

Robotics with Lego EV3 + Scratch



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Robotics: a very compelling problem setting

Using robots with kids allows you to:

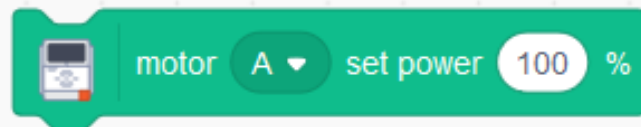
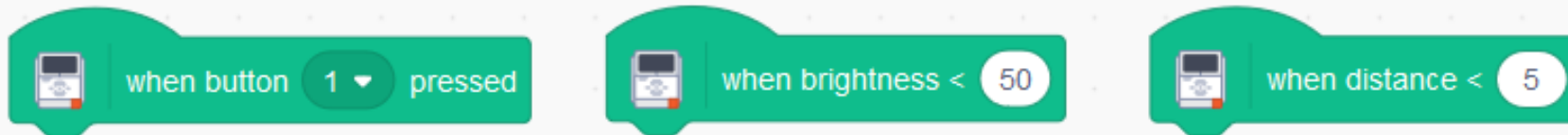
- enhance motivation
- show concrete evidence of the kid's programs movements
- tackle CONCURRENT problems (as we saw with music)
 - read sensors WHILE moving
 - coordinate the movement of many motors

Scratch is VERY limited but, with Lego EV3, sufficient to build:

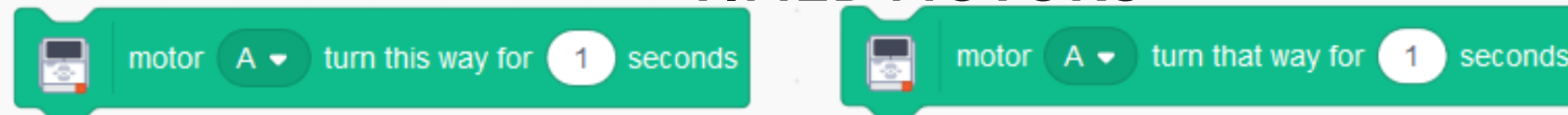
- a car moving in a labyrinth
- a robotic arm
- ...

Scratch Lego mindstorms EV3 extension

3 NEW EVENTS



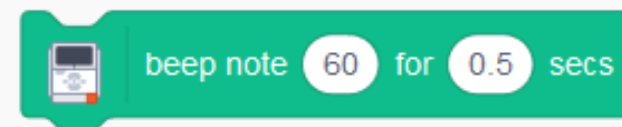
TIMED MOTORS



4 SENSORS



BEEP NOTE



LIMITS of Lego EV3 Scratch extension: SENSORS

You can use ONLY ONE sensor for:

- DISTANCE (Ultrasound sensor)
 - DISTANCE IN INCHES???
- BRIGHTNESS (Light/colour sensor)
 - VERY LOW VALUES!!!

The BUTTON-PRESSED event is somewhat erratic

The DISTANCE-LESS-THAN event works better

The LIGHT-LESS-THAN event seems not to work!!! (!”\$\$”£!\$!)

LIMITS of Lego EV3 Scratch extension: MOTORS

You can use UP TO 4

- motors on A, B, C, D ports
- touch sensors on ports 1, 2, 3, 4

BUT: CANNOT rotate one motor for a given angle (ONLY TIMED run)

- !!! This suggests to build a learning unit on calibration tables

MOTOR POSITION SEEMS NOT TO WORK !\$”\$!”£|\$£|!

OTHER:

- BLUETOOTH IS “BLOODY TRICKY” ... !|\$!%£\$!”%!”

Suggested topics

Calibration of movements and sensors

Composition of concurrent actions

Blocking/Non-blocking actions → messages w./w.o. wait

...

CONCURRENCY and Robotics in Scratch

You must coordinate:

- many motors (at least 2 for movement)
- many sensors

You can define multiple threads for the same event/MESSAGE

- unfortunately, messages DO NOT carry arguments
- then we use global variables

Choose a simple parametrization of single movements and JOIN

- time, speed, direction for each motor
- to get forward/backward, curves

Demo

DEMO