UNI
FR

A Simple Cross-Platform Python API For Controlling The E-puck2 Educational Robot

Author : David Roman Frischer

Supervisors : Denis Lalanne and Julien Nembrini

31 May 2021

Department of Computer Science - Bachelor Project Presentation

Robotics Course

Teacher :

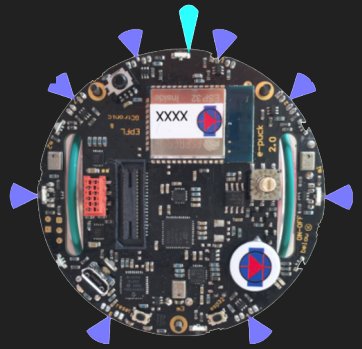
Dr. Julien Nembrini

Introduction to robotics and state machines using the e-puck robot.

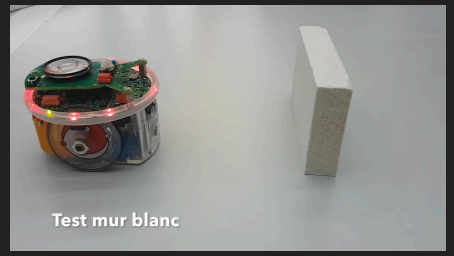
For first year students in Computer Science

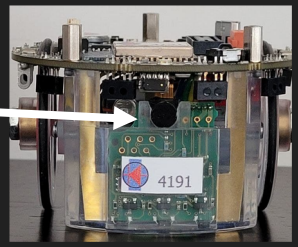
Programming language : C (until 2020)
Python (since 2021)

What are the capabilities of the robot ?

