Robot Workshop

by
Liz Stoneham
AKA
Robot Liz-ii

Hampshire IT Conference

Thursday 29th June 2017

Why Use Robots?

- 'WOW' factor when teaching Maths, Science and Technology

- Enthuse and fascinate your pupils

- Unique approach to covering topics

- Make lessons FUN

Summary of Workshop

- Examples of Robots use in Maths, Science and Technology

- Data logging
  - More details about how it works
  - Mindstorms software basics
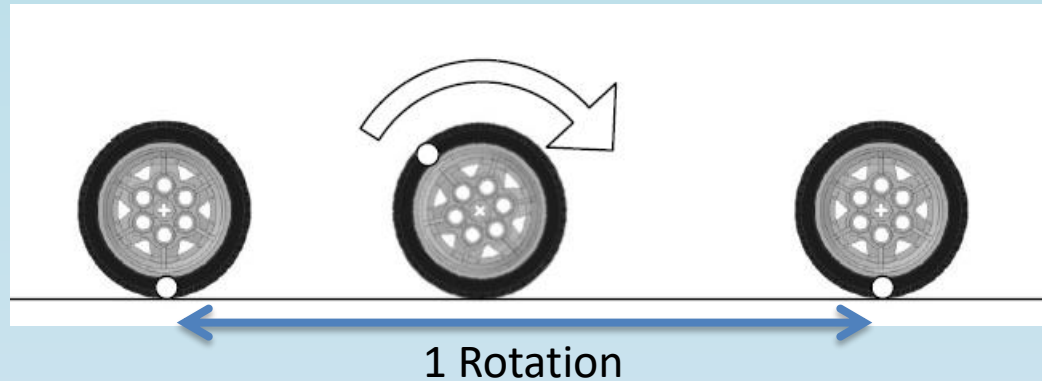 - Hands on experience of using Data logging with Lego EV3 and Mindstorms

Examples of Robots use in Maths

- Rotations of Wheel
  - Calculate distance by multiplication
- Turn an Angle
  - by Turning Motors
  - using Gyroscope Sensor
- Make Robot drive around a triangle/square
  - Calculate distance
  - Calculate external angel

Mathematics

1 Rotation

- Rotations of Wheel

  - Calculate distance by multiplication

- 1 Rotation travels for 3.5cm

- Then 3 Rotations is 3 x 3.5cm

Total Number of Rotations =

$$\frac{\text{Total Distance (cm)}}{\text{Distance moved in ONE Rotation (cm)}}$$

