

Leaphy Flitz Manual



Leaphy Flitz - Introduction

How does this book work?

In this booklet you will find lessons to learn how to work with the Leaphy Flitz robot. By completing the assignments for each level, you will automatically learn how to program the Flitz robot. In this way you can get off to a great start in the world of robots and technology!

Problem solved!

Leaphy Flitz doesn't always do what you want it to do. That's why you can learn so much from it. So: Go and give it a try. Feel free to make mistakes and carry on!

Arduino technology

On the Leaphy Flitz is a mini-computer called 'Nano'. This computer is very widely used by techies all over the world. Together with the Leaphy Delphy shield you can easily learn how to work with computers. Work with it carefully, and you will enjoy it for a long time.

And now: let's get to work... Enjoy!

The Leaphy team

Robot Design Leaphy Flitz: Olivier van Beekum

Lesson Material - concept and elaboration: Roeland Smith and Olivier van Beekum

Third edition -February 2024 © Leaphy Foundation

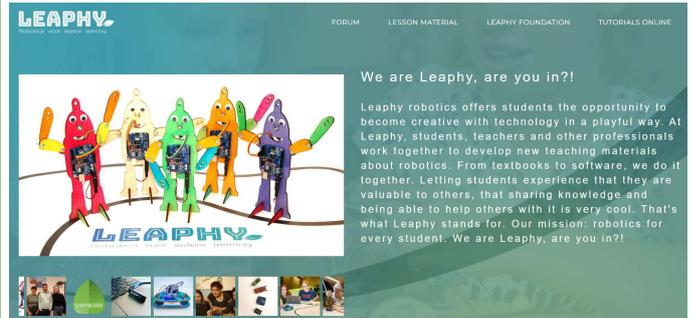
Level 1 –Build & Download

Congratulations! You have just received the kit for building and programming the robot Leaphy Flitz. In this level, we'll explain how to get started.

Level 1.1 – Building

You can build the Leaphy Flitz robot with the help of instructional videos on the Leaphy website.

Assignment: Look up the instructional videos for the Leaphy Flitz robot on Leaphy.nl. Build your Flitz robot according to the instructions in the videos

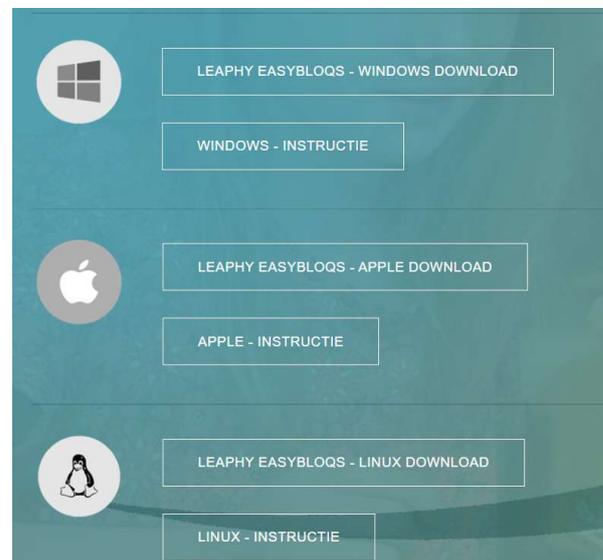


Level 1.2–Installing Leaphy Easybloqs

To program your Leaphy robot, all you need is a computer with WiFi and USB port. Go to leaphyeasybloqs.com for the online version or Leaphy.nl to download the program.

Do you use leaphyeasybloqs online together with a Windows computer? Then also install the drivers, which you can find under 'More' in the top menu.

Assignment: make sure you can use the Leaphy programming software (online or installed) on your own computer.



Level 2 – Thread loose?

The Leaphy Flitz has a light, a belly sensor and a hand sensor. With the help of the instructional videos, you have created the Leaphy Flitz. In this level, you check if everything is connected properly.

Level 2.1 – Loose thread?

The nano computer on your Leaphy Flitz is attached to the Leaphy Delphy shield. The shield connects the nano to the rows of pins on the left and right. In this way you can easily connect sensors and lights to it.

Assignment: Find out which 3 different types of pins there are on the shield.



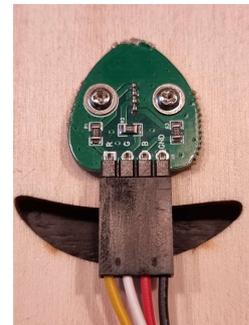
Level 2.2 – Connection Light

Use the diagram on the right to check whether the connection of the light is correct.

On the back of the light are the signs:

- Gnd Ground
- R Red
- G Green
- B Blue

Assignment: Check if the light is connected properly. Use the diagram on the right. Please note: the colors of the wires in the photo may be different from the wires on your own Flitz. That's okay.



RGB-Led	Delphy shield
Gnd	D8
R (Red)	D11
G (Green)	D10
B (Blue)	D9

Level 2 – Thread loose?

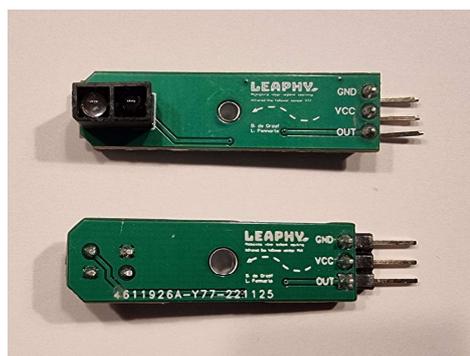
Level 2.3 – Belly sensor connection

Sensors of the Flitz have 3 types of pins, Gnd, Vcc and Out. These fit on the pins of the Shield. The out pins have numbers that start with a D (Digital) or A (Analog). Analogous pins only measure 0 or 1, digital pins can make measurements between 0 and 1023. We'll explain the difference further in level 7.