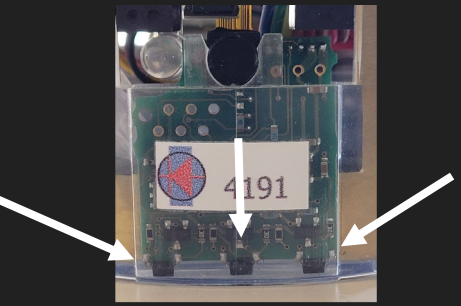


Proximity sensors

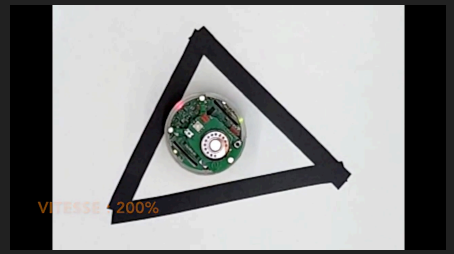


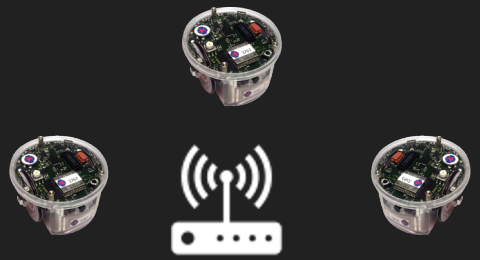


On-board Camera



Ground sensors

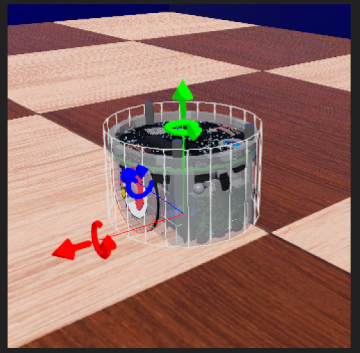




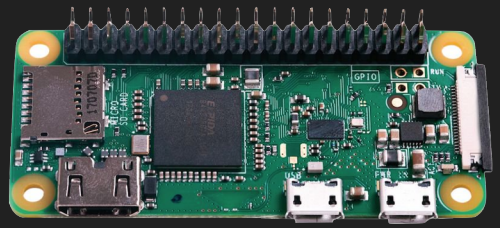
LAN Communication

The Three Platforms

WiFi

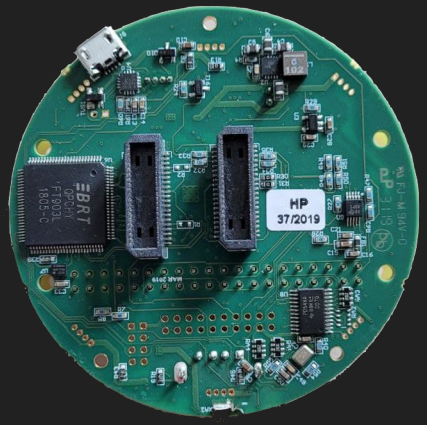


Webots
Simulation

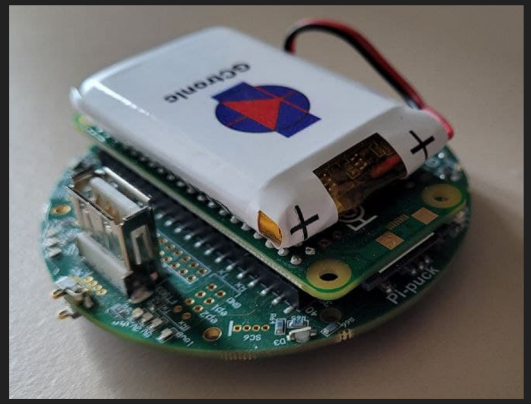


On board
RaspberryPi

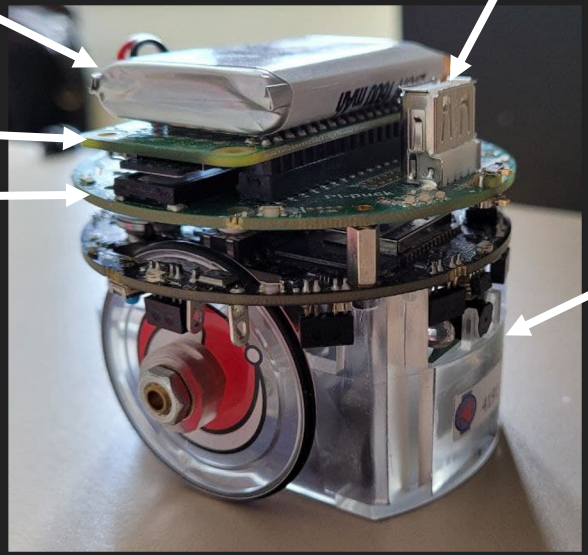
The pi-puck



back

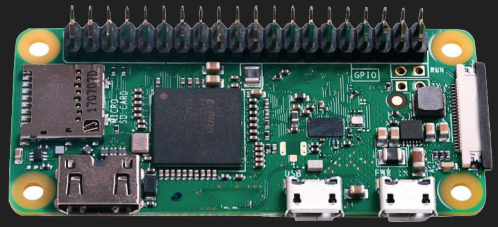


front



WiFi

Webots
Simulation

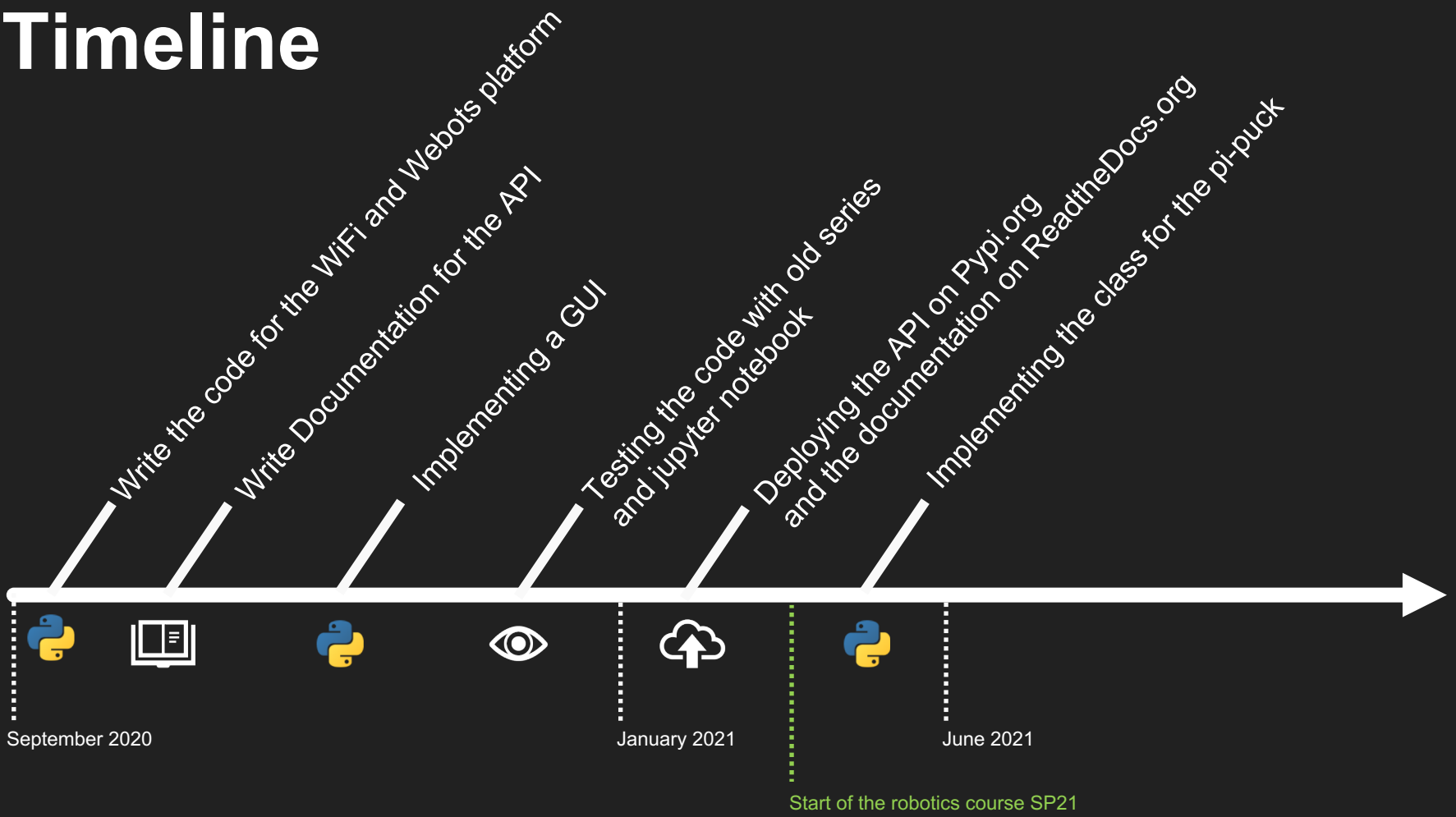


On board
RaspberryPi

THE PROBLEM ?

Each platform has its own specific code to control the e-puck !

Timeline


Write the code for the WiFi and Webots platform
Write Documentation for the API
Implementing a GUI
Testing the code with old series and jupyter notebook
Deploying the API on Pypi.org and the documentation on ReadtheDocs.org
Implementing the class for the pi-puck
September 2020
January 2021
June 2021
Start of the robotics course SP21

C

```c
#define SIMULATION 0

#if SIMULATION
#include "../API/webots/webotsAPI.h"
#else
#include "../API/epuck/epuckAPI.h"
#endif
```

```c
int main (int argc, char **argv) {
    #if SIMULATION
    #else
    ip = argv[1];
    #endif

    init_robot();
    init_sensors();
```

```c
    int counter = 0;
    set_speed(NORM_SPEED, NORM_SPEED);

    while (robot_go_on() && counter < 20) {
        counter = counter + 1
    }
    cleanup_robot();}
```