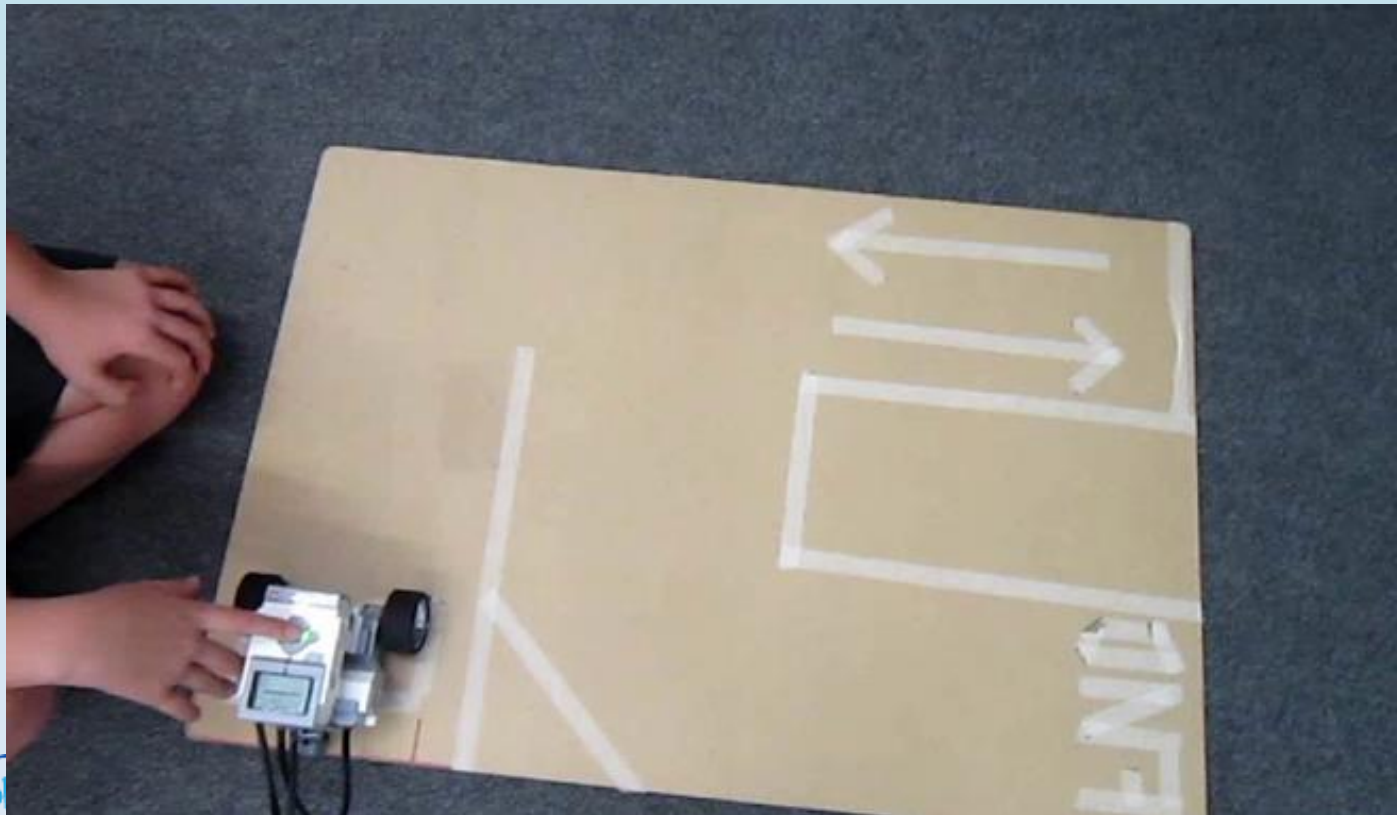# Turn an Angle

- Using Gyroscope Sensor

OR

- By Turning Motors

Turn at an Angle – Gyroscope sensor

To Navigate Map need to Calculate Lengths and Angles

https://youtu.be/jz572IOG_Do

Examples of Robots use in Science and Technology

- How much light is reflected or absorbed
  - Use light sensor to measure reflection
  - Program to increase speed as light increases
- Detect objects with Ultrasonic Sensor
  - Similar to animals – bats, dolphins, whales
  - Used on ships to detect other ships and depth of seabed
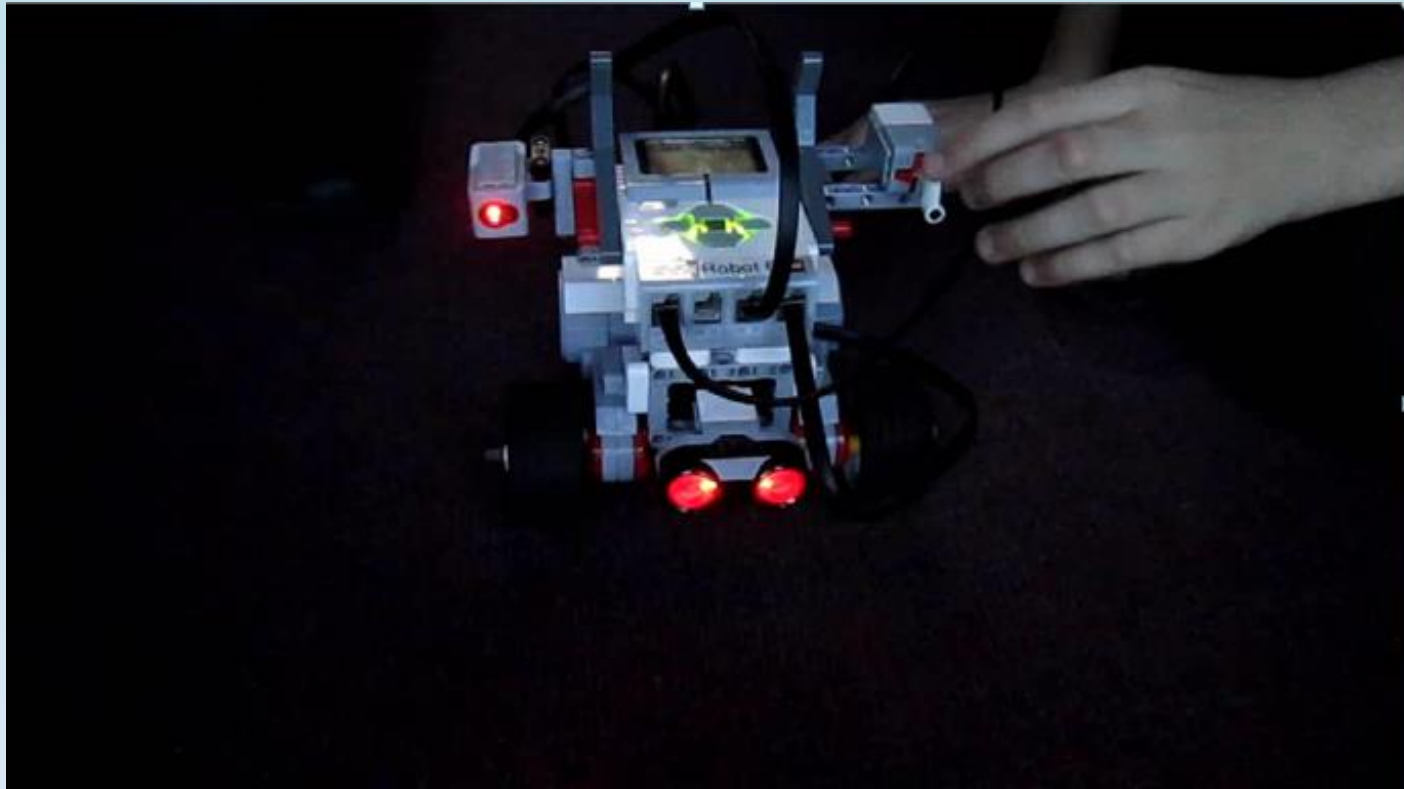
Use Light Sensor to Measure Reflected Light
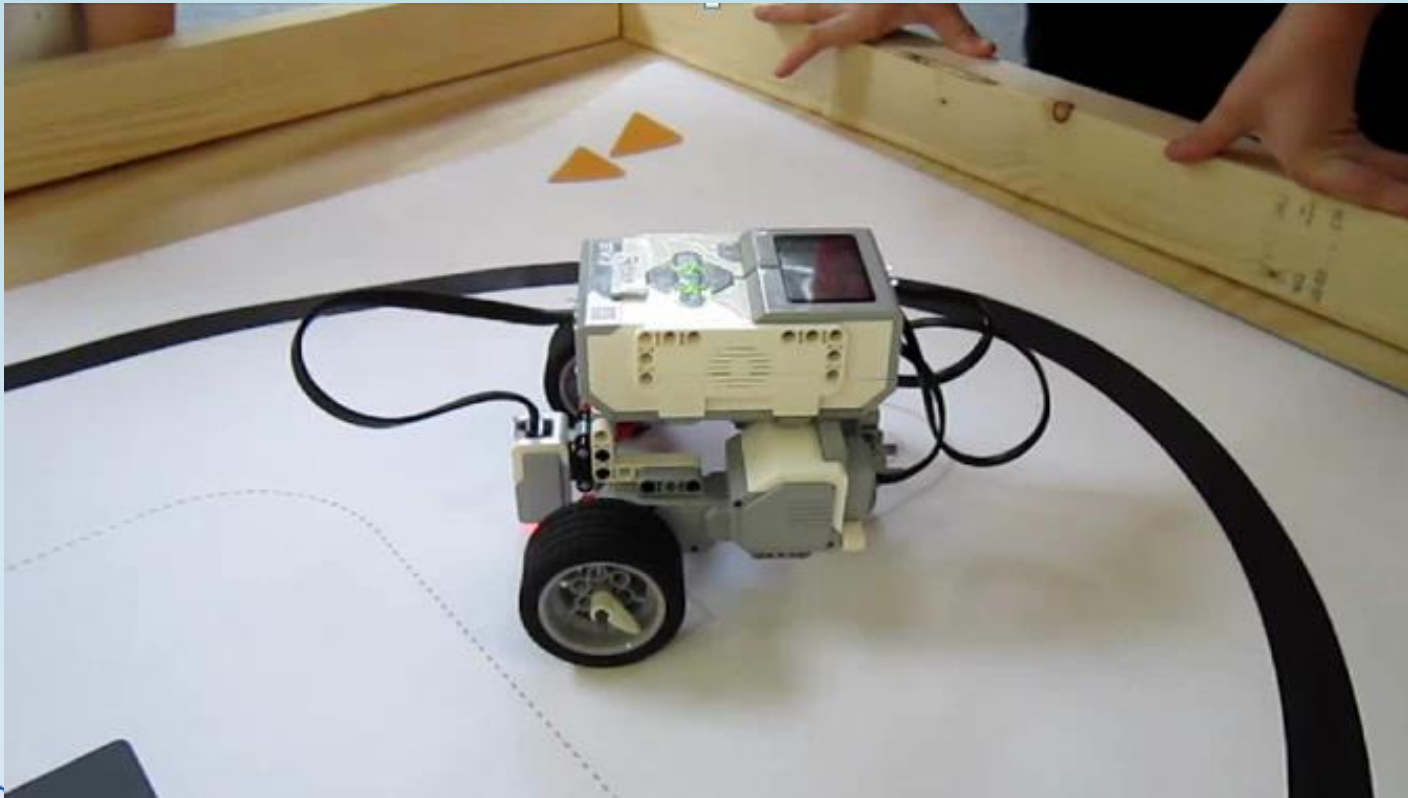
Fun
Last Robot Left in Circle is the Winner!

