CODESKILLS 4ROBOTICS

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CODESKILLS4ROBOTICS

Promoting Coding & STEM Skills Through Robotics: Supporting Primary Schools to Develop Inclusive Digital Strategies for All

IO2-A3:

STRUCTURE OF THE SHORT TERM STAFF TRAINING FOR TEACHERS (AND PARENTS)

Project ID

ERASMUS+

Cooperation for Innovation and the Exchange of Good Practices

Strategic Partnerships for School Education (Key Action 2)

Project Number - **2018-1-EL01-KA201-047823**

CODESKILLS4ROBOTICS

Promoting Coding and STEM Skills Through Robotics:

Supporting Primary Schools to Develop Inclusive Digital Strategies for All

Duration: ~~**28**~~ **31 Months**

01/09/2018 - ~~31/12/2020~~ (31/03/2021)

Project extended by 3 months due to Covid-19

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Project Consortium

P1: National Center for Scientific Research “Demokritos”(**Greece**)
P2: Lifelong Learning Platform(**Belgium**)
P3: Regional Directorate of Primary and Secondary School Education of Crete(**Greece**)
P4: Emphasys Centre(**Cyprus**)
P5: Hellenic Mediterranean University(**Greece**)
P6: Halsingland Education Association(**Sweden**)

DEMOKRITOS

LIFELONG LEARNING PLATFORM
EUROPEAN CIVIL SOCIETY FOR EDUCATION

REGIONAL DIRECTORATE OF PRIMARY AND SECONDARY EDUCATION OF CRETE

Emphasys CENTRE

HELLENIC MEDITERRANEAN UNIVERSITY

Hälsinglands Utbildningsförbund

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Website: http://codeskills4robotics.eu/

Intellectual Outputs

- **IO1** • Building the Competence Framework
- **IO2** • Dual Digital Educational Back Pack for Primary Schools
- **IO3** • Eco-System of Assessment & Validation Methodology through Open Badges
- **IO4** • Interactive Portal and Mobile App
- **IO5** • Toolkit for Setting Up the DIGITALSKILLS@SCHOOLS Clubs
- **IO6** • DIGITALSKILLS@SCHOOLS Strategy for Sustainability & Upscaling

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Target Group

Direct target group is primary school **children** aged 9-12 years old with emphasis on children with fewer opportunities (+girls).

Indirect target group is **teachers** whose profiles will be upgraded through the professional development programme to acquire the essential digital and coding skills.

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Project Aims

- **To develop** and evaluate an **educational pack containing** all the essential materials, tools and resources for the **introduction of coding and robotics to primary schools**;
- **To support** primary **schools** in developing their own **digital-inclusive strategies** for the promotion of coding, robotics and STEM skills;
- To introduce and use the **Open Badges system** as **a method to validate** and award the coding skills acquired by **both teachers and students**, (**online assessment tool and** a mobile app);
- To design, in accordance with the 2018 Digital Education Action Plan for EU**, a strong campaign** as part of the EU Code/Robotics Week; CODESKILLS4ROBOTICS Competitions will be organized at the regional, national and EU level, thus promoting transnational cooperation.

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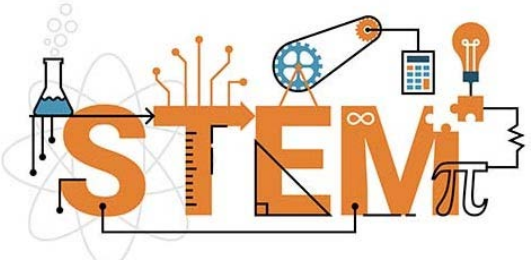
STEM Skills

- **Robotics** is the area of knowledge that **involves STEM** subjects: Science, Technology, Engineering and Mathematics.
- In the near future millions of **jobs** will be performed by robots instead of humans and millions of new ones will be created based on robots.
- People who will understand robots will have a significant advantage on the job market.
- Preparing today's children to become the innovators and inventors of tomorrow begins with STEM education programs.



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Soft Skills

- **Fine motor skills:** if the students are involved not just in programming, but also in physically **building** their robots, then **robotics is a subject that keeps up with the latest technology trends while keeping them away from screens** and encouraging them to **use their hands** and **learn by doing**.
- **Teamwork:** the many phases of **building, programming and testing a robot** are usually performed by a **team**, which teaches students to **work together for a common goal**.

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Soft Skills

- **Thinking outside the box:** creating a robot from scratch sharpens the students' **creativity** and **problem-solving** abilities by giving them **a task to perform** and showing them that **there are several valid ways to do it**. Students are **in complete control of the process**, which keeps them **engaged and attentive** and makes the project **rewarding and fun**.

- **Perseverance:** a robot built by a team of students likely will not work correctly on their first try. Assembling and programming a robot is **a trial and error process** that teaches the **patience and humility** to retrace your steps and **correct your own mistakes**, and a healthy dose of stubbornness that drives you to **try harder next time**.

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Curriculum Gaps

A **survey** has been conducted based on **two different questionnaires** (pupils and teachers).

- Most of the students have already understood the **importance of programming** and would like to attend an educational robotics class in their school to build and program a robot or learn new things.
- Students **are interested in Educational Robotics**, but they have not been given the chance to experiment in that field.
- **More** educational robotics **kits** must be given to schools
- **The constructionist approach** can be used by teachers through robotics projects to engage their students in exploring new concepts and learning different ways of thinking (i.e. improve their STEM skills)
- **The interest of teachers** to employ Educational Robotics in their lesson must **be increased**.
- **A lack of training** regarding not only technical aspects but also how to best integrate Educational Robotics in the classroom.
- More emphasis should be given to explain the term of Educational Robotics.

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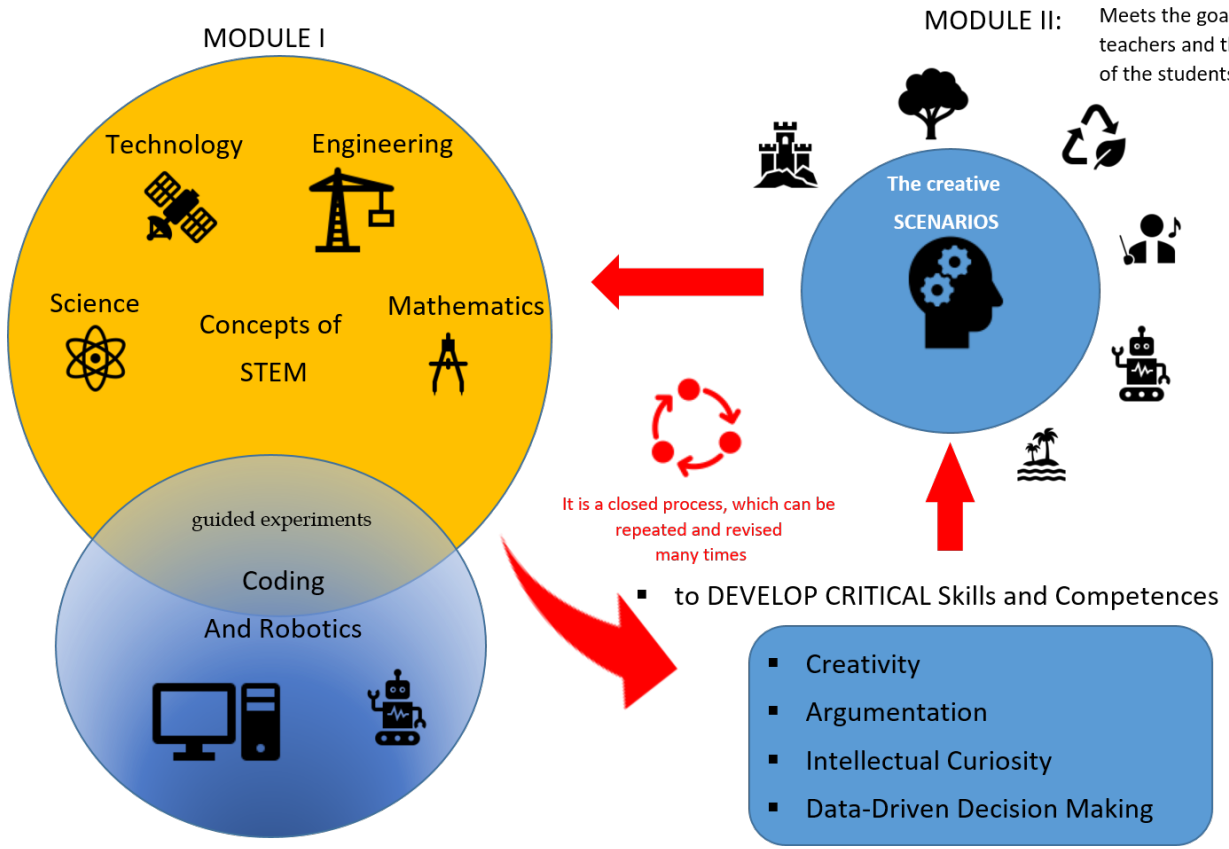
Competence Framework



The **educational pack** is based on a targeted **Digital Competence Framework**, which will also serve as a basis for the **monitoring** and **assessment** of the students progress

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Educational Back Pack

Module 1: Develop Basic STEM Skills and Programming

Section A - Basic Robotics Movements → Basic Badge
Section B - Robotics Sensors → Intermediate Badge
Section C - Advanced Robotics → Advanced Badge

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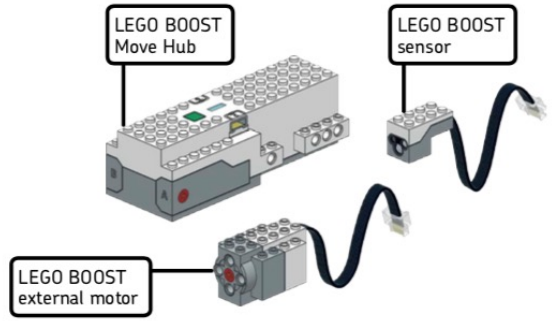
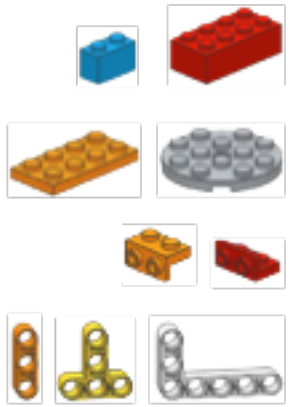
Module 1:
Develop Basic STEM Skills & Programming

- **Learn the basic terminology**
- **Identify**, classify, and name the parts of the Lego Boost
  - Building parts (bricks, plates and flat tiles, snot elements, beams)
  - Mechanical Parts (axles, pins, hinges, gears, wheels, treads)
  - Advanced Parts (drive base, motors, sensors)
- **Learn** basic building technics
- **Be familiar with** motors and sensors and the IDE of Lego Boost
- **Learn basic programming technics** (instructions, algorithms, loops and branches)
- **Understand** concepts from Science, Engineering and Maths
- Implemented through the Lego Boost Kit





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Educational Back Pack

Module 2: Building and Programming Small Robots

Section A – The Lego Boost Constructions

Vernie, M.T.R.4 & Guitar4000

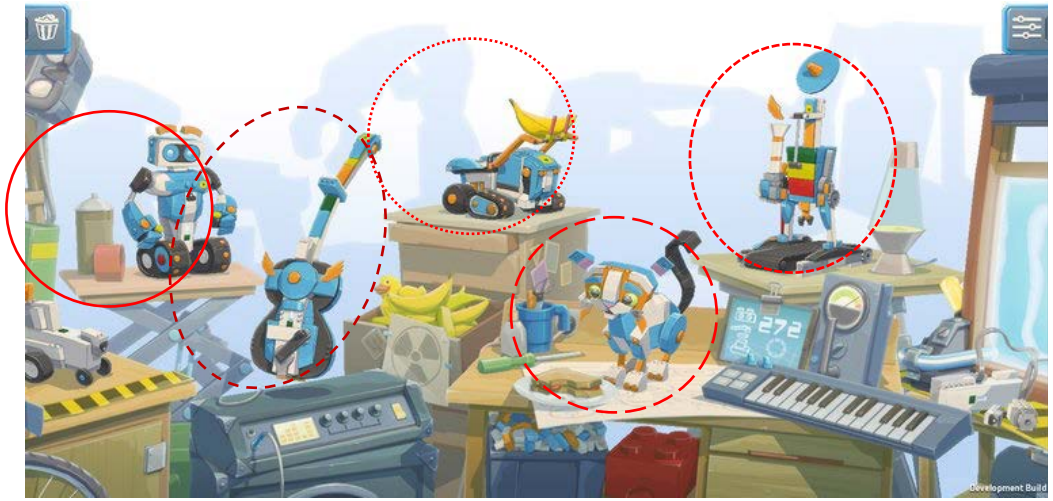
Section B - The 4 Creative Scenarios

History Scenario → **History Badge**

Space Scenario → **Space Badge**

Environment Scenario → **Environment Badge**

Culture Scenario → **Culture Badge**



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Module 2:
The Creative Scenarios

Students will:

- **Learn** to build small educational robots
- **Explain** the abilities of the robots and understand how to **make programs**
- **Implement basic programming techniques**
- **Understand** how to **solve problems** and **scenarios**, based on Historic Events, Environmental sensitivity, Technology, life on planet earth, culture or space
- **Work together** to create and build new scenarios or new robots
- **Add their own techniques and imagination** to extend programming options beyond the original suggestions

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Open Badges

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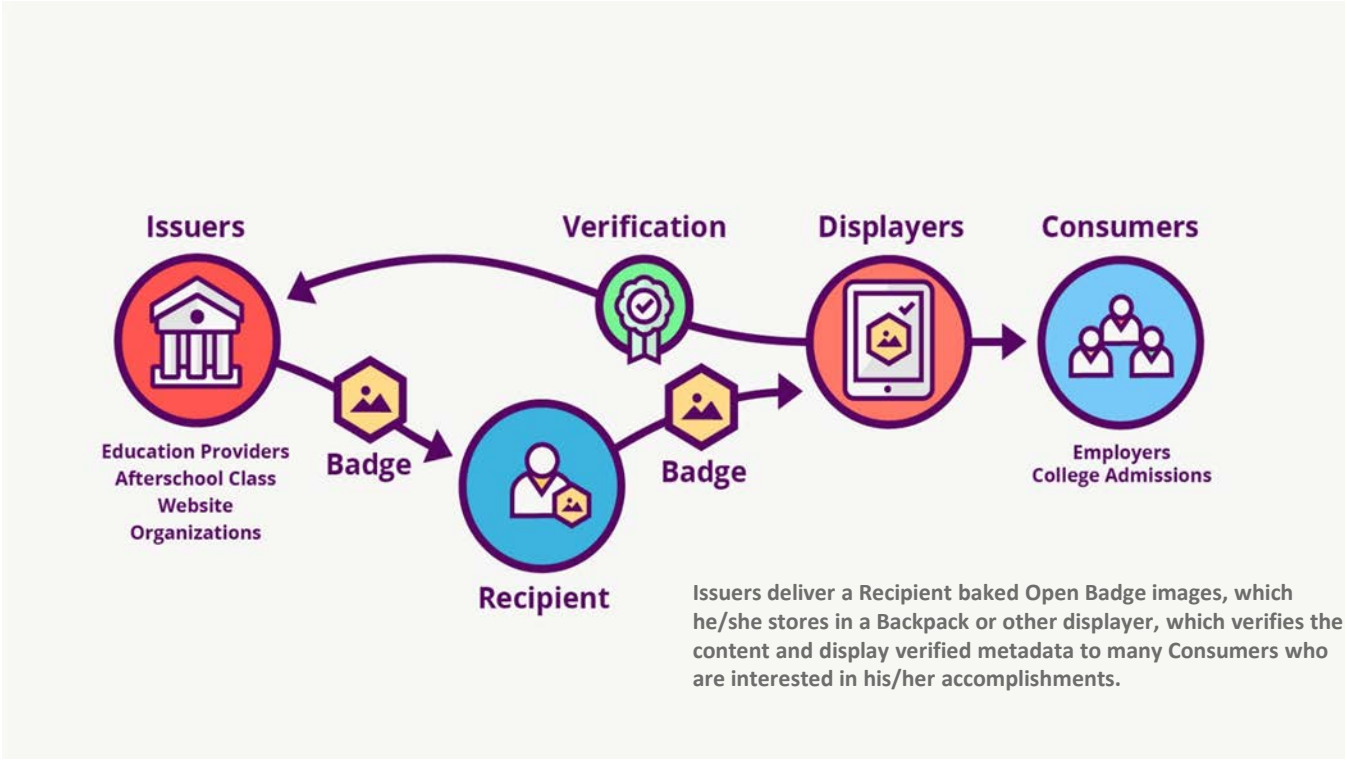
Open Badges Ecosystem



What are Open Badges?

Open Badges are verifiable, portable digital images with **embedded metadata** about **skills** and **achievements**, documenting the badge **issuer**, **criteria**, and **evidence** among other info.

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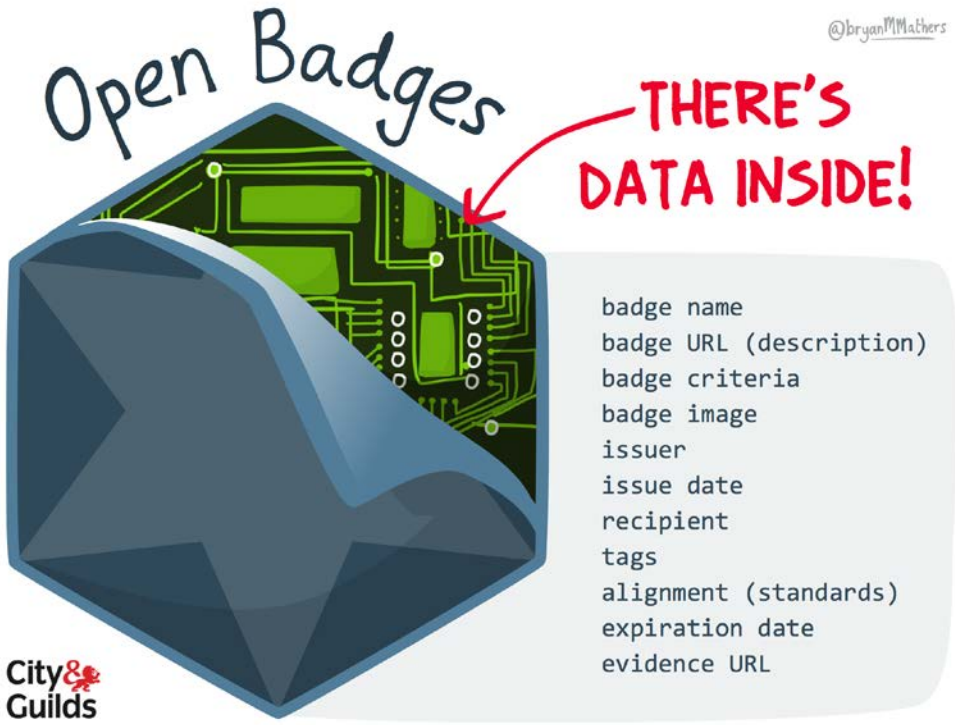
Open Badges Anatomy



URL (Description): Provides the **details of achievement**: describes the **context**, specifies the achievement, refers to **completed tasks**, explains the **assessment procedures**

Criteria: Provides **tasks** set by badge issuer to **assess** whether the learning outcomes have been **achieved** and **completed** by badge earner to **qualify** for specific badge

Image: Image **visualization** (image file)

Issuer: An **organization**, company, **institution** or private person that **issues** a badge

Date Issued: Date badge was issued

Recipient: An individual who **earns** a badge. Identified through an e-mail address

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https://www.youtube.com/watch?v=HgLLq7ybDtc&ab_channel=ChicagoArtDept

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e-Platform

Visit & Register!

http://codeskills4robotics.iit.demokritos.gr/

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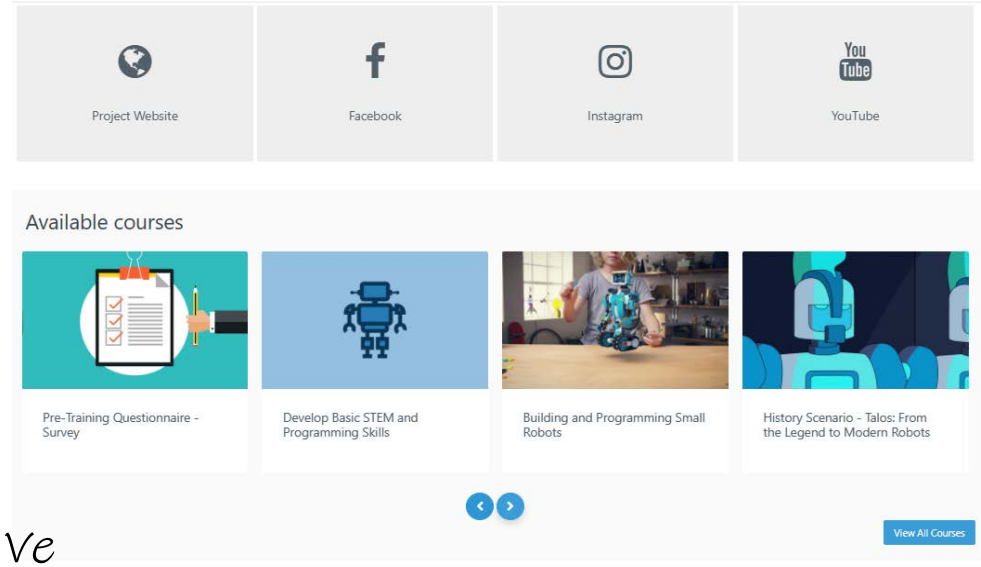
Website: **http://codeskills4robotics.eu/**

e-Platform



We also have an APP for m-Learning!