Assignment: Check that the wires of the belly sensor are properly connected. The out pin of the sensor on on D2 (digital pin 2) of the shield, Vcc on 5V (middle row of pins of the shield) and Gnd on the outer row of pins on the shield. You can also use the schedule on the right

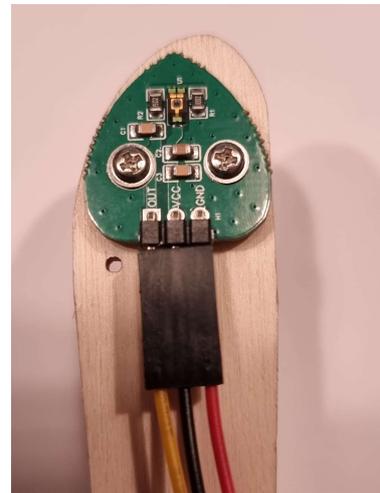
Belly sensor	DelpHY shield
Gnd	Gnd
Vcc	5v
Out	D2



Level 2 – Thread loose?

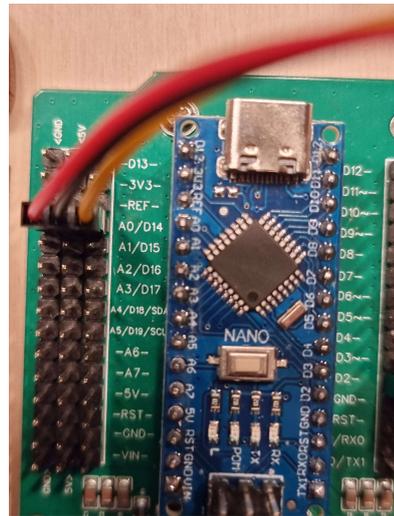
2.4 –Hand Sensor connection

In the picture on the right and the diagram below you can see how to connect the hand sensor. Please note: the color of the wires on your Flitz may differ from the wires in the photo.



Level 2.5 – Hand sensor connection

Here is a picture of the connection of the wires of the hand sensor to the computer. The out pin of the hand sensor is on pin A0 of the shield. Vcc of the hand sensor pin is connected to the 5v pin of the shield. The gnd pin of the sensor is connected to the pin belonging to the outer row on the shield.



Level 2.6 – Hand sensor diagram

The wires of the hand sensor are connected according to the diagram on the right.

Hand sensor	Delphy shield
Gnd	Gnd
Vcc	5v
Out	A0

Level 3 – Command Blocks

The Leaphy Flitz is programmed with 'Leaphy Easybloqs', the block code of the Leaphy Software. In this level you will learn more about that.

Level 3.1 – Choose Leaphy Flitz

Start the Easybloqs program and click on the Leaphy Flitz image. Choose the Flitz nano, the version this book is about.



Level 3.2 – Different programming blocks

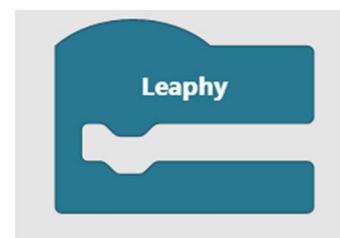
On the left side of your screen, you will see different groups of programming blocks.

The dark green Leaphy Flitz blocks at the very top are all action blocks which can give a call to action. Nose-light Red, Green and/or Blue on and off, reading belly or hand sensor. With the 'show' blocks, you can show the values that the belly sensor or hand sensor transmits to the computer. More on this later.



Level 3.3 – Leaphy block

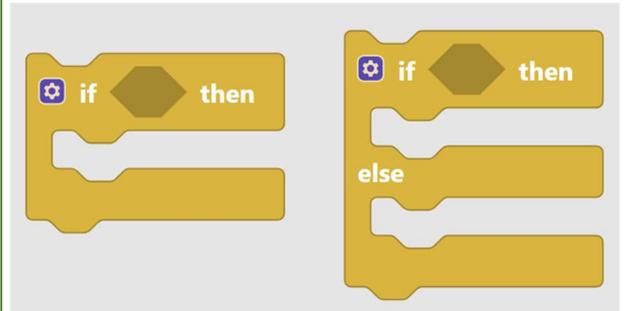
Programming is done by stacking the different blocks on top of each other in the right order. Please note! Only blocks that are between the 'Leaphy' block are sent to the Flitz's computer.



Level 3 – Command Blocks

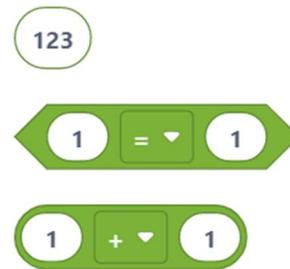
Level 3.4 – Yellow Thinking Step Blocks

The yellow thinking step blocks tell you when, how often and for how long Flitz has to do something. In the empty spaces between the words IF and THEN you can put blocks with 'situations'. You will also use the repeat forever block a lot.



Level 3.5 – Green Number Blocks

You use these blocks to compare, a value is less than < or larger than > or equal to = the value that the hand sensor measures, for example.



Level 3.6 – Orange Variable Blocks

The orange variable blocks are special because you can give them a name yourself. These blocks are like trays in which the Flitz stores numbers or even a calculation. So you can give each container its own name. In level 8 you learn to work with it.



Level 3.7 – Custom Blocks

With the light blue subprogram blocks you can merge a program you have created into 1 block. Very useful when you are going to make longer programs.



Level 4 – Stacking Blocks

Now that everything is properly connected, you can create your first program in this level and learn how to get it on the Leaphy Flitz.

Level 4.1 – Programming

All the separate parts of the program have been explained, but how do you make a program?

On the left side of the screen are the different groups. Click on the group you need command blocks from. You always start with the blue-green starting block 'Leaphy', which is already present.

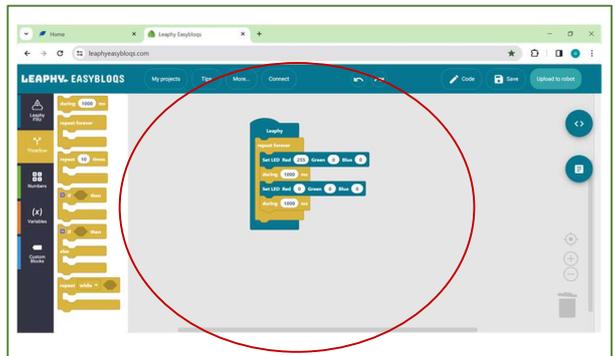
Tip: always use only one starting block.