Speed increases as light increases

Use Ultrasonic Sensor to Detect Object

Then Add Gripper to detect and Grip

https://youtu.be/T9SfG0UmWAQ

Examples of Robots use in Technology

- Design, amend and accessorize the Robot

- Program the redesigned Robot

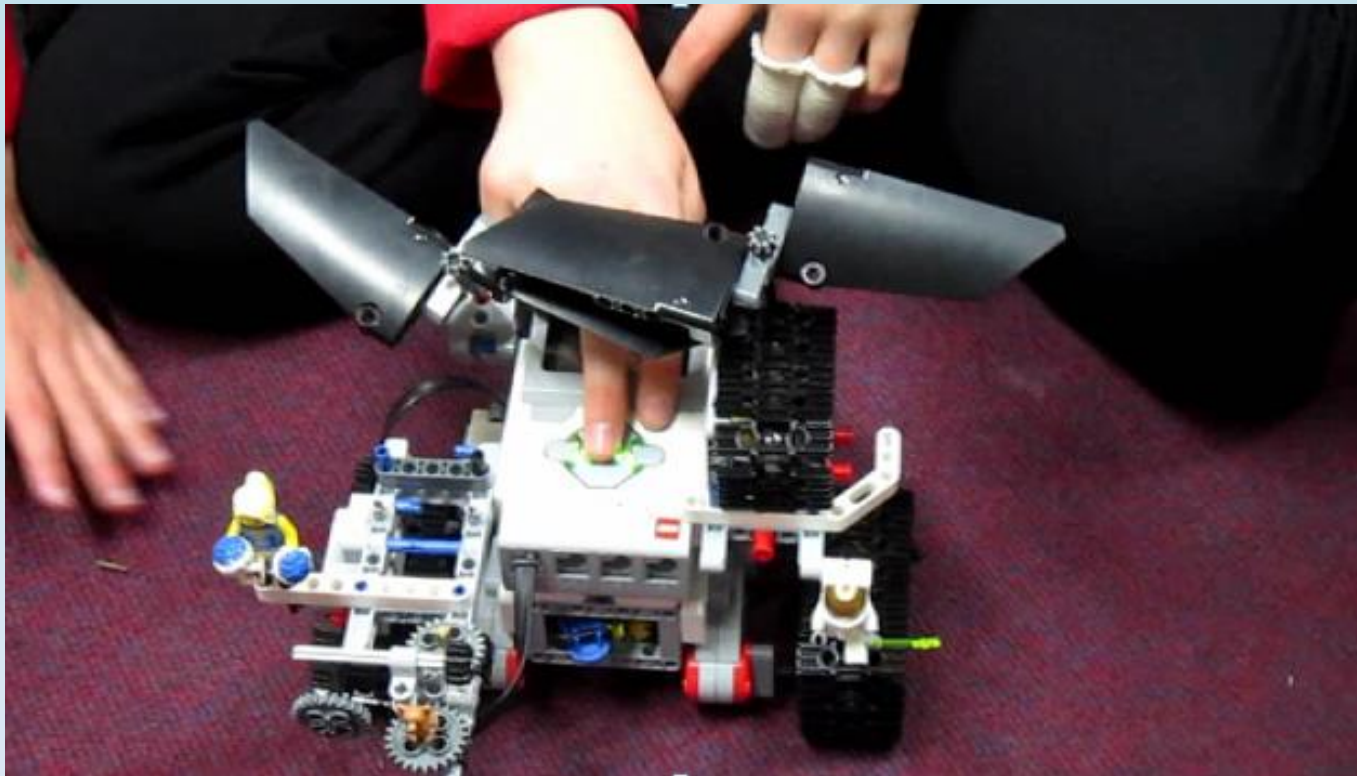- 'Hammertron' designed and built by Sam
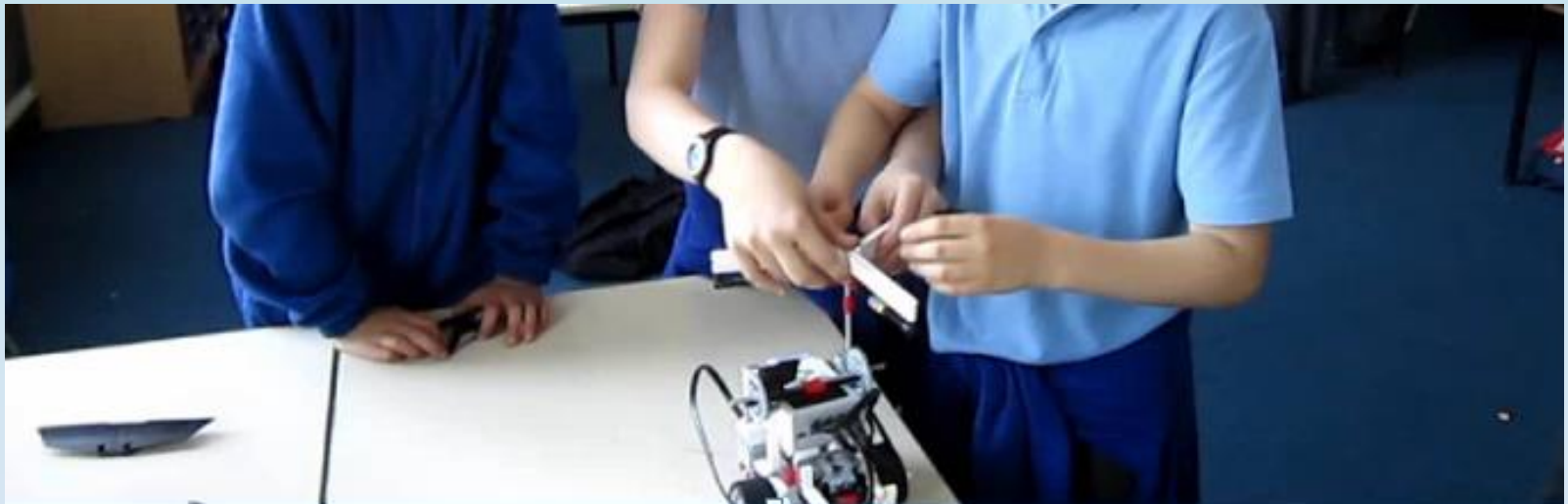

Compilation video of Robots Redesigned
https://youtu.be/SQ4lzOKL4n4

Examples of Robots use in Technology

Wink Cruise designed and built by Lydia and Mckenzie
https://youtu.be/TomUDmLG9SY

Examples of Robots use in Technology

Helicopter designed and built by Christopher, Oscar and Sam

Example in Music

- Different length of notes
  i.e. 4 Crochets in a bar

- Different notes

- Change the speed of music
  – Tempo

Data Logging with EV3s and Mindstorms

- Use to gather and record data to help in answering questions

- Use scientific diagrams and labels

- Use different graphs

- Predict results

Hands On Workshop

- To Program and run a prebuilt Lego EV3 Robot to autonomously move and use a data logger with sensor to detect objects

- Interpret the data produced on a Graph

- See Lesson Plan for

  Give your Maths Lesson a 'Wow' by using Robots.

  Lesson Plan for Using a Datalogger on an Autonomous Physical System and Analysing the Data produced on a Graph

