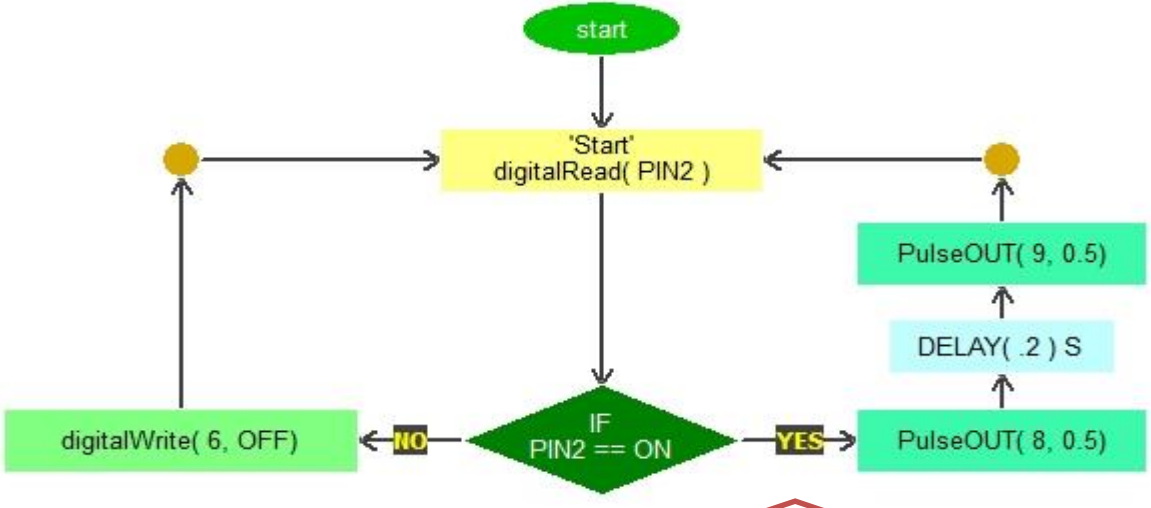
Prototyping activity #8 – Panic Button With Visual and Audio Alert





