Adventures of Young Innovators

Volume 3: Innovation is my future

Khalid

Innovate a pinna for E

And ..

He also innovated a smart walker for the baby!
Adventures of Young Innovators

Volume 3: Innovation is my future

First Edition - 2019
EBot Microcontroller & Software

EBot is an ecosystem developed by Creative Bits Solutions-Kuwait, it focuses on teaching programming and prototyping through a very easy process. It consists of two main parts a Microcontroller unit which is a small compact digital computer, and an educational software that uses drag and drop method to make programs without writing long codes.
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Pinna ..

a problem in the sound sensor!

Learning Objectives

1. To know the importance of the pinna.
2. To differentiate between low and high pitches.
3. To be introduced to sound sensor.
4. Learn to program sound sensors.

New way of learning

Innovative Thinking  Problem Solving  Focus and attention  Analysation  Thinking Skills  Programming
Khaid noticed that EE doesn’t hear him well when asked to do some work.

What’s wrong EE? Can’t you hear me when I call you?

EEE!

Sorry Khalid... I think the sound sensor doesn’t work well!

Khalid test the sound sensor by opening it and he discovers that adding a pinna would make it more efficient.

I FIX IT!
High and Low Sounds

Jassim went on a tour to Japan with his family. One time, when he was walking in a garden with his father, he saw an old man with a small dog. He noticed the man was holding a small whistle. From time to time, the man put the whistle in his mouth and blew on it but Jassim did not hear any sound. But the little dog always became excited and rushed up to his owner whenever the man blew on the whistle! Jassim asked his father, “Why does the little dog run to the owner, even though the whistle does not produce any sound?” His father replied, “There is a sound from the whistle, but it is a special sound that can only be heard by animals. The whistle emits a noise at a certain frequency that the human ear cannot hear.”
Humans distinguishes sounds through the ear. The ear consists of cartilage that appears outside the head and it is called “Pinna", its function is assembling sound waves to enter the external ear canal, a channel which begins from the ear flank. The inner part of it is bony and ends with a membrane called the eardrum. Waves pass through this channel to the opening on the inner drum of the ear.

Sound is an external effect on the ear. It causes the sensation of hearing. Sound travels in solid, liquid, and gaseous media but does not move in a vacuum. It disperses at different speeds. In solid media it is faster than in liquid media and in liquid media it is faster than in gas media.

Sound moves in the form of waves called sound waves, which are produced by the vibration which creates transverse and compression waves, so when waves are far a part it will produce lower pitch voices eg. men voices, while closer waves produce higher pitch voices eg. women voices. The number of waves per second called the sound frequency, and its unit, hertz.

The intensity of the sound is affected by several factors, the most important of which is the distance between the sound source and the sound receiver. It is inversely proportional to intensity, also the density of the transmitting medium is proportional to intensity. The vibrating surface area also affects the intensity of the sound. There are special instruments for measuring the sound intensity which give certain values. The normal value is 35 dB and listening to sounds of 90 dB and above for long periods of time is harmful to the ear and may lead to deafness.
1x 15x9 Brick
2x 15x3 Brick
2x 5x3 Brick
1x Large Gear
2x L Adapter
1x Outputs
In this project, students will learn the effect of the pinna in amplifying the sound and how does the direction affect the sound level.
A motor which has the ability to move to any angle between -90 and +90 degrees, 180 degrees in total.

DC Motor

A device that converts electrical energy into mechanical energy in a rotational manner.

Servo motor
Live control is a feature that allows the user to connect directly to the outputs and control them, without the need to download the code to the Ebot.

1. Click on 🛡️ from the right menu.
2. Select the type of output to be measured by marking (✓) in front of the pin, then choose the sensor type from the drop-down menu and select its properties below.
3. Press the Start button at the bottom of the screen to see the changes, now you can change the values and see changes directly in your project.
Did you Know!

The speed of sound in the air is 340 m/s, and a person is subject to sound pollution or noise caused by loud and severe sounds, which may cause severe harm. Therefore, the human must maintain the blessing of hearing and thank God.

Questions:

1. How is sound transferred?
2. What is the unit of sound measurement?
3. What factors affect the intensity of a sound?

Further discussion:

1. Try a pinna to your project, what do you notice?
2. How does space men talk without air?
Taking Notes will help you develop your projects in the future, and it will prevent you from repeating same mistakes.

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Safe track ..
to protect from risks!

