EU Code Week Teach Day 2024

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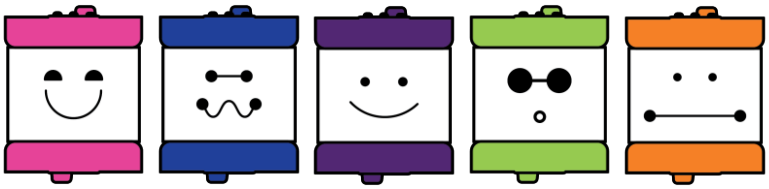
littlegirlBits

LESSON 1°

littleBits™

Getting to know Basic Bits



COMPUTER SCIENCE DEPARTMENT
SCHOOL OF SCIENCE
INTERNATIONAL HELLENIC UNIVERSITY

iPES Lab

March 2024

Course objective:

To get acquainted with basic devices or Bits. You will know some bits (each with its own characteristics) which you will then use to implement simple and complex applications.

Attention: We will work with electric/electronic components so we must:

(1) avoid using them in or near water.

(2) do not plug them into electrical outlets in your home.

(3) do not touch or hold them while they are operating.

(4) keep conductive materials (such as foil, paper clips, staples, staple pins, etc.) **out of reach.**

(5) avoid handling by children younger than three (3) years of age as they contain small pieces.

(6) close them when you notice that they have become excessively hot (which is normal in most of the time).

(7) the devices contain magnets. If ingested, they may stick together inside the body, so seek medical attention immediately.

To create an application that implements something specific (e.g. an alarm clock, a beeper, etc.) we need to implement a circuit. All circuits, usually, have four (4) basic units:

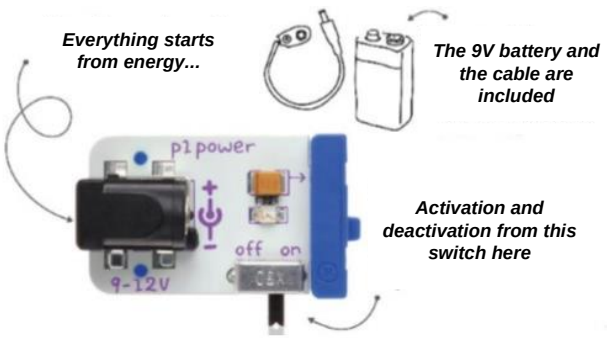
- **Power** (The color is **blue**)
- **Input** (The color is **pink**)
- **Output** (The color is **green**)
- **Wires** (The color is **orange**)

We can use **Wires**, they are Bits that connect different units between (wired or wireless), to extend our circuit or to redirect its direction (flow of current or data).

Each circuit must, in order to work, receive energy in the same way as your mobile phone or your TV works. This energy usually comes from batteries (even a TV or a car can run on batteries) or from an electrical outlet (the appliances in our home get their power from an electrical outlet).
So, the first circuit that all your applications will start with is the following:

Power
Bit name: p1 power

Here you connect the battery cable



Let's Think... Why do we always have to start with the **blue** circuit, i.e. **Power** (or energy)

Wondering… Could our watch work without a battery (which provides the energy that it needs)? Could we vary the intensity of a light bulb in our office? Could we see the volume of the music on our sound system?

The device we use, because it will affect our output, so it's an **input**, it is **pink**, and it's called a dimmer or slide dimmer.

Input
Bit name: i5 slide dimmer

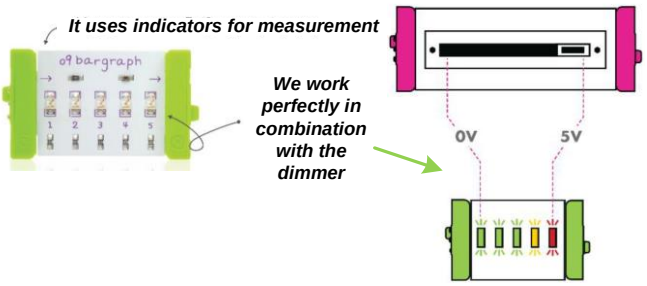
You can slide the cursor and see the effecting result in the output

The sequence will be different for each circuit you make. But you will use a **green** Bit which will be the result of your circuit. That is, with the **green** Bit we will "see" what we expect from our circuit, something we also call **output**.
The **output** in a circuit can vary and this depends on our creativity. We will have a different output if we want to make a light for our bicycle, if we want to make an alarm clock or if we want to make a controlled fan.
That's why there are many littleBits in **green**, each of which gives us both a different **output**.

In case you want to measure the light intensity (not in specific units but with LED indication), connect in Application 1.1 in addition and a Bargraph Bit. But firstly, let's examine this Bit in detail:

Output
Bit name: o9 bargraph

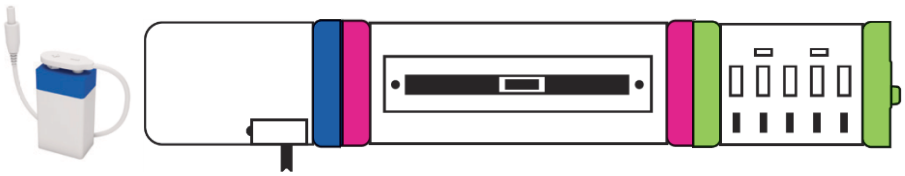
This circuit has five (5) LEDs with three different colors, and if you increase the intensity of the signal passing from one circuit to another, its indication is also affected.