Challenge

Enhance the above algorithm with Text to Speech Alert

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

Module #6

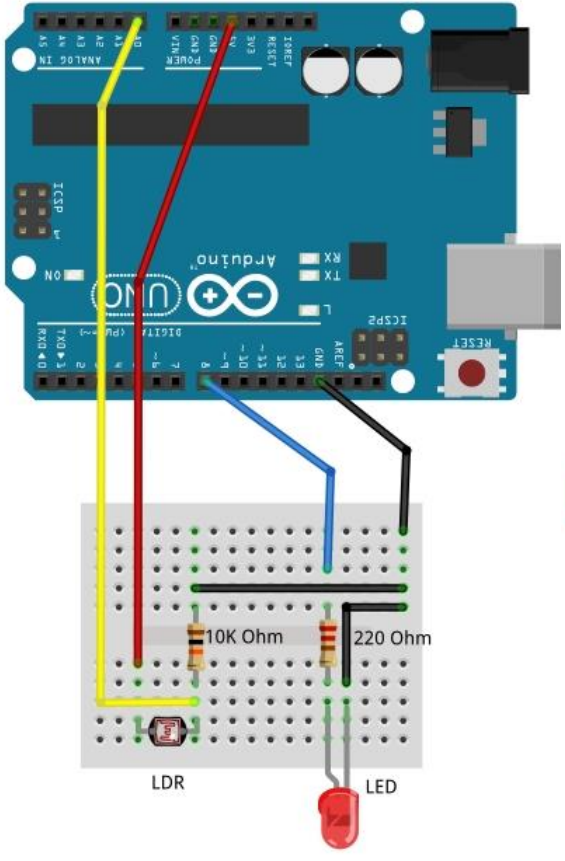
Prototype activities using

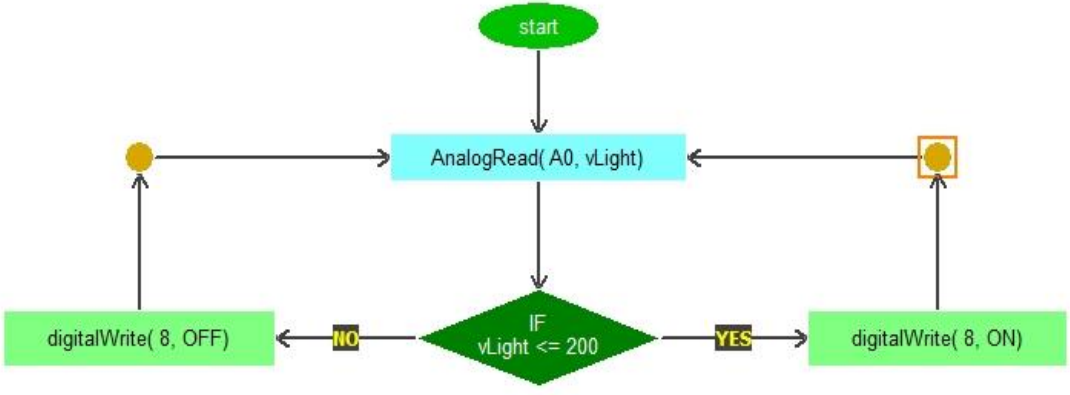
Analog Input and Output

Arduino & FlowLogic 6

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..





Modify this condition to suit your requirement

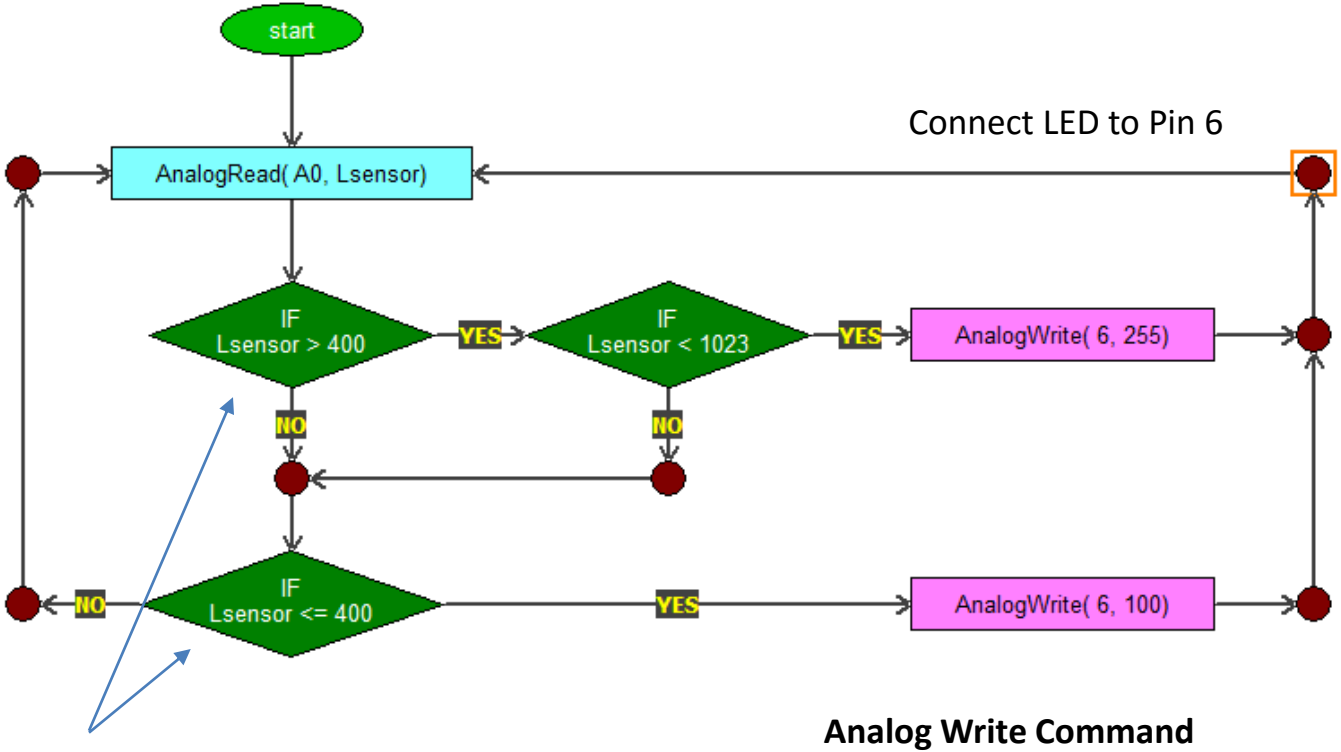
Task : Read ambient light value From Pin A0 that was produced by LDR light Sensor and store the value dynamically into *vLight* variable