Learning Objectives

1. To be introduced to robot vacuum
2. To be encouraged to innovate new projects
3. Try integrating previous experiences to innovate new projects
4. To use acquired knowledge to build Edge Avoiding Robot

New way of learning

Innovative Thinking  Problem Solving  Focus and attention  Teamwork  Taking Responsibility  Programming
**New way of learning**

**Learning Objectives**

- Khalid, Please take care of my baby, I need to buy some stuff
  - da da
  - I will, Don’t worry
- OH, NOO!
  - hehe
  - CRAK!
- DON’T TOUCH ELECTRICITY
  - cheek!!

- hehe... dada...
- UHH! I am tired! this baby moves a LOT!
- OKAY!

Don’t worry Khalid! How about building an automated baby walker that will keep him in close zone?

I am preparing the black border...

The walker is ready!!

We have placed 4 IR sensors under the walker, a sensor on each corner, with two motors!

if any of these sensors sense black, it will reverse the motor’s direction, and the other motor will turn to right or left randomly
Vacuum Robot

In the pursuit of human creativity and innovation, much technical effort is devoted to designing machines that relieve the daily chores. The number of innovations and inventions boomed at the beginning of the century, with the advent of household electrical appliances. These machines are designed to do most of the work of cleaning, washing and home entertainment. Today, “robots” are being designed to perform multiple functions.

First, there appeared a “cook robot,” which prepares simple meals in the kitchen automatically. Then the waiter robot appeared, who makes coffee and give it to the customers. Nowadays, Vacuum Robot is the new trend, it cleans the floors without human intervention and works under the same philosophy as robots.
The Vacuum Robot is a small robot that is placed on the ground, and starts automatically by sending instructions through a special application, without any intervention from humans. This robot uses sensors which accurately locate objects, such as furniture, doors and walls at 360 degrees. The vacuum robot operates automatically, without colliding into objects, and leaves no corner or edge unturned, working on all types of flooring. This invention depends on laser-based “edge sensing” technology, and has applications in science, industry and transportation.

When the Vacuum robot is finished cleaning, or when it needs to charge its battery, it goes to the charging station and connects itself to the power source until the next order, which can be set in advance or set specific working time for the robot to start automatically up schedule!

Some of these vacuums are equipped with a camera, others work with infrared, and new models of robot vacuums have been equipped with water, and start a new line of robot Mopers. This technology has a significant role in Smart the home concept, where most of the tasks are being controlled automatically using special applications.
In this project, students will learn about sensors and engines and their importance in electronic systems and how to make a small car that protects the passenger by avoiding the edges.
Assembly Instructions
Electronics connection

**Infrared Sensor**

is a sensor that sends waves of electromagnetic energy which are transferred through the light. It consists of two components, an emitter and a receiver.

**DC Motor**

A device that converts electrical energy into mechanical energy in a rotational manner.
Input Reading is a feature used to read the values of a sensor based on its surrounding environment. It is used to identify the values of the sensors in the current environment to ensure the best functionality.

1. In the Ebot Blockly software, click on Input Reading from the right menu.

2. Select the type of sensor and the pin that is used to connect to it, and then click Debug. Make a note of the values.

PC Control

Live control is a feature that allows the user to connect directly to the outputs and control them, without the need to download the code to the Ebot.

1. Click on from the right menu.

2. Select the type of output to be measured by marking in front of the pin, then choose the sensor type from the drop-down menu and select its properties below.

3. Press the Start button at the bottom of the screen to see the changes, now you can change the values and see changes directly in your project.
Did you Know!

The first machine to be considered a “robot” was the “peacock fountain” machine invented by the Arab scientist Al-Jazari’s. It is a simple machine to wash hands and provide an automatic towel!

Questions:

1. What is a robot? Is it just a robot?
2. How does a smart broom work?
3. Can human hands be displaced with the development of technology? & why?

Further discussion:

1. Can you develop new projects using edge avoiding technology?
2. What improvements can you add to this project?
Taking Notes will help you develop your projects in the future, and it will prevent you from repeating same mistakes.

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Smart Fishing Rod

Comfortable, and catch a lot!

Learning Objectives

1. To be introduced to new maritime innovations
2. To encourage experimentation to make new innovations
3. To integrate previous experiences to create new projects
4. To use acquired knowledge to build automated fishing rod
Here, I caught a fish!

Eeee

Hop

It has ESCAPED!

HA HA

I didn't catch any fish, while Ayman caught two!

I am going to build a smart fishing rod that will pull the string automatically when felling a fish... hehe

I can now ENJOY the beach
Maritime innovations

Since the beginning of humanity, man has not only lived on land, but has also looked to the sea as a place of recreation and exploitation of treasures. To take advantage of the wealth of the sea, man had to discover and invent certain tools.