Scan the QR Code and Download our Mobile App!

http://codeskills4robotics.iit.demokritos.gr/

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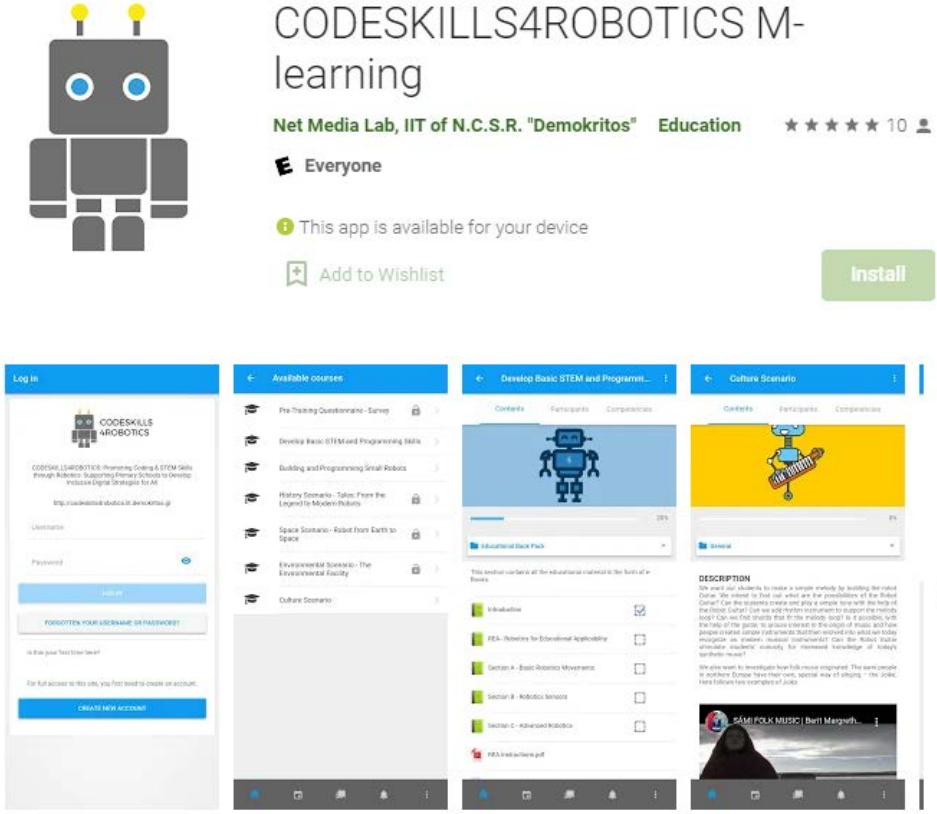
Mobile App



Scan the QRCode and download our Mobile App!

GET IT ON Google Play

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- **Present the equipment** you need to get started, which includes the equipment and the software being used. This is done in conjunction with the use of sensors, motors and gears.
- **Creating** and programming our **mobile robot** named REA with detailed instructions for **building it** with sample code and exercises which introduce
- **Present basic principles of coding** such as Sequence, Selection and Iteration as well as the use of variables.
- **Present Vernie**, a multifunctional robot which is one of the recommended builds of the Lego Boost Kit. Here you will be briefly introduced to its many functionalities, which are included in the companion software application.

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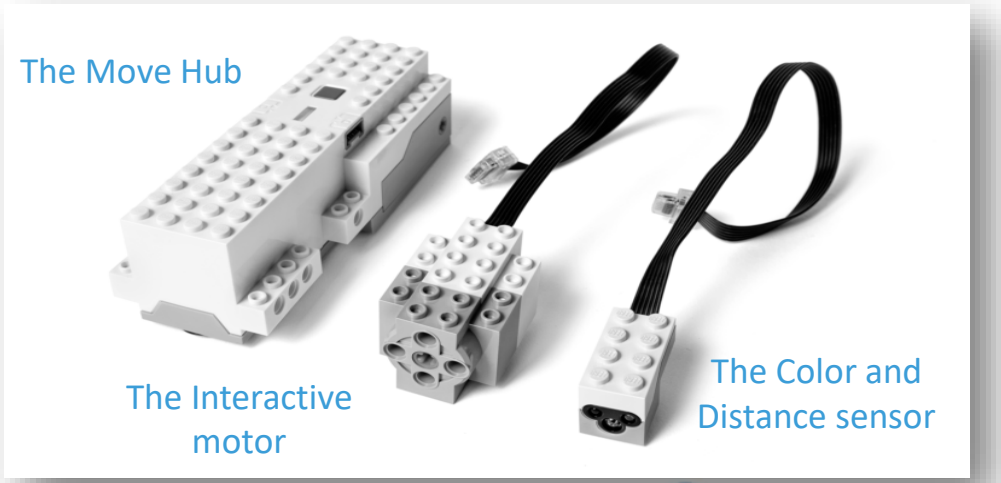
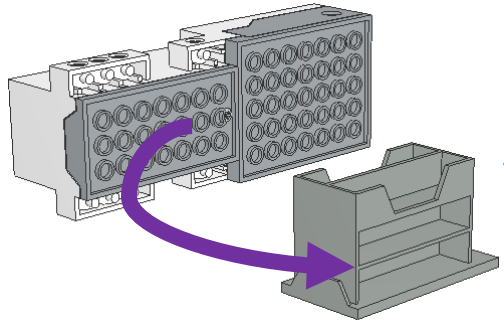
The Lego Boost Kit

The Lego Boost Kit was released by Lego in 2017. The recommended ages are 7-12 and it combines classic Lego building with intuitive programming.





The Battery compartment

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The Lego Canva

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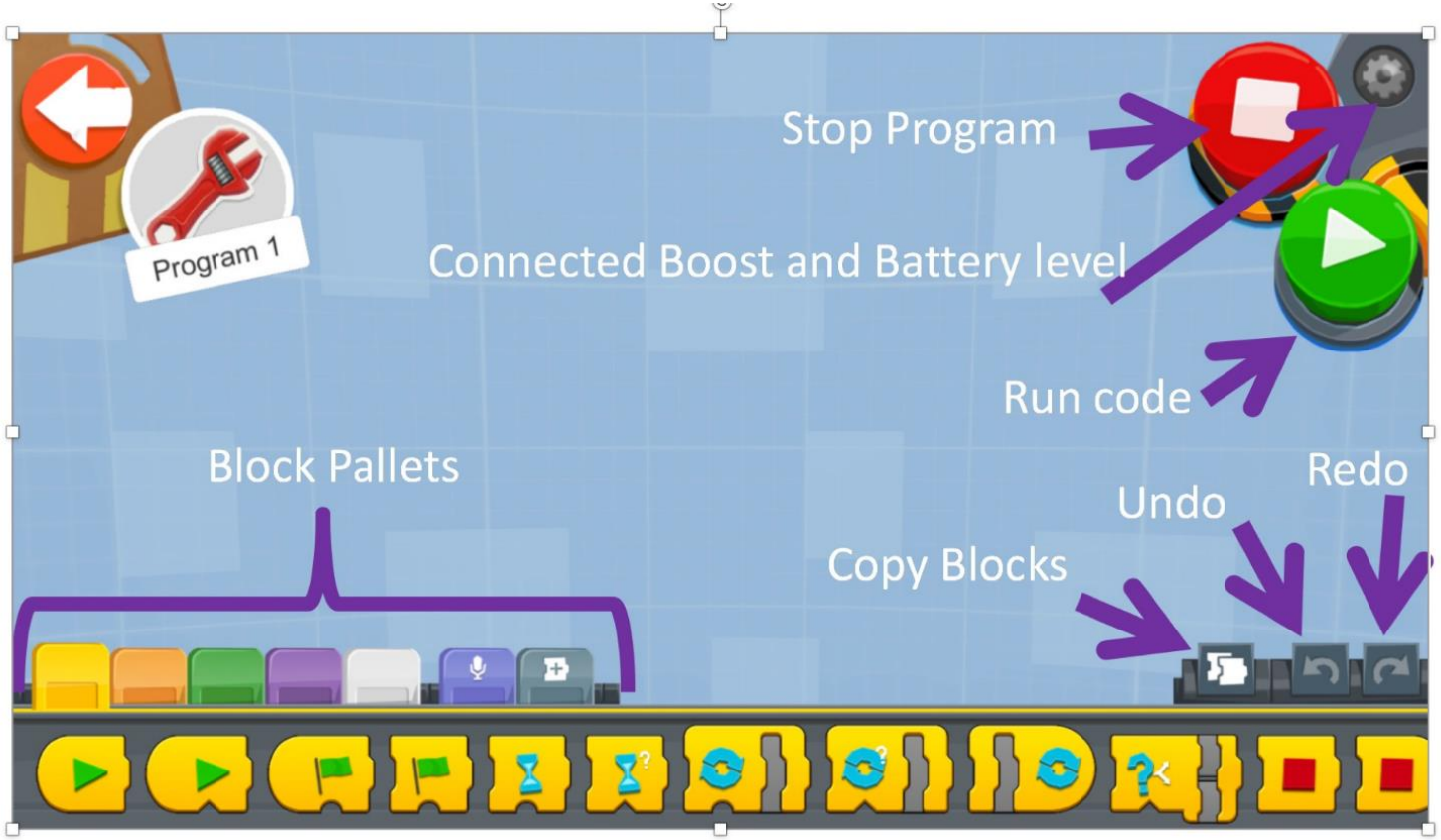
The Lego Canva