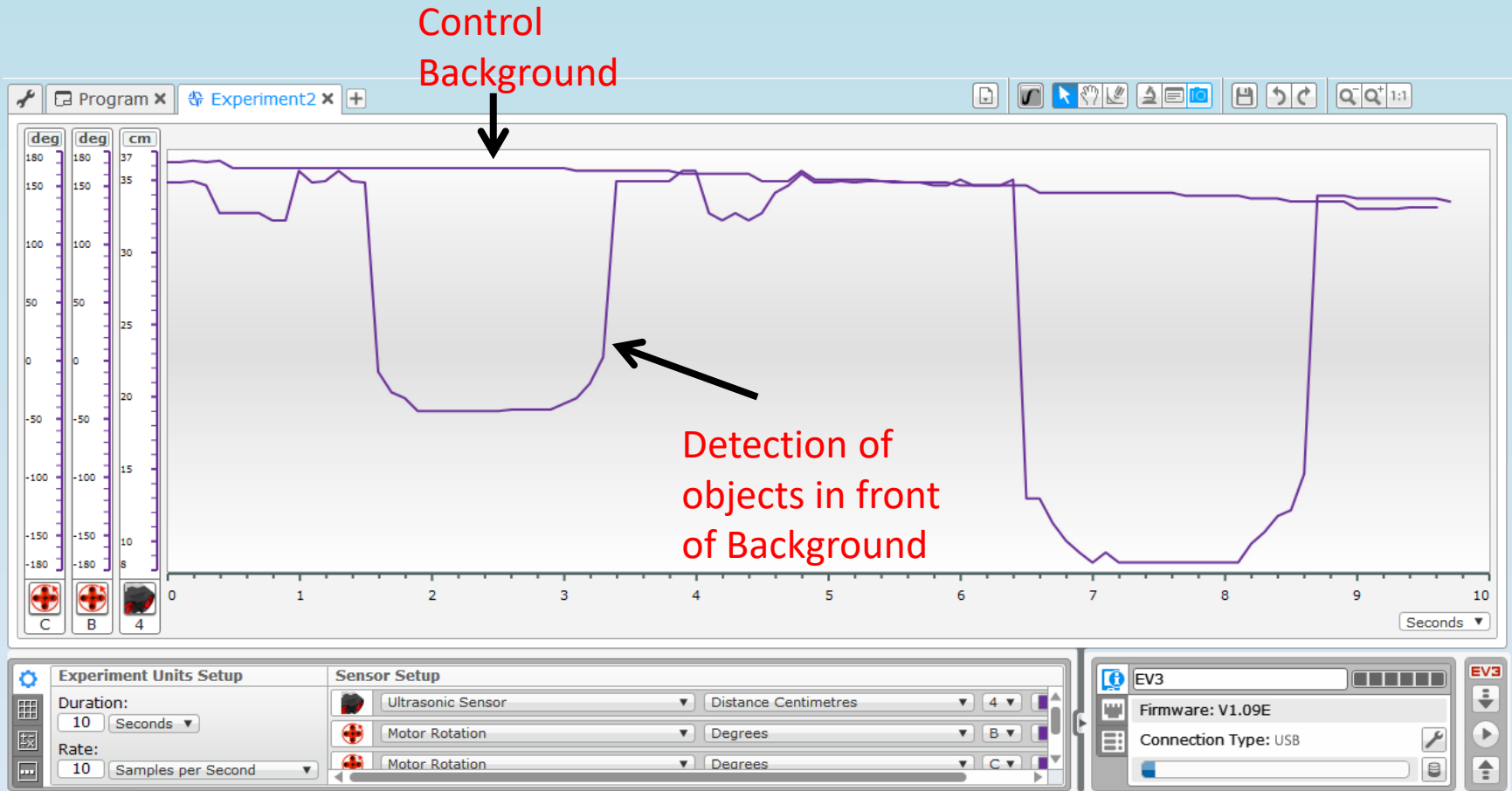 Follow STEP 1, 2, 3 and 4

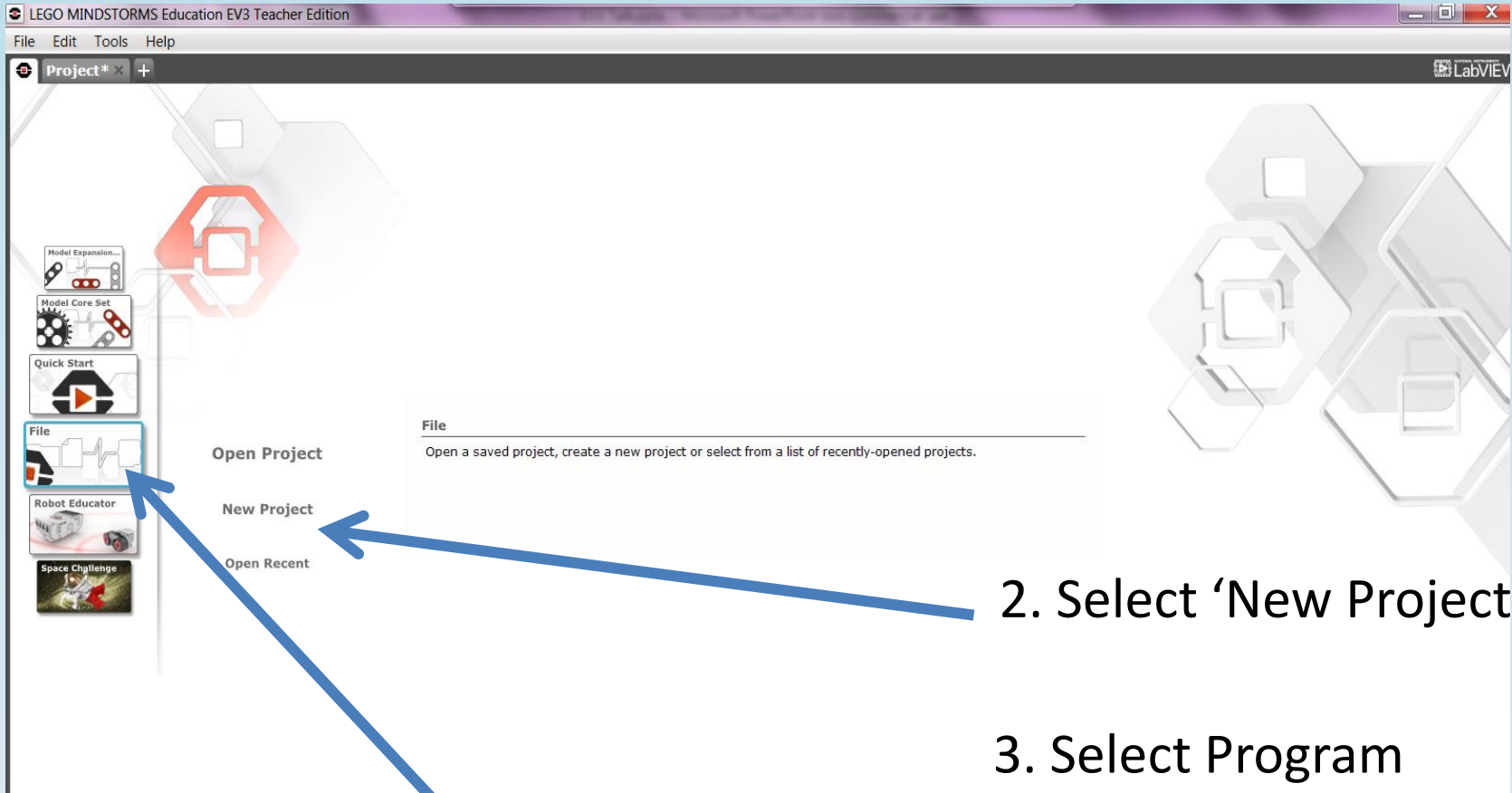# Google Self Drive Car detecting surrounding objects

