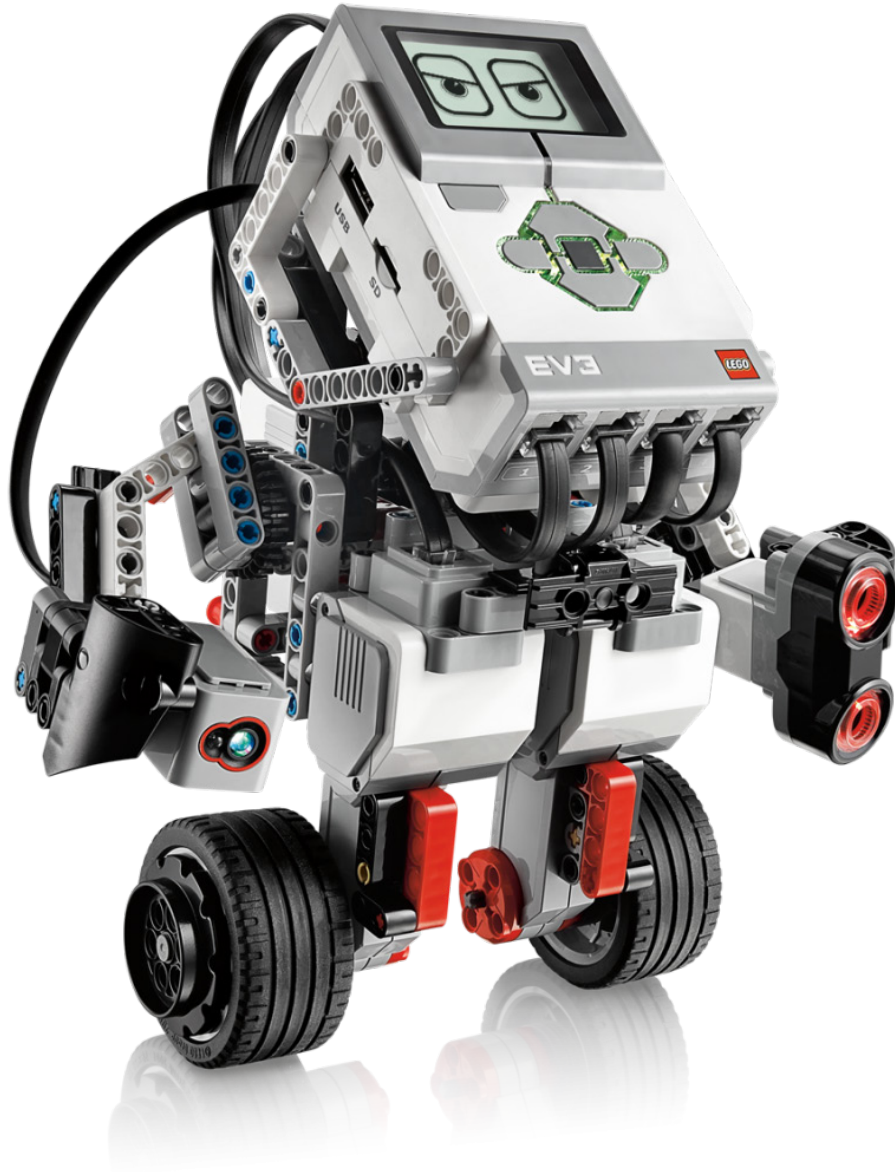# BEGINNING
LEGO ROBOTICS

Wichita State University

Engineering Summer Camps 2022

smithlearning.com/robotics

EV3 Key Parts

Output Ports (for motors)
defaults are _____ and _____
for large motors

USB Port
connect to computer

SCROLL

ENTER

Touch Sensor

Color Sensor

EXPANSION
PORTS

BACK

Ultrasonic Sensor

ALL MOTORS AND SENSORS
use "Auto ID"
(so defaults are less important)

Input Ports (for sensors)
defaults are
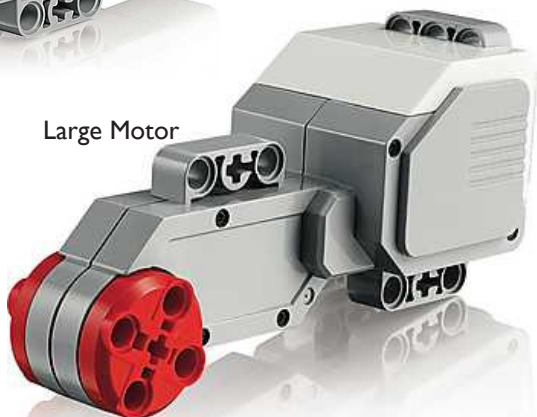
_____, _____, _____, _____

Medium Motor

Gyro Sensor

Large Motor

Infrared Beacon

Infrared Sensor

EV3 Brick Navigation Map

1. RUN RECENT

Most recently run programs that will be displayed on this screen. The program at the top of the list which is selected by default is the latest program run

Run Recent screen

2. FILE NAVIGATION

Access and manage all the files on your EV3 Brick, including files stored on a SD Card. Files are organized in project folders. In the File Navigator, files can be moved or deleted.