Application 1.1: Construct a circuit based that you can adjust the intensity of your bicycle's light.

Materials needed

One (1) battery with cable
One (1) **device (p1 bit)** to connect the battery and supply power
One (1) **device (i5 bit) slide dimmer**
One (1) **device (o9 bit) bargraph**



Application 1.2: Construct an alarm using LittleBits circuits from the above applications (whichever you deem appropriate) and a **buzzer** to create the noise.

Output
Bit name: o6 buzzer

The use of the Bit provides different sound intensity depending on the current/signal flowing through the circuit.

Materials needed

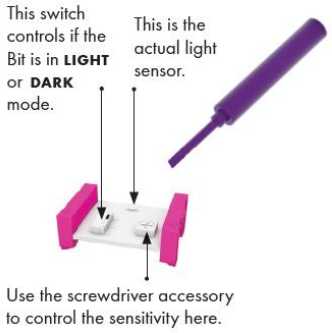
Composition of circuits from previous applications:
One (1) **device (o6 bit) buzzer** (output circuit that produces sound).

Application 1.3: Build an alarm clock using LittleBits circuits from the above applications (whichever you deem appropriate), a buzzer to create the noise, and a **light sensor**.

The purpose of the application is to place it near the window at night. Set the light sensor to send a signal to the buzzer (which will cause the noise) when the sun rises, that is, when it detects light. Then the alarm will sound, and you will be ready for school.

Input
bit name: i13 light sensor

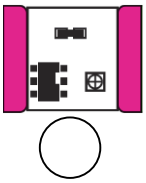
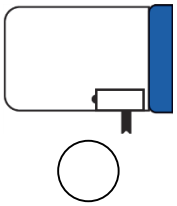
With a screwdriver, you can adjust the sensitivity of the sensor.

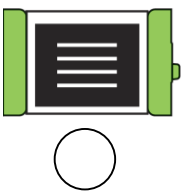
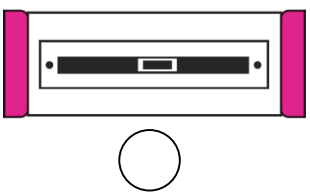


Materials needed

Composition of circuits from previous applications:
One (1) **device (i13 bit) light sensor**.

Recognize the following Bits/devices and number them in the correct order for implementing **Application 1.3.**

Application 1.4: Construct a simple fan to cool you down.

Output
bit name: o13 fan

Yes, it's exactly what you see: a small electric fan, which is connected to a LittleBits unit.

Materials needed

One (1) **device (p1 bit)** to connect the battery and provide us with its power
One (1) **device (o13 bit) electric fan**
One (1) **device (i5 bit) potentiometer**

Could the last application be useful even for pets?

The answer is **YES**. If you have a puppy, you can integrate your circuit into lego blocks, use hooks and adhesive strips, and attach your circuit to the ceiling of your pet's house. This way, your pet can stay cool inside its little house even during the summer.

The lesson information: What is a battery and how do I measure it?

In very simple terms, we can define a battery as a closed container filled with chemicals that convert chemical energy into electrical energy through electrochemical reactions. If you look at any type of battery, you'll see that it has two terminals: **positive (+)** and **negative (-)**.

The chemical energy of the battery causes the movement of electrons (electricity). This energy is gradually converted into heat (mostly within the wire connecting the terminals), and the battery "discharges". Typically, we connect something useful between the two terminals of the battery, such as a light bulb, a cassette player, a radio, etc., which uses the electrical energy produced by the battery. The first electric battery was created by **Alessandro Volta in 1800**.

The voltage measurement (in Volts) of a battery is done using an electronic device called a multimeter.
The multimeter is set to measure voltage, current, and resistance.
Today, we will measure the voltage (V) of the battery we have by following these steps:

- Set the multimeter to the DCV 20 position.
- Place on the multimeter the measurement probes (**red** and **black**) as shown in the picture.
- Finally, touch the **red** probe to the **positive terminal (+)** and the **black** one to the **negative terminal (-)** of the battery respectively.
- The reading on the display is the supply voltage of the battery.

Voltage (before):____V → *use during the lesson* → **Voltage (after):____V**

Turn off the power supply to your circuit using the switch (simply turn off the switch of the first LittleBits circuit) and ...

Disconnect all LittleBits and place each one in the correct position inside the box in front of you.

Care and Cleaning

You should clean your units by wiping them with a dry cloth only. Of course, you have the option to dampen your cloth with a cleaning agent called isopropyl alcohol and then wipe with a dry cloth.