On a simplified level, Workshop looks at similar technology to detect objects with sensors by a moving robot
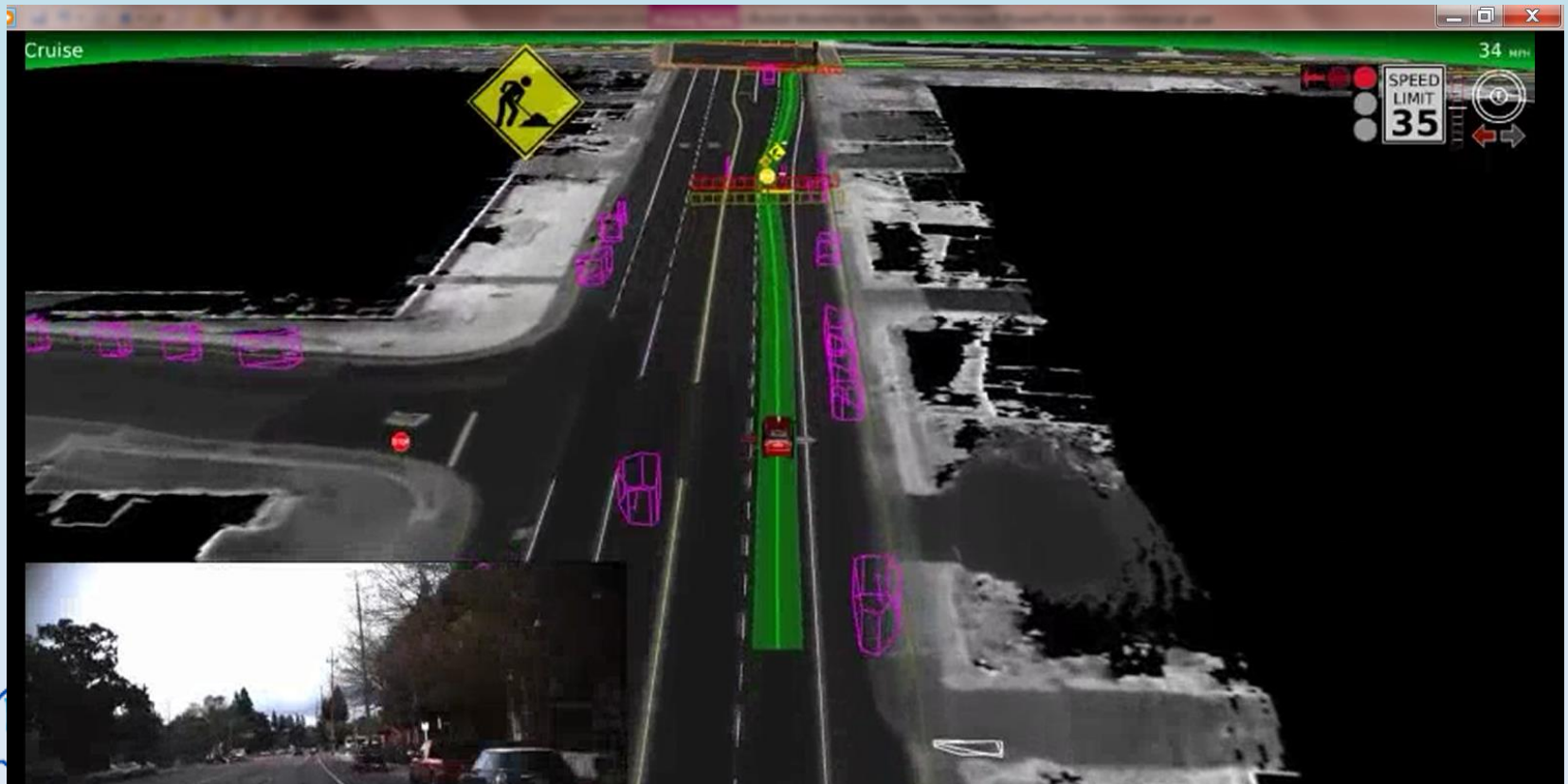
Expected Results - Expanded Graph to show detection of objects by Ultrasonic Sensor on EV3 Robot

Control Background

Detection of objects in front of Background

Lego Mindstorms Home Screen "Lobby"

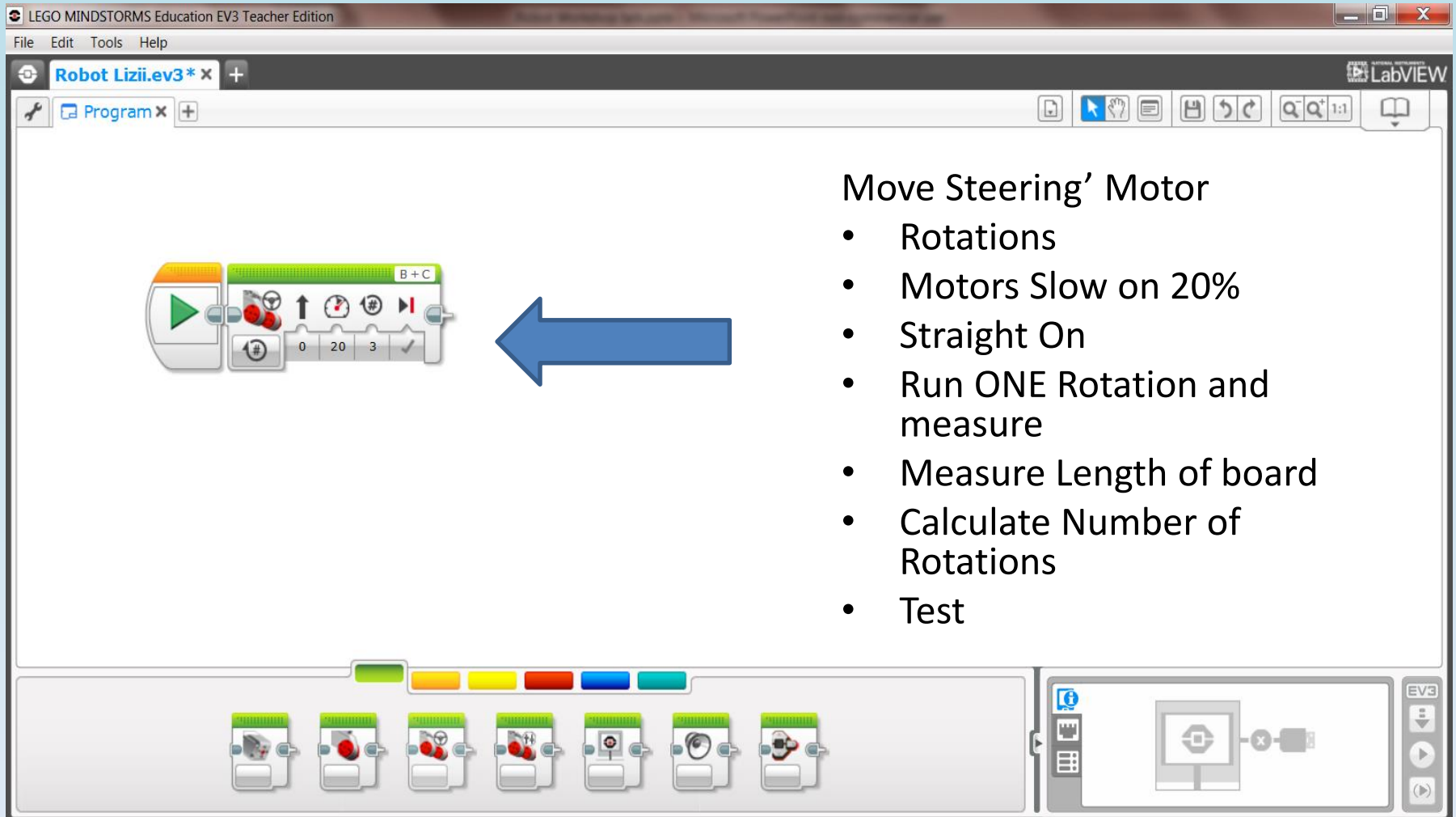2. Select 'New Project'