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The Block Pallets

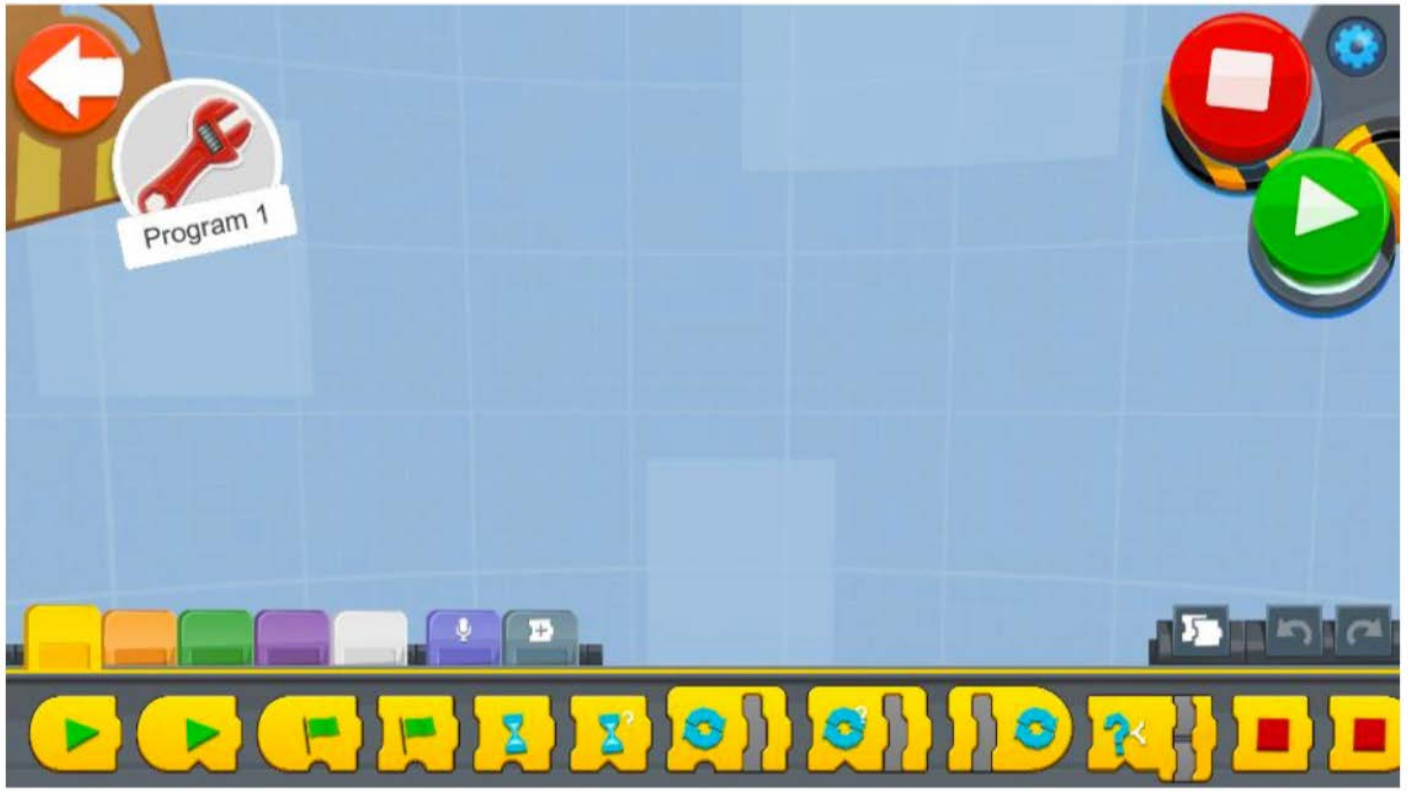

Figure 15: The Yellow Block Pallet

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The Block Pallets

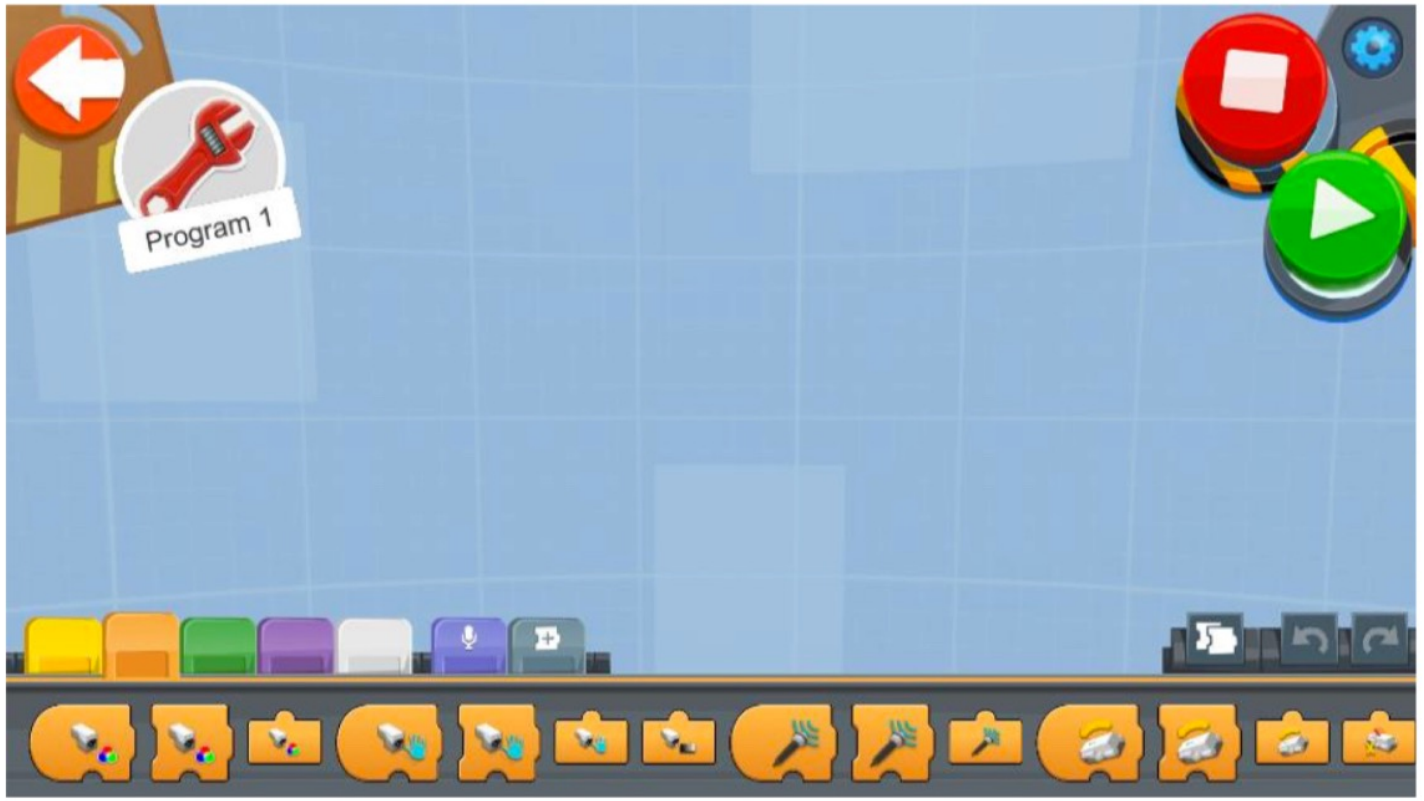

Figure 16: The Orange Block Pallet

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The Block Pallets

Figure 17: The Green Block Pallet

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The Block Pallets

Figure 18: The Purple Block Pallet

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The Block Pallets

Figure 21: Recording a sound

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The Block Pallets

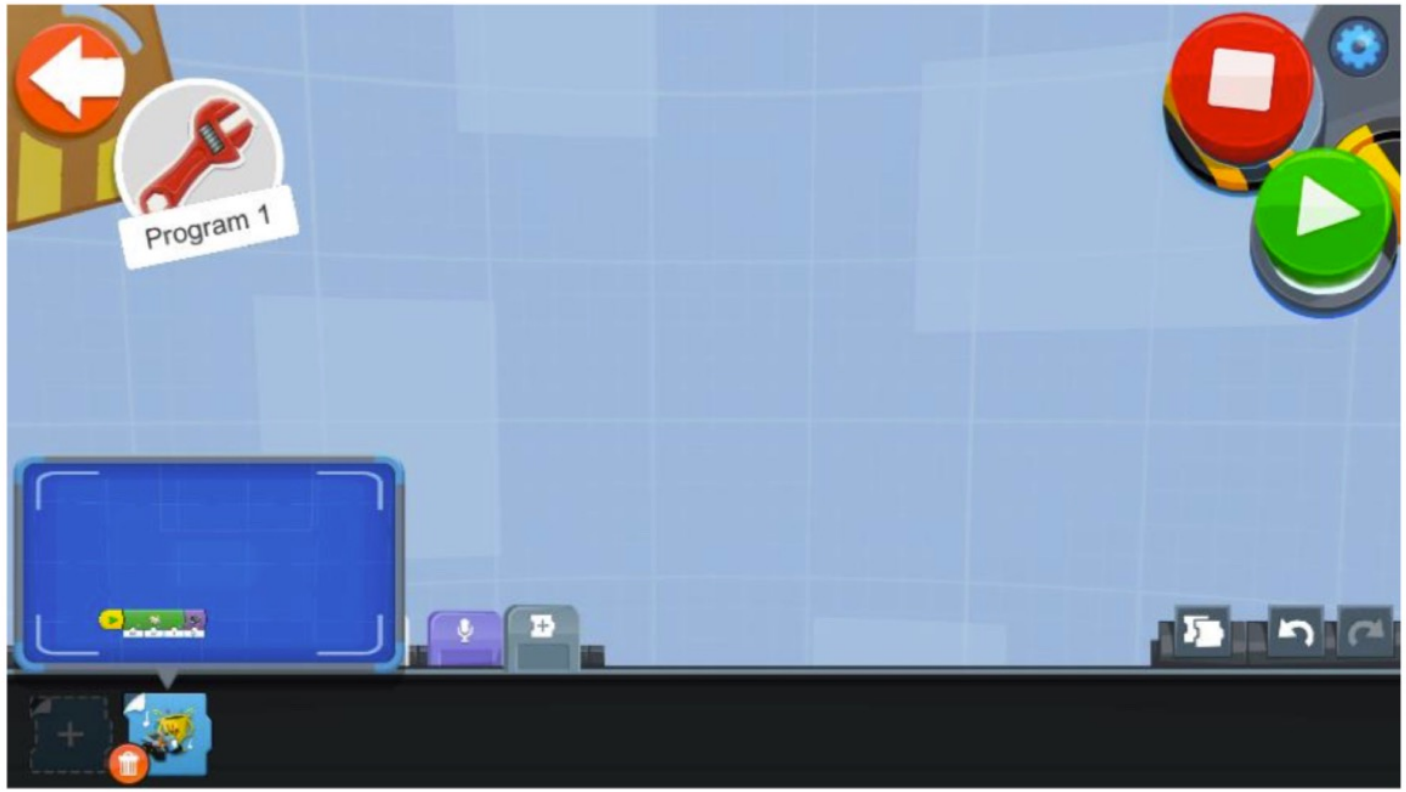

Figure 22: The Group Actions block

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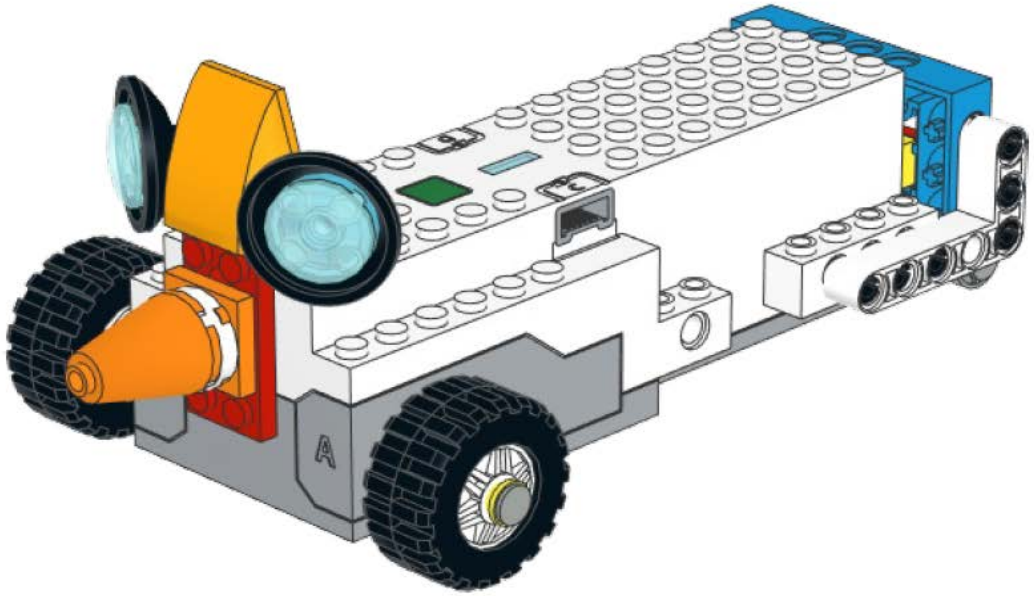
Building REA



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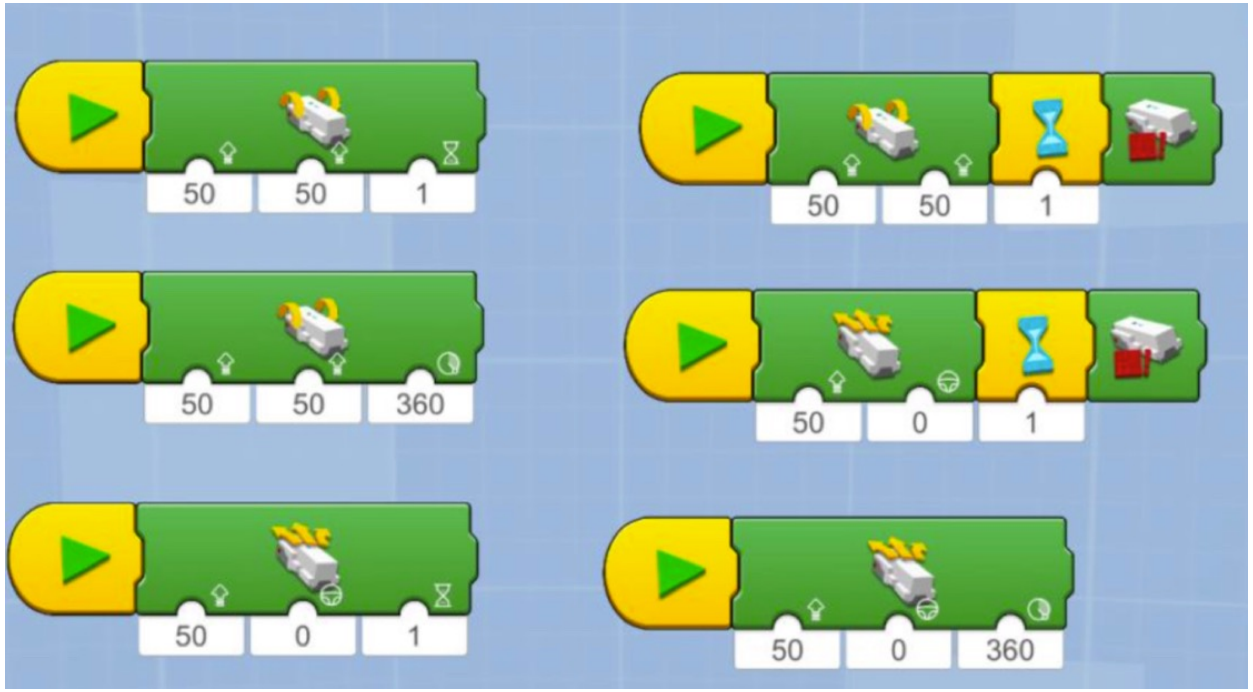
Sample Programs of Moving Blocks



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Example Exercise Sheet 1

The race for Planet Mars is on! You are required to build and test REA a robot that is capable of following a set of commands to explore the surface of the red planet.

Before we send REA into space, we must first test her thoroughly here on earth. Run the following experiments and observe how REA behaves. For this experiments a ruler will be needed for measuring distances. Do not move to the next experiment until your teacher has seen your current experiment.

- Drive REA forward for 2 degrees of the wheels. How far did your robot travel?
- Drive REA forward for 2 seconds of the wheels. How far did your robot travel?
- How many degrees will be needed for REA to drive its wheels for one full rotation?
- Drive Forward for 2 rotations of the wheels. How far did your robot travel?
- What is the circumference of the robots wheel? (Hint: You will need to measure the diameter of the wheel)
- How far will REA drive if the wheels turn 3 rotations? Do the calculations!

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Example Exercise Sheet 1

- Now program REA to move 3 rotations and measure how far it goes. Does it go as far as you expected?
- Program REA to drive forward for 5 rotations slowly and then 1800 degrees backwards as fast as possible.
- Make REA turn around a complete circle (360 degrees). What happened? How far did REA turn if you type in 360°?
- How many degrees of the wheel does REA need to turn a complete circle? (Hint: Keep experimenting until it is perfect!)
- Drive REA forward for 50 cm, turn around 180° and drive back to where you started. What should the duration be to go forward 50 cm? (Hint: Have a look at the circumference of your wheel, this will tell you how far your robot goes in 1 rotation)
- Make your robot drive in a 'figure of 8' (Hint: Create a diagram first like the examples below before you start programming. Don't forget to mark your starting point so each effort starts exactly at the same point!)

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Example Exercise Sheet 1

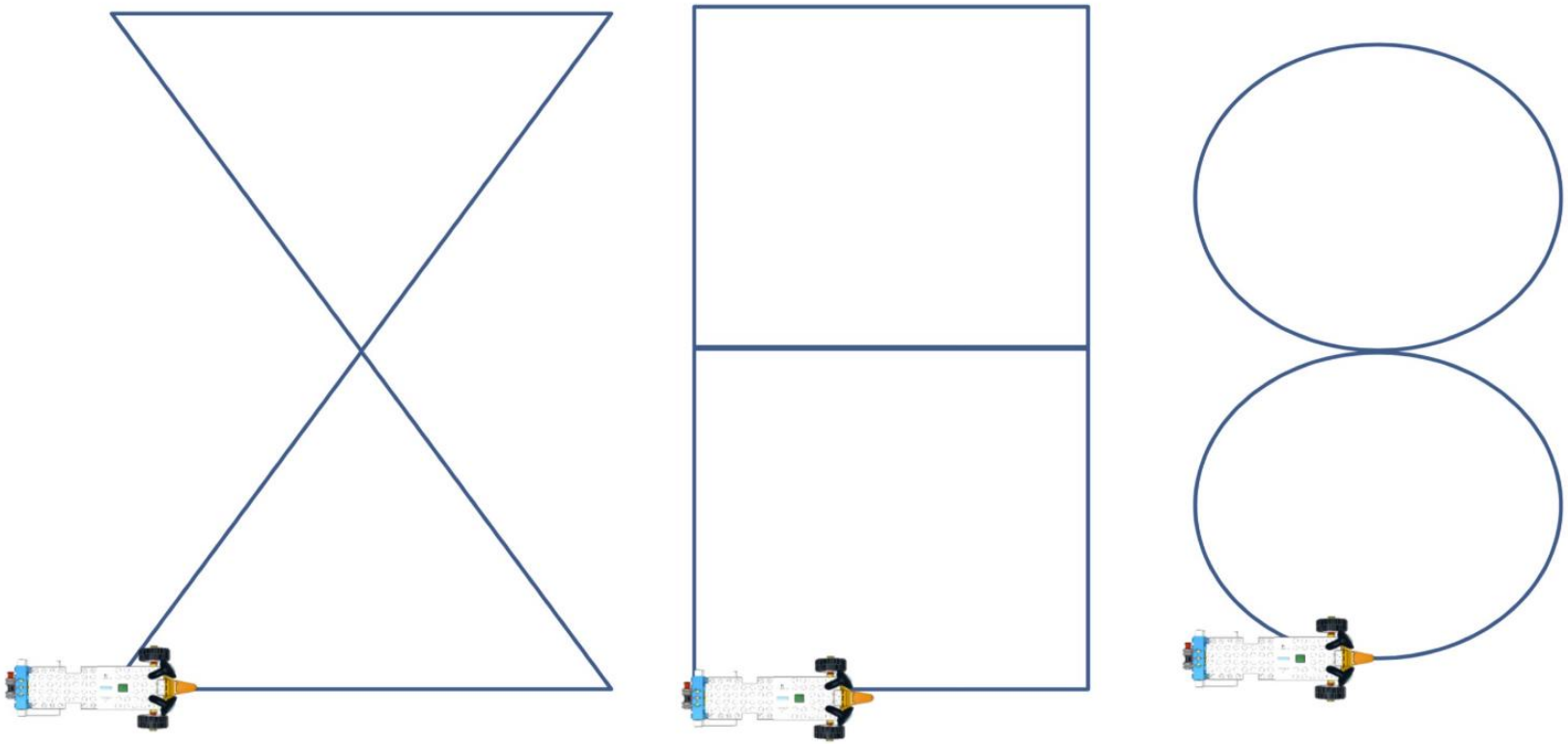

Figure 28: Sample diagrams for moving REA

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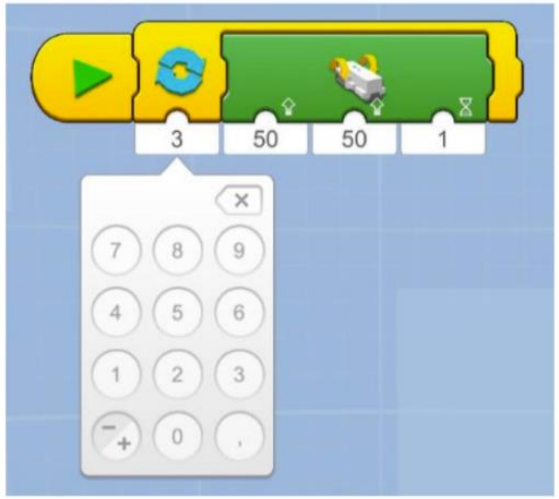
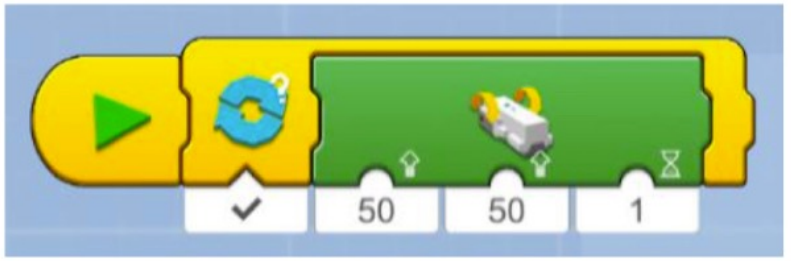
Loop Blocks

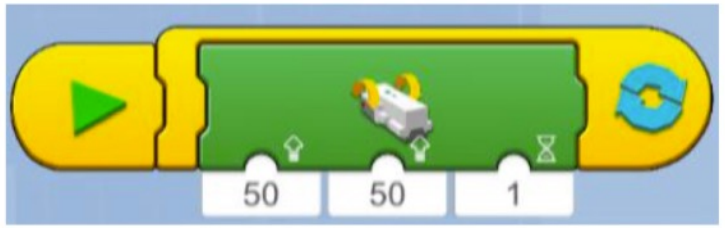
Loop While True:



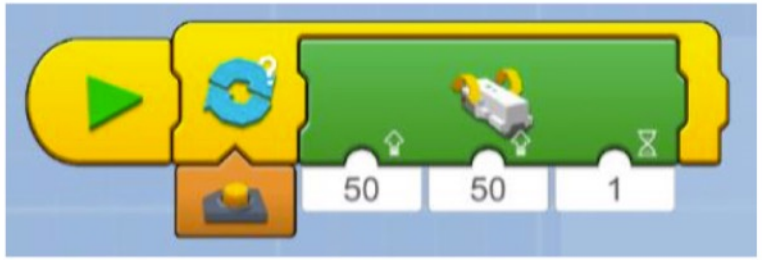
Loop While True:



Loop Forever:



Loop when an action is performed like the push of a button:



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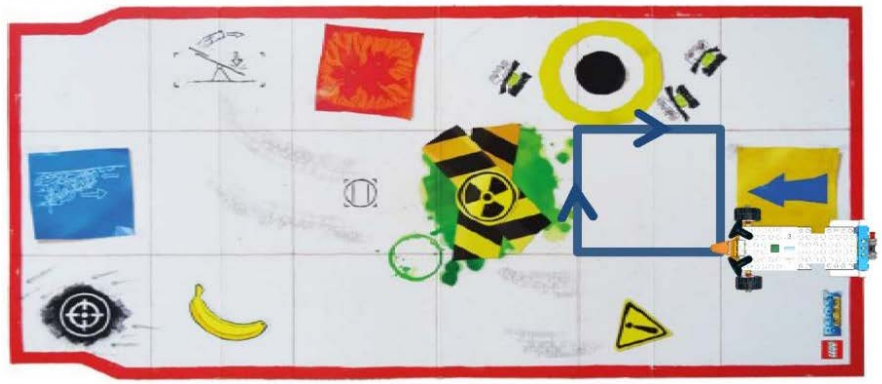
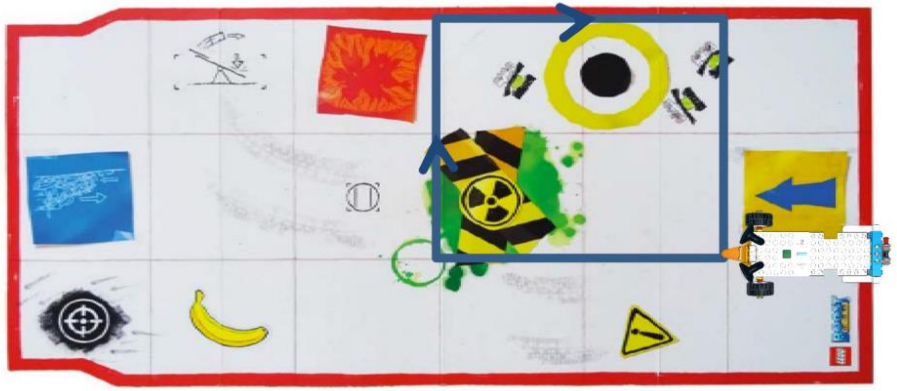
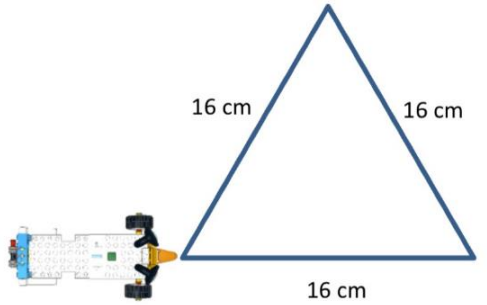
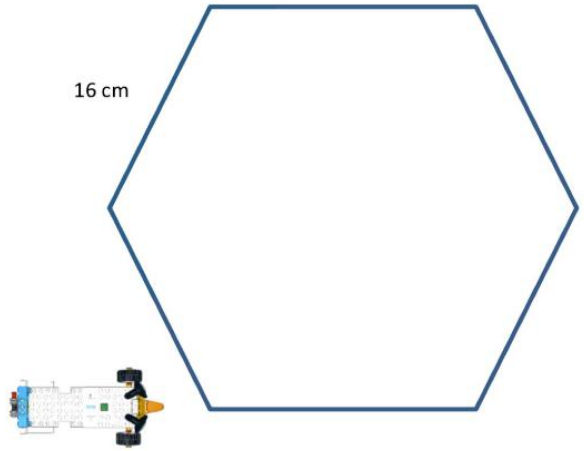
Example Exercise Sheet