The boat was one of the first inventions to conquer the sea and with it man was able to reach distant islands. People then began to develop methods of fishing using nets, and later developed boats equipped with fishing tools. Not only that, man wanted to discover the deep sea, so he created equipment to allow him to stay under water safely for as long as possible, and he developed a diving suit. The development of marine technology and modern equipment has made diving and adapting to the aquatic environment safe, as the body is

<table>
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<tr>
<th>Scientific Term</th>
<th>Scientific Concept</th>
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<tbody>
<tr>
<td>Island</td>
<td>Any piece of sub-continental land that is surrounded by water</td>
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<tr>
<td>Submarine</td>
<td>A watercraft capable of independent operation underwater.</td>
</tr>
<tr>
<td>Smart fishing rod</td>
<td>Term 1</td>
</tr>
<tr>
<td>Renewable energy</td>
<td>Is energy that is collected from renewable resources</td>
</tr>
<tr>
<td>Non renewable energy</td>
<td>Is energy that comes from sources that will run out or will not be replenished in our lifetimes</td>
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protected from cold water and kept isolated from sea organisms such as coral reefs, which can be dangerous. The man also invented a vehicle to help him roam the depths, called the submarine, which is an underwater vehicle equipped with mechanisms for breathing and observation.

Because of ever increasing human needs and the need to obtain more and more food from the sea, it was necessary to develop a more effective means of fishing. Fishermen have recently invented a smart fishing rod, which is very different from a traditional fishing rod. The smart fishing rod is equipped with sensors, taking readings every second to capture vibrations that show the presence of fish in the water near the hook, and tell the owner to pull the hook at the right time. This technology runs an application on a smart phone, which connects to a Bluetooth enabled chip on the hook. The smart fishing rod increases the chance of catching fish, and saves fishermen time and effort. This rod adapts to all circumstances, and can withstand extreme natural conditions and even works during storms or strong wave conditions.

Recently in the Emirate of Dubai, an amphibious vehicle was invented, which is an environmentally friendly vehicle equipped with ten advanced inspection devices. All of the devices work on solar energy, and are equipped with the latest technologies, to detect errors that occur when transporting goods on ships, and also help inspectors to do their jobs effectively. At the ports, a new type of submarine equipped with surveillance cameras and lighting, has been invented for underwater photographing and to monitor and inspect the bottom of ships.

Work is under way to set up windmills in the sea to harness the power of the wind, as this is a source of renewable and clean energy, and offers a sustainable alternative to traditional energy sources that will soon be depleted.
Project Plastic Pieces

- 1x Medium Frame
- 4x Large Frame
- 2x 5x1 Brick
- 4x 15x3 Brick
- 2x Large Gear
- 2x Medium Gear
- 3x L Adapter
- 1x Full Bush

Electronics:
- 1x Outputs
- 1x Inputs
Project Final Image

(Smart Fishing rod)

In this project, students will learn how to develop the traditional fishing rod to be smarter and help him to catch fishes even when he is not holding the rod.
Assembly Instructions

1. 

2. 

3. 

4. 

5. 

6.
Electronics connection

Infrared Sensor

is a sensor that sends waves of electromagnetic energy which are transferred through light. It consists of two components, an emitter and a receiver.

DC Motor

A device that converts electrical energy into mechanical energy in a rotational manner.
Live control is a feature that allows the user to connect directly to the outputs and control them, without the need to download the code to the Ebot.

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3. Press the Start button at the bottom of the screen to see the changes, now you can change the values and see changes directly in your project.
Questions:

1. Why should man develop new methods for taking advantage of the sea?
2. How does a smart hook work?
3. What is an amphibious car?

Further discussion:

1. What did you learn from this lesson’s article?
2. What improvements can you add to this project?

Did you Know!

The first submarine was designed in 1620 by the Dutchman “Cornelis Drebbel.” He designed a small submarine with 12 paddles which dove into the River Thames at a depth of 3.5 - 4.5 meters for 15 hours.
Taking Notes will help you develop your projects in the future, and it will prevent you from repeating same mistakes.
Earthquake

a scary lesson!!

Learning Objectives

1. To know the causes of earthquakes
2. To understand the hazards of earthquakes on humans
3. To know Richter scale
4. To use acquired knowledge to build simple Richter scale

New way of learning

Programming  Inventing  Problem Solving  Taking Responsibility  Planning  Creative Thinking
Today's topic is about earthquake

Cracks and sliding rocks are one of the main causes of earthquakes!