(Flitz can run multiple Starting Blocks at the same time, but gets confused quickly if you don't do it properly.)



Level 4.2 – Build

Drag the individual command blocks to the center of the screen. This is the programming field, this is where you build your program. You do this by stacking the different blocks in a logical order on top of each other and in the Leaphy block.

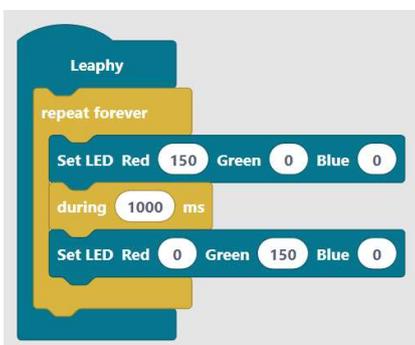


Level 4.3 – Repeat and Wait

Put a 'Repeat forever' block around each program.

Otherwise, the Flitz will only do everything once.

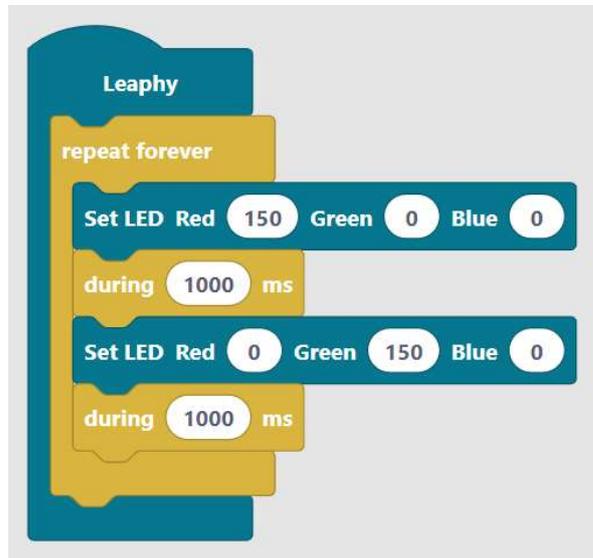
Use **waiting blocks**. The green LED light in the example on the right will turn on for such a short time that you won't see it. Then it goes to red again. **Which block do you have to add to see the green light?**



Level 4 - Colour Programming

Level 4.4 – Are the colors correct?

Assignment: We are going to test with the program on the right whether the Green light works. Make a stack of blocks like the one on the right

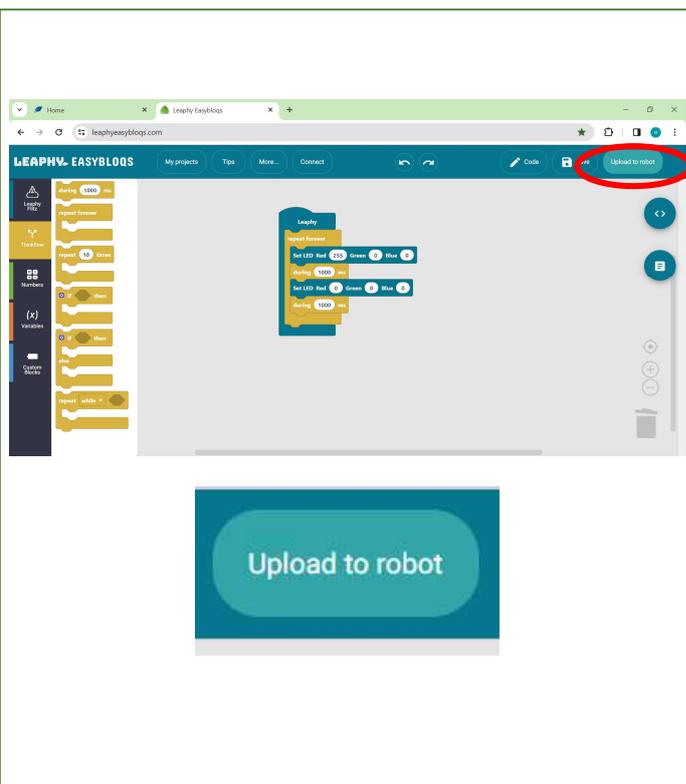


Level 4.5 – Upload

Finished stacking? Then you can now upload the program to your Leaphy Flitz. But how do you do that? It's easy:

> Connect Leaphy Flitz to your laptop with the USB cable.> Click on the 'Upload to robot' button and you're done! If all goes well, the nose light of the Flitz will now come on after a few seconds.

Assignment: what messages do you see in between?

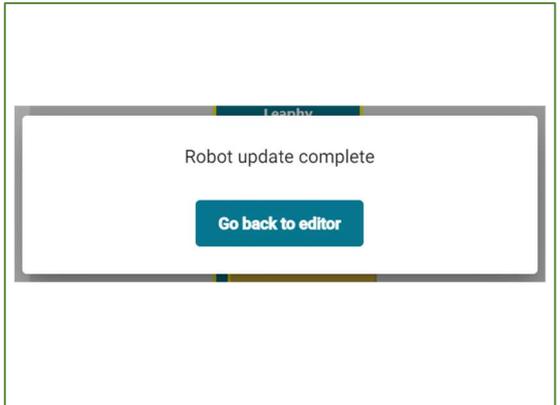


Level 4 – Test & Save

Level 4.6 – Testing

Often you have to wait a while uploading a sketch but hopefully you will get this message at the bottom of your screen: 'upload completed'. Congratulations, you've now put your first program on the Flitz!