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Building the Sensor

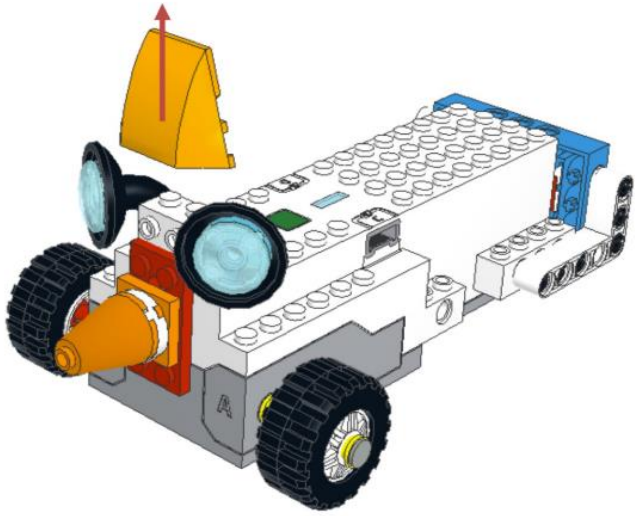
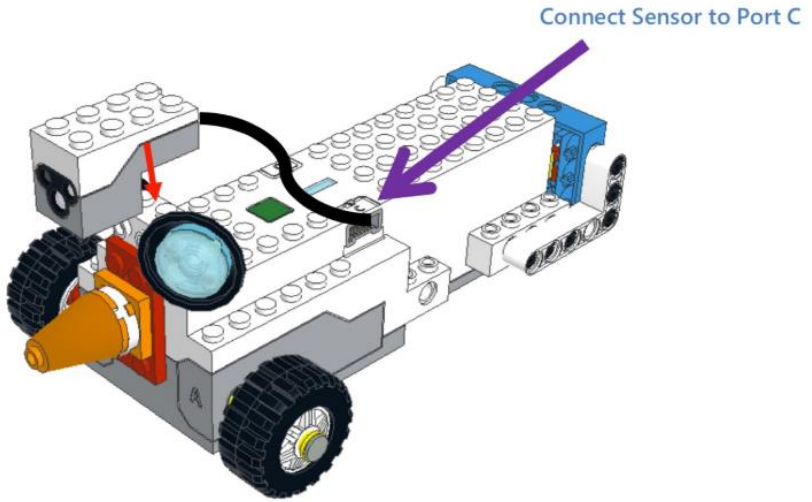
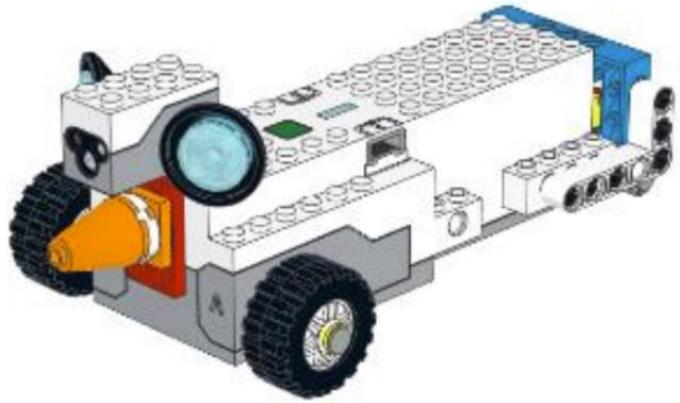


Figure 35: REA the explorer





Color and Distance Sensor

Figure 36: The Colour and Distance sensor

How the Sensor Works:

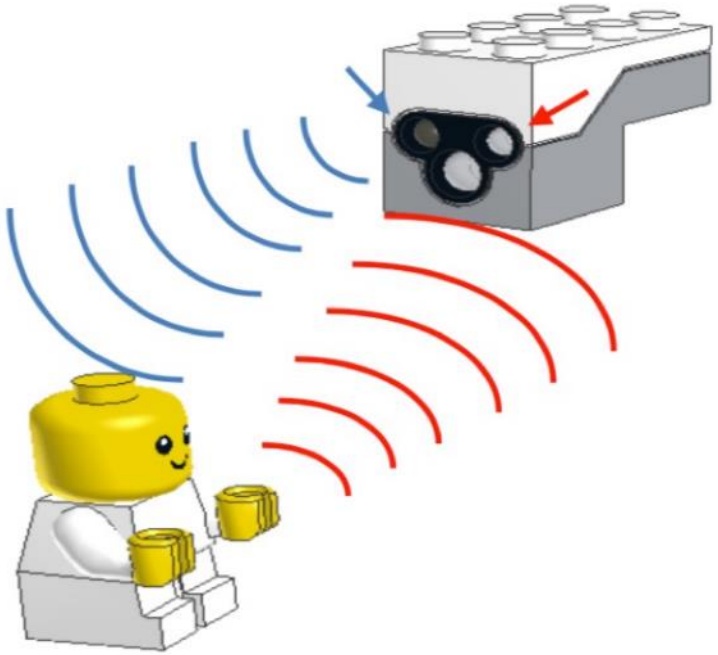


Figure 37: Sending/Receiving an infrared signal

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The Detecting Objects Blocks

Trigger on Distance Block - Triggers when the distance measured by the sensor is less than the distance indicated by the value under it. When triggered it executes the sequence of code which follows. It can take values from 0 to 10.

Sensor Distance Reporter - Displays in real time the current distance measured by the sensor. In order to be used in a program it needs to be attached to the bottom of other blocks. It can take values from 0 to 10.

Wait for Distance - Waits for the distance measured by the sensor to be less than the distance indicated by the value under it. When an object is not closer than the value indicated, the program stays paused and when the condition is met the program continues to the following sequence of instructions. It can take values from 0 to 10.

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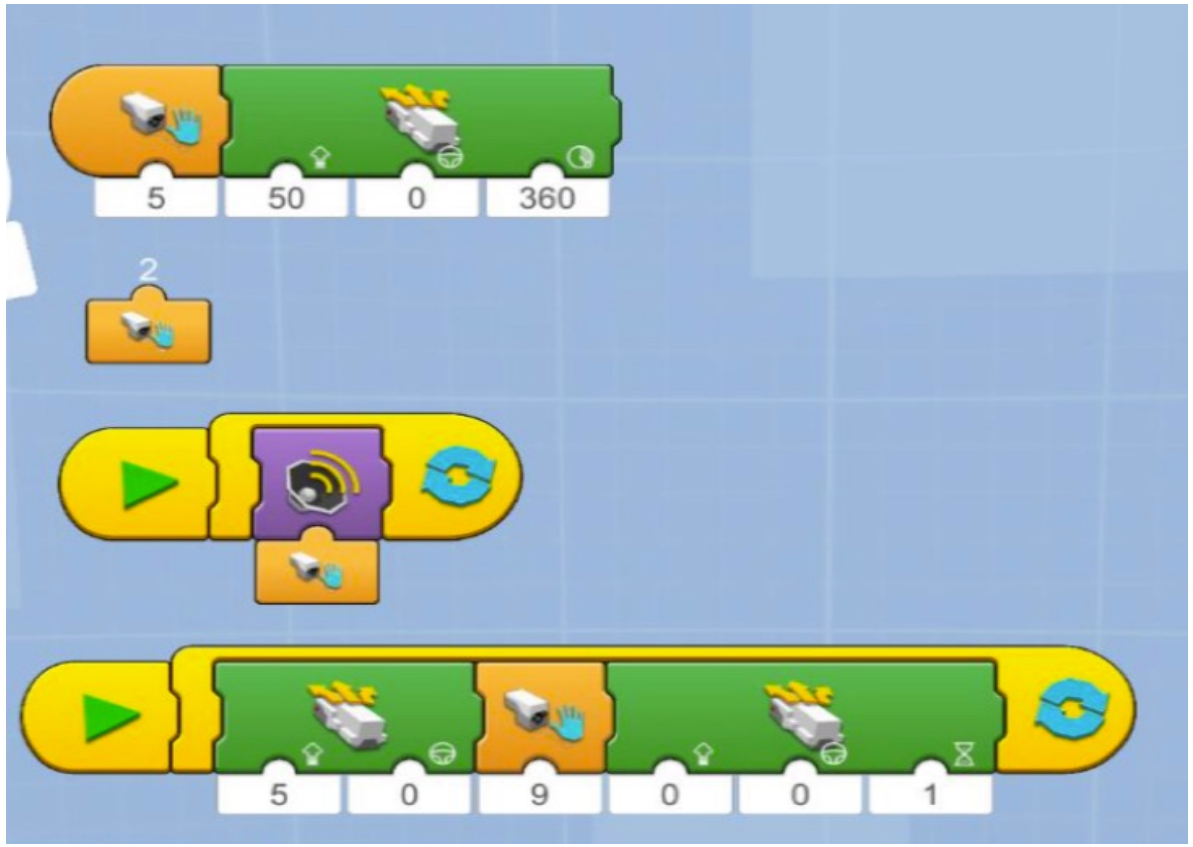
Sample Programs of Detecting Obstacles



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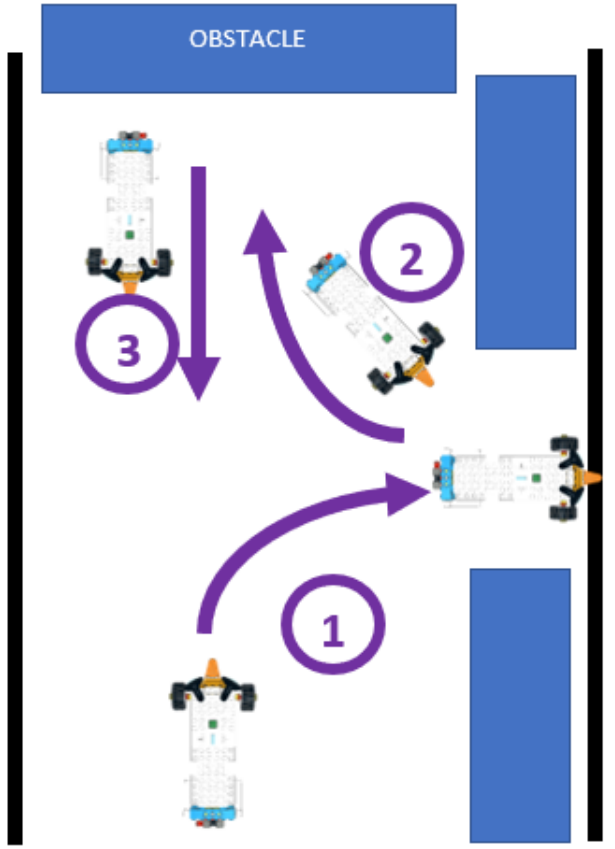
Example Exercise Sheet

1. Take a ruler and measure the distance of an object from the LEGO BOOST Color and Distance sensor. Use the **Sensor Distance Reporter** block and note down the corresponding distance. Try and find what the distance 1 to 10 means in the real world in centimeters.

2. Move the sensor at the back of REA. Try and do a 3-point turn with an obstacle at the back. The following schematic will give you an idea on how this problem can be solved.

3. Create a straight track with obstacles. You can use objects found in the classroom. REA should drive forward and when an obstacle is found try and avoid it and then return to the track.

4. Move the sensor so it will face downwards. Try and create a program which will stop REA from falling from the edge of a desk.



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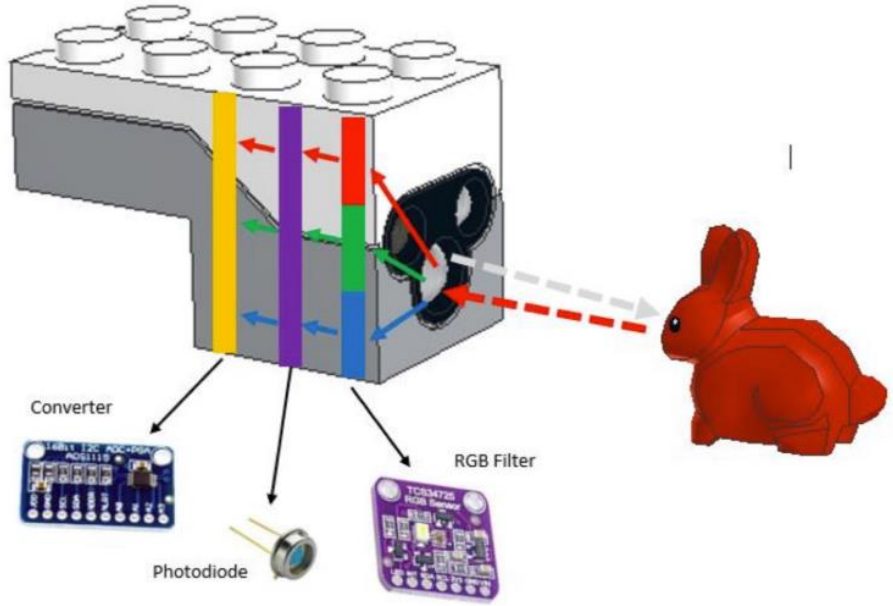
Detecting Colors

How the sensor works:

The color sensor works by shining a white light at an object and then recording the reflected color. It can also record the intensity of the reflection (brightness). Through red, green and blue color filters the photodiode converts the amount of light to current. The converter then converts the current to voltage which our Lego Hub can read and presents it on our screen.



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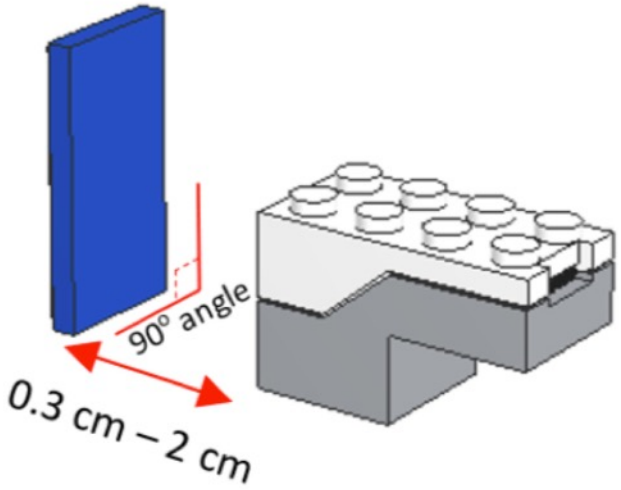
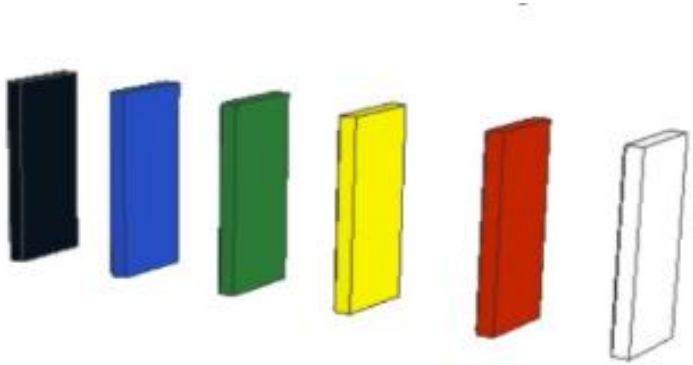
Detecting Colors





The sensor has to be at a distance of 0.3 cm to 2 cm and at a 90 angle from an object in order to correctly detect the color.

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The Detecting Colors Blocks

Trigger on Color - Triggers when the color measured by the sensor is equal to the color indicated by the value under it. When triggered it executes the sequence of code which follows. It can take seven values: No color, Black, Blue, Green, Yellow, Red and White.

Wait for Color - Waits for the color measured by the sensor to be equal to the color indicated by the value under it. When the color detected is not equal to the value indicated, the program stays paused and when the condition is met the program continues to the following sequence of instructions. It can take seven values: No color, Black, Blue, Green, Yellow, Red and White.

Sensor Color Reporter - Displays in real time the current color measured by the sensor. In order to be used in a program it needs to be attached to the bottom of other blocks. It can show seven values: No color, Black, Blue, Green, Yellow, Red and White.

Sensor Light Level Reporter – Displays in real time the **current ambient light level measured by the sensor**. In order to be used in a program it needs to be attached to the bottom of other blocks. It can indicate values from one to ten. One being the darkest and ten being the brightest.

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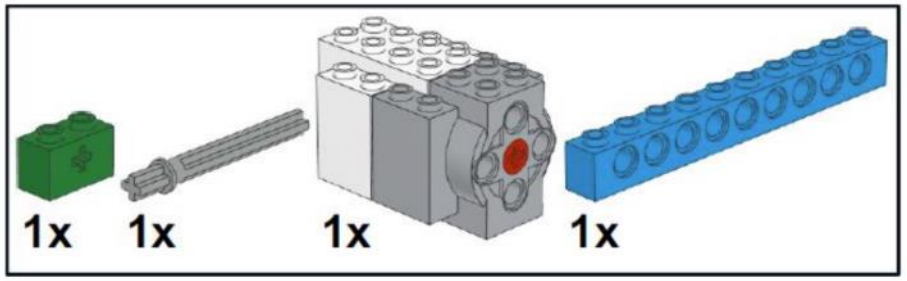
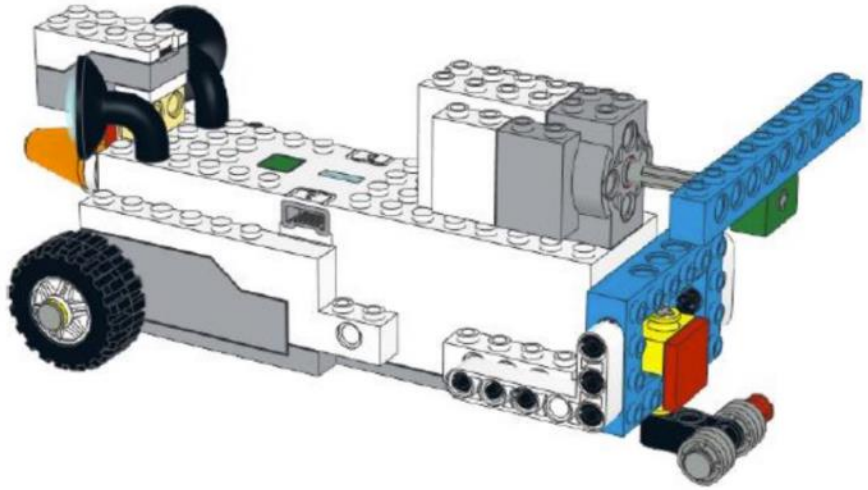
Sample Programs of Detecting Colors





We will first need to install the interactive motor before we see the detecting colors programs.