Center of the crack

The Crack

In this model, we will see how does the earthquake damage homes!

OMG!
How does Earthquake happen?

In 2004, while tourists enjoyed the nice day at the beach, the waves of the sea suddenly rose and flooded a number of cities across several countries in eastern Asia, causing extensive destruction and human and environmental disaster.

Scientists were puzzled to explain what happened, but they quickly identified that the disaster was caused by a powerful earthquake in the sea called a “tsunami.” Earthquakes are a natural phenomenon that causes great destruction to humans. In ancient times, the earth’s solidity and stability were often taken for granted. However, the earth’s vibrations and earthquakes recorded over the centuries have proven that the earth is not static, but very active.
An earthquake is the result of a vibration in the earth’s crust, and may have several causes. Sometimes the vibrations are the result of an eruption of a volcano, sometimes, it is caused by the collision of a meteorite with the earth. Scientists have found that some earthquakes occur after filling a mine with earth, and sometimes as a result of the movement of the tectonic plates of the earth. Scientists are able to explain in simplified terms, how earthquakes in the Earth occur, and can also tell us about the causes.

It is known that the earth crust forms the outer surface of the earth. The crust consists of many plates, which are slippery at the so-called “lower oily layer.” In the areas where these plates of earth meet, there are three causes of earthquakes:

- The crust is broken into two tectonic plates.
- The crust is exposed to two tectonic plates, which run in opposite directions.
- The crust slips under one of the tectonic plates, and the other plate shifts above.

The occurrence of these three events may lead to cracking in the earth’s crust. Over time, rock masses form around these cracks, which are known as “faults.” Faults have a higher occurrence of earthquakes (around the area of the cracks) than other regions.

The rock masses that are formed around the cracks often create intense pressure, which leads to friction. As a result of the great friction, these rocks are restricted, and leads to pressure pushing the tectonic plates against the rocks. This creates potential energy that eventually generates movement through earthquakes. Earthquakes vary in strength from one place to another. There is a scale called “Richter,” which measures the strength of earthquakes. The larger the number on the scale, the more devastating the earthquake.

- A scale of 1 to 3 on the Richter scale is a weak earthquake that may not be felt.
- A scale of 4 to 6 on the Richter scale is an average earthquake, and some impact occurs.
- A scale of 7 to 9 on the Richter scale is an earthquake that causes destruction of cities, and can claim many victims.
Project Plastic Pieces

**Inputs**
- 5x1 Brick (5)
- 5x3 Brick (3)
- Full Bush (1)
- Half Bash (1)
- Medium Gear (1)
- Large Gear (2)
- Small Gear (1)
- Large Frame (1)
- Small Shaft (1)
- 5x1 Brick (5)

**Electronics**
- Wheel (1)

**Outputs**
- 1x POT
- 1x Wheel
In this project, students will learn about earthquakes and their impact, then make an earthquake simulator to sense its seriousness.
**Potentiometer**
A component that allows the user to change its resistance by turning a knob.

**DC Motor**
A device that converts electrical energy into mechanical energy in a rotational manner.

**LCD**
A single colored screen used to show text messages. Different LCD screens have a different number of characters that can be utilized.
Variables are containers for storing information such as names, symbols and numbers. They are used to store and retrieve large or variable information (eg, the temperature, or the height of a particular liquid level).

1. Click on  from the right menu.
2. Click on Create Variables.
3. Choose a name and starting value for the variable (eg. 0).
Did you Know!

The strongest earthquake in recorded human history was the Chilean earthquake of May 22, 1960, which recorded 9.5 on the Richter scale!

Questions:

1. What is an earthquake?
2. How do earthquakes occur?
3. How do you protect yourself when an earthquake occurs?

Further discussion:

1. Use your device to record the readings in your area, what do you find?
2. What improvements can you add to this project?
Taking Notes will help you develop your projects in the future, and it will prevent you from repeating same mistakes.

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**Scientific innovation stories..**

A series of stories about young adventurers facing problems in life and inventing solutions using Ebot. Each book contains four different scientific technology projects for children that develop programming, electronics connections, and mechanical skills.

The series include the following books:

- **Volume 1:** Innovations around us
- **Volume 2:** Innovate solutions
- **Volume 3:** Innovation is my future
- **Volume 4:** Finding solutions through scientific innovation
- **Volume 5:** From idea to innovation

**Skills gained:**
- Problem Solving
- Projects Programming
- Electrical Projects
- Mechanical Projects

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