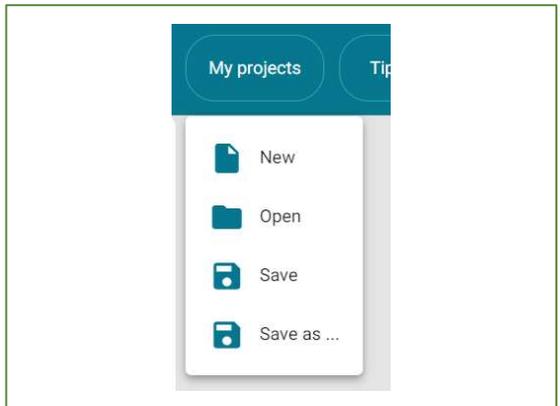
Assignment: How many colors can you make? Yes exactly, all! Mixing colours with light! Try making purple or even pink.



Level 4.7 – Save

Some programs take a lot of time to make, and sometimes you want to save them to use again later. Here 's how to save a sketch:

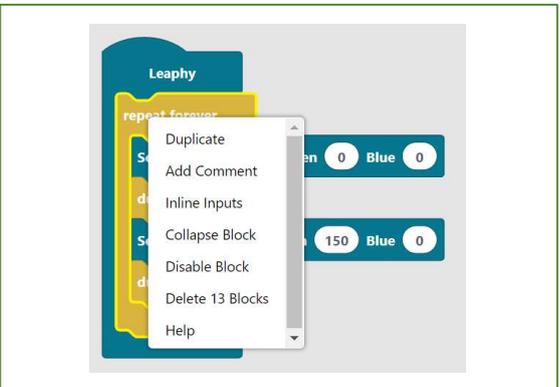
- >Go to 'my projects' at the top left of the text bar
- >Go to 'save as' and save your file
- >You can also open it in this screen, via 'open'



Level 4.8 – Add Comments

When you share a program with others, it is sometimes useful to add comments to the command blocks. This can be done in the following way:

- > Move the arrow over the command pad and press the right mouse button
- >Click on 'comment' and start writing!



Level 4 – Disco-Nose

Level 4.9 – Disco-nose

We are going to do experiments with the noselight as a disco nose. You can see an example on the right, but much more is possible!

Assignment: Set the same color to 50 or 255 to see the difference. You can also flash different colors in quick succession.

If you want the nose light to blink faster, you can work with numbers with the duration block and milliseconds (the block says 'ms'). There are 1000 milliseconds in 1 second. If you want a waiting time of 1 second, that's 1000 ms in the block. Half a second is 500 ms.

Assignment: You can also make the light flash. That's basically turning the light on and off. You can turn off the light by setting all 3 colors to 0. Just try the program on the right.

```
Leaphy
repeat forever
  Set LED Red 255 Green 0 Blue 0
  during 1000 ms
  Set LED Red 0 Green 255 Blue 0
  during 1000 ms
  Set LED Red 0 Green 0 Blue 255
  during 1000 ms
```

```
Leaphy
repeat forever
  Set LED Red 255 Green 0 Blue 0
  during 1000 ms
  Set LED Red 0 Green 0 Blue 0
  during 1000 ms
```

Level 5 – Morse

Even before the telephone was invented, people could 'talk' to each other remotely. One of those ways was via Morse code, several short or long signals for each letter were sent to each other and deciphered via long power cables between cities.

Level 5.1 – 'Talking' using Morse

With Morse you can make sentences, but abbreviations also work: SOS in case of emergency you probably know and means 'Save Our Souls'

Task: Try to figure out how you could make the Flitz say something with Morse code.

On the right is shown the real Morse code as it is still used today. For example, the letter A is a short flash followed by a long flash with the light.

This way you can 'make' all the letters and numbers with the light. Note: Leave a 1-second pause between each letter.

A	● —	U	● ● —
B	— ● ● ●	V	● ● ● —
C	— ● — ●	W	● — —
D	— ● ●	X	— ● ● —
E	●	Y	— ● — —
F	● ● — ●	Z	— — ● ●
G	— — ●		
H	● ● ● ●		
I	● ●		
J	● — — —		
K	— ● —	1	● — — — —
L	● — ● ●	2	● ● — — —
M	— —	3	● ● ● — —
N	— ●	4	● ● ● ● —
O	— — —	5	● ● ● ● ●
P	● — — ●	6	— ● ● ● ●
Q	— — ● —	7	— — ● ● ●
R	● — ●	8	— — — ● ●
S	● ● ●	9	— — — — ●
T	—	0	— — — — —

Level 5 – Morse and Code

Level 5.2 – Long sketches

Sending a message on one end of the line also means that someone on the other end will receive the message.

Assignment: Try to find out what the Flitz 'says' when the program next to it is used.

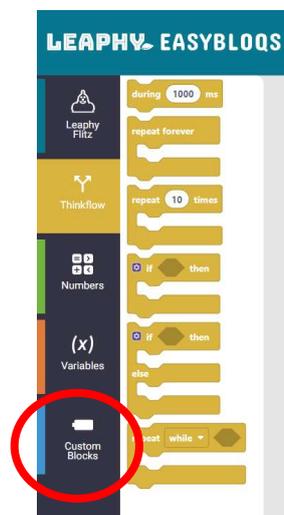
That's right, 'HI'. You can see that a two-letter Morse code immediately produces very long code. Is there no other way?

Certainly, with the 'custom blocks' function



Level 5.3 – Custom Blocks

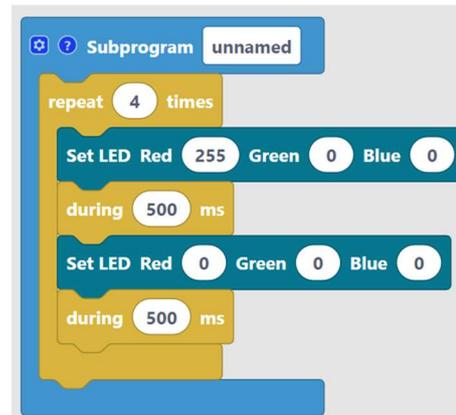
Click on the group 'Custom blocks' and slide the top block 'subprogram' to the right to your work field.