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

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



Connect LED to Pin 6

Modify this condition to suit your requirement

Analog Write Command

Value : 0 > LED OFF 255> LED very Bright

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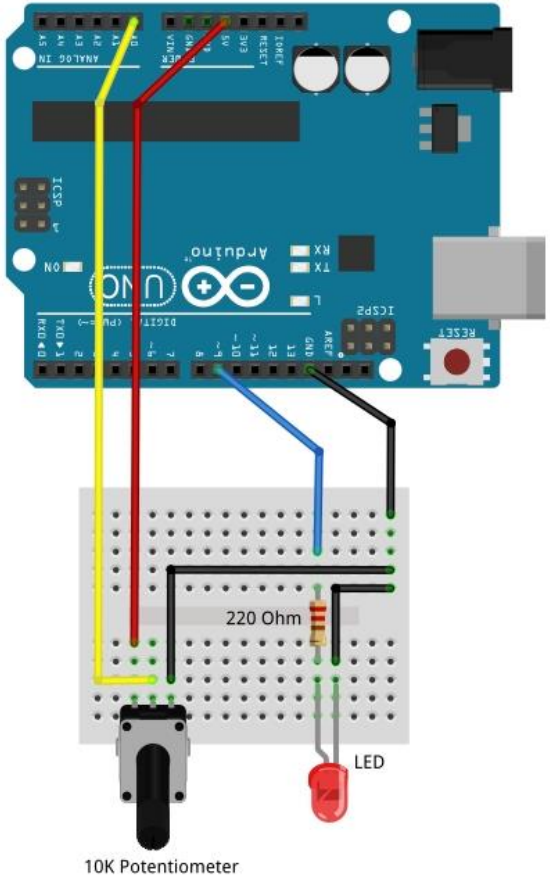
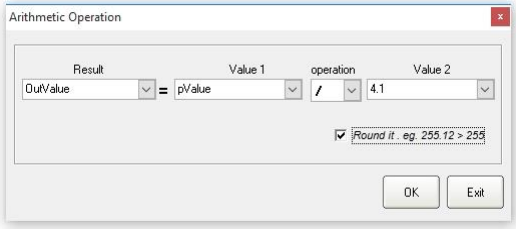
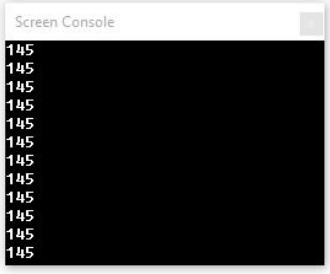
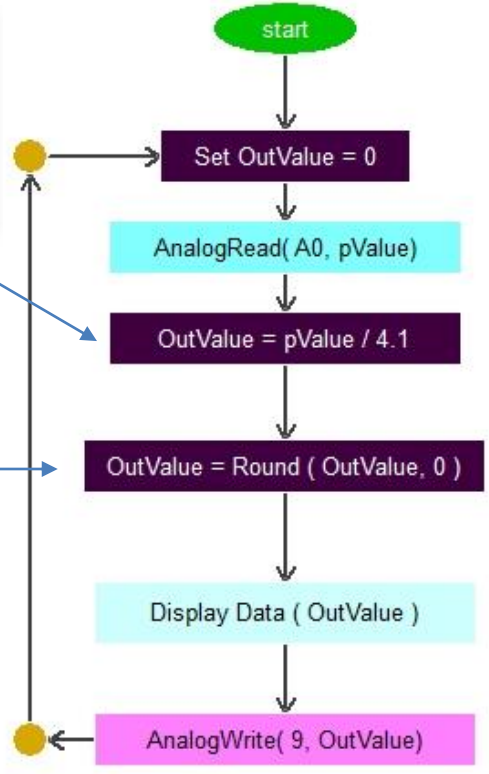
Prototyping activity #11 – Potentiometer