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Sample Programs of Detecting Colors

Program - Detecting Colors

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The If/Else Blocks

The **If/Else** statement allows REA to easily make decisions based on the inputs from the sensor. **If** a condition is met (meaning it is **TRUE**) REA will execute a specific block of code. **Else** if the condition is not met (meaning it is **FALSE**), REA will execute another block of code.

If/Else - If a condition is True then execute the top sequence, else if it is False execute the bottom sequence.

Equal Operator - Returns True when an input from a sensor (color/distance/ambient light) is equal to a value.

Less Than Operator - Returns True when an input from a sensor (color/distance/ambient light) is less than a value.

Greater Than Operator - Returns True when an input from a sensor (color/distance/ambient light) is greater than a value.

Not Equal Operator - Returns True when an input from a sensor (color/distance/ambient light) is not equal to a value.

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Example Exercise Sheet

1. Using the Boost playmat set a square where the goal of REA will be to reach. When REA detects:
    - **Green** - she should move one square block forward.
    - **Blue** - she should make a 90° turn to the right.
    - **Yellow** - she should make a 90° turn to the left.

Add playmat.

2. Traffic lights
    - **Green** - Go
    - **Orange** - Slow Down speed
    - **Red** - Stop
3. Try using the **if** blocks this time and recreate the first 2 exercises. ***Note to teacher:** Nested **if** will be needed.

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Example Exercise Sheet

1. Cover REA with a box so no light goes to Rea's sensor. When the box is removed REA should move forward for 1 second.
2. Take a cardboard which can fit REA in and allow REA to move around herself 360o on the spot. Punch a hole or create a door from where light can get to the sensor. REA should start rotating and when the sensor senses light REA should stop moving.

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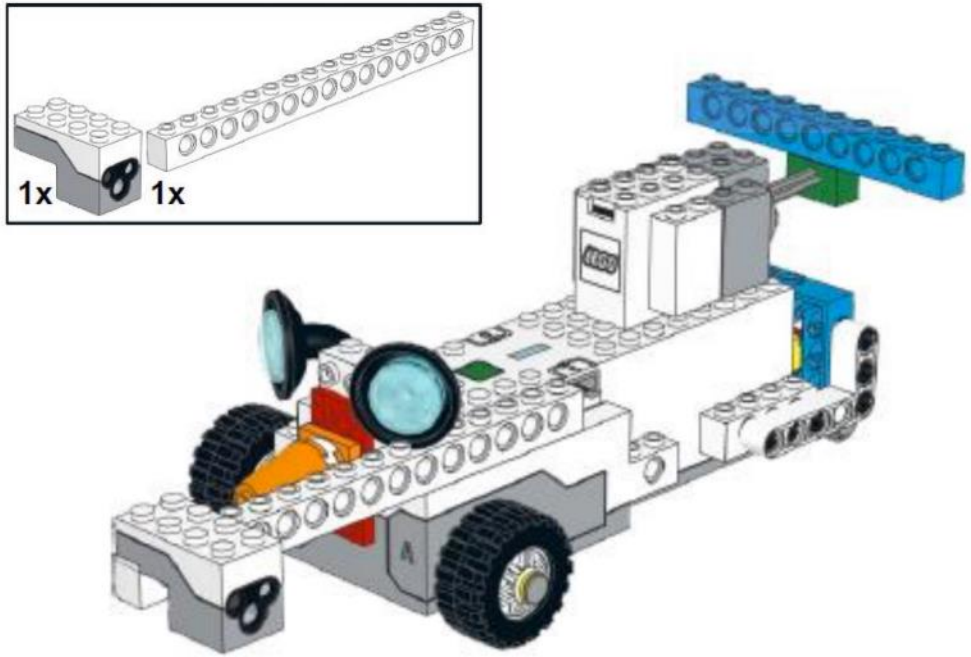
Following Walls

Building the Sensor



Create a track with walls where REA will be moving in:

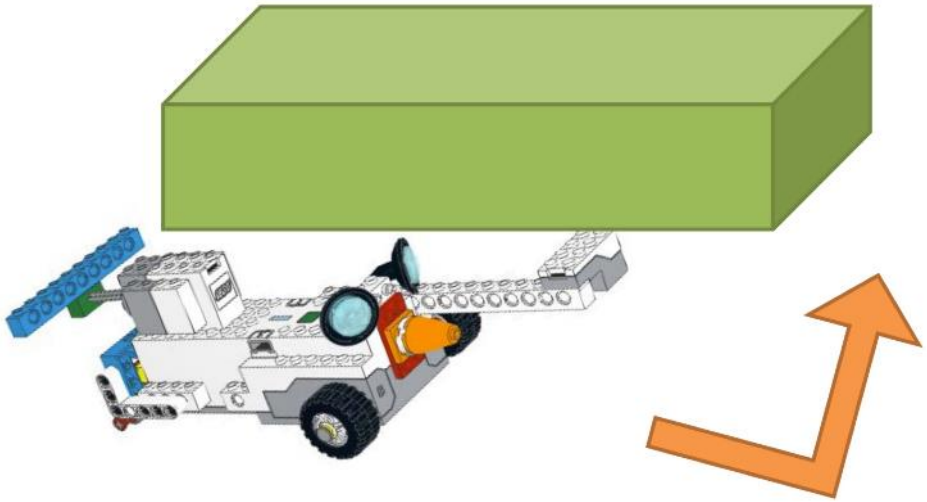
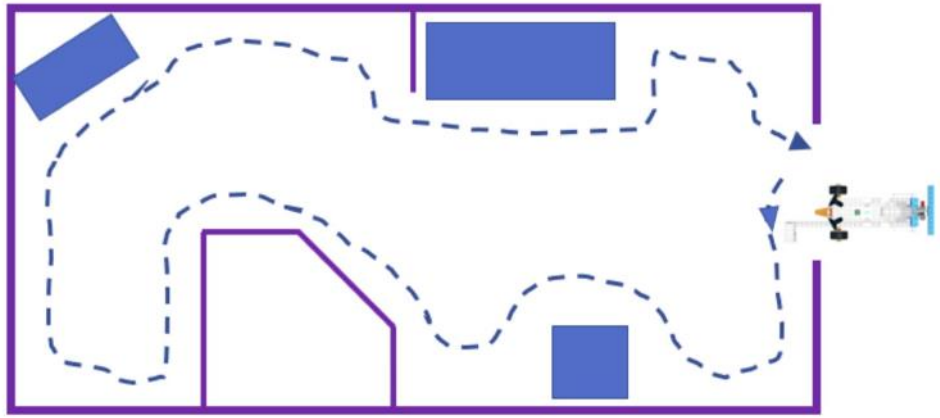


Figure 44: REA with the distance sensor

Following Walls



Program - Following Walls

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Example Exercise Sheet

1. Try and modify the above code so that REA can finish the track you created faster!

- Experiment with increasing and decreasing the amount for comparison in the **Less than Operator**.
  - What happens when 5 is decreased?
  - What happens when 5 is increased?
- Experiment with increasing and decreasing the **speed** of REA.
  - What happens when the speed is decreased?
  - What happens when the speed is increased?
- Experiment with increasing and decreasing the **angle** which REA turns.
  - What happens when the angle is decreased?
  - What happens when the angle is increased?

Record the settings you have made changes to. Try and figure out the best settings for your robot to reach the end of the track at the least amount of time.

2. Modify REA's Sensor location so it will follow the edge of a table, you will need to make changes on REA's program also.

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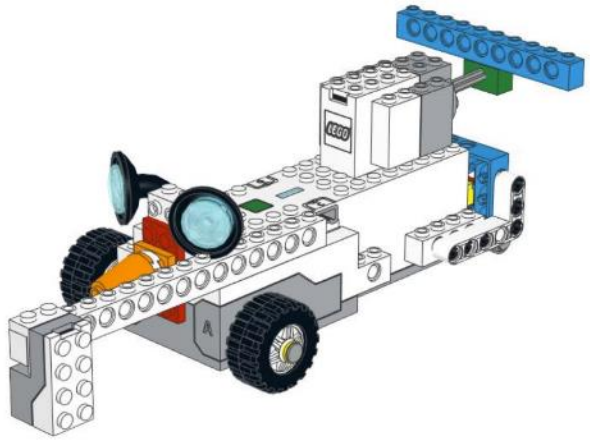
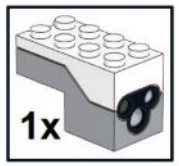
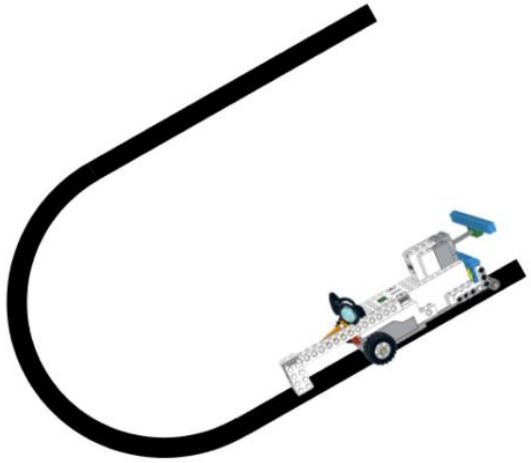
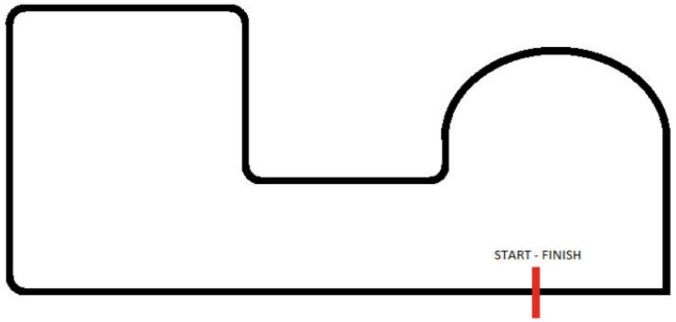
Follow the Line

Building the Sensor









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Follow the Line:
Take Measurements

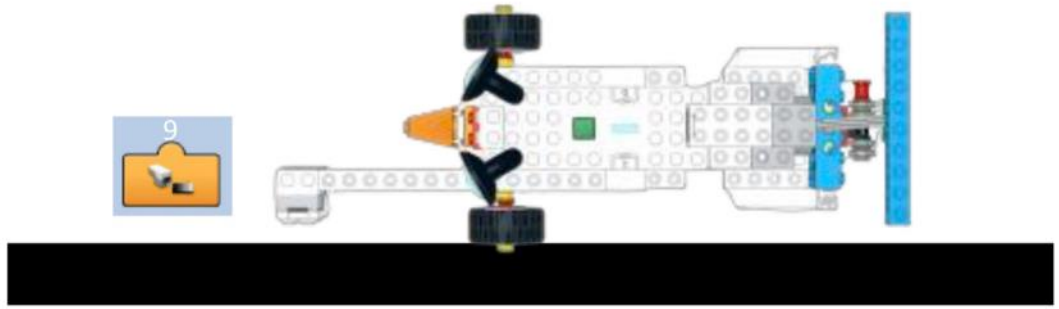

Figure 53: Follow the line - Take 2 measurements on the white background

Figure 52: Follow the line - Take 2 measurements on the black line

Figure 51: Follow the line - Take one measurement

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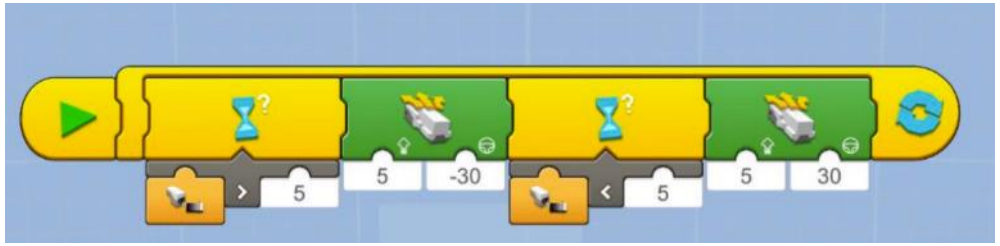
Follow the Line:
Take Measurements



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React on Sound

Trigger on Sound Level - Triggers when the sound level measured by the sensor is greater than the sound level indicated by the value under it. When triggered it executes the sequence of code which follows. It can take eleven values from 0 – 10.

Wait for Sound Level - Waits for the sound level measured by the sensor to be greater than the sound level indicated by the value under it. When the sound level detected is not greater than the value indicated, the program stays paused and when the condition is met the program continues to the following sequence of instructions. It can take eleven values from 0-10.

Sound Level Reporter - Displays in real time the current sound level measured by the sensor. In order to be used in a program it needs to be attached to the bottom of other blocks. It can show values from 0-10 including one decimal values, for example 7,8.

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Sample Programs for Detecting Sound

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REA under Remote Control

Joystick Widget Show - Presents the Joystick Widget in the Lego BOOST App when this block is activated.

Joystick Widget Hide - Hides the Joystick Widget from the Lego BOOST App when this block is activated.

Joystick Widget Speed Reporter - Displays in real time the current Joystick Widget speed (-100..100). In order to be used in a program it needs to be attached to the bottom of other blocks. In most cases it used as the steering input to a Drivebase Move Steering block. It can show values from -100 to 100 including two decimal values, for example 78,89.

Joystick Widget Steering Reporter - Displays in real time the current Joystick Widget steering (-100..100). In order to be used in a program it needs to be attached to the bottom of other blocks. In most cases it used as the speed input to a Drivebase Move Steering block. It can show values from -100 to 100 including two decimal values, for example 78,89.

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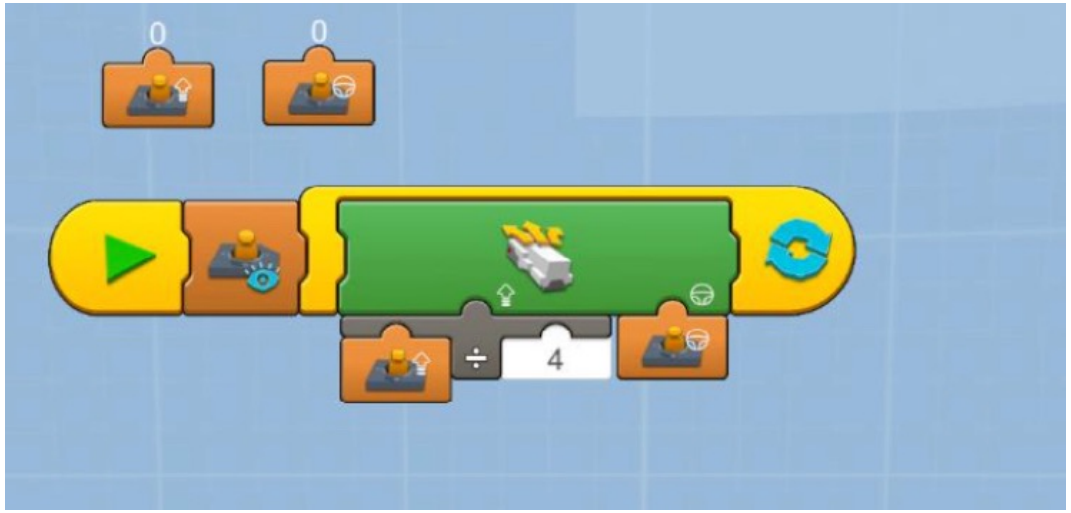
Sample Programs for Remote Control



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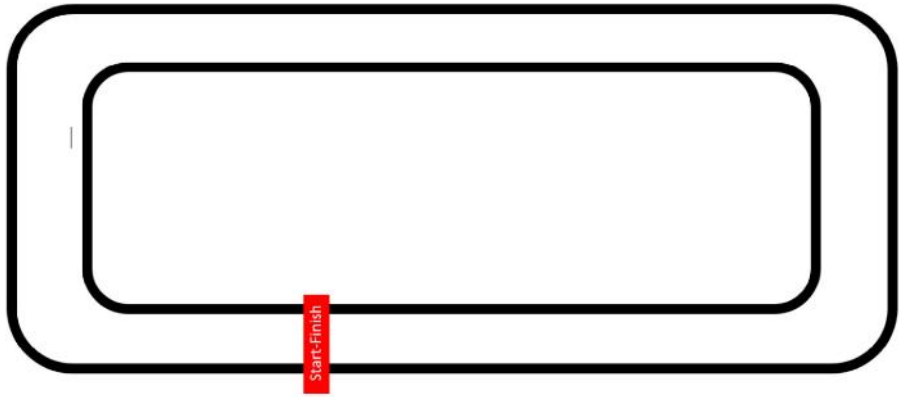
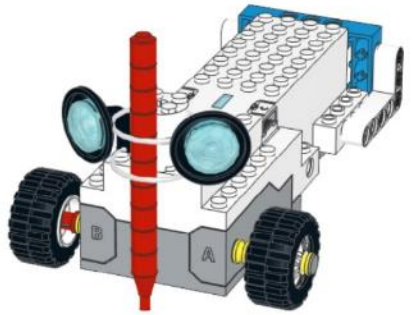
Example Exercise Sheet

Race on a track! Prepare for a race with your classmates. Create a race track in your classroom with different objects available to you. Take control of REA and navigate through the curves and straight lines. Here is an example of a track but you can always use your imagination and create a different one!





Let us modify REA and add a pen/marker then with the help of the joystick of the Boost App try and write your name initials on a piece of paper. You can follow the instructions provided or you can also think of other ways for adding the marker.

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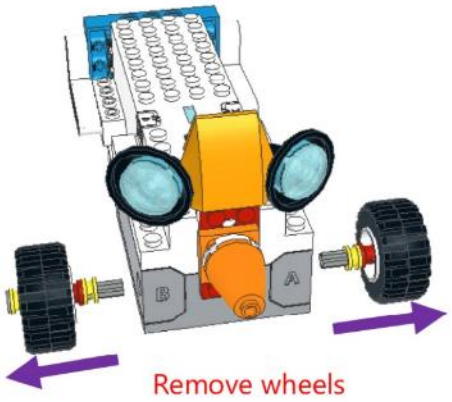
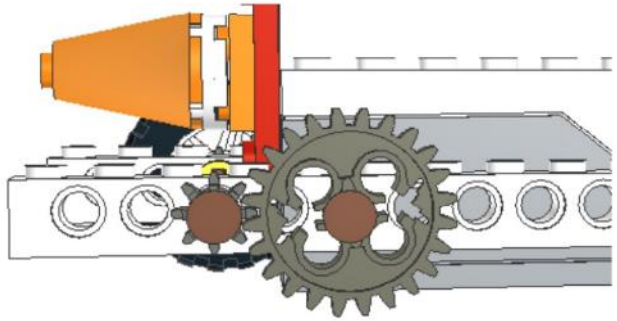
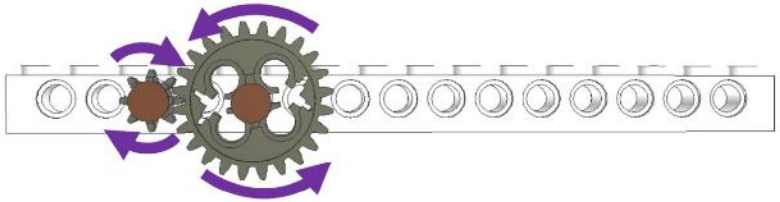
Geared Up REA







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Geared Up REA

Exercise:

With a timer and a ruler measure the time taken for REA and Geared Up REA to complete the distances indicated and fill in the table

	Distance	REA time	GEARED UP REA time
1.	30 cm		
2.	40 cm		
3.	50 cm		
4.	60 cm		
5	70 cm		

What do you observe?

