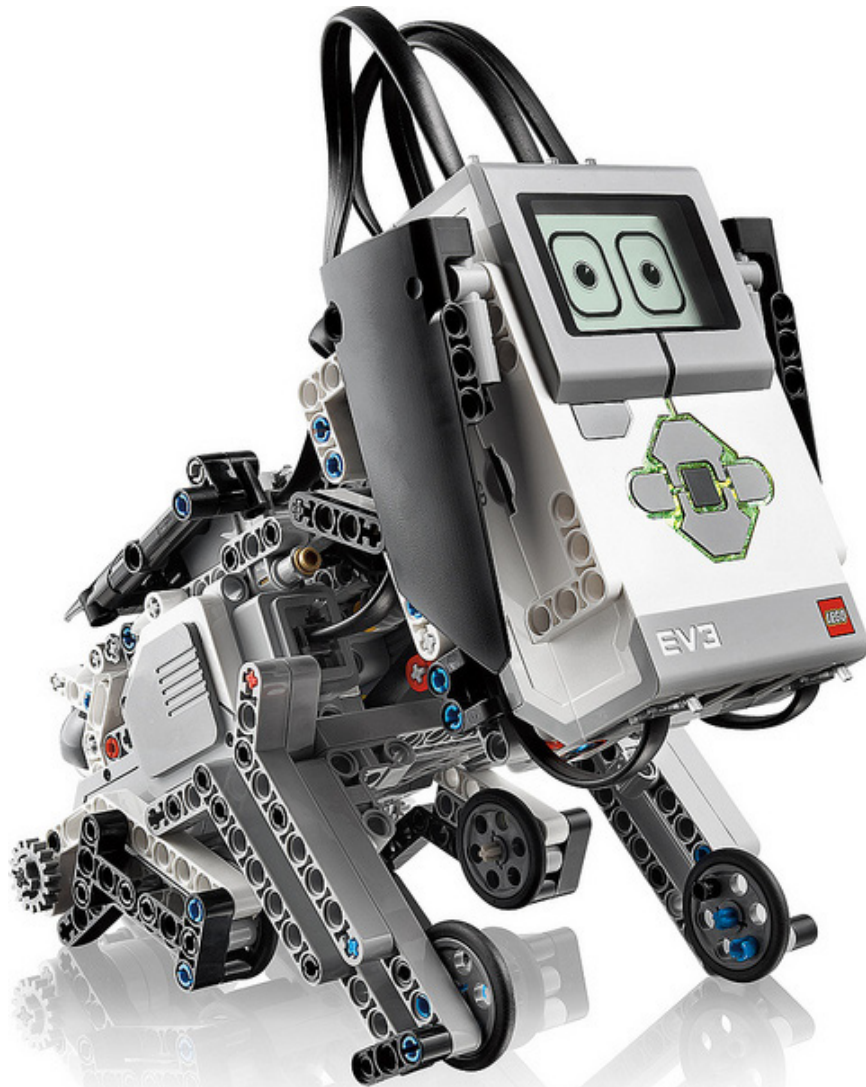


NEW COACHES/PARENTS ROBOTICS WORKSHOP

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Resources available at <http://smithlearning.com/robotics>
Shocker Mindstorms Challenge information at <http://www.wichita.edu/shockermindstorms>

EV3 Key Parts

Output Ports (for motors)

defaults are _____ and _____
for large motors

USB Port
connect to computer

SCROLL

ENTER

EXPANSION PORTS

BACK

Input Ports (for sensors)

defaults are _____

ALL MOTORS AND SENSORS

use "Auto ID"
(so defaults are less important)