Screen Console Widget



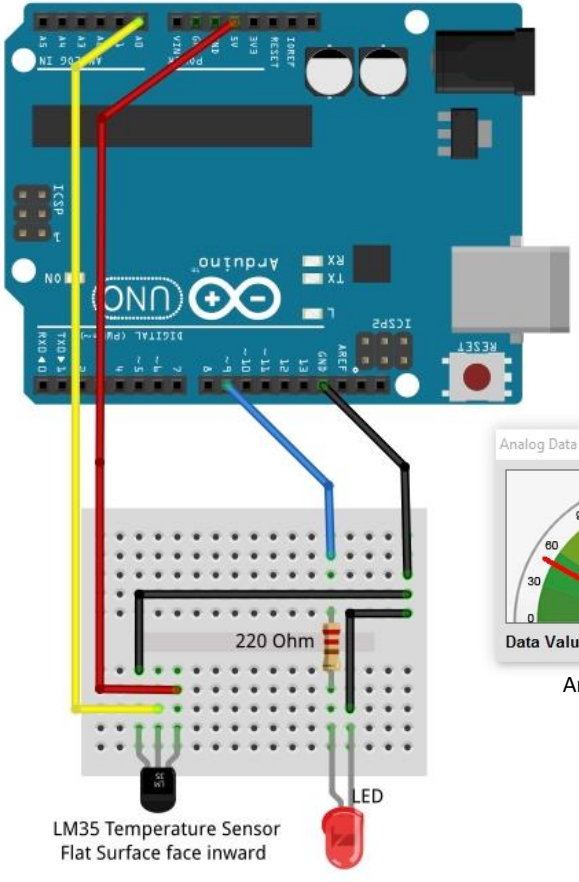
Challenge

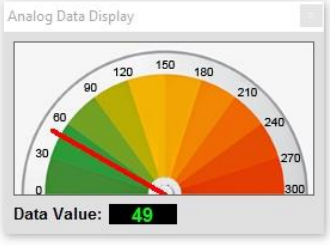
Connect 3 potentiometer to digitally mix RGB LED color