3. Select Program

1. Select File   4. Open

Workspace Opens

Use Move Steering Block
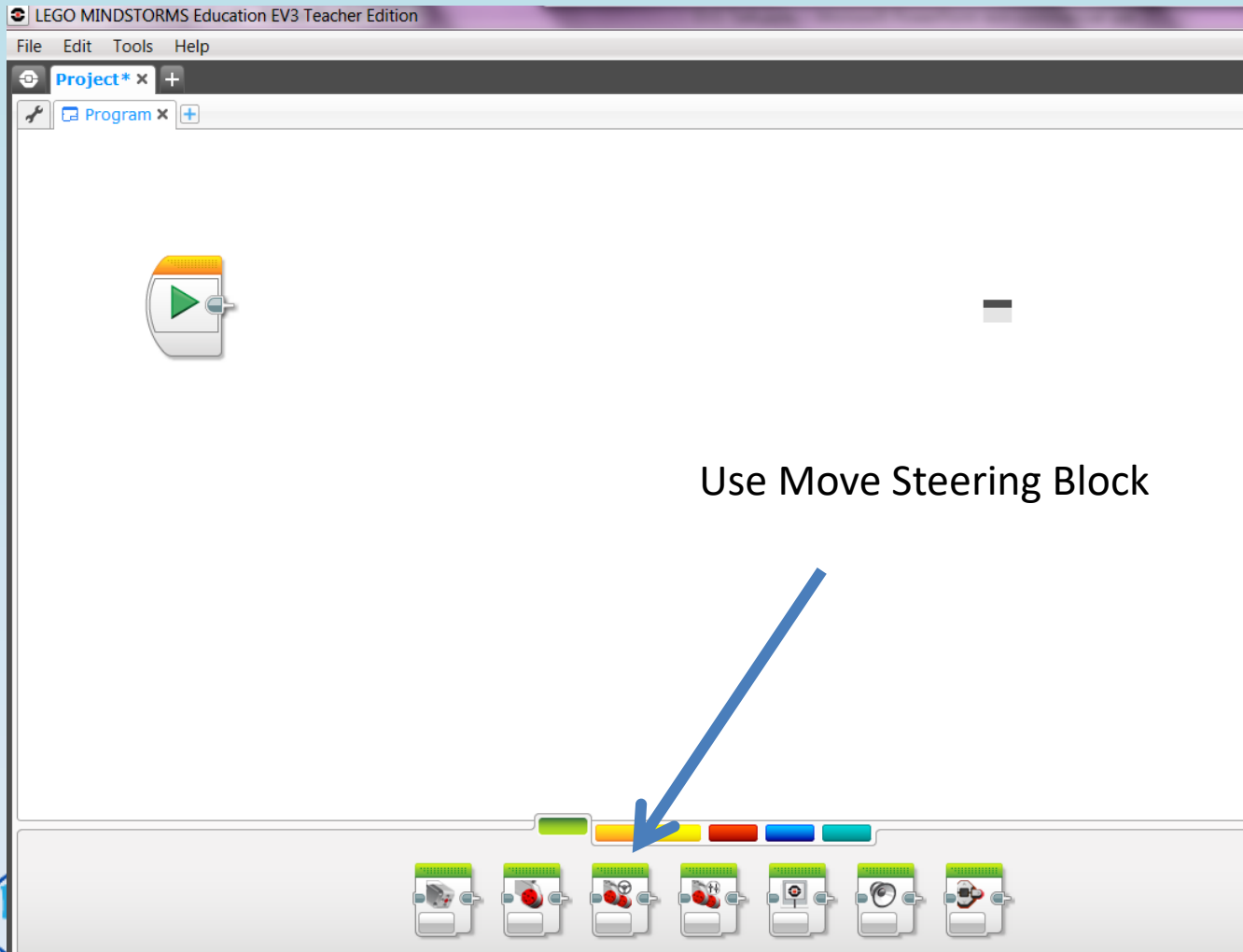
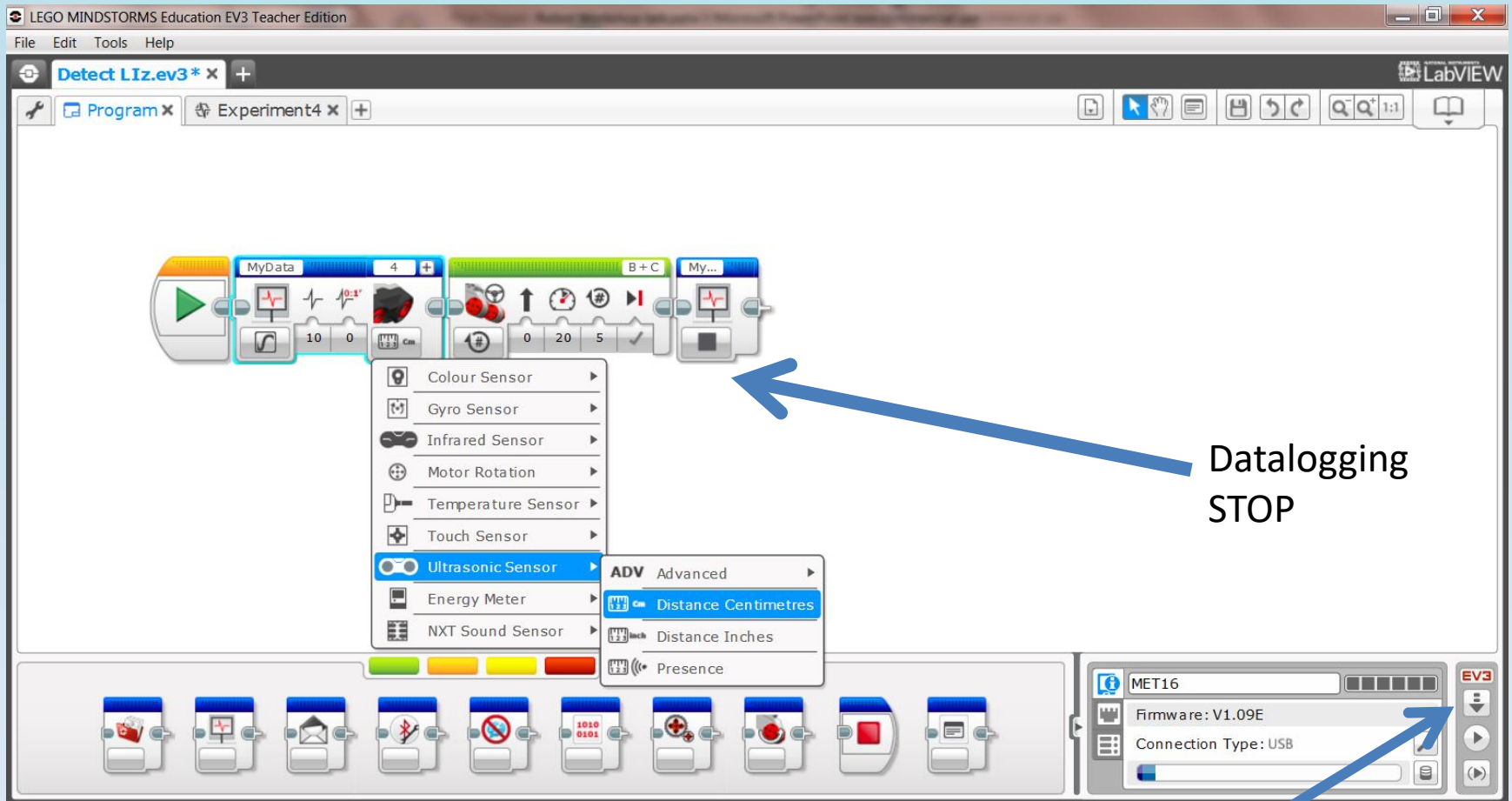# Test your Robot – Move across Length of board

Move Steering' Motor
- Rotations
- Motors Slow on 20%
- Straight On
- Run ONE Rotation and measure
- Measure Length of board
- Calculate Number of Rotations
- Test

Add Datalogger Block to Motor

Data Logger Block
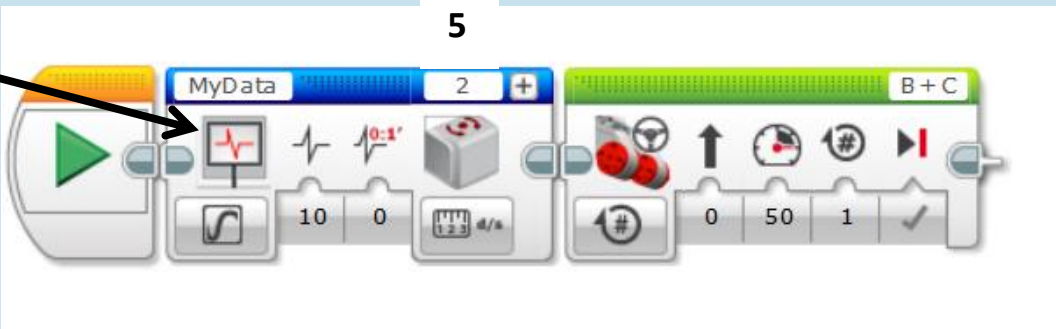
Change sensor on Datalogging block