Python

```python
from unifr_api_epuck import wrapper
import sys
```

```python
if __name__ == "__main__":
    ip_addr = None
    if len(sys.argv) == 2:
        ip_addr = sys.argv[1]

    rob = wrapper.get_robot(ip_addr)
    rob.init_sensors()
```

get instance of the robot

```python
    counter = 0
    rob.set_speed(rob.NORM_SPEED)

    while rob.go_on() and counter < 20:
        counter = counter + 1

    rob.clean_up()
```

Function overloading

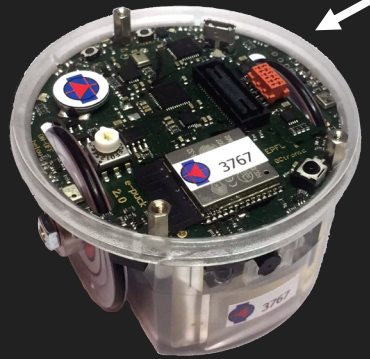
```
rob = wrapper.get_robot(ip_addr=None, is_pipuck=False)
```

E-PUCK

`ip_addr = 'W.X.Y.Z'`

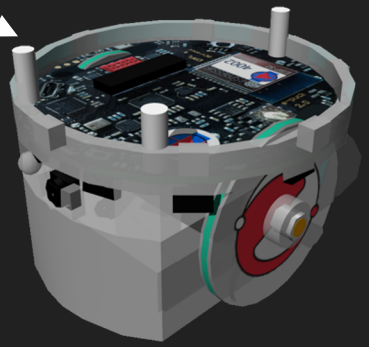
`is_pipuck`

`ip_addr = None`



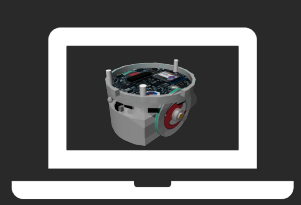
real robot

real robot + pi-puck



Webots robot

Communication between e-pucks



(192.168.40.110)

Host Manager

(192.168.2.2)


```
data = {'connected ‘: {}}'192.168.40.110':True,
                         '192.168.40.191':True,
                         '192.168.40.122':True,},

        '192.168.40.110' : [] ,
        '192.168.40.191' : [],
        '192.168.40.122' : ['Hi', 123, [1.96 ,3.62 ,5.53]]}
```

LAN

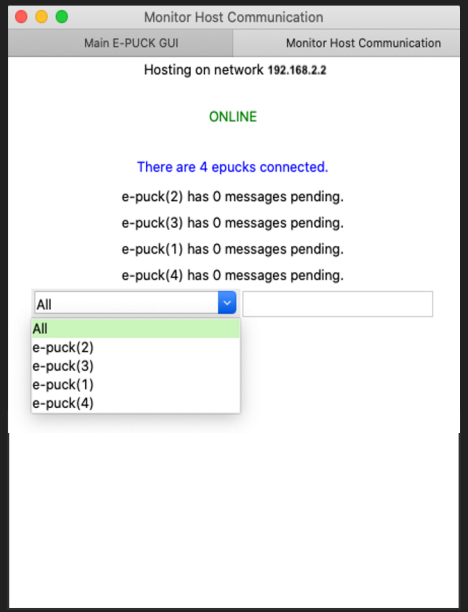
(192.168.40.191)

(192.168.40.122)

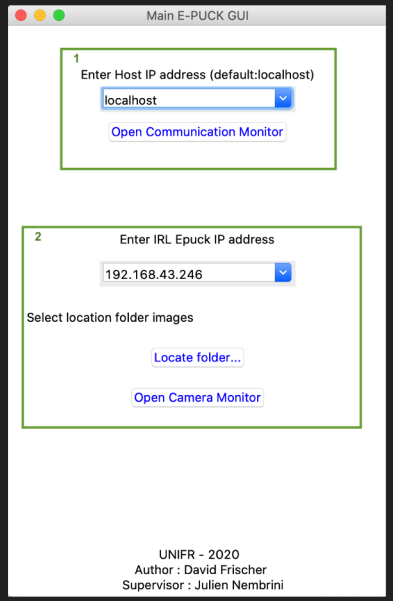
(192.168.2.3)