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

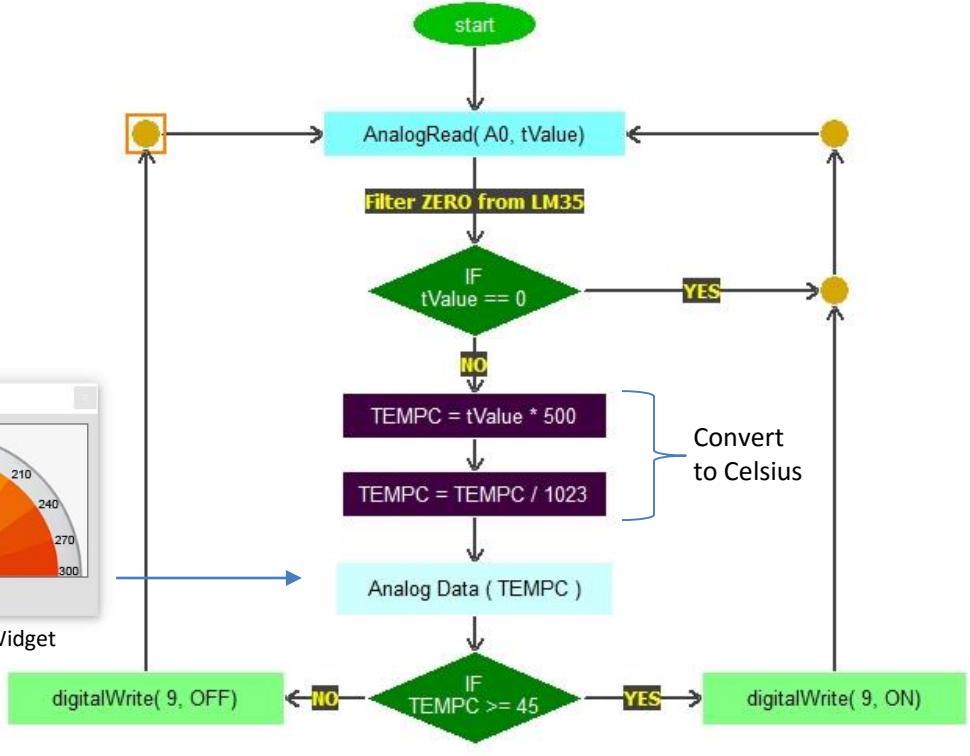
Arduino & FlowLogic 6

Prototyping activity #12 – Temperature Sensor LM35





Analog Gauge Widget



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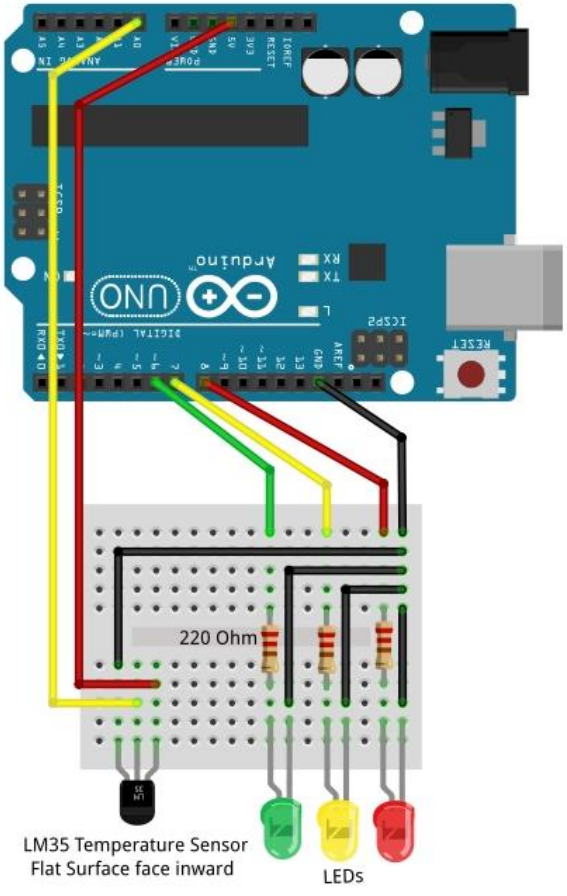
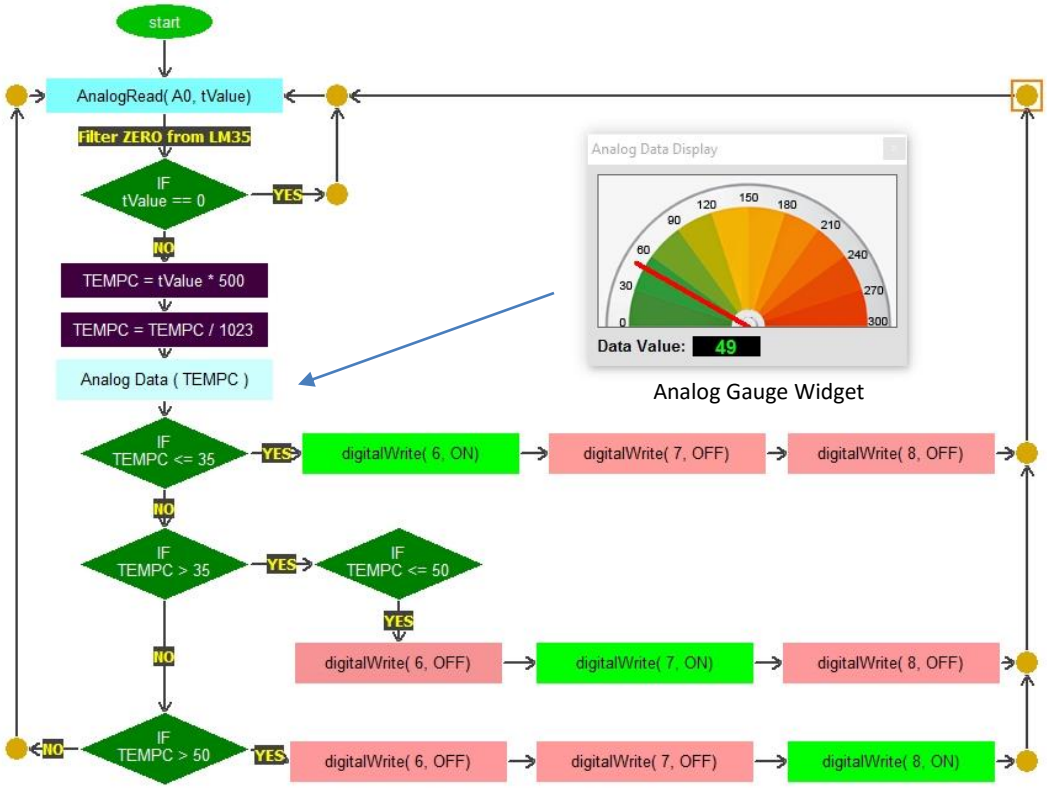
Prototyping activity #13 – Heat Range Detection project Using Temperature Sensor LM35





Analog Gauge Widget

1. Construct LM35 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

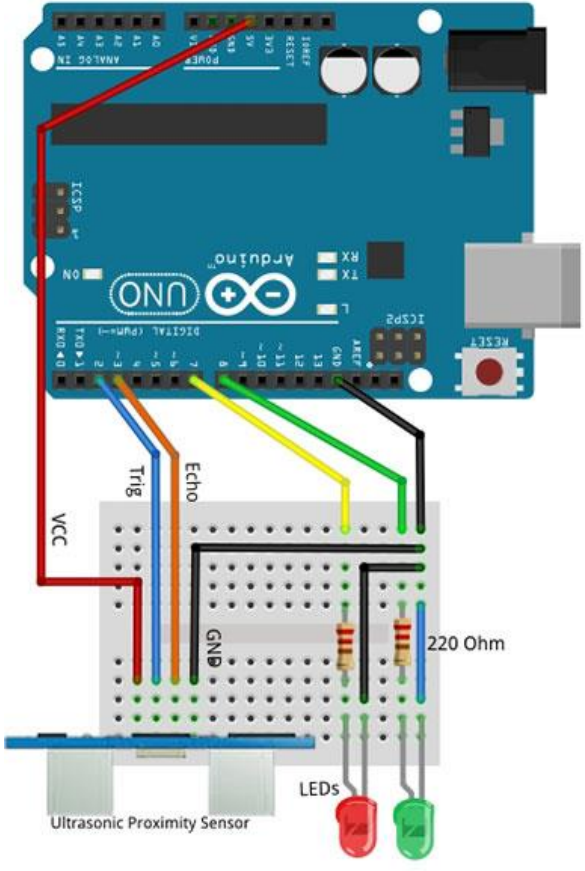
Module #6

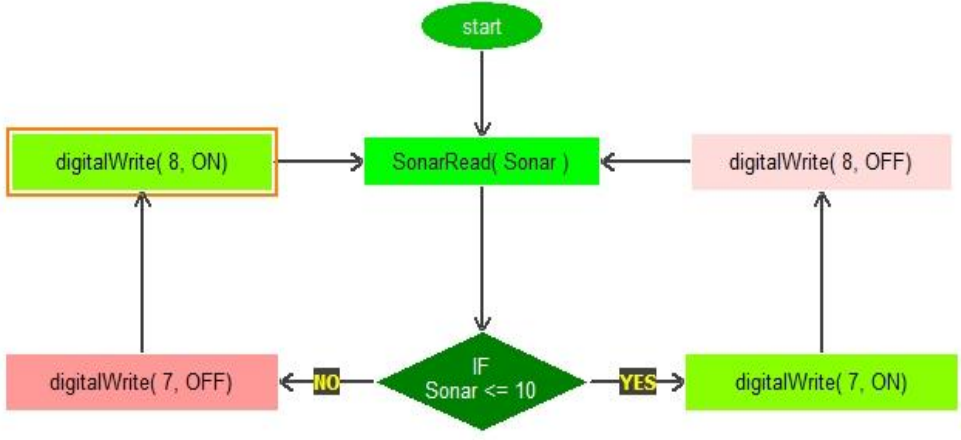
Prototype activities using

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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