Touch Sensor



Color Sensor



Ultrasonic Sensor



Gyro Sensor

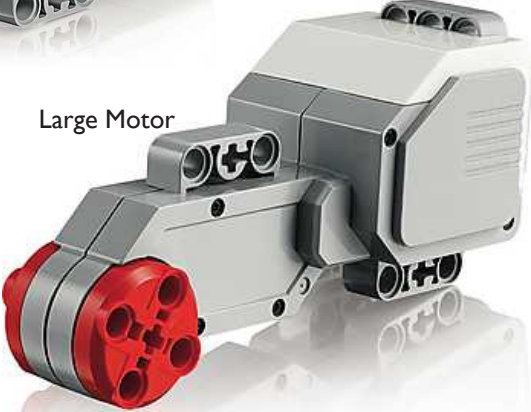


Infrared Sensor

Medium Motor



Large Motor



Infrared Beacon

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

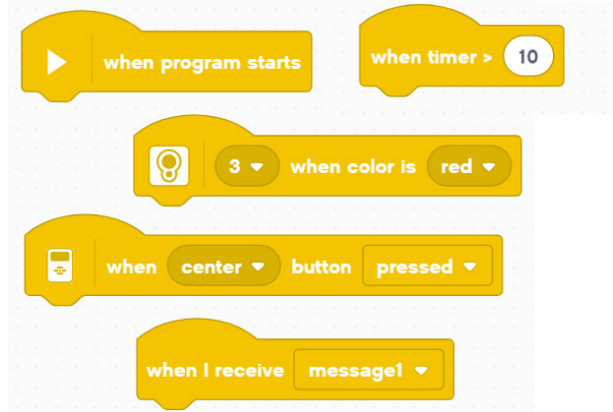
Building Blocks: EV3 Programming

The screenshot shows the 'Start Here' page of the LEGO Mindstorms EV3 software. At the top, there is a navigation bar with icons for HOME, START, UNITS, BUILD, and MY PROJECTS. A red arrow points from a blue callout box labeled 'Open a Saved Project' to the 'MY PROJECTS' icon. Below the navigation bar, the text 'Start Here' is displayed, followed by 'Get familiar with EV3 in three fun activities!' and a 'START' button. A hand holding an EV3 brick is shown in the background. Below this, the 'Recent projects' section features a 'New Project' button with a plus sign. A red arrow points from a yellow callout box labeled 'Start New Project' to this button.

The screenshot displays the 'LEGO MINDSTORMS Education EV3 Classroom - 1.2.2' programming environment. On the left is the 'Block Palette' with categories: MOTORS, MOVEMENT, DISPLAY, SOUND, EVENTS, CONTROL, SENSORS, OPERATORS, VARIABLES, and MY BLOCKS. The main 'Programming Area' contains a 'when program starts' block. A red-bordered window titled 'SMITH' shows a virtual EV3 brick with sensor and motor connections. A red arrow points from a red callout box labeled 'Brick Dashboard' to the top-left corner of this window. At the bottom right, a green 'Download & Run' button is visible.

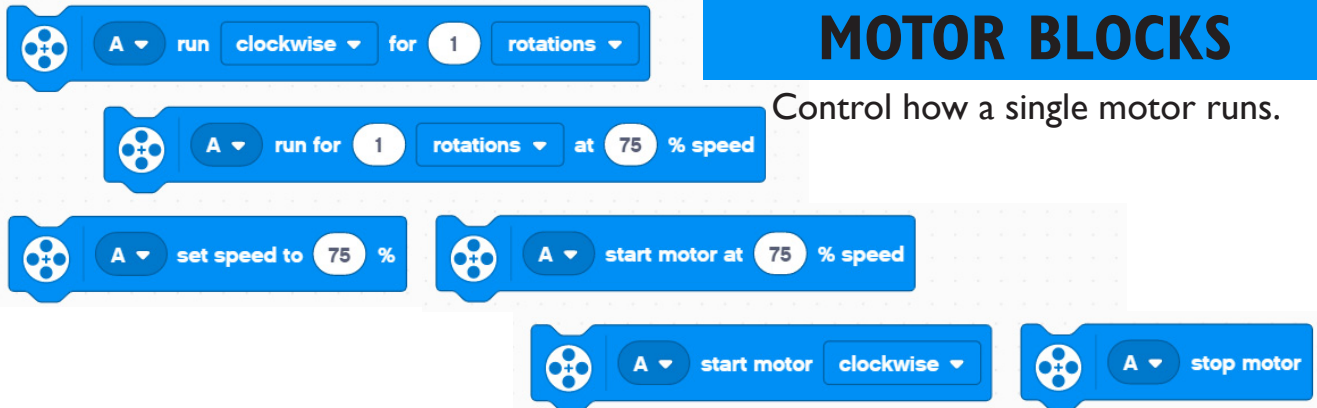
EVENT BLOCKS

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



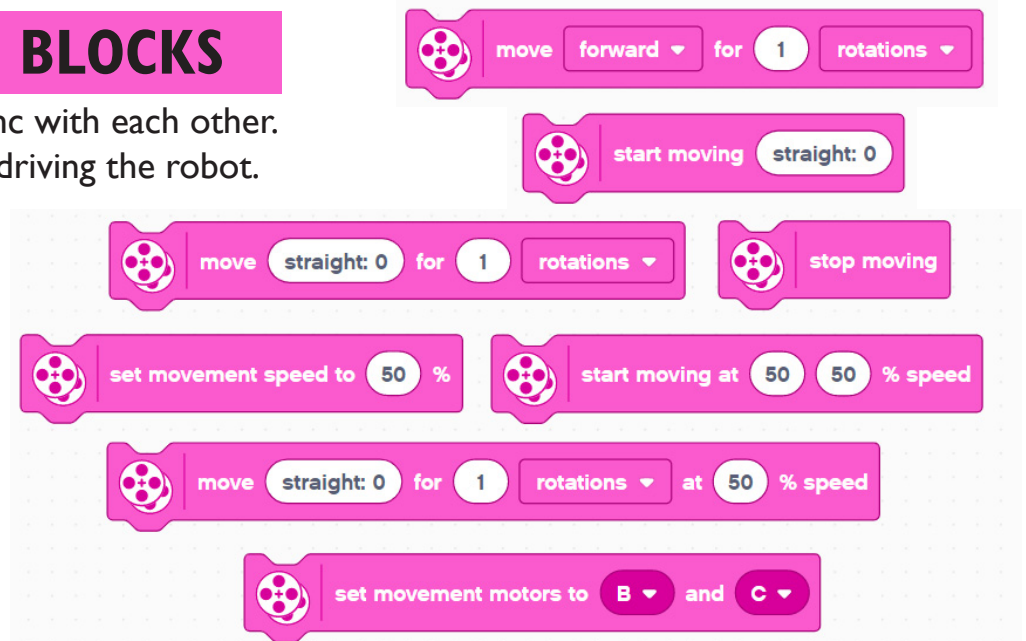
MOTOR BLOCKS

Control how a single motor runs.



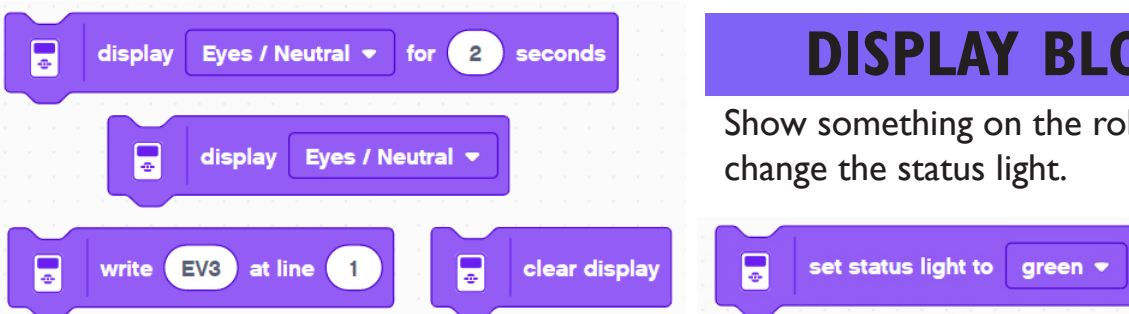
MOVEMENT BLOCKS

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



DISPLAY BLOCKS

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



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
```

```
drive to line
define drive to line
start moving straight: 0
wait until 4 distance in inches < 5
stop moving
```

```
drive and turn 5
```

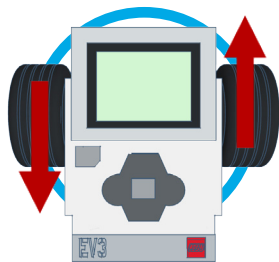
MY BLOCKS

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

```
define drive and turn distance
move forward for distance rotations
move right: 100 for 2.5 rotations
```

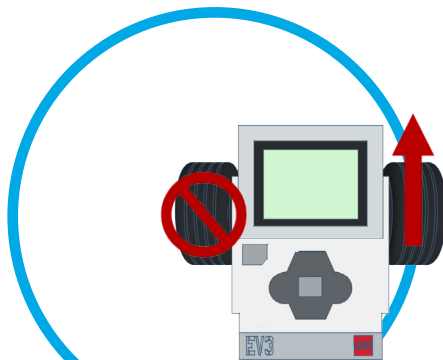
3 Types of Turns

SPIN
(or Point Turn)



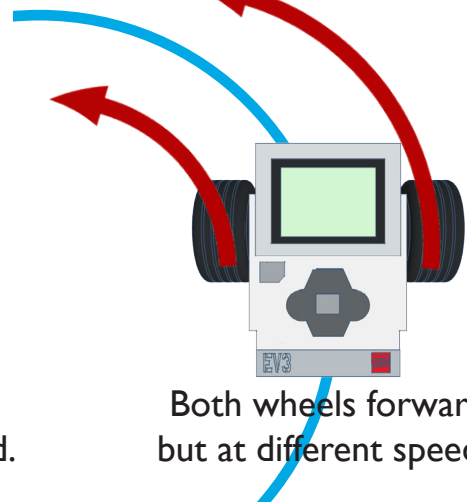
One wheel forward and one backward at same speed.

PIVOT
(or Swing Turn)



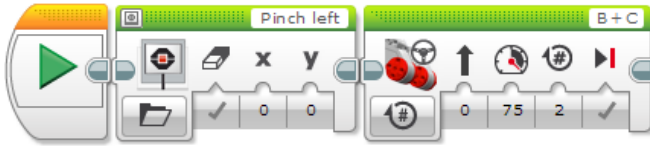
One wheel forward and one wheel stopped.

GRADUAL
(or Arc Turn)



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.

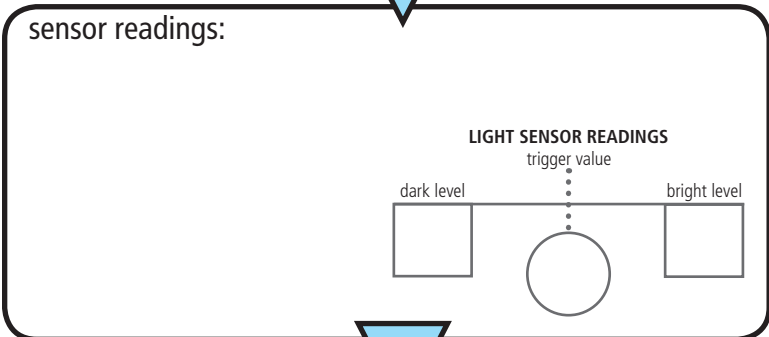
Planning Sheet

Program Name: _____

task:

sketch of course:

steps in task:



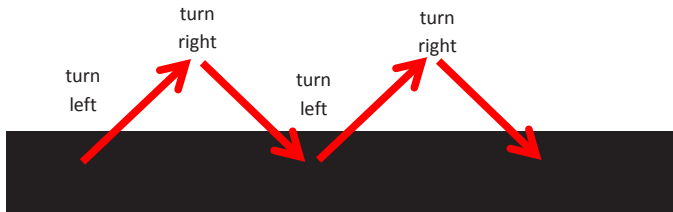
notes / reflection:

notes / reflection:

Following a LINE

ONE Sensor (2-state line follower)

SENSOR	RESULT
white	turn right
black	turn left

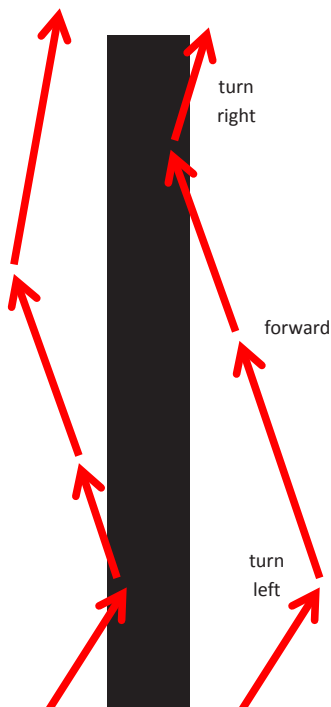


```

when program starts
  forever
    if [3] is reflected light intensity < 50 %? then
      B stop motor
      C start motor clockwise
    else
      B start motor clockwise
      C stop motor
  
```

TWO Sensor (4-state line follower)

LEFT SENSOR	RIGHT SENSOR	RESULT
black	black	stop
black	white	turn left
white	black	turn right
white	white	forward



```

when program starts
  forever
    if [2] is reflected light intensity > 50 %? and [3] is reflected light intensity > 50 %? then
      B start motor clockwise
      C start motor clockwise
    if [2] is reflected light intensity < 50 %? and [3] is reflected light intensity > 50 %? then
      B stop motor
      C start motor clockwise
    if [2] is reflected light intensity > 50 %? and [3] is reflected light intensity < 50 %? then
      B start motor clockwise
      C stop motor
    if [2] is reflected light intensity < 50 %? and [3] is reflected light intensity < 50 %? then
      B stop motor
      C stop motor
  
```