How much faster is Geared Up REA in comparison with normal REA?

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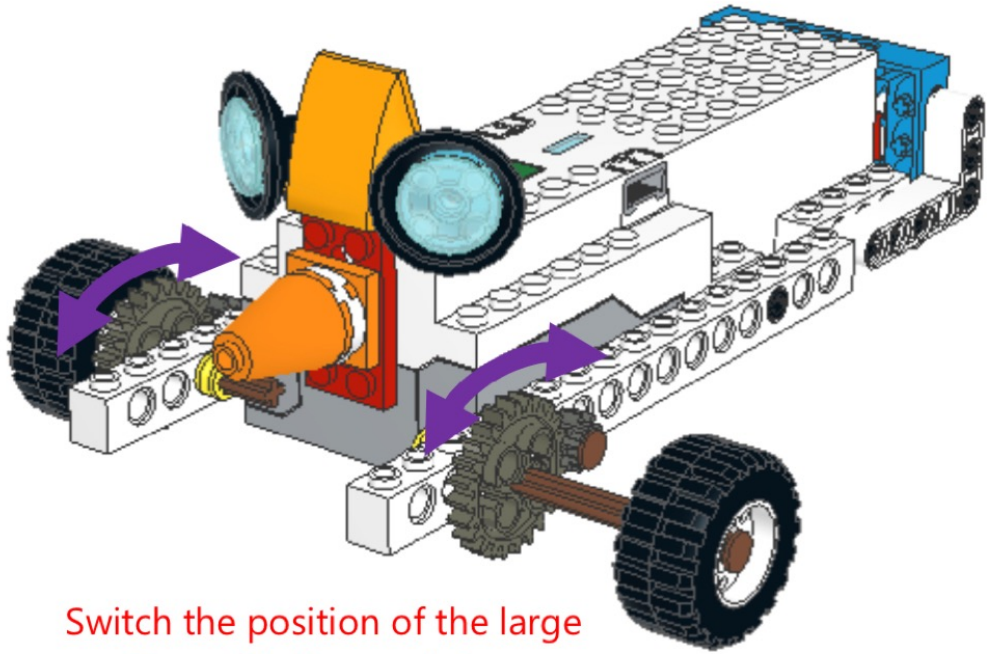
Geared Up REA



Switch the position of the large
Gear with the small Gear

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Geared Down REA:
Exercise

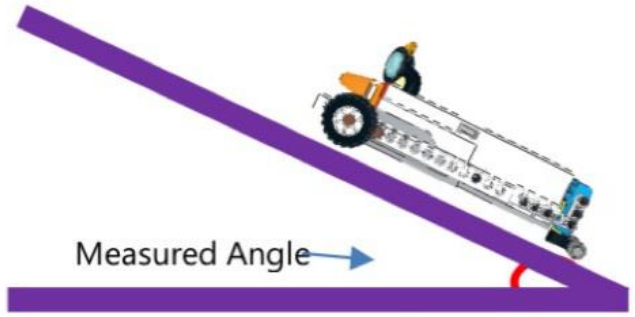

Figure 65: Exercise - Measure the Angle

Take a piece of flat wood big enough for REA to move on and add some books in order to create an angled incline. Use a protractor to measure the angle and compare the angles for REA and Geared Down REA which they can climb. Complete the following table.

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Geared Down REA:
Exercise

	Angle in Degrees	REA time	GEARED UP REA time
1.	10		
2.	15		
3.	20		
4.	25		
5	30		
6	35		
7	40		
8	45		
9	50		
10	55		
11	60		
12	65		

- What do you observe?
- What is the maximum angle Geared Up REA can climb and what is the maximum for normal REA?

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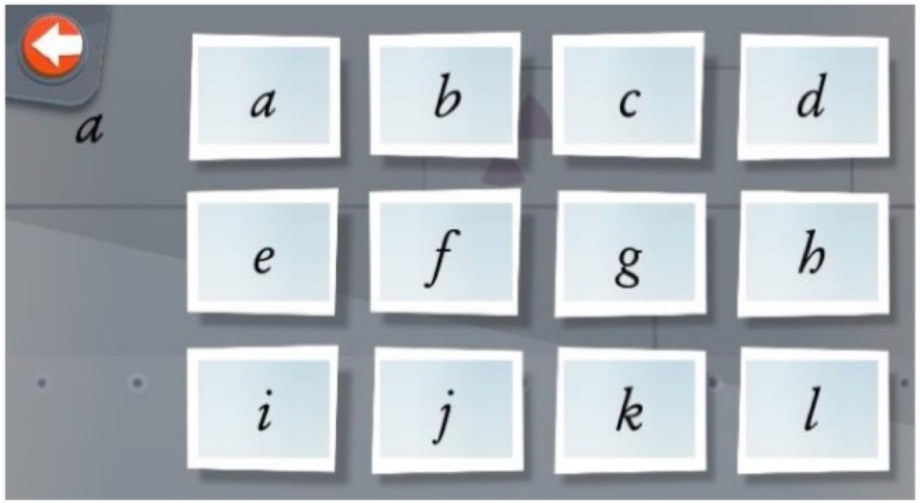
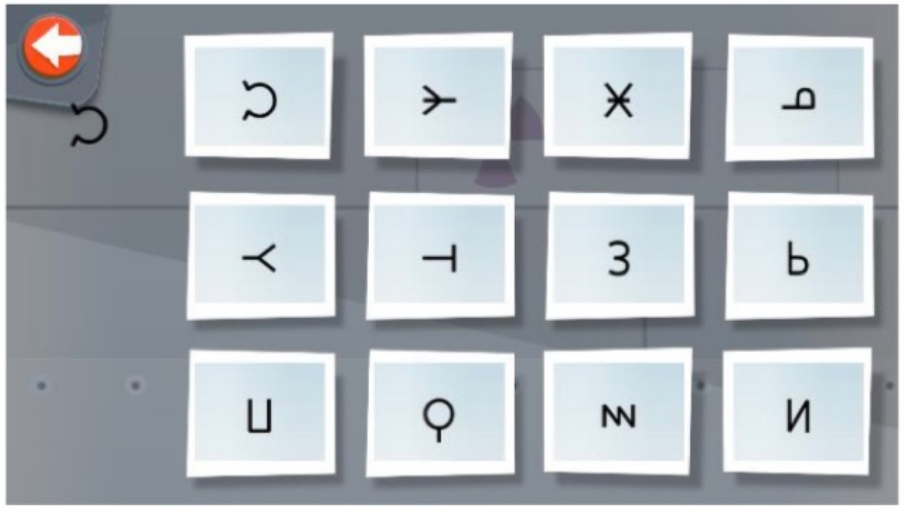
Maths & Calculations

The Lego Boost App gives you the option to name the container-memory with the use of only one letter of the English alphabet or a symbol of a different symbolic alphabet.





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Maths & Calculations

Variable Write Local - Updates the local variable to store the number indicated.

Variable Read Local - Displays in real time the number sored in the local variable.

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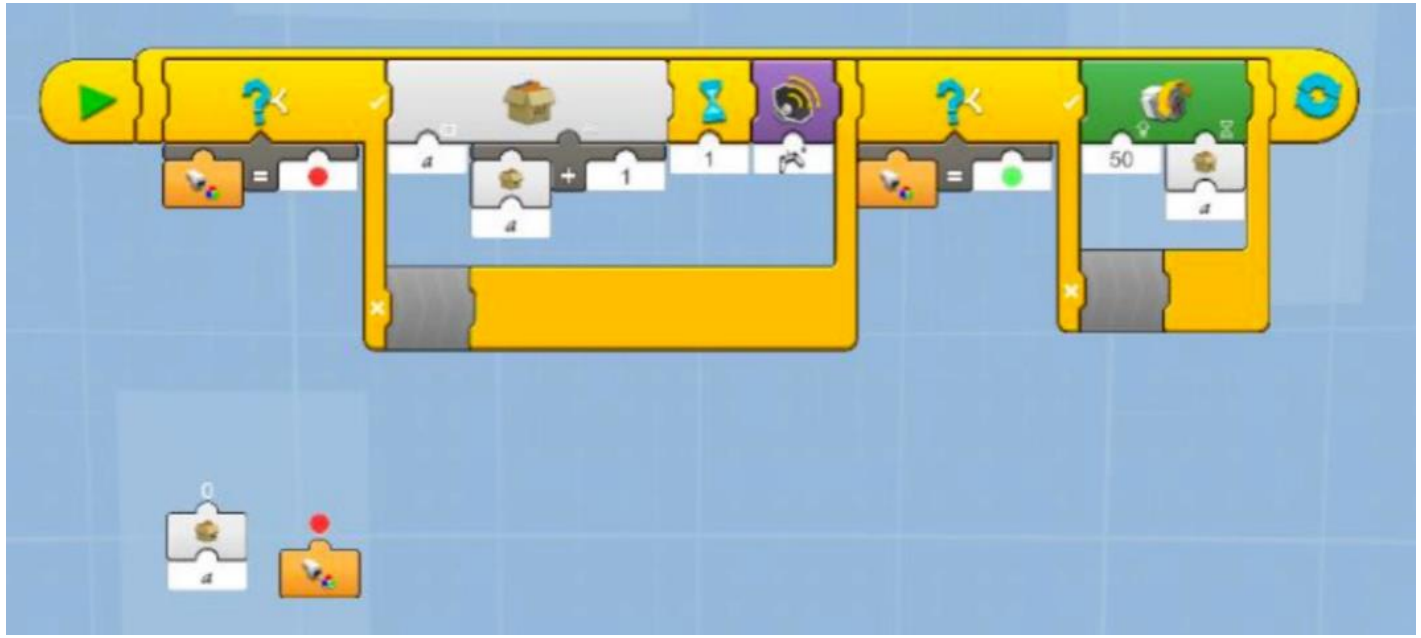
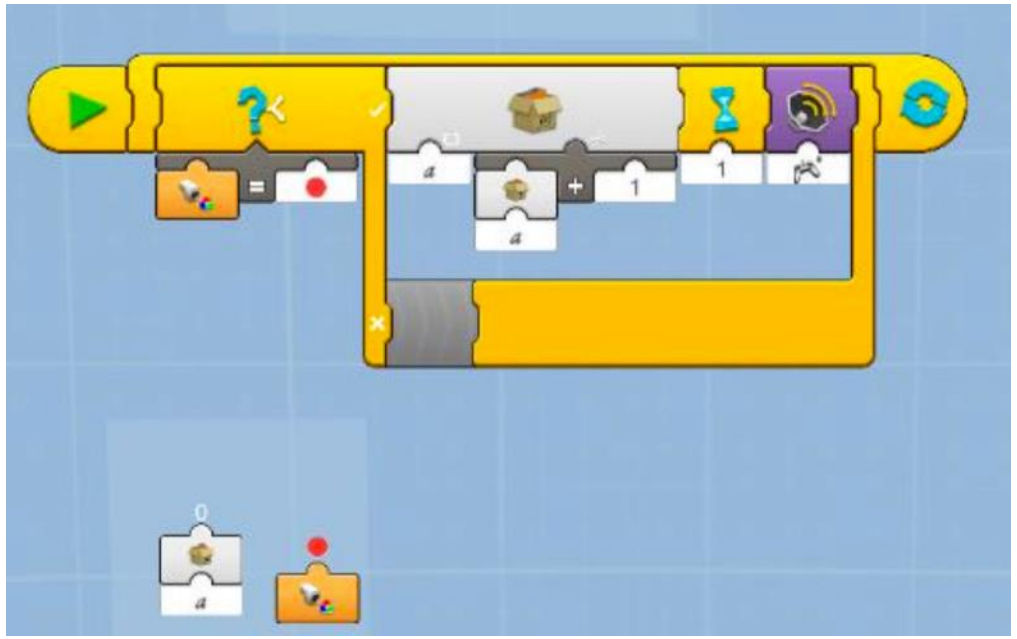
Sample Programs for Maths & Calculations





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Example Exercises

Having in mind the previous example programs create a program which when:

a) **RED** color is detected to add 1 in variable “a”

b) **GREEN** color is detected to subtract 1 from variable “a”

c) **WHITE** color is detected to multiply by 2 the contents of variable “a”

d) **BLUE** color is detected to divide by 3 the contents of variable “a”

Create a program which stores how many squares in the play mat REA can move forward. For example, if the content of the variable used is 3 REA has to move 3 squares forward.

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Vernie the Robot

- Can move forward and backwards (parameters to set up: speed, distance, time)
- Able to turn to the left and right (parameters to set up: angle)
- It can play sounds and talk (parameters to set up: sound, duration)
- Can react to sounds (parameters to set up: sound level)
- Able to import recorded (customized) sounds
- Can lift up and down its arms, each arm and both
- It can turn its head left and right
- Can identify colors (parameters to set up: color)
- Can identify objects by distance (parameters to set up: distance)

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M.T.R.4

- It can move forward and backwards (parameters to set up: speed, distance, time)
- Able to turn to the left and right (parameters to set up: angle)
- Grabber arm can lift up & down and pick up & toss things
- Is able to push small objects forward
- Its sensor can identify objects by distance (parameters to set up: distance)
- It can sense colors (parameters to set up: color)
- It can react to sounds (parameters to set up: sound level)
- It can play different sounds (parameters to set up: sound, duration)

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Frankie the Cat

- It can move both its back feet up-and-down
- It can move its tail left and right
- It can move ears, eyes and eyebrows
- Is able to play cat sounds and other various sounds (parameters to set up: sound, duration)
- It can identify colors (parameters to set up: color)
- It can react to sounds (parameters to set up: sound level)
- It produces sounds when touched at the top

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Guitar 4000

- It can play a variety of different music melodies (notes and chords) (parameters to set up: choose the chords or sounds)
- Its sensor can identify the moving bar distance and thus define the pitch (parameters to set up: distance)
- It can combine melodies along with a combination of different sounds with various rhythms using the desired pitch

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Autobuilder

- It can move the belt forward and backwards (parameters to set up: distance, time)
- It can move gripper up and down
- It can pick up Lego bricks and put them down to assembly parts together
- Is able to complete a given assembly: a small Lego model (mini Vernie) of five parts (parameters to set up: the given Lego pieces)

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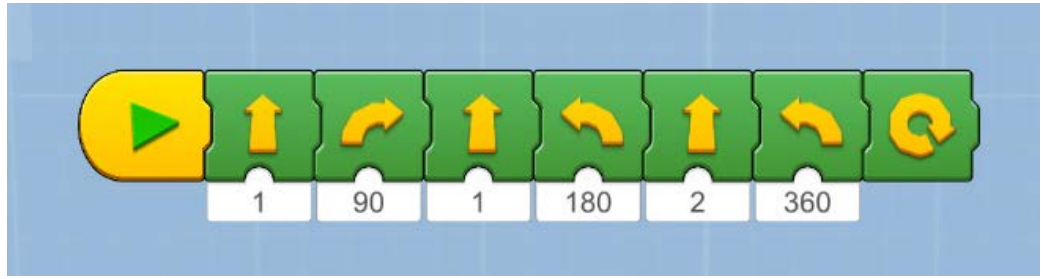
Vernie's Movement and Communication

1

2



3

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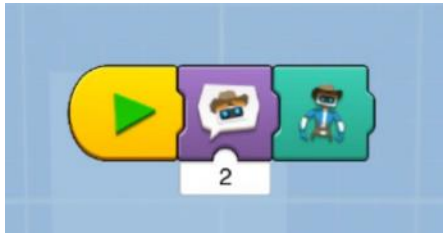
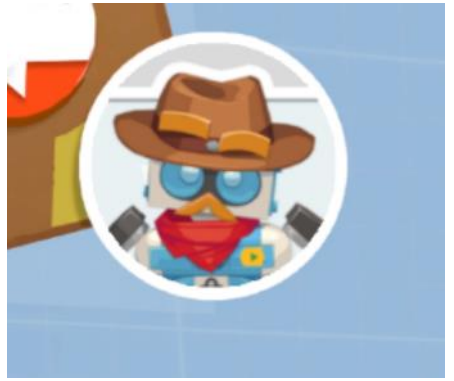
Vernie as a Cowboy

Shoot the Target.

Wait and shoot the target until you clap your hand.



Makes Vernie entering in a duel with you. You need to be prepared and push the button quickly.



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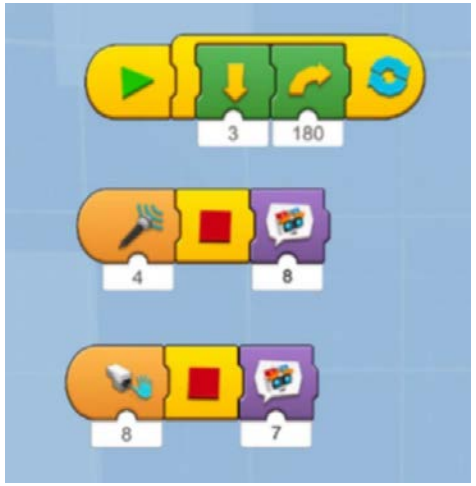
Vernie as a Police Officer



With this program police officer Vernie uses different triggering conditions. The first loop makes Vernie walk around until a sound or an obstacle being detected. Then a subprogram is being activated.

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Vernie as a Police Officer

With the above program Vernie asks you some questions. The interesting thing here is that in the last block of the program police officer Vernie is using a random phrase.

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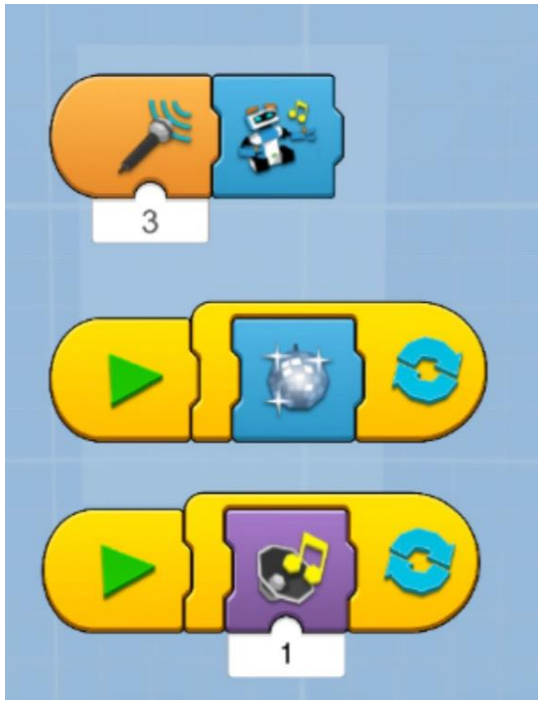
Vernie as a Dancer



With this program Vernie creates a disco atmosphere and starts dancing when he hears the music.