The Graphic User Interface

1



- Inform the online e-pucks
- Send messages
- Cross-platform host
- Accessible in the full LAN range



- GUI integrated in the pypi package
- Smart and Easy to use

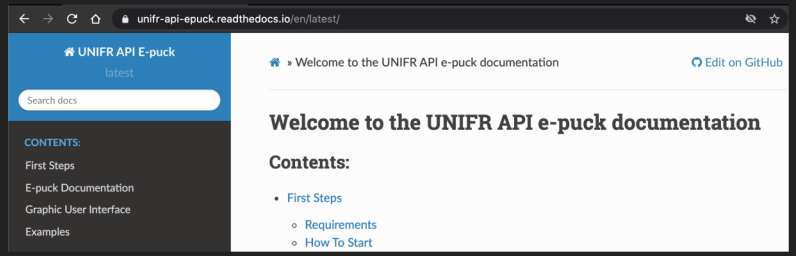
2

- Adjust refresh rate
- Take picture
- Copy / paste the path

Deploy the code

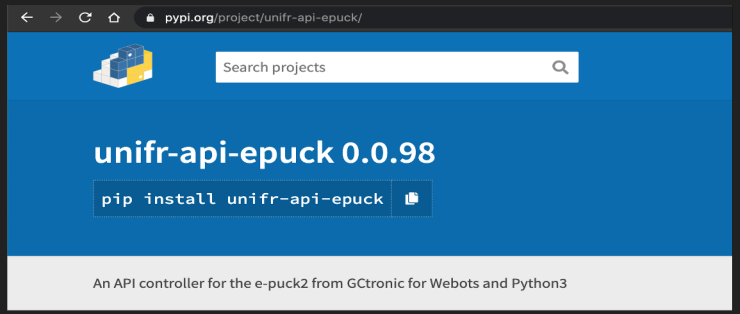
```
$ pip3 install unifr-api-epuck
```

ReadTheDocs.org



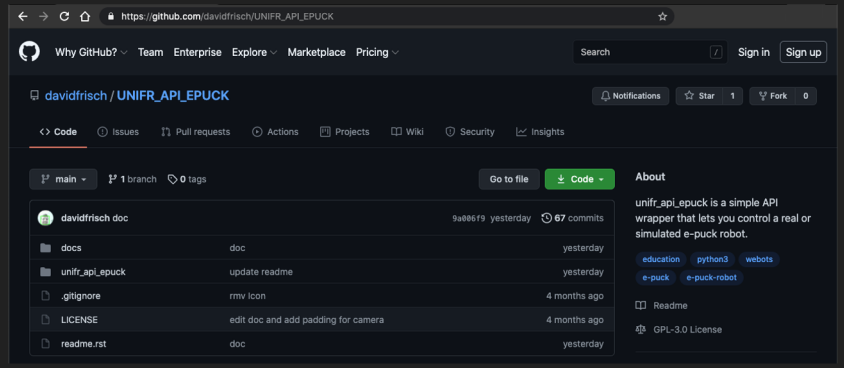
https://unifr-api-epuck.readthedocs.io/en/latest/