Datalogging STOP

Download

Download the Data logging program
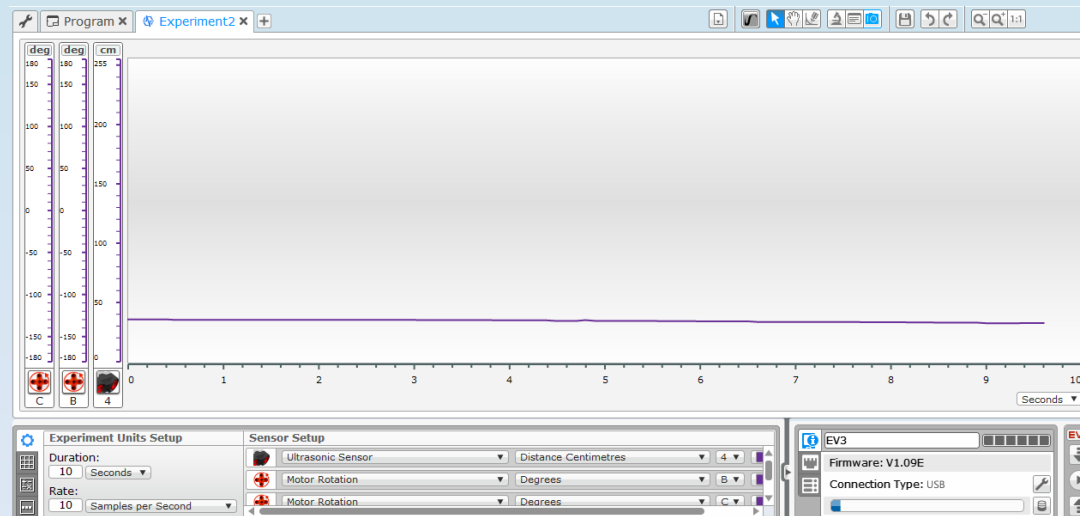
- Run the CONTROL program

  Along the length of the mat

  Aim the ultrasonic sensor towards a background approx 35 – 40cm away from the sensor

Uploading Experiment 1 (Control) onto Laptop

- Attach lead
- Select new experiment (+) tab
- Select upward arrow to upload
- List of projects appear. Select submenu
- Import
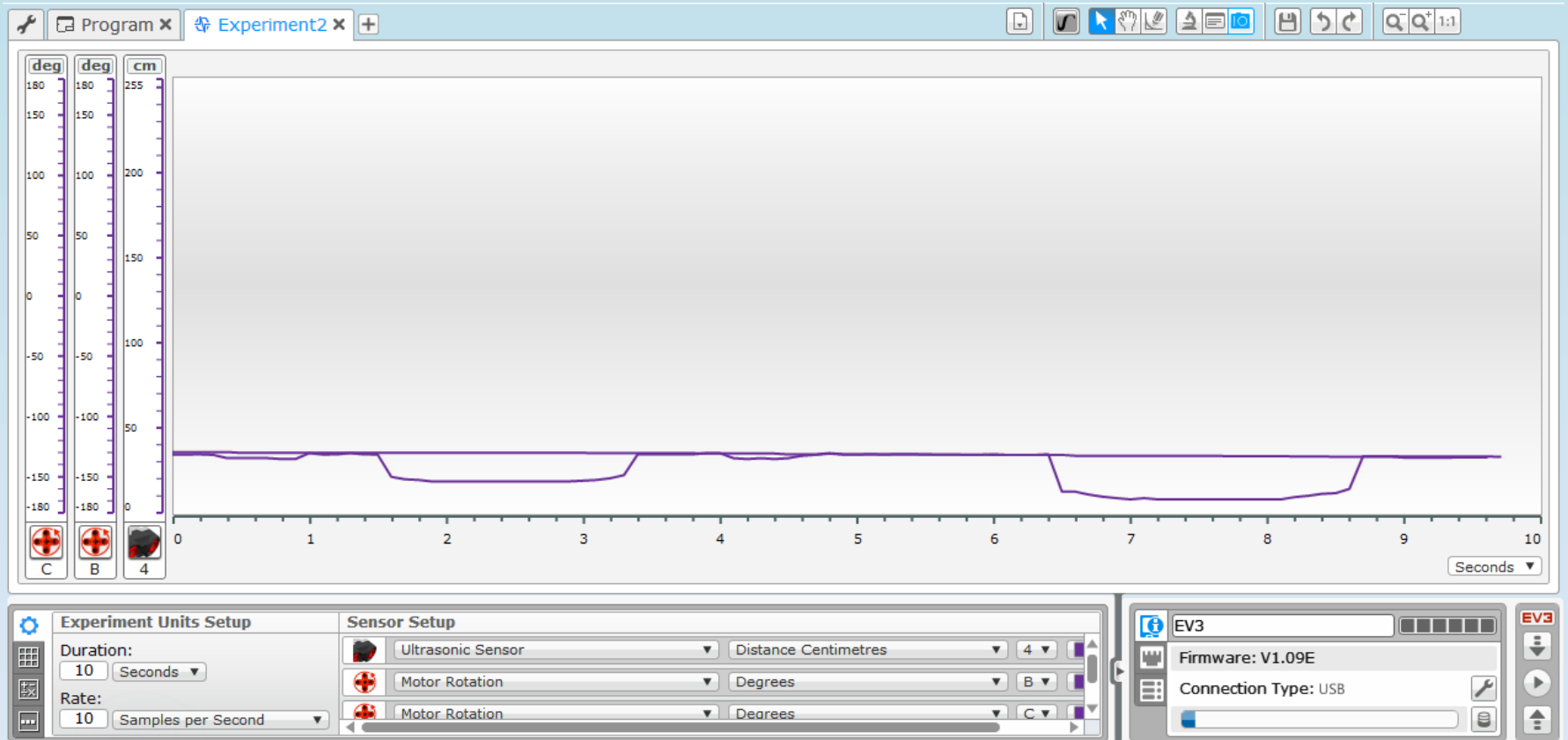- Graph loaded. Turn off Oscillator mode

Repeat for Experiment 2 to Detect Objects

- Place objectives in front of background

- Measure distance of objects away from sensor

- Run Robot along mat (same path as Control)