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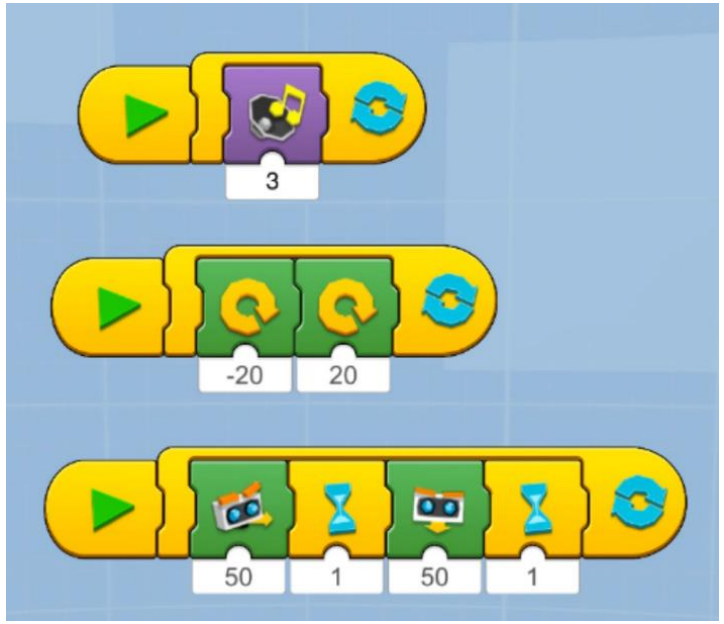
Vernie as a Dancer



You can make Vernie dance as you want. These programs are just an example. There are no rules, but always keep the music playing!

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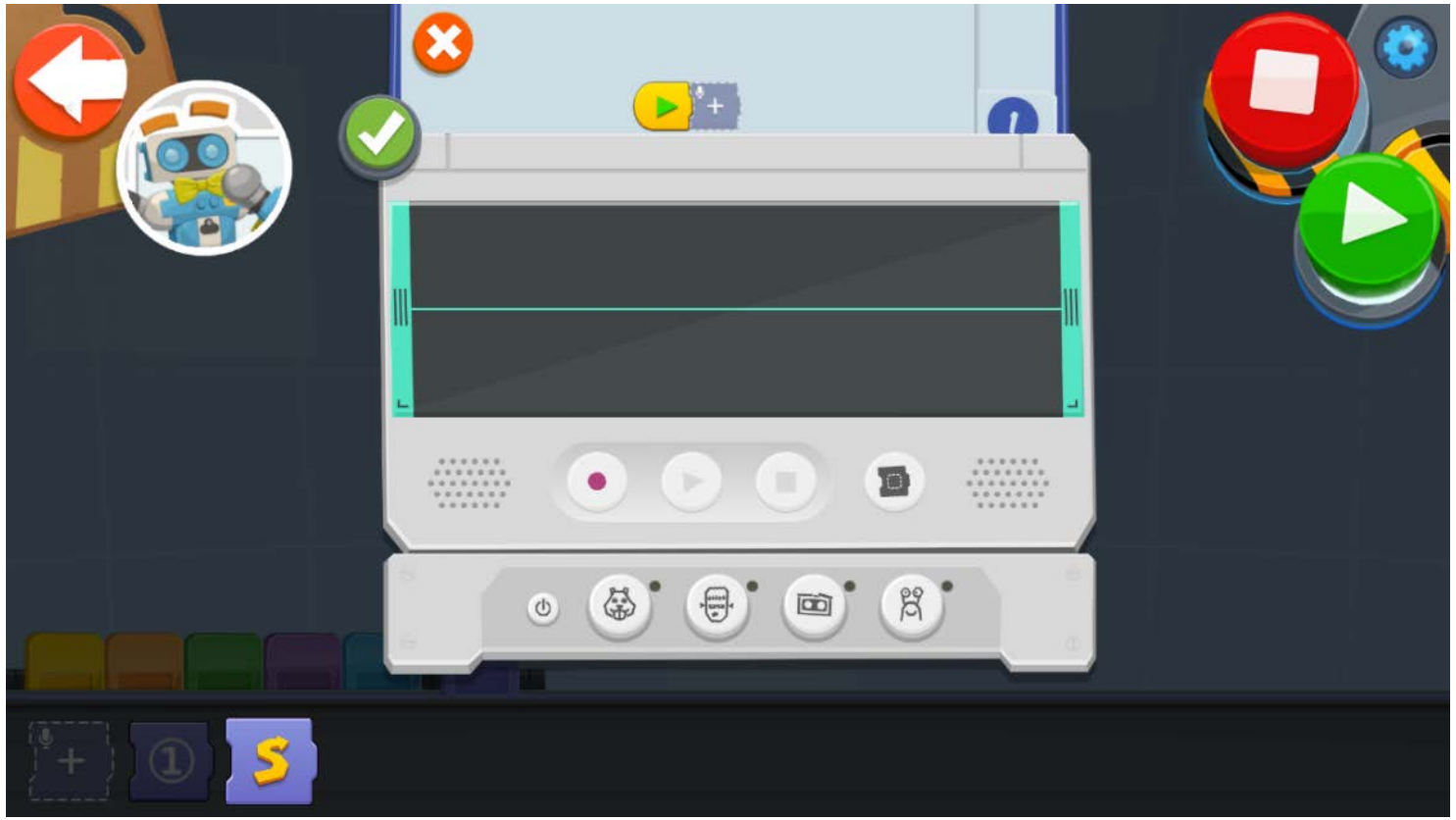
Vernie as a Singer



You can record anything you like and Vernie will sing it. On the microphone section block you will find the record function. Every time you record something a new voice block is being created and you can use it on Vernie.

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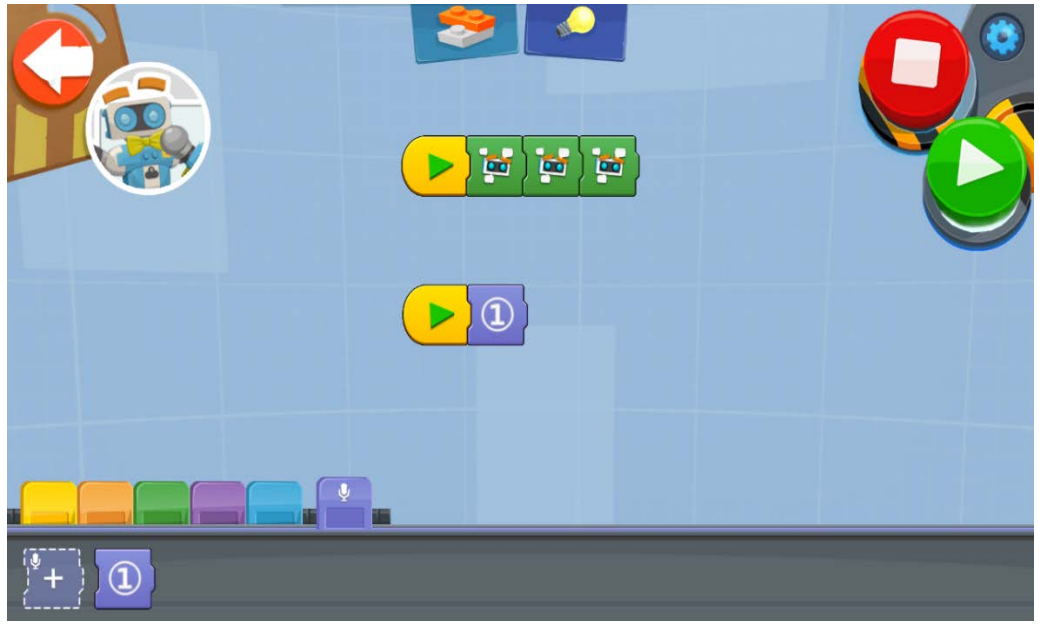
Vernie as a Singer



Another example

The **green** blocks used in the above program make Vernie move his head randomly.

There is a huge variety of sounds in purple and in blue block sections. Just be as much creative as you can!

Try to run this program and you will understand what we mean by that.

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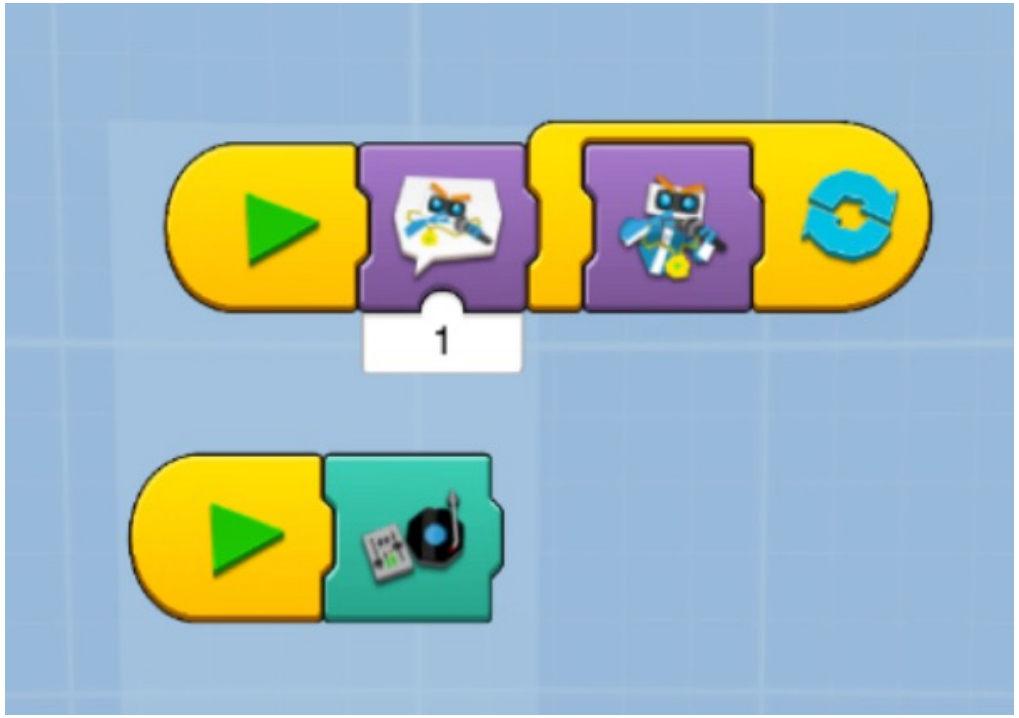
Vernie as a DJ



Use sound effects with the above program.

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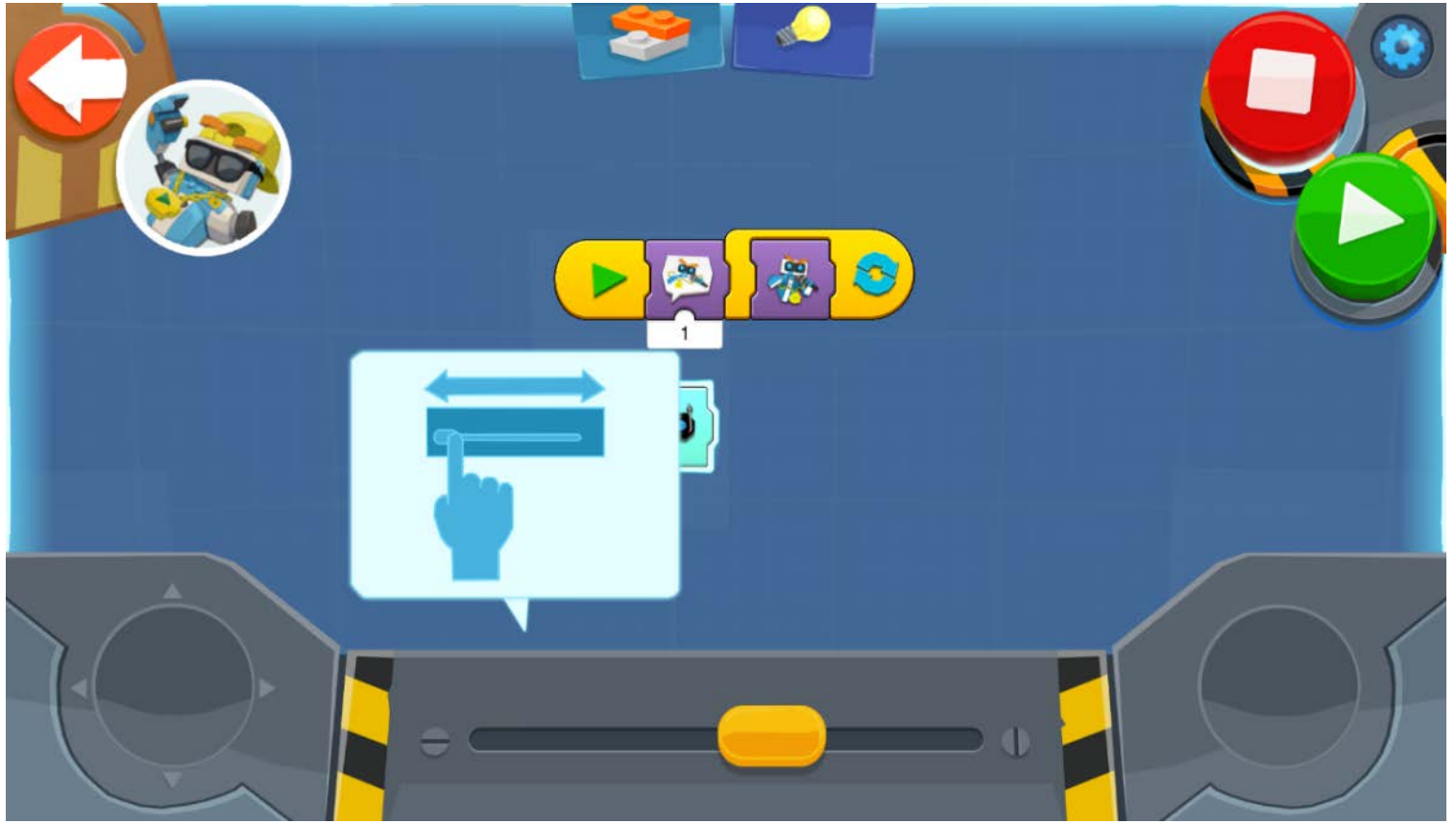
Vernie as an Athlete



You can control Vernie with this program. Just push the button to accelerate and use the slider for steering.

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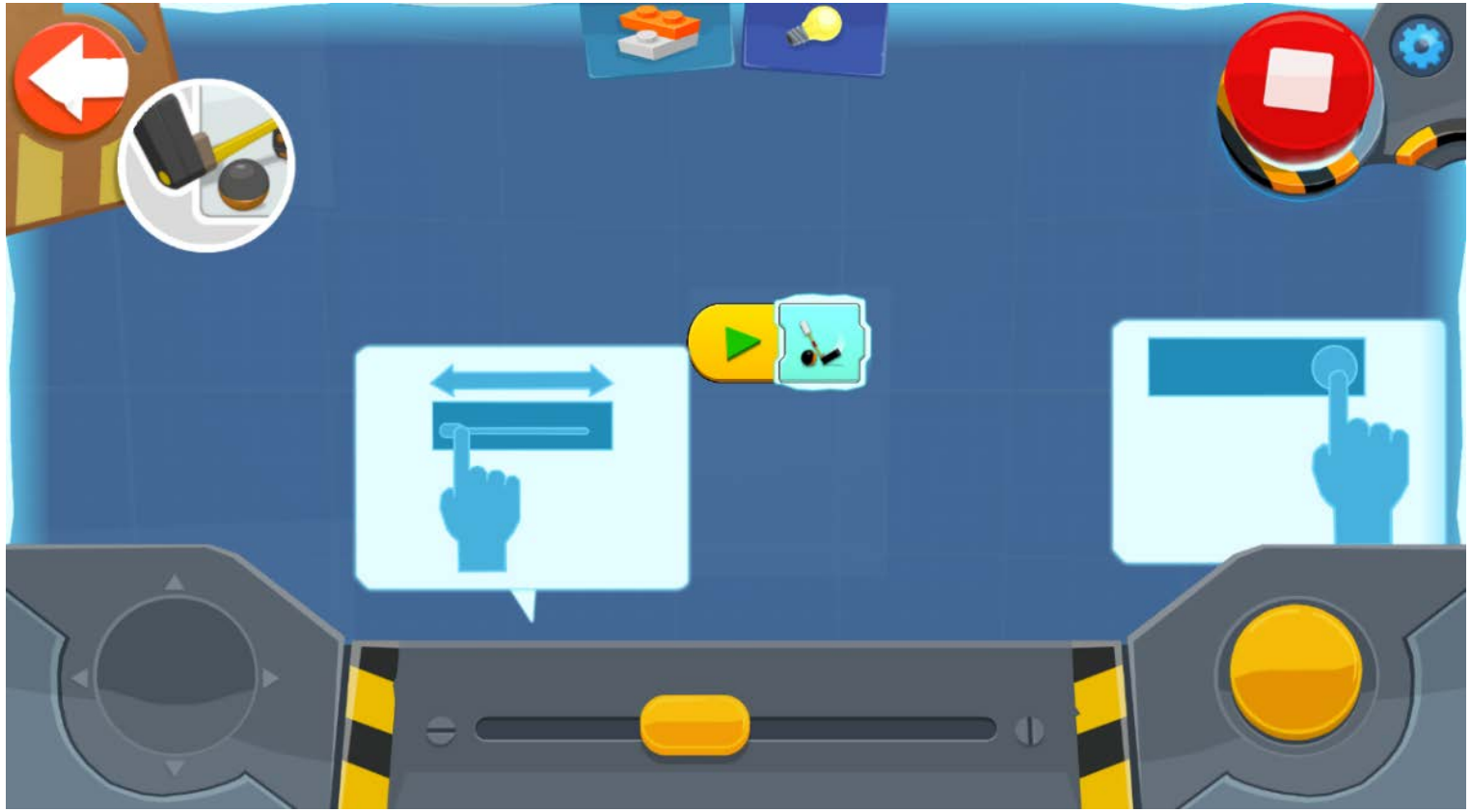
Vernie as an Athlete



Play some golf with Vernie. This program allows you to control his stick.