Level 5 – Make a letter

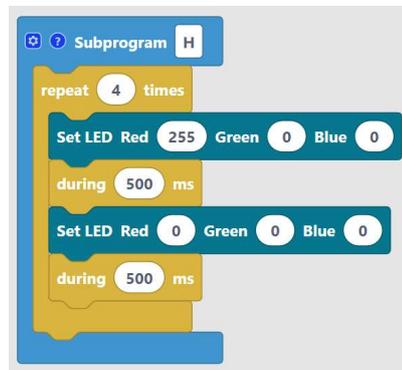
Level 5.4 – Subprogram block

Now paste the code for the letter H, (blink four times) into the subprogram block.



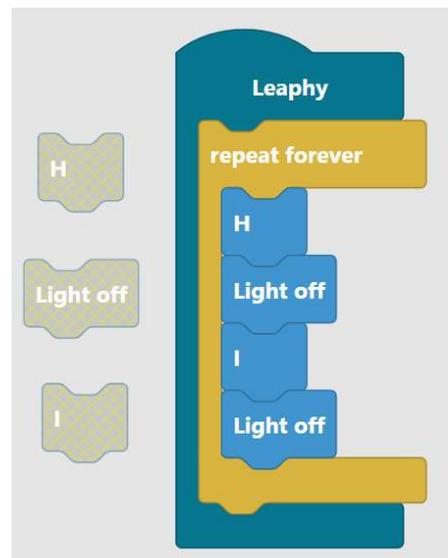
Level 5.5 – Make a letter

At the top right, you can give the block a name, for example 'letter H'



Level 5.6 – Whole Alphabet

Now a new block will appear with your code 'in it'. You can do this for each letter. Together with a 'light off' block, you can now program Morse code very easily.



Level 6 – The Belly Sensor

To know, to 'perceive' what is happening around us, people have senses such as eyes and ears. Robots can also perceive the environment with senses, which we call 'sensors'. The Flitz has 2 sensors, the first one you will now learn to use: the belly sensor.

Level 6.1 – How does the belly sensor work?

If you look closely, the belly sensor has two 'lights' on the end, one black and one white.

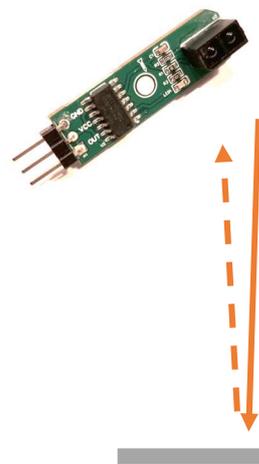
The white light emits invisible (infrared) light. If that falls on a surface, the light bounces back to the black light a bit. That black light is actually not a light but a receiver.

The receiver only sends a signal to the Flitz's computer when there is reflected infrared light.

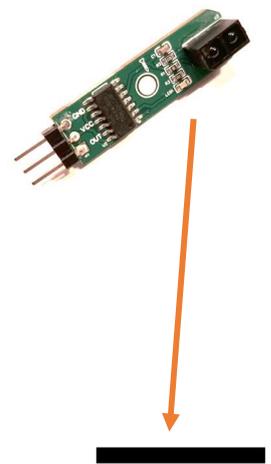
So the belly sensor can only measure two things, there is reflected light: the value is 1 or there is no reflected light: the value is 0.

and value by

A



B

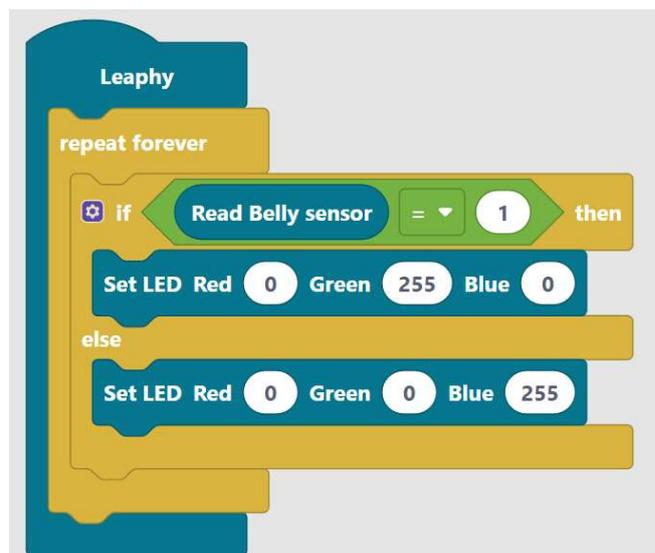


A. Emitted light, value=1

B. No emitted light, value=0

Assignment: create the program on the right and test whether your belly sensor works. What color does the light turn when you hold your finger near the sensor? **Caution: daylight can confuse the sensor. Then close the curtain!**

Assignment: Can you program the sensor in such a way that the light turns red without changing the blue blocks?



Level 7 – The Hand Sensor

In addition to the belly sensor, the Flitz has another sensor, the hand sensor. The hand sensor works completely differently than the belly sensor. In this level you will learn how the hand sensor is different from the belly sensor and how to program it, read on!

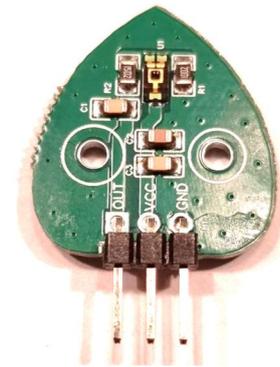
Level 7.1 – What do we measure?

The hand-held sensor measures light intensity. In other words, the hand-held sensor measures how much light is in the environment.

The sensor gives a number between 0 and 1023 for the amount of light in the environment. On the right you can see what those values roughly mean.

Digital & Analog

This is different from the belly sensor, which only works with 0 or 1. The belly sensor is therefore a sensor that is 'digital'. The hand sensor gives 1024 different values, which is called analogue.