Open folder in File Navigation

3. BRICK APPS
- Port View
- Motor Control
- IR Control
- Brick Program
- Brick Datalog

Brick Apps screen

4. SETTINGS
- Volume
- Sleep
- Bluetooth
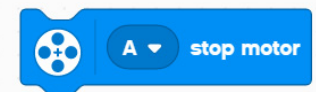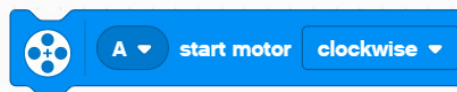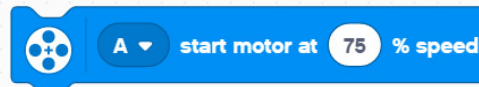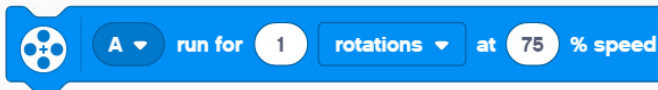- WiFi
- Brick Info

Settings screen

Building Blocks: EV3 Programming

Open a Saved Project

Start New Project

Brick Dashboard

Programming Area

Download & Run

Block Palette

EVENT BLOCKS

Run actions based on events (like a the program starting, a sensor responding, or a timer reaching a certain value).

when program starts
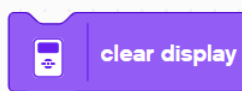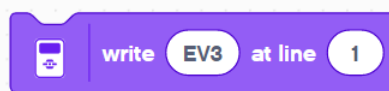
when timer > 10

3 ▼ when color is red ▼

when center ▼ button pressed ▼

when I receive message1 ▼
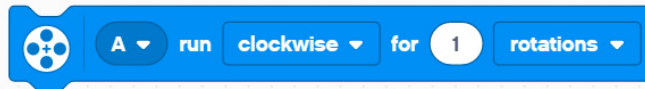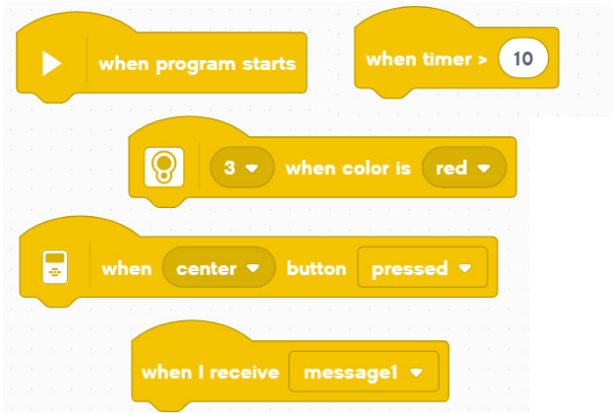
MOTOR BLOCKS

Control how a single motor runs.

A ▼ run clockwise ▼ for 1 rotations ▼

A ▼ run for 1 rotations ▼ at 75 % speed

A ▼ set speed to 75 %

A ▼ start motor at 75 % speed

A ▼ start motor clockwise ▼

A ▼ stop motor

MOVEMENT BLOCKS

Control 2 motors in sync with each other. This is commonly used driving the robot.

move forward ▼ for 1 rotations ▼

start moving straight: 0

move straight: 0 for 1 rotations ▼

stop moving

set movement speed to 50 %

start moving at 50 50 % speed

move straight: 0 for 1 rotations ▼ at 50 % speed

set movement motors to B ▼ and C ▼
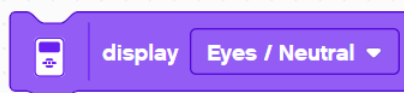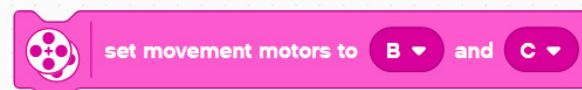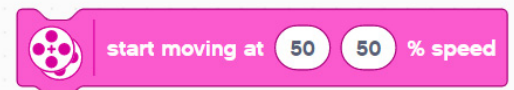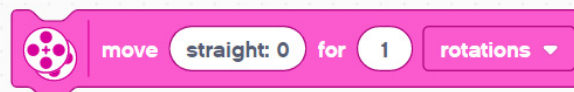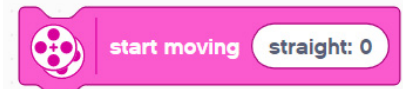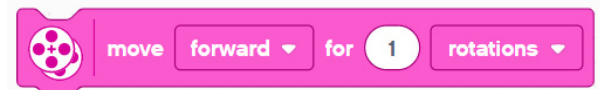
DISPLAY BLOCKS

Show something on the robot screen or change the status light.

display Eyes / Neutral ▼ for 2 seconds

display Eyes / Neutral ▼

write EV3 at line 1

clear display

set status light to green ▼
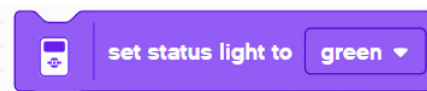
SOUND BLOCKS

Play a sound through the robot.

play sound | Communication / Hello ▼ | until done

start sound | Communication / Hello ▼

stop all sounds

set volume to 100 %

play beep 60 for 0.2 seconds

CONTROL BLOCKS

Change the flow of the program with repeats, waits, or conditions (if/then).

wait 1 seconds

wait until ⬡

repeat 10

forever

repeat until ⬡

if ⬡ then

if ⬡ then
else

stop | and exit program ▼

SENSOR BLOCKS

Read or compare values from sensors (color/light, touch, distance, gyro, brick buttons).