Pypi.org



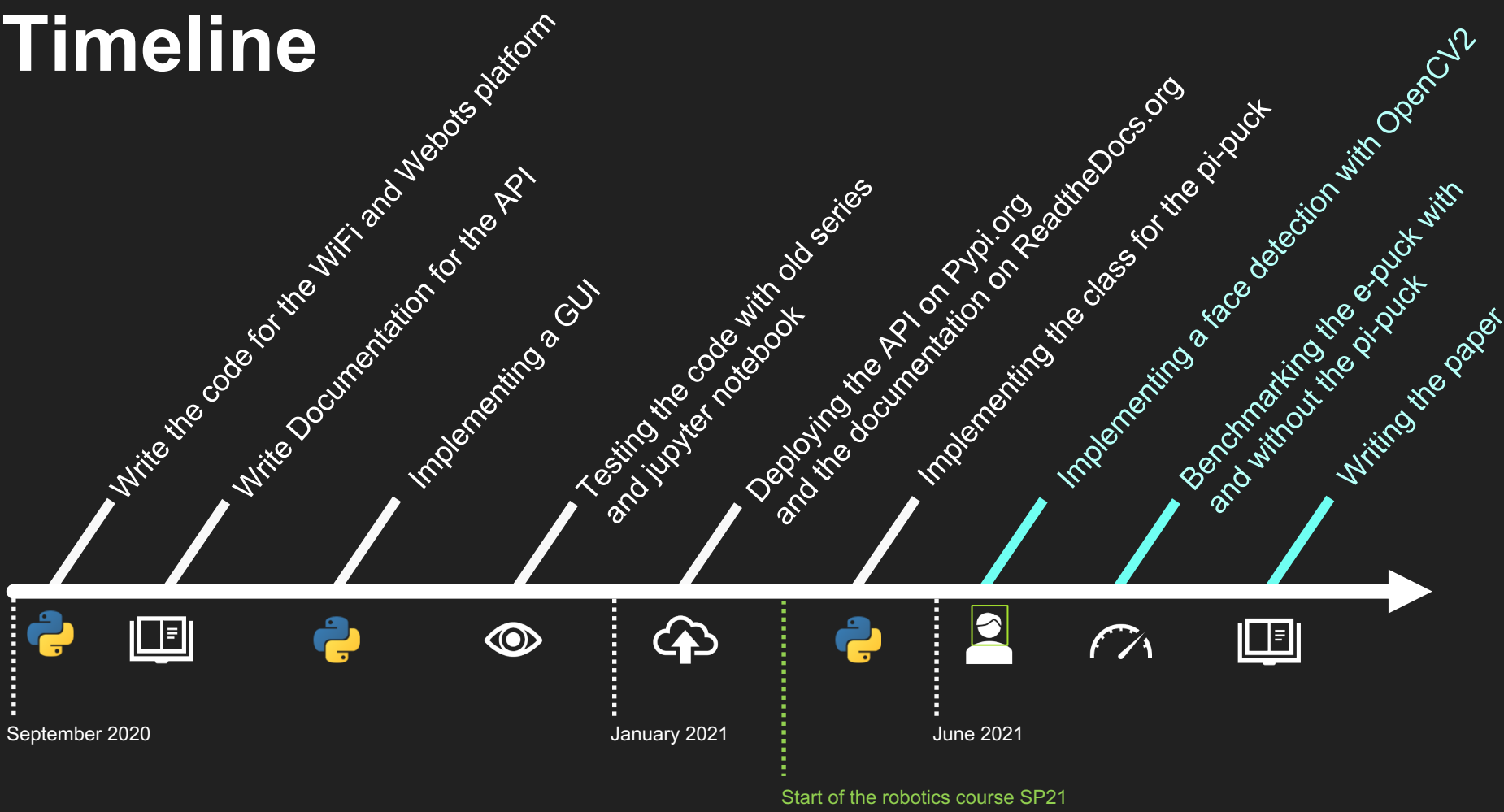
https://pypi.org/project/unifr-api-epuck/

Github.org



https://github.com/davidfrisch/UNIFR_API_EPUCK

Timeline


Write the code for the WiFi and Webots platform
Write Documentation for the API
Implementing a GUI
Testing the code with old series and jupyter notebook
Deploying the API on Pypi.org and the documentation on ReadtheDocs.org
Implementing the class for the pi-puck
Implementing a face detection with OpenCV2
Benchmarking the e-puck with and without the pi-puck
Writing the paper
September 2020
January 2021
June 2021
Start of the robotics course SP21

Useful links

- PDF link of today’s presentation :
- Github : https://github.com/davidfrisch/UNIFR_API_EPUCK
- Pypi : https://pypi.org/project/unifr-api-epuck/
- ReadTheDocs : https://unifr-api-epuck.readthedocs.io/en/latest/

UNI
FR

A Simple Python Cross-Platform API
For Controlling The E-puck2 Educational Robot

Thank you for listening

Any Questions ?