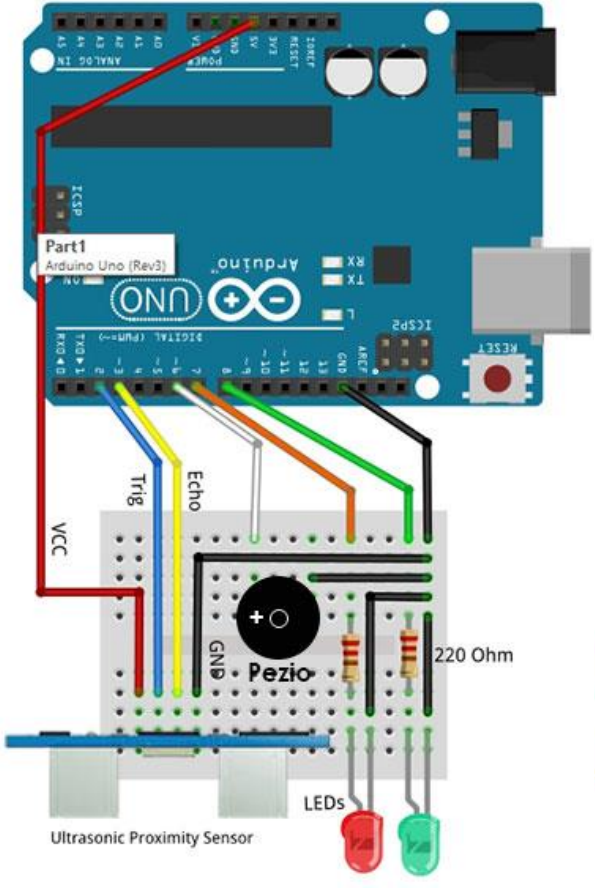
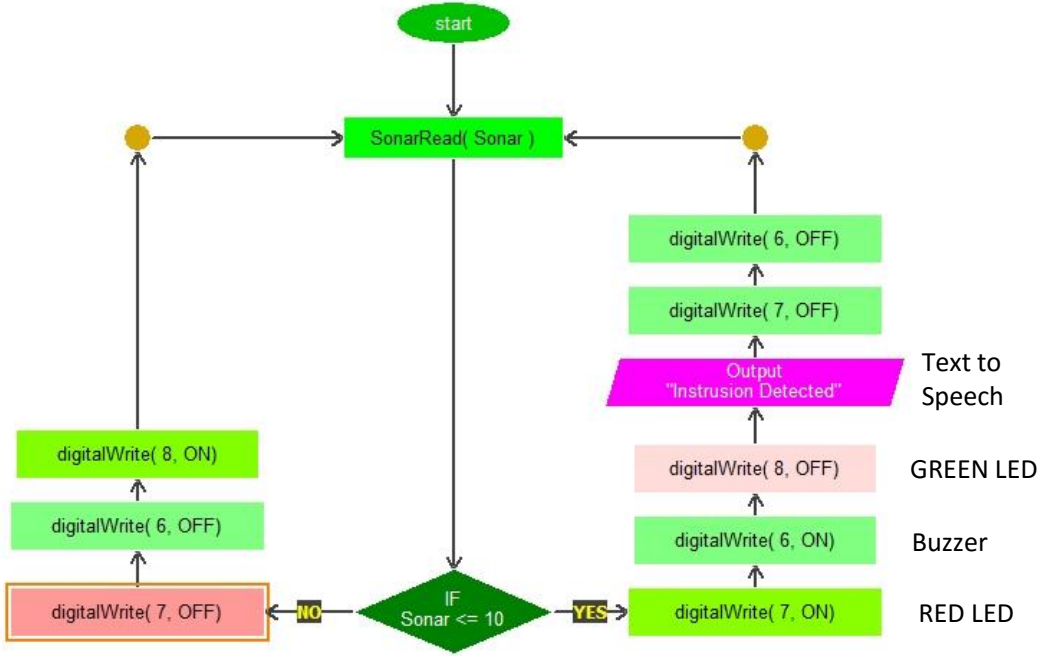
Prototyping activity #15 – Ultrasonic Proximity Sensor Intrusion Detection project





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

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