3 ▼ color

3 ▼ is color red ▼ ?

3 ▼ is reflected light intensity < ▼ 50 %?

3 ▼ reflected light intensity

3 ▼ is ambient light intensity < ▼ 50 %?

3 ▼ ambient light intensity

1 ▼ is pressed?

is center ▼ button pressed?

button

4 ▼ is distance < ▼ 15 cm ▼ ?

4 ▼ distance in cm ▼

timer

OPERATOR BLOCKS

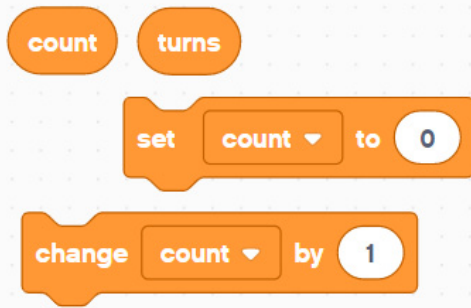Complete math and logic operations.

pick random 1 to 10

◯ + ◯

◯ < 100

⬡ and ⬡

not ⬡

join apple banana

VARIABLE BLOCKS

Create your own variables and lists to store data.

count turns

set count ▼ to 0

change count ▼ by 1

MY BLOCKS

Define your own function (set of instructions) that can be called at any time from anywhere in your program.

drive to line

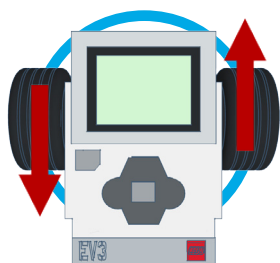define drive to line

start moving straight: 0

wait until 4 ▼ distance in inches ▼ < 5

stop moving

define drive and turn distance

drive and turn 5

move forward ▼ for distance rotations ▼

move right: 100 for 2.5 rotations ▼
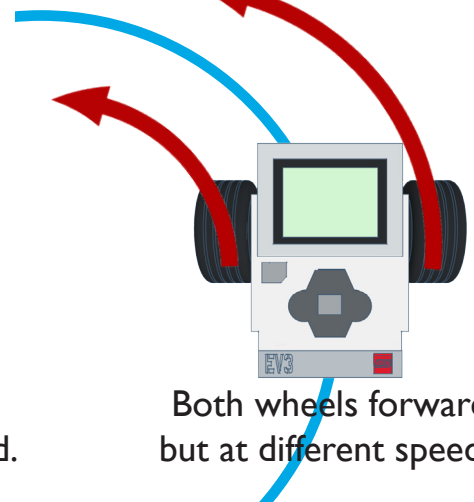
3 Types of Turns

SPIN
(or Point Turn)

PIVOT
(or Swing Turn)

GRADUAL
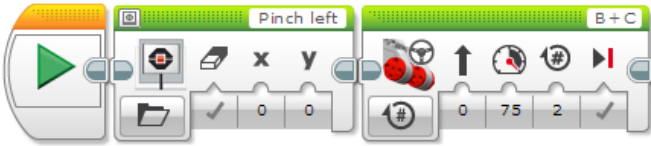(or Arc Turn)

One wheel forward and one backward at same speed.
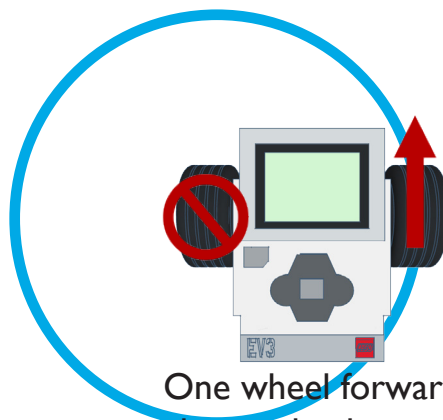
One wheel forward and one wheel stopped.

Both wheels forward but at different speeds.

Robotics Design Process

1. Learn

What is the PROBLEM we need to solve?

What are the OBSTACLES or RESTRICTIONS we will face?

2. Plan

BRAINSTORM how to solve the problem and overcome obstacles.

Draw a sketch of your ROBOT.

Write your program out in PSEUDO-CODE.

3. Build

Build your ROBOT design.

Collect your SENSOR DATA.

Write the PROGRAM for your problem one step at a time.

4. Test

WATCH and TAKE NOTES of your robot's performance.

5. Reflect

Keep a RECORD of your progress.

Decide what CHANGES need to be made on robot or program.

Notes & Discoveries: