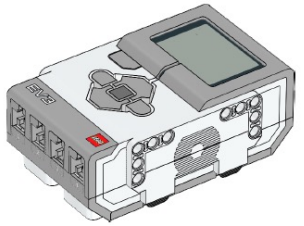


# LEGO Mindstorms EV3

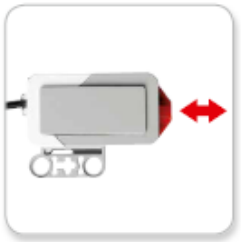
Workshop

Erasmus+ (2017-19)

(J. Götz, Humboldt-Gymnasium Ulm)

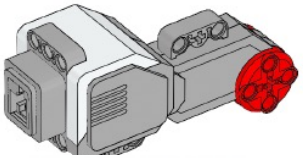
# Overview - sensors

- **Touch sensor**: detects if robot is touching something
- **Gyro sensor**: to measure angles (e.g. angle of inclination)
- **colour/light sensor**: to detect colours (e.g. follow a line)
- **ultrasonic sensor**: to get distances



# Overview - actors

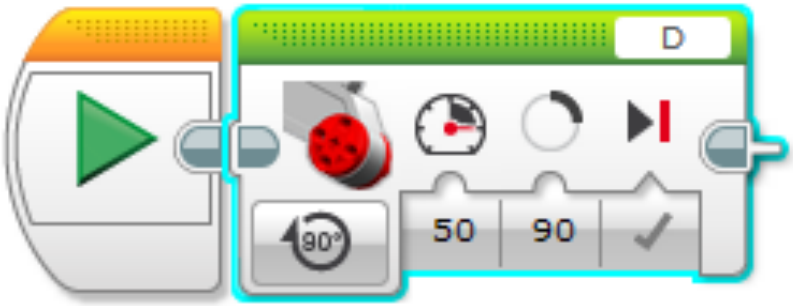
- Large motor
- Medium motor



- Display
- Speaker

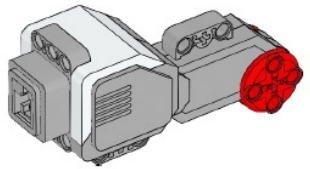
# A first program with the EV3

- How to use the EV3-software

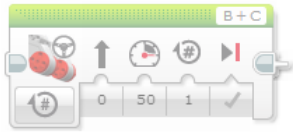



- Blocks (sorted by different colours)
- Move steering („Standardsteuerung“)
- Transfer program to brick

# Task 1: „Motor“

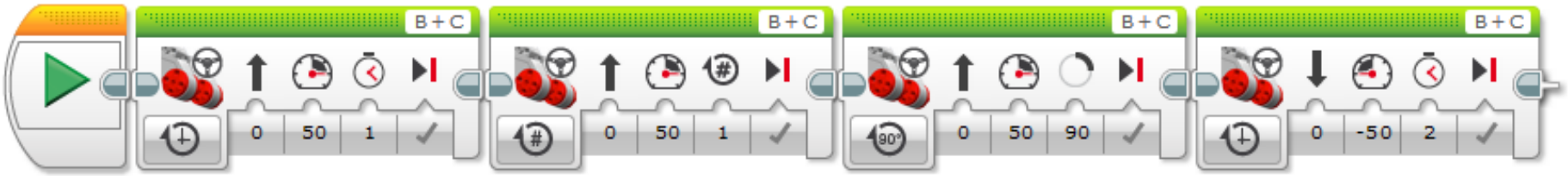


- The „Robot Educator“ should be able to
- A) … drive forward (1 second)
- B) … drive one round of a wheel
- C) … turn both wheels in an angle of 90 degrees
- D) … drive 2 seconds backward.




# Task1: solution

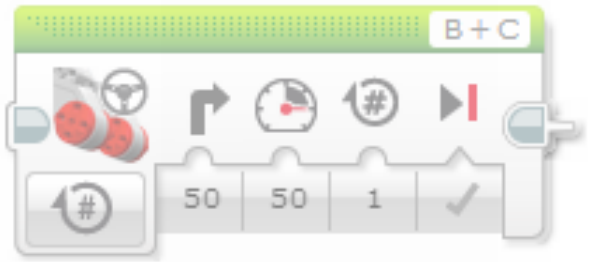
- 1 second, 1 rotation,
- 90 degree , backward 2 seconds



# Task 2

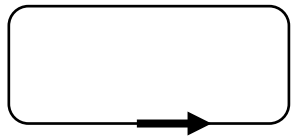
- Write a program and let the robot drive a 90 degree-curve

Hint:



# Square or Rectangle (repetition)

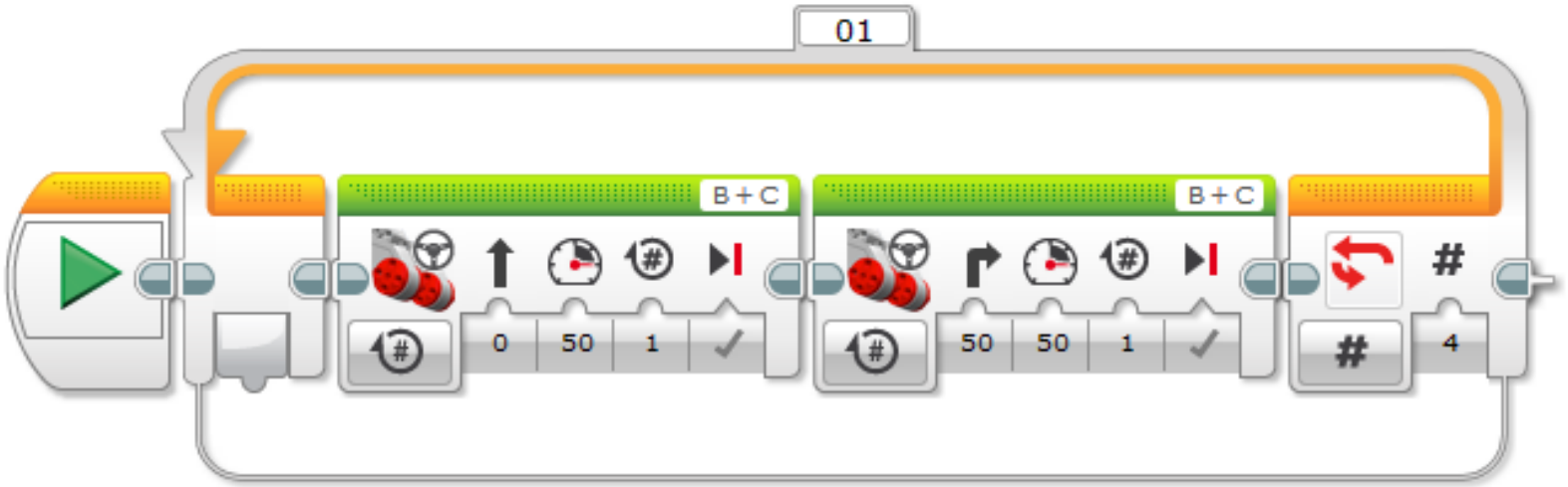
- … the robot drives a square
  (size : about 50x50 cm)
- use „repetition-block“



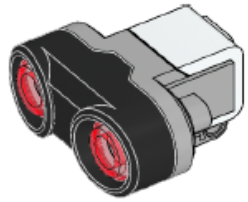
- Additional tasks:
- … drive one rectangle
- 5 repetitions of the rectangle

# Task 2: Solution

- Solution for „square“

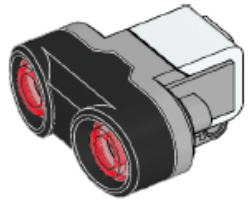


# How to use sensors



- Example: ultrasonic sensor
- Purpose: get distance to objects
- Programming example
- „trick“: wait-block
- Portview (on brick)

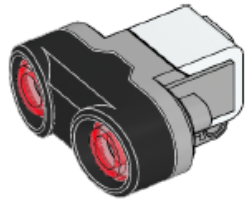
# Task 3



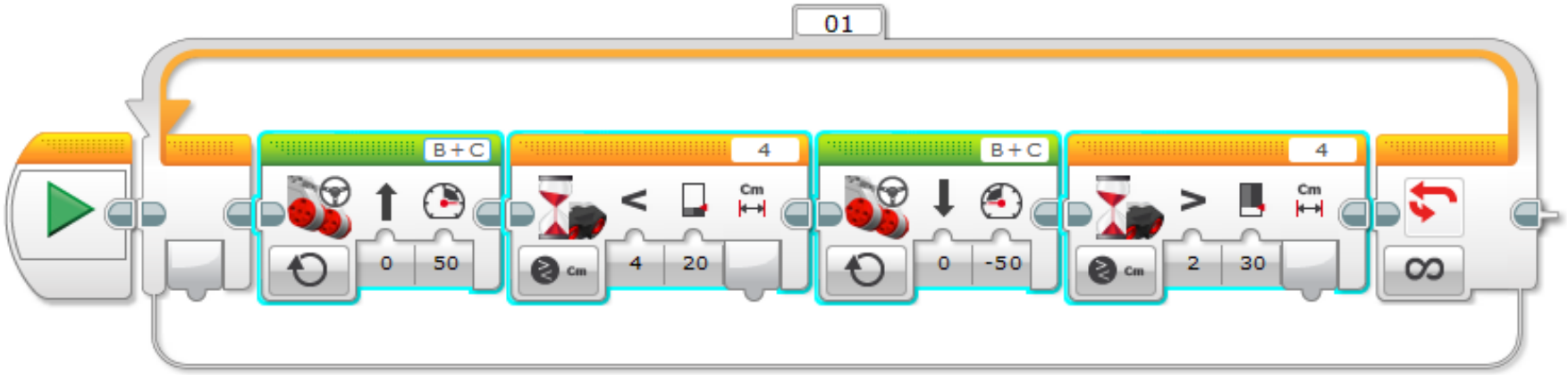
- Drive forward and stop the robot if distance to an obstacle

  is lower than 20 cm
- Additional task 1: backward up to distance is greater than 30 cm
- Add. task 2: repeat (without limit)

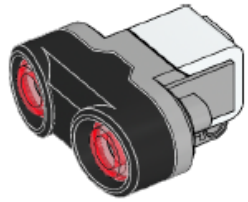
# Task 3: Solution



- Ultrasonic sensor



# Task 4

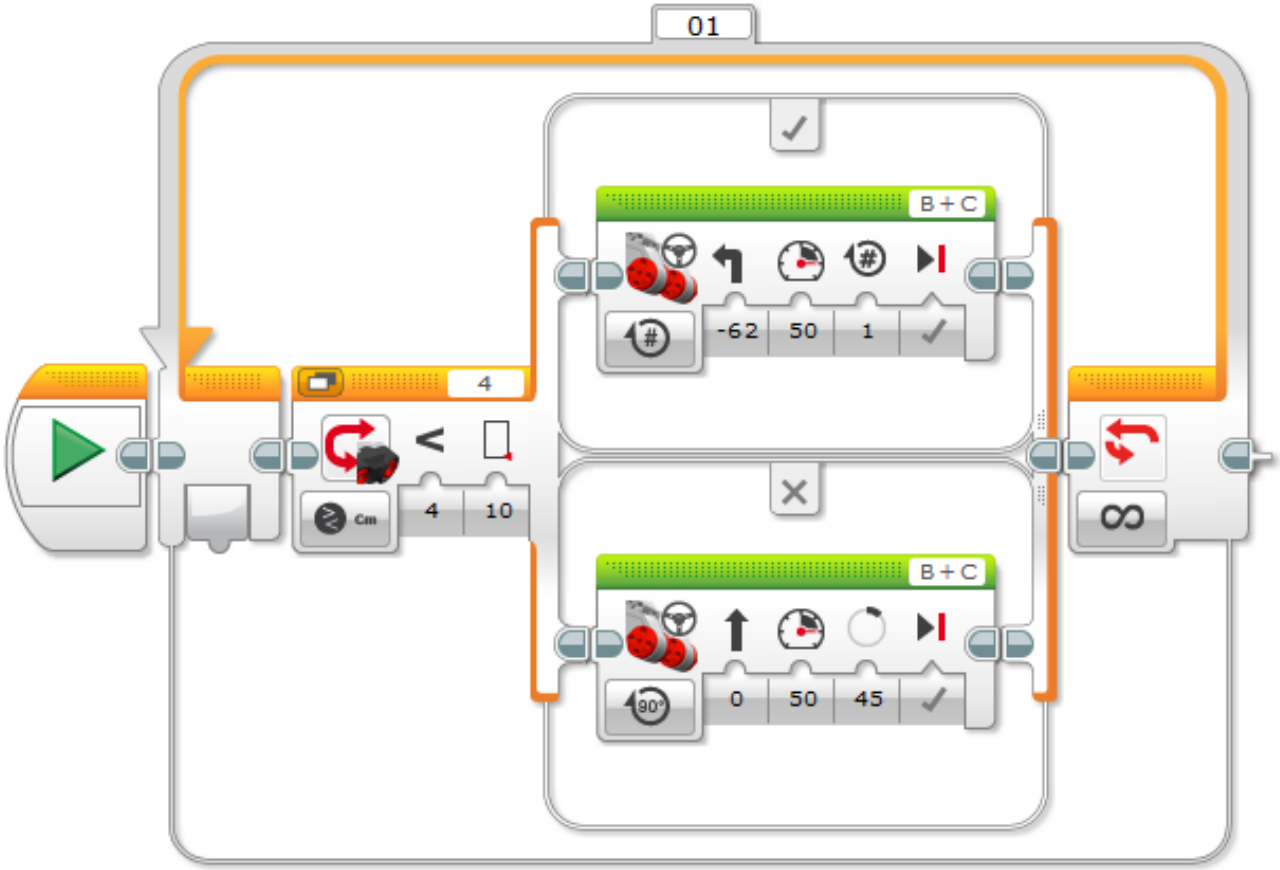


- Get out of the way of obstacles.

- For example:
- If an obstacle is detected, drive backward (only a short distance) and turn left.

# Task 4: Solution

- obstacles

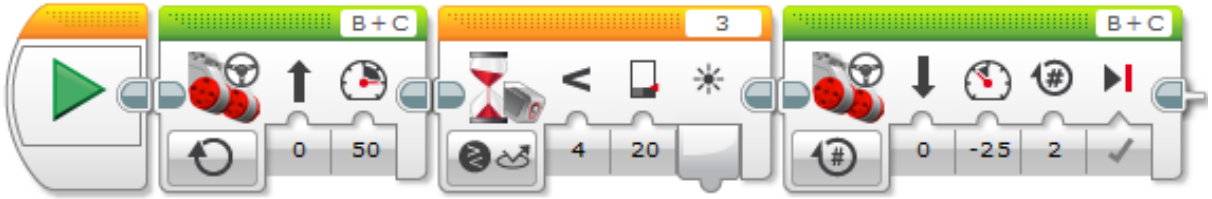


# How to use the colour sensor

- Task 5:
- Stop at a black line

# Task 5: colour sensor (solution)

- Stop at a black line
- (and drive backward – two turns, slowly)



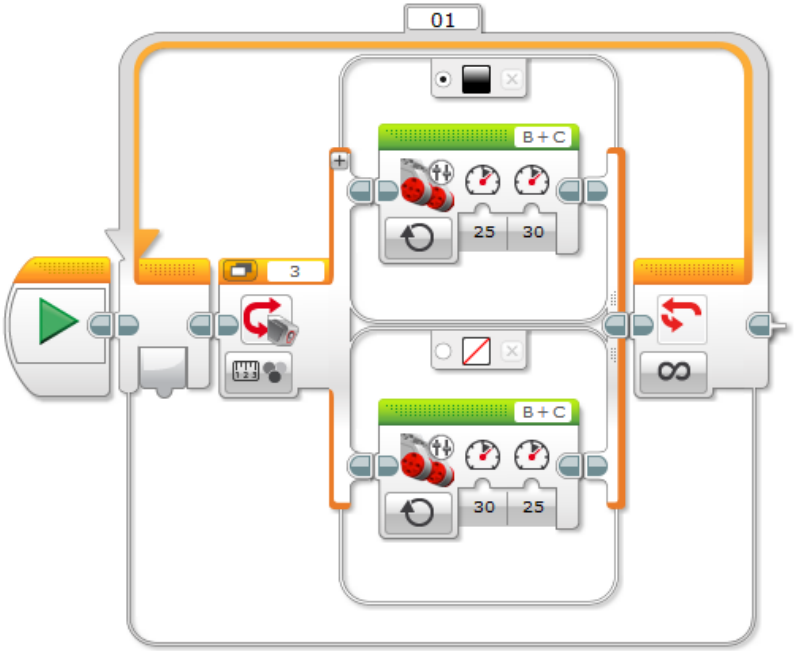
# Follow the line

- Task 6:

- Robot follows a (black) line

# Task 6: Solution

- Line-Follower
- (move tank)

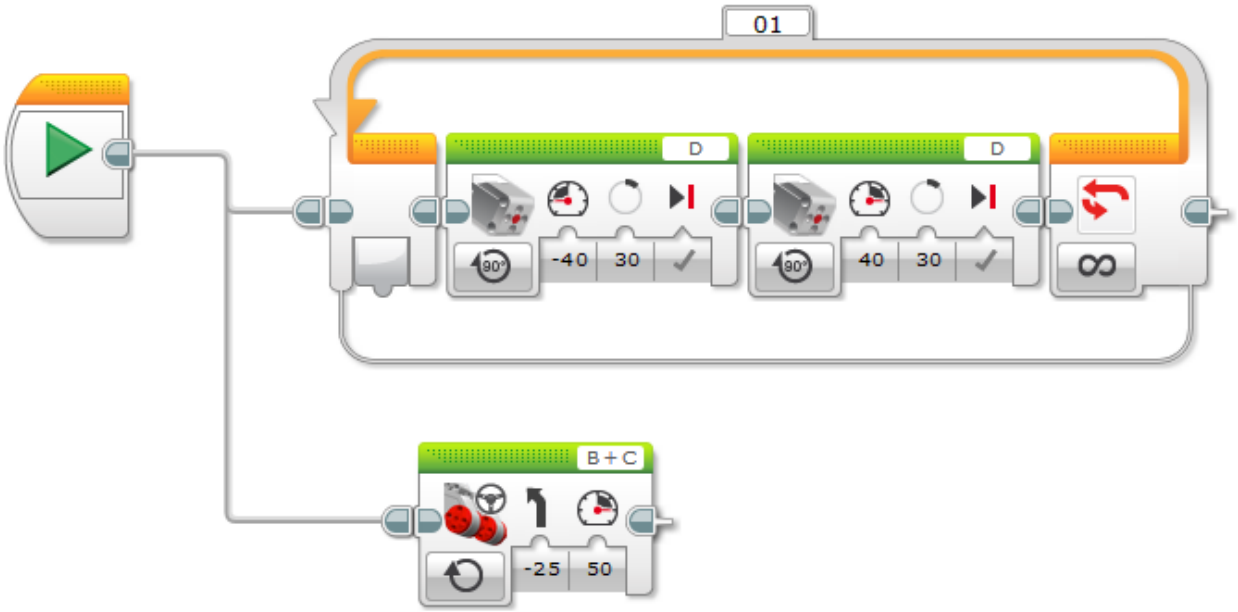


# Parallel execution

- The robot drives and moves the bar (medium motor), it waves to us

# Solution: Parallel Execution

- Drive and wave to …

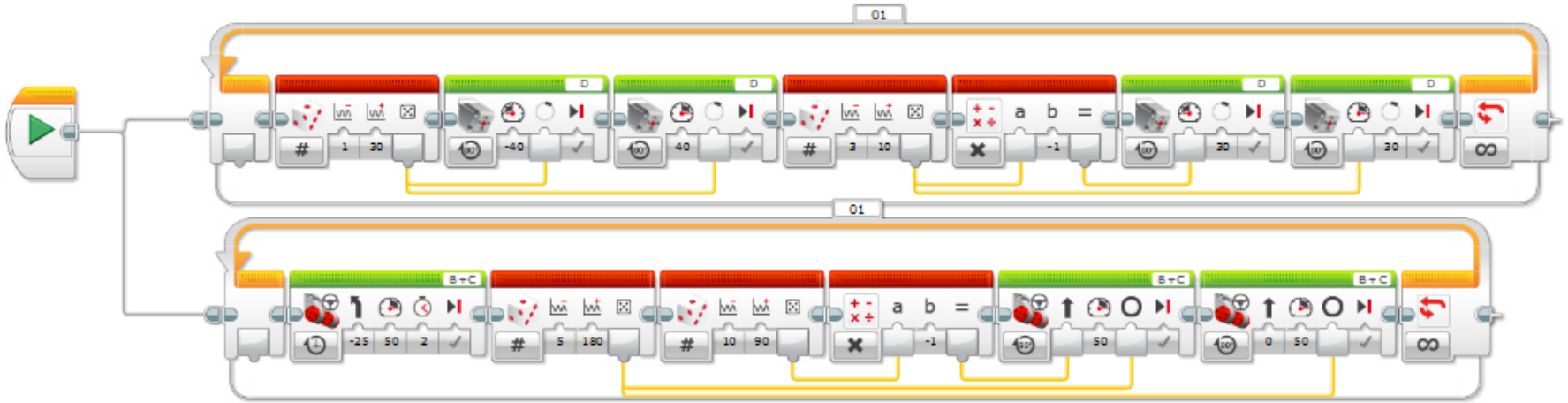


# Dance moves

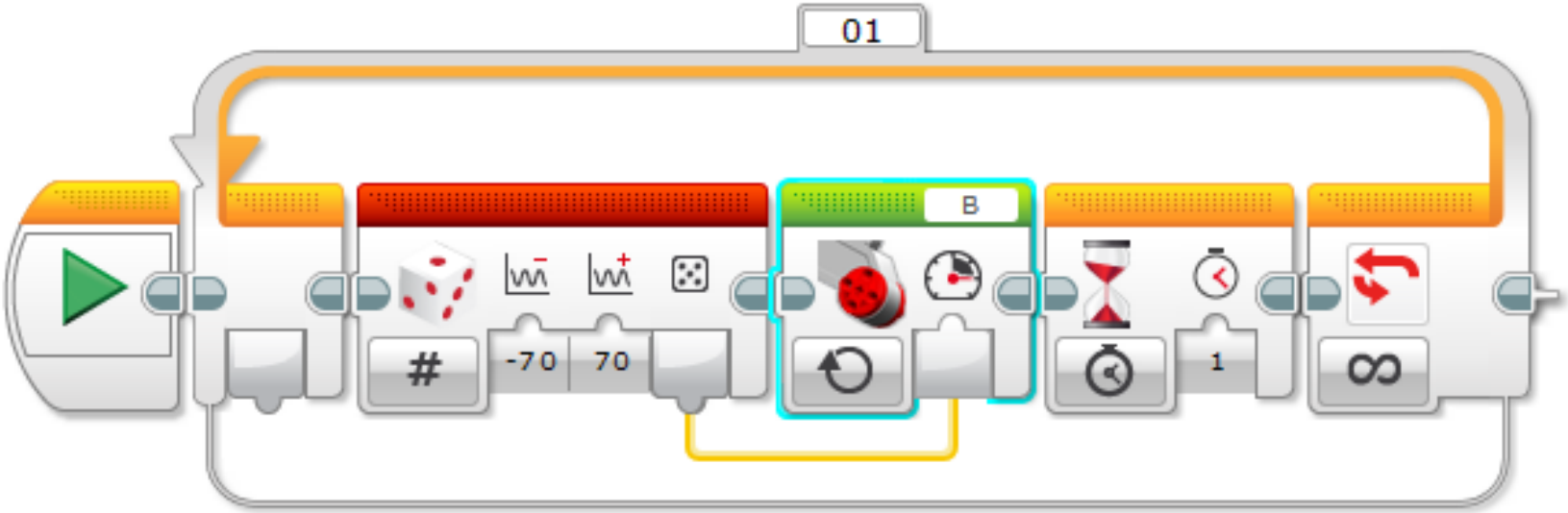
- Let the robot dance…

# Dance moves (random)

- Solution
- Random dance moves



# Add.: Random numbers



- Thank You and have much fun!