Let's talk about some Technical Terms (and learn some greek):

Input
Είσοδος

Light
Φως

Bargraph
Ραβδόγραμμα

Sensor
Αισθητήρας

Electric
Ηλεκτρικός

Battery
Μπαταρία

Output
Έξοδος

Power
Ισχύς

Volt
Βολτ

Fan
Ανεμιστήρας

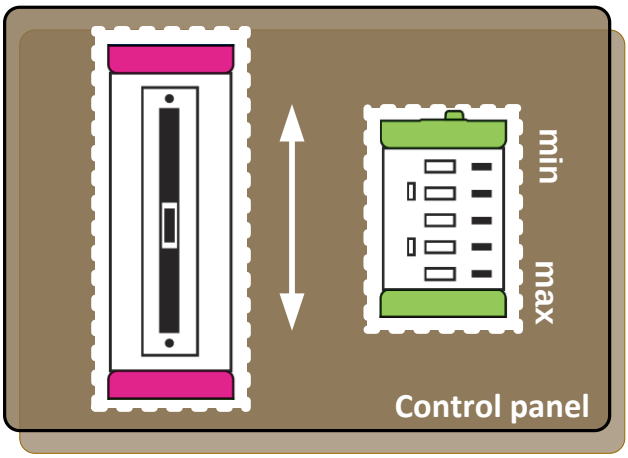
Bits
Δυαδικά ψηφία

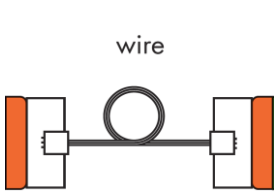
Buzzer
Βομβητής

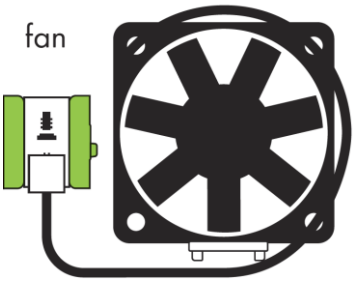
Wires
Σύρματα

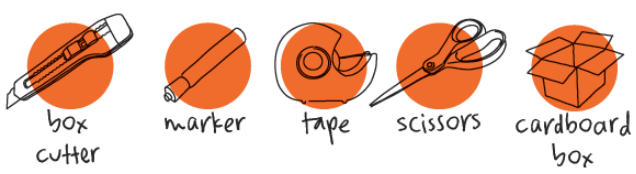
Homework

From the recyclable materials you have at home, choose a piece of relatively stiff cardboard to implement a **fan control panel**. A control panel typically refers to a user interface that allows individuals to interact with and manage various aspects of a system or device. Control panels are good to have the appropriate indicators, so the cardboard should be designed to have volume adjustment and speed indicators. For the construction, you will need crafting tools and whichever Bits from the lesson you think are useful. **Have fun!**





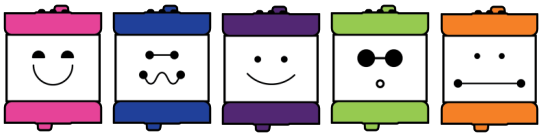




Tip!!!

If I want to have easier connections, I can use the basic Wires, which is a cable that provides flexibility in design. I can attach the Bits with adhesive tape onto the cardboard.

Notes:



little girl Bits

This training material was initially created in 2017 to empower young girls in STEM and was translated in english and augmented with AR technology in 2023

Authors: D.Karampatzakis, F.Karampatzakis, I.Mpakali, D.Pogaridis

Circuit 1.1

2

Play!

Exercise

1

Application 1.1

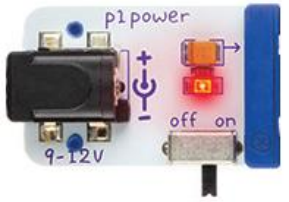
Solution

3

LIBRARY OF AVAILABLE LITTLEBITS

o9 BARGRAPH

i3 BUTTON



p1 POWER

o13 FAN

i5 SLIDE DIMMER

BATTERY

o6 BUZZER

i11 PRESSURE SENSOR

INFO

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Educational Robotics at Schools Online with Augmented Reality - eROBSON project has received funding from the European Union's Erasmus Plus programme, grant agreement 2020-1-NO01-KA226-SCH-094120
https://erasmus-plus.ec.europa.eu/projects/search/details/2020-1-NO01-KA226-SCH-094120

Circuit 1.2

2

Play!

Exercise

1

Application 1.2

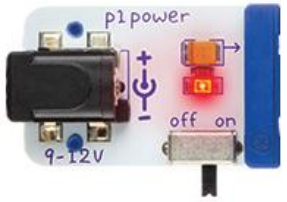
Solution

3

LIBRARY OF AVAILABLE LITTLEBITS

o9 BARGRAPH

i3 BUTTON



p1 POWER

o13 FAN

i5 SLIDE DIMMER

BATTERY

o6 BUZZER

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Circuit 1.4

2

Play!

Exercise

1

Application 1.4

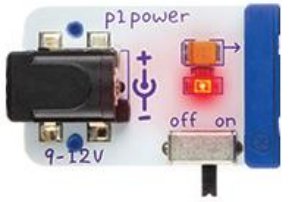
Solution

3

LIBRARY OF AVAILABLE LITTLEBITS

o9 BARGRAPH

i3 BUTTON



p1 POWER

o13 FAN

i5 SLIDE DIMMER

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