- Upload and import program

- Graph Loaded

Graph to show detection of objects by Ultrasonic Sensor on EV3 Robot

Expanded Graph to show detection of objects by Ultrasonic Sensor on EV3 Robot

Control Background

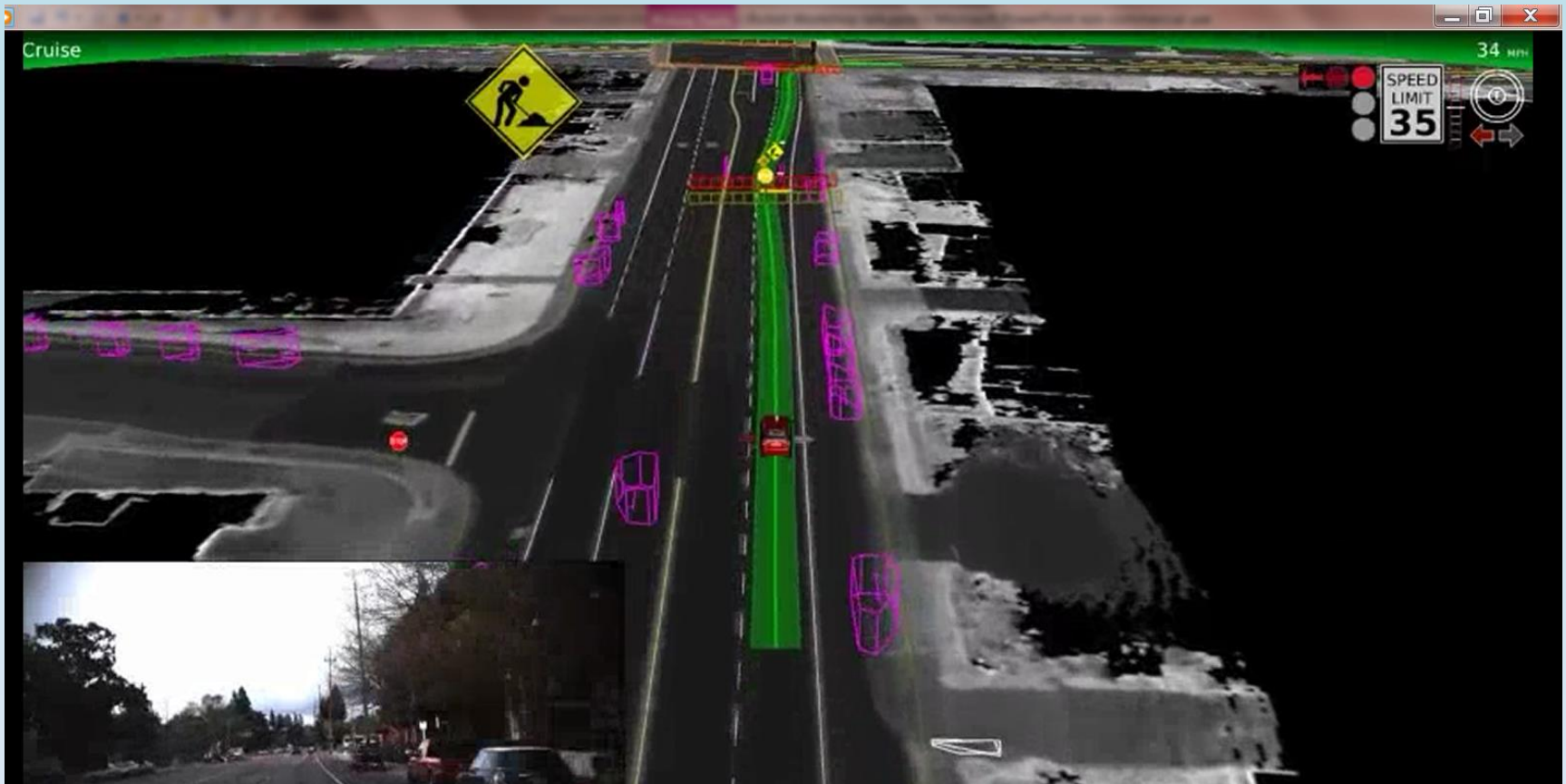Detection of objects in front of Background
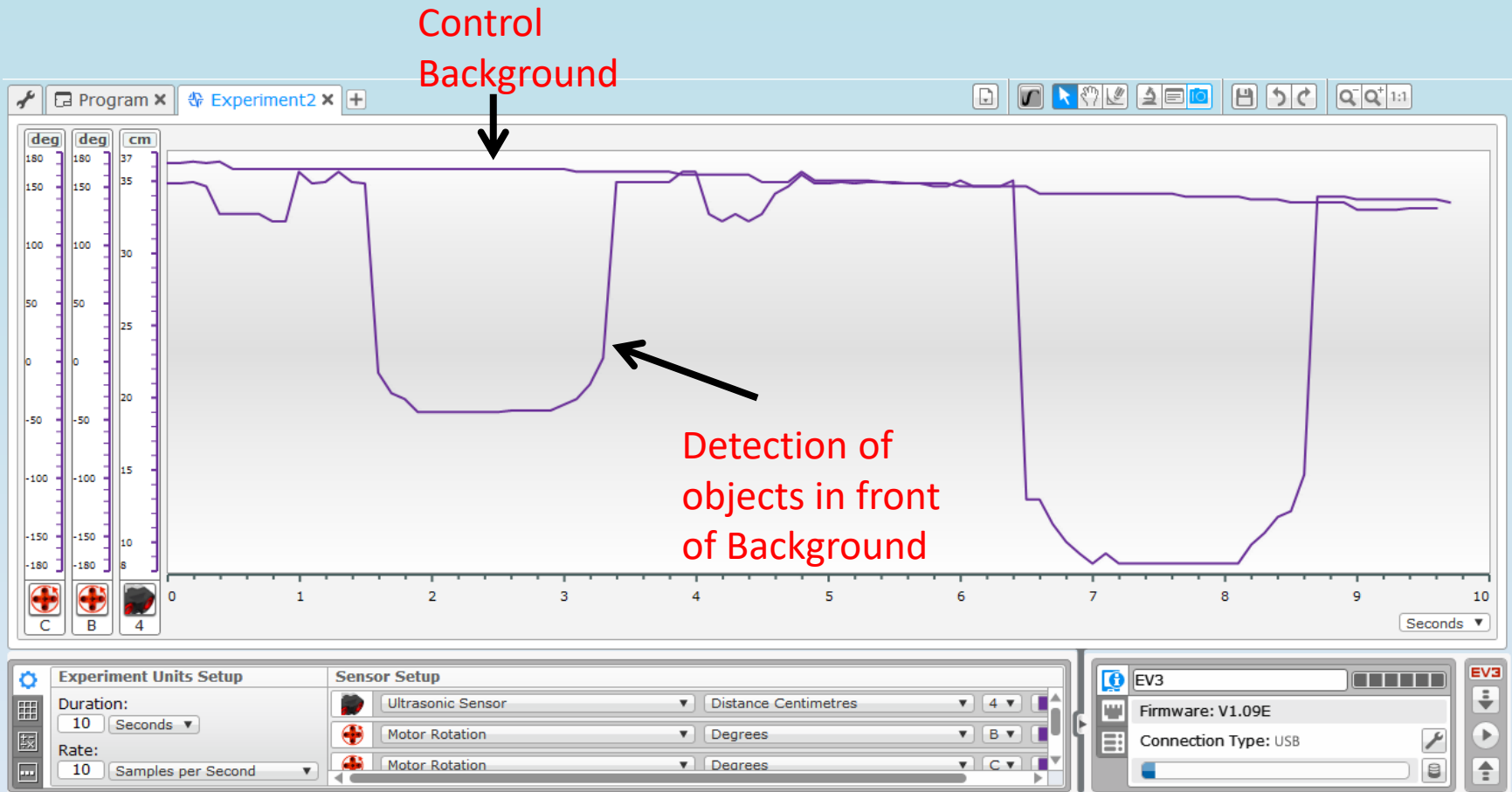
Analyse Graph

- Discuss the X and Y axis

- Time to run program

- Time between Objects

- Predict the outcome by measuring distances and objects

- Discuss limitation of equipment and measurements

Google Self Drive Car detecting surrounding objects

Video of Google Self Drive Car

https://youtu.be/TsaES--OTzM

A Ride in the Google Self-Driving Car

Conclusion

- Robots can add the 'Wow' factor to STEM subjects

- Robots are used across all industries

- It is predicted that the use of Robots will increase in the future

- It is important to keep our youngsters up to date with technology and, possibly, inspire them to build the Robots of the future