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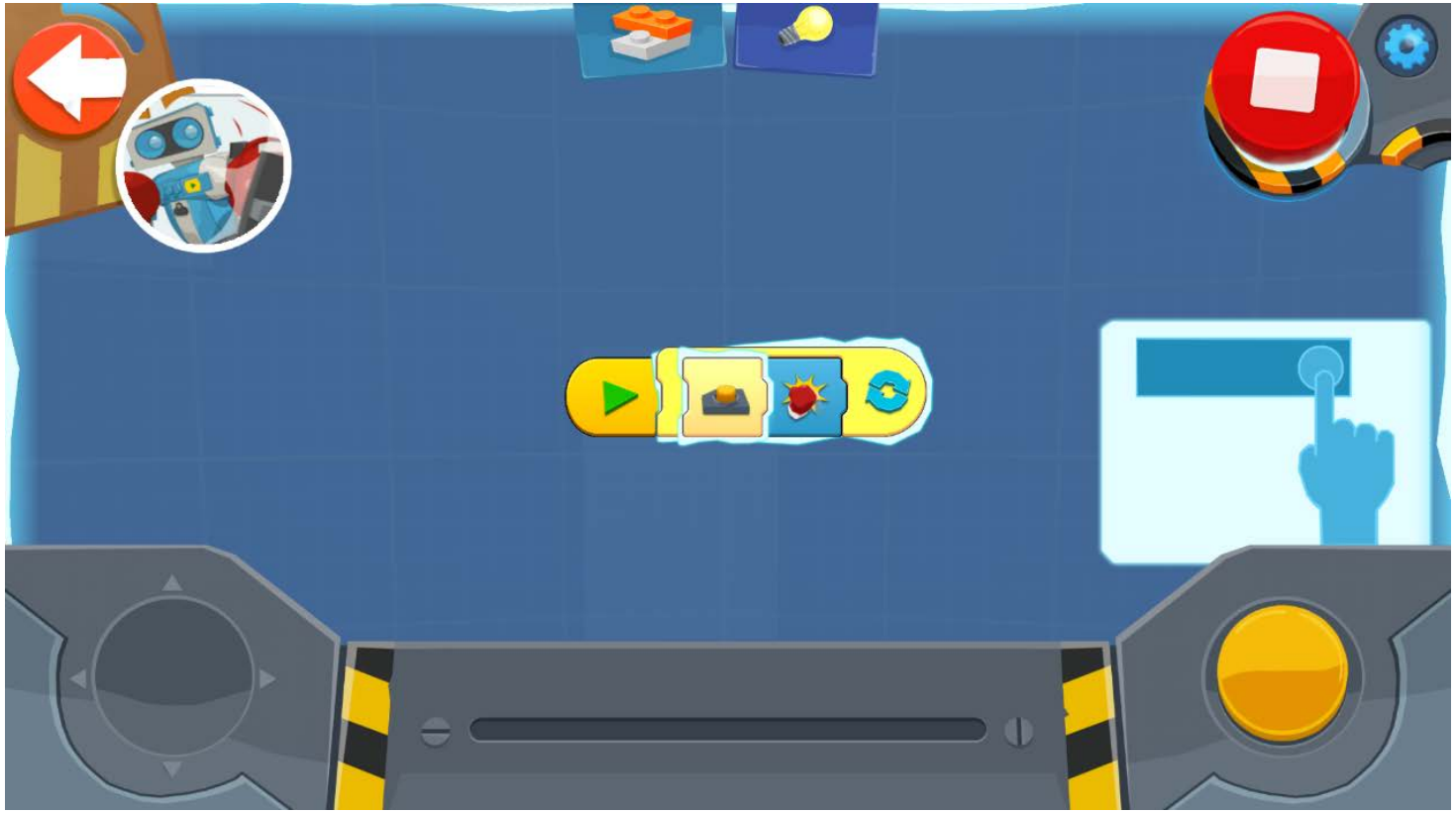
Vernie as a Boxer



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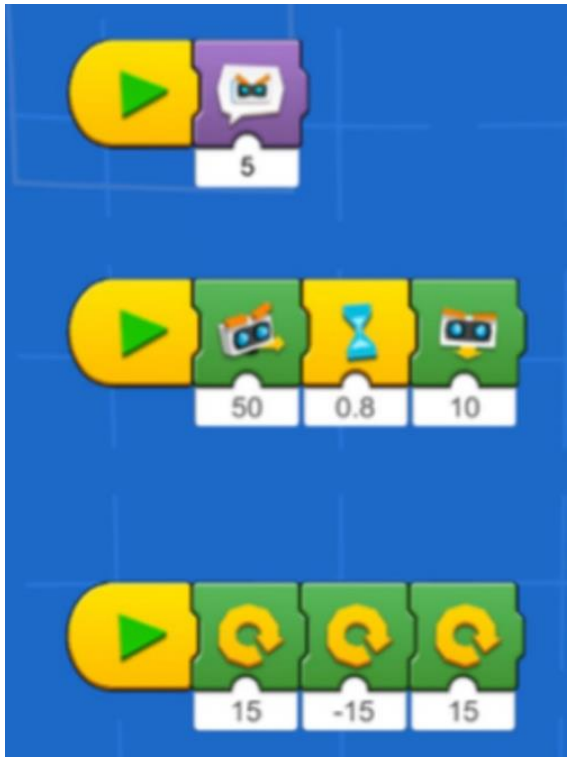
Vernie as an Athlete



On the **blue** block-section there are some blocks that contain sub-programs. When you choose those blocks a blue program window pops up. In this window you can see the program that is “hidden” inside the block. You can always modify these blocks as you like by clicking on the blue window.

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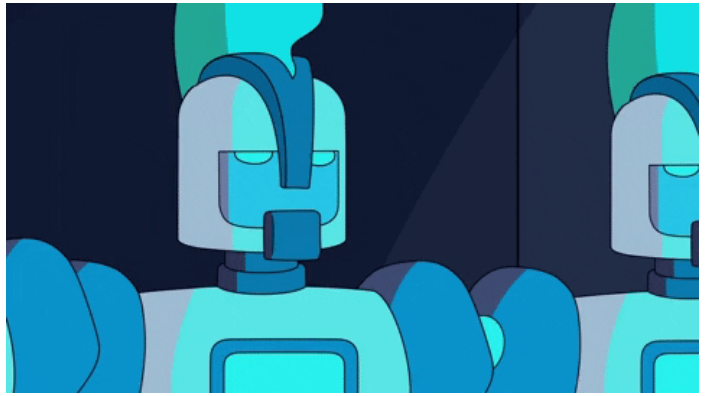
History Creative Scenario:
From the Legend to Modern Robots

- In this scenario, students will be introduced to the legend of Talos. They will construct and program a Robot just like the mythical guardian of Crete. Finally, they will discuss issues related to the protection and preservation of important cultural sites.
- This scenario addresses pupils of the last 3 years/classes of Primary School.
- Teamwork, Creativity
- For this scenario, you will need 3-4 Lego Boost kits and tablets that are compatible with them. Pupils will be divided into groups and instructions will be given to them.
- 1 hour for the completion of the assignments, video recording of the proceedings, discussion, analysis of the project and suggestions for new assignments/activities



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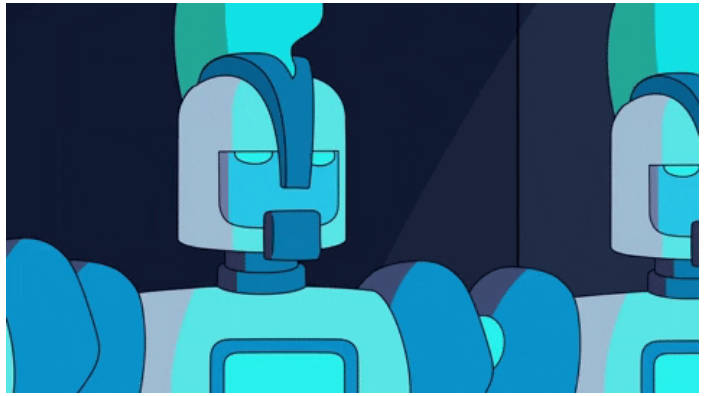
History Creative Scenario:
From the Legend to Modern Robots

- Learning Objectives

  Pupils will:

  - Be introduced to the legend of Talos and the geomorphology of Crete
  - Calculate the perimeter of the island of Crete and the speed of Talos
  - Construct the robot
  - Learn simple movement commands
  - Get familiar with the sensors of the robot and how to use them
  - Develop their imagination and creativity through the construction of the robot
  - Develop team working skills



- Duration - Estimated Time: 8 Teaching hours

  - 2 hours for starting point (introduction), questions, drawing
  - 3 hours for the construction of Vernie
  - 2 hours for programming the robot and the carrying out of the assignments

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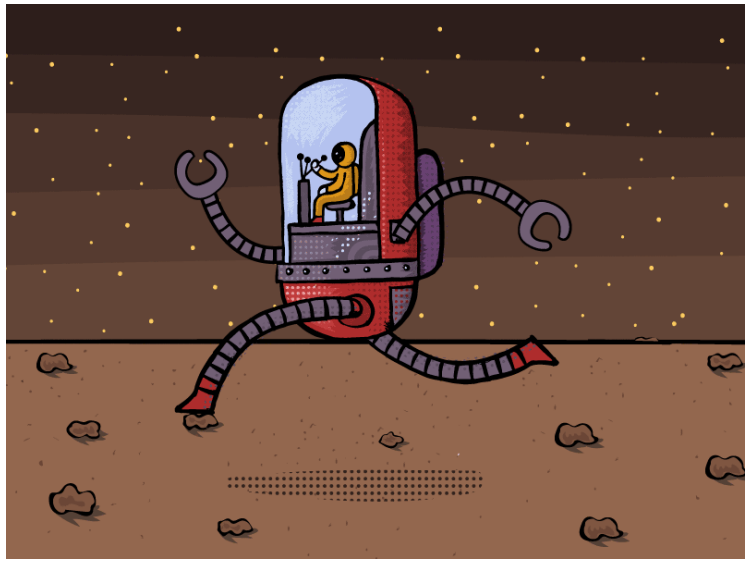
Space Creative Scenario:
From Earth to Space

- In this scenario, pupils will get to know the planets of our Solar System and program the robot in order to explore them. Finally, they will discuss issues related to space exploration, the difficulties, the changes that such an action will bring about and its impact on Humanity.
- This scenario addresses pupils of the last 3 years/classes of Primary School.
- Teamwork, Creativity
- For this scenario, you will need 3-4 Lego Boost kits and compatible tablets. Pupils will be divided into groups and instructions will be given to them.



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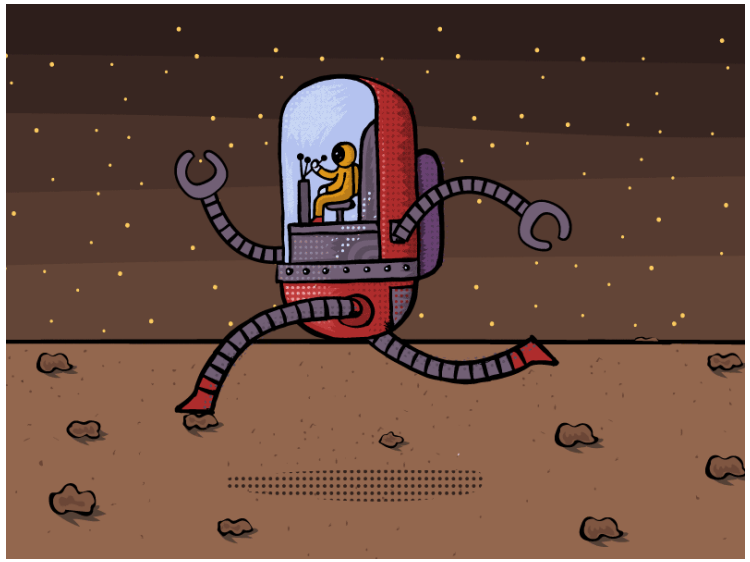
Space Creative Scenario:
From Earth to Space

- Learning Objectives

  Pupils will:

  - get to know the planets of the Solar System
  - calculate the distances between them and the difficulties of traveling to another planet.
  - build the robot
  - learn simple movement commands
  - get to know the robot sensors and how to use them
  - develop their imagination and creativity through the construction of the robot
  - develop teamwork skills

- Duration Estimated Time: 5-6 Teaching hours
  - 1 teaching hour, starting point (introduction), presentation of planets, discussion.
  - 2-3 teaching hours, construction of the robot.
  - 2 teaching hours, programming, project analysis



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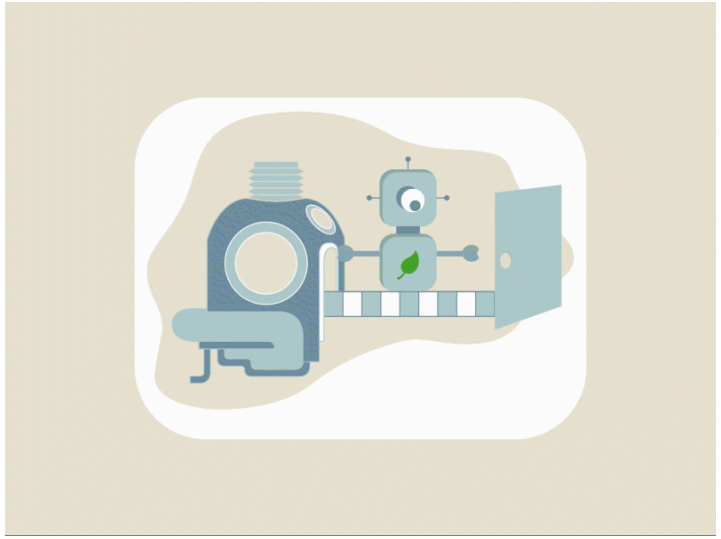
Environment Creative Scenario:
Environmental Facility

- Students aged 9 to 12 will learn about the environment and the importance of sorting the waste that humans create. The Swedish National Agency for Education declare in the syllabus for grades 4-6 the following formulation as a steering document for teachers:
  - Nature and society
  - "Human dependence on and influence on nature and what this means for sustainable development. Ecosystem services, such as degradation, pollination and purification of water and air."
  - The students will build the robots Vernie and M.T.R.4 for inspiration and use them in different activities concerning the scenario environment.
- Students aged 9-12 (Grades 4-6)
- Teamwork, Creativity
- For this scenario, you will need 4-6 Lego Boost Kits and compatible tablets, depending on the number of students in the class. You will need an extra for the teacher. Pupils will be divided into groups and instructions will be given to them. Preferably gender mixed groups.



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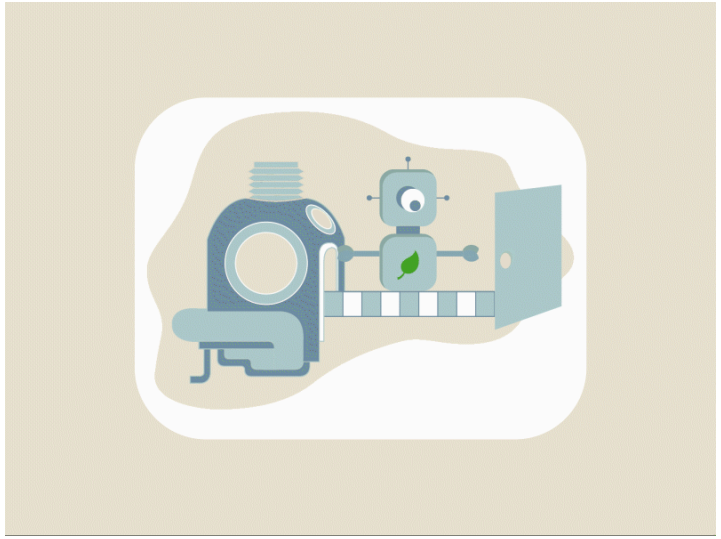
Environment Creative Scenario:
Environmental Facility

- Learning Objectives

  Pupils will:
  - be introduced to the recycling scenario
  - construct the Robot
  - learn simple movement commands
  - get familiar with the sensors of the robot and how to use them
  - develop their imagination and creativity through the construction of the robot
  - develop team working skills
  - learn about recycling stations and how waste products are transported to the station



- Duration Estimated Time: Estimated time for the scenario will be 540΄
  - Student΄s study visit to the local environmental station, 120΄
  - Two groups building Vernie, 120΄
  - Simultaneously two groups building M.T.R.4, 180΄
  - Programming the robots, 120΄
  - Activities such as sorting waste products, 60΄
  - Finalizing the scenario 60΄

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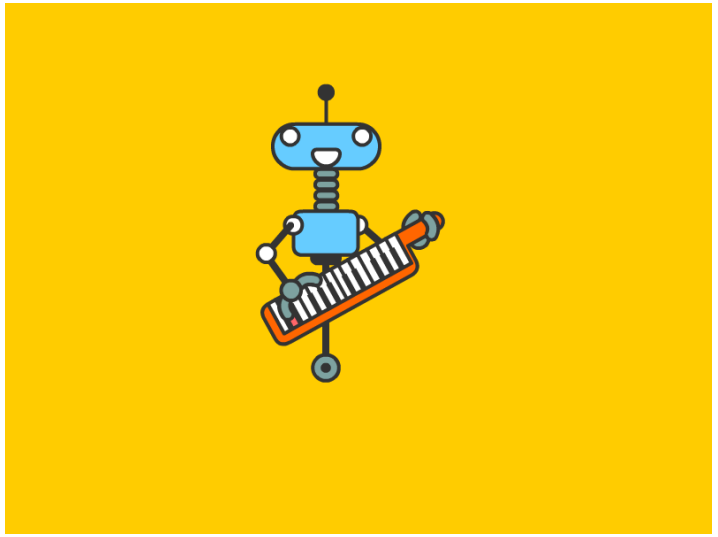
Culture Creative Scenario:
Music and Culture Scenario

- In this scenario, students will learn about culture and folk music. They will construct and program the Guitar Robot. The students will learn how to play a simple tune with the help of the Robot Guitar. They will find the tone A with 440 vibrations per second. Students will learn about how people created simple instruments that then evolved into what we today recognize as modern musical instruments. The Robot Guitar will be an introduction to synthetic music.
- Students aged 9-12 (Grades 4-6)
- Teamwork, Creativity, Music history, Musicality
- For this scenario, you will need 4-6 Lego Boost kits and compatible tablets, depending on the number of students in the class. You will need an extra for the teacher. Pupils will be divided into groups and instructions will be given to them. Preferably gender mixed groups.
- Students should have basic knowledge of music theory. What a major scale is and how does it sound like? Students should also know about the regional folk music in the area and traditions connected to music.



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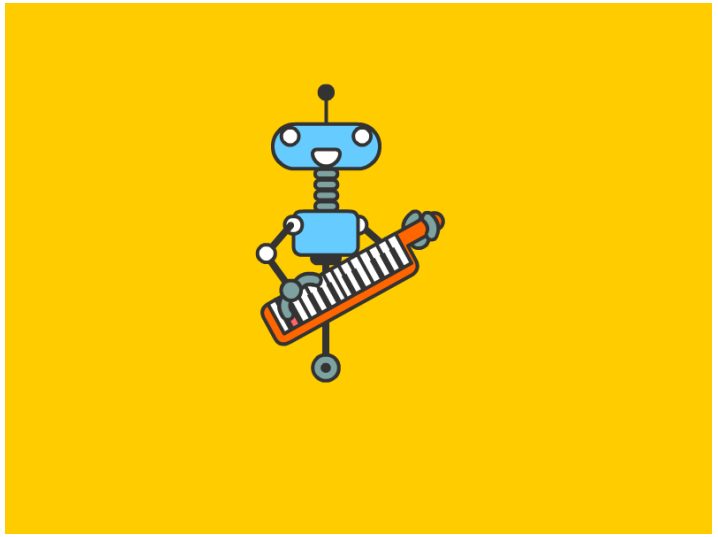
Culture Creative Scenario:
Music and Culture Scenario

- Learning Objectives

  Pupils will learn about:

  - the history of musical instruments. They see the connection between The Robot Guitar and modern synthetic music
  - notes, minor and major chords
  - folk music in different countries



- Duration Estimated Time: 480 minutes
  - Building the Robot Guitar, 180 minutes
  - Programming RG, 120 minutes
  - Music history, Folk music 180 minutes

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Pilot-test and **review** all the material, products (**IO1-IO4**), processes and procedures in order to be able to use them during **IO5**

Participants:

- **Partner Project Coordinator** who will be responsible for the implementation of the project in each country
- **Teachers or other related professionals** who will be involved in the implementation & evaluation of the e-tool & programme in schools, educational centres, who will become **Multipliers** for their colleagues and **Ambassadors** of the project

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C1:Short Term Joint Staff Training

C1 Training will be devoted to the:

- **analysis** of the **Project & Programme** to be applied into practice and **how it can be introduced in schools** & educational centres (IO5)
- presentation of the **educational back pack** to be used in school with students
- **e-Platform** & its functionalities (**assessment tool**, **e-books**, **e-Community, e-Databank, Open Badges** etc.)
- awarding of an **overall Open Badge (Mentor Badge)** at the end of the training to become **Project Mentors**. It records and validates their competences acquired during the training and gives proof of their ability to support and manage students' participation in the programme

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