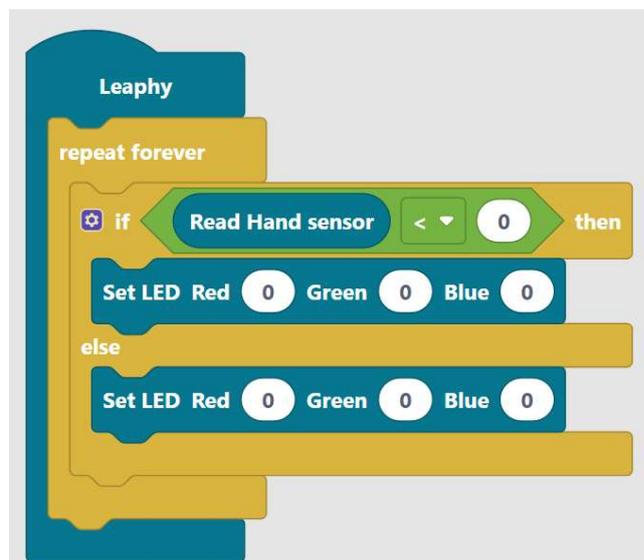


<i>Completely dark</i>	<i>50</i>
<i>Living room by day</i>	<i>500</i>
<i>Daylight clouded</i>	<i>800</i>
<i>Daylight sunny</i>	<i>900</i>
<i>Torch light close by</i>	<i>1000</i>

Assignment: Make Flitz's nose change color when it gets dark. Start with the program as shown on the right and enter the values for LED yourself.

Assignment: Try to find out which value you need to enter for the hand sensor. You can use the diagram above as a starting point.

Assignment: Can you also make the Flitz blink its nose in the dark?

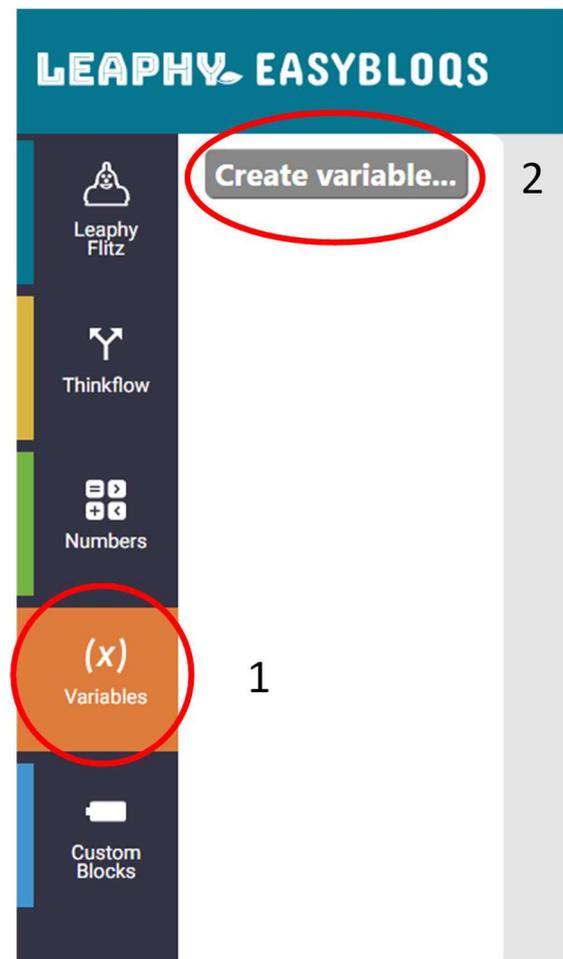


Level 8 – Color Dice

Level 8.1 – Blue or green?

You can use the Leaphy Flitz as a color die. The computer on its belly can make random numbers. You can use those numbers to turn the colors on and off.

Assignment: Create a variable. You can do that with the orange blocks, just take a good look at the pictures on the right. Click on 'create variable' and name your variable: 'Color choice'. Now 3 new orange blocks will appear as shown on the right.



Level 8 – Colour dice

Assignment: Now make the program on the right that rolls the dice between two colors. You can see that at the top the lights are turned off every time. Just try what happens if you don't.

Assignment: Can you roll the dice with three colors? Give it a try!

```
Leaphy
repeat forever
  Set LED Red 0 Green 0 Blue 0
  during 1000 ms
  set Colour choice to random integer from 1 to 2
  if Colour choice = 1 then
    Set LED Red 0 Green 150 Blue 0
    during 2000 ms
  if Colour choice = 2 then
    Set LED Red 150 Green 0 Blue 0
    during 2000 ms
```

Level 9 – Measurement on your screen

Level 9.1 – To measure is to know?

In level 7 you have seen that you can have Leaphy Flitz measure light. At that time, you estimated the light intensity yourself using the table in this book.

It can also be done differently, you can show the values that Flitz measures with the light sensor. How? Use the 'Show on screen' block. You can find this block in the top group 'Leaphy Flitz'

Assignment: Create the program as shown on the right and upload it to the Flitz.

Assignment now measure the amount of light at different places in the room. You can do this by clicking on the script button as indicated on the right. Now you can see the values that Flitz measures with the light sensor at the bottom right of the screen.

By clicking on the trash can icon, Flitz starts measuring again. Where is there more light, by the window or inside by the light?

The image shows two screenshots of the Leaphy Easybloqs programming environment. The top screenshot displays a script with the following blocks: a 'Leaphy' block, a 'repeat forever' loop containing a 'Show on screen' block with the text 'Read Hand sensor', and a 'during 3000 ms' block. A red circle highlights the script button in the top right corner. The bottom screenshot shows the 'Serieële output' window with a trash can icon circled in red. The output window displays the following data:

```
void loop() {  
13:45:03:851 940  
13:45:06:851 940  
13:45:09:849 940  
13:45:12:850 940  
13:45:15:850 940  
13:45:18:850 940  
13:45:21:850 941  
13:45:24:850 941  
13:45:27:850 941  
13:45:30:851 941  
13:45:33:850 941
```

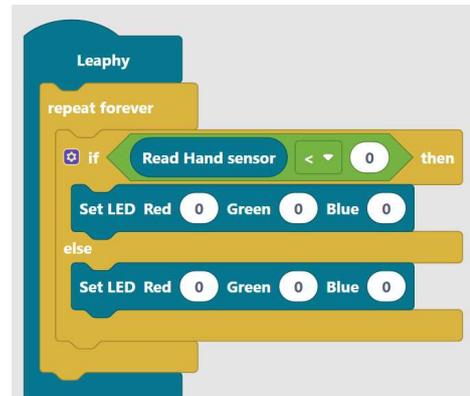
Level 10 – Pass it on!

In this level you will learn how to make the Leaphy Flitz pass its light to another Leaphy Flitz robot. For this level you need more than 1 Flitz robot!

Level 10.1 – Hand sensor and LED

With the program on the right, you can make sure that the nose light turns on when the hand sensor measures more light.

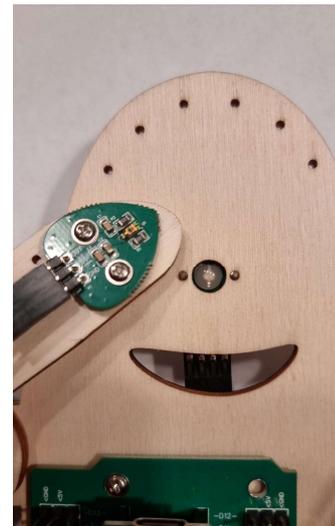
Assignment: Choose your own color and make sure the light turns on when it gets lighter. Use the serial monitor to determine which value you need to enter. At what value of the hand sensor does the light always stay on for you?



Level 10.2 – Flitz passes it on!

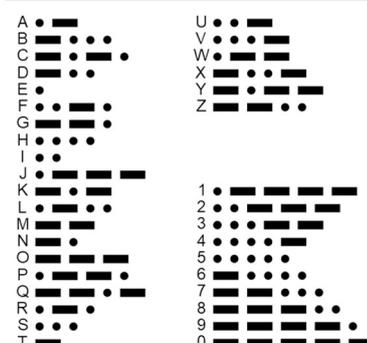
With the hand sensor of one Flitz robot, you can now also measure whether the nose light of another Flitz robot is on or off.

Assignment: Line up as many Flitz robots as possible next to each other with your class. Make sure the hand sensor is close to the light of the Flitz next to it. Can you program the Flitz robots to 'pass' a light from one Flitz to another Flitz?



Level 10.3 – Flitz a Morse

Assignment: Can you also have the Flitz robots pass on a Morse code? Line up the Flitz robots and have someone at the end of this 'chain' decipher the Morse code provided by the first robot in line.



Level 11 – Wave, wave!

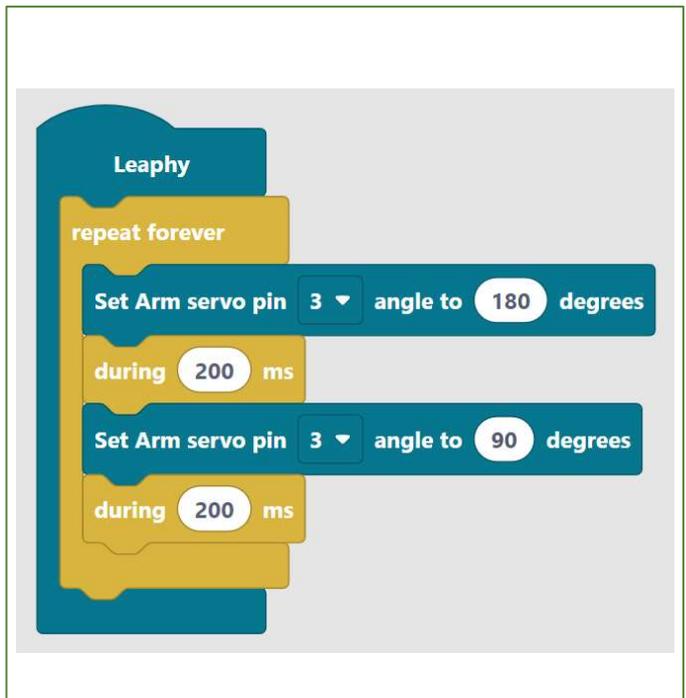
The last level, time to say goodbye, in this last level we are going to wave goodbye to the Leaphy Flitz

Level 11.1 – Moving servo arm lats

To move the servo arm, you can use the command block servo arm. By default, this is on pin 2 while our arm is attached to pin 3. So you have to adjust this

Assignment: With the program on the right you can make the arm swing. Can you also change the colour of the nose light with every swing?

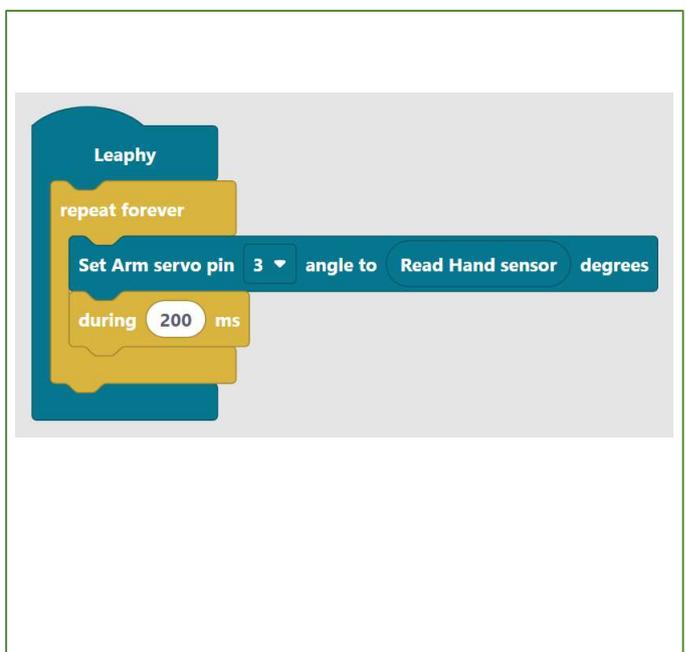
Assignment: Can you also think of a program where the Flitz only swings when you hold your finger near the belly sensor? Think of the 'if then different' command block



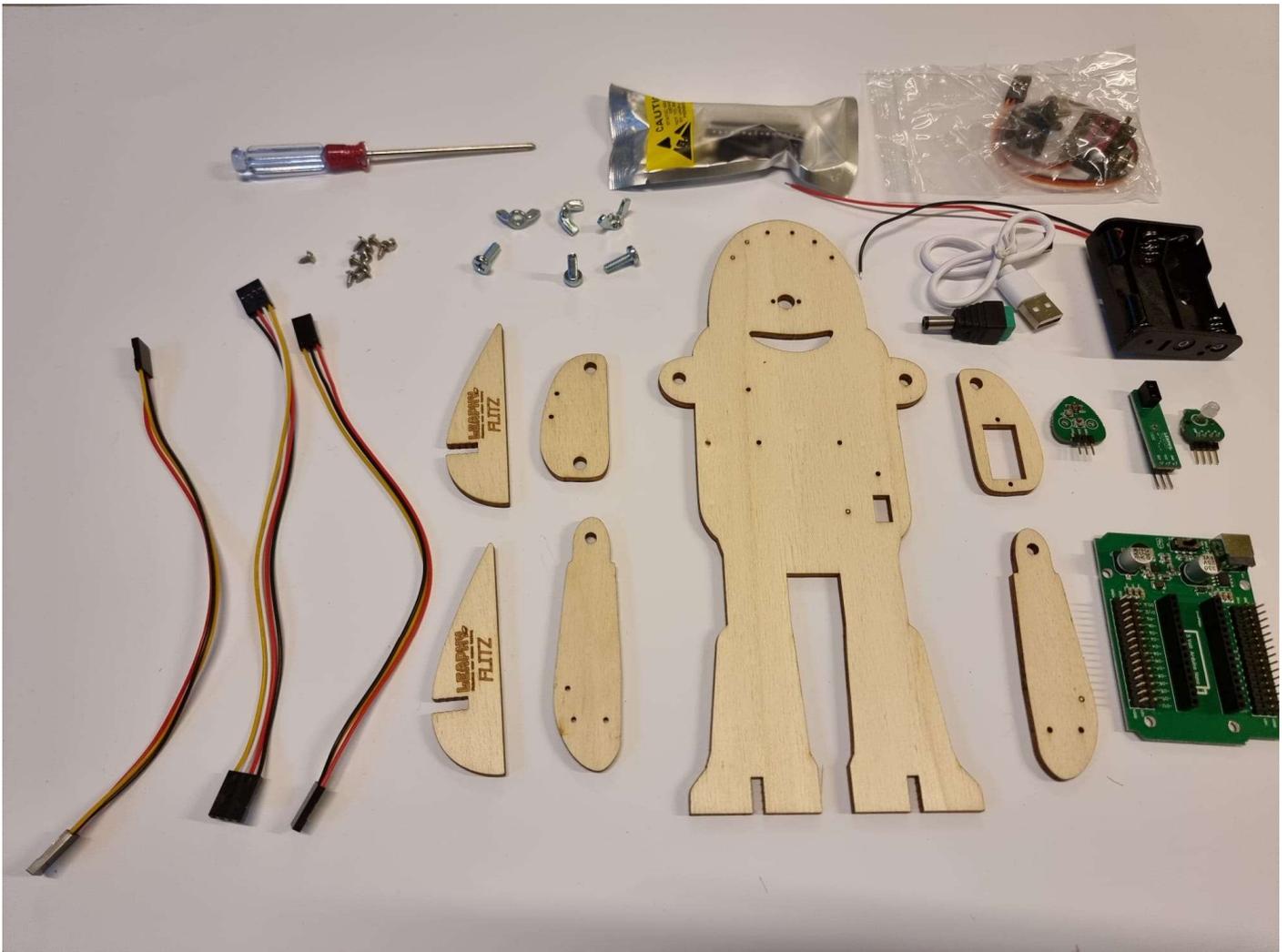
Level 11.2 – Flitz as a light meter

By using the read hand sensor block together with the servo arm block you can program the Flitz as a light meter

Assignment: Recreate the program on the right and upload it to your Flitz. What happens to the arm when you hold the Flitz near the window?



Flitz parts



Using this picture you can check whether all the different parts of the Flitz robot are indeed present:

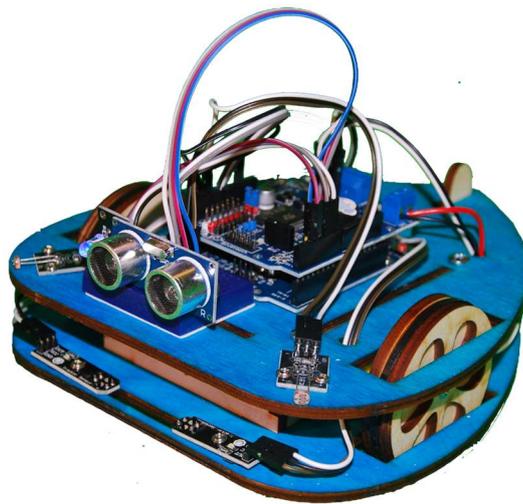
- | | | |
|---|------------------------------|----------------------------|
| 1 wooden body frame | 3 wingnuts m4 | 1 IR sensor (belly sensor) |
| 2 wooden upper arms (1 with room for servo) | 1 small screwdriver | 1 RGB light |
| 2 wooden lower arms | 1 nano computer | 1 Delphy shield |
| 2 wooden feet | 1 servo motor | |
| 2 wires for 3 pin | 1 batteryholder | |
| 1 wire for 4 pin | 1 usb cable | |
| 10 screws m3 6mm | 1 adapter | |
| 3 screws m4 12 mm | 1 light sensor (hand sensor) | |

Flitz next level?

So that was it, wasn't it? Have you got the hang of it and are you ready for the next level? Then take a look at our other robots on Leaphy.nl. Maybe the Leaphy Original is something for you!

Have you come up with something new for the Leaphy Flitz? Let us know by sending an email to contact@leaphy.nl or post a message on our forum on Leaphy.nl.

The Leaphy Team



The Leaphy Foundation is supported by:

