INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Tricycle Project
Dick Dastardly
Crystal Ball

Review
04/01/2022

-Sprint 4-

Pierre Calmettes
Romain Choulot
Yixia Liu
Gautier Martin
Nikita Mikhin
Valentin Piqueras

Yassine Ariba
Guillaume Auriol
Elodie Chanthery
Barbara Moore
Didier Le Botlan

Presentation plan

- Project Purpose
- Sprint 4
- Camera and LIDAR
- Trajectory
- Sprint 5
- Scrum Master Minute

Project Purpose

A tricycle with multiple integrated sensors and actuators, conscious of its surrounding.

- Equip a car with sensors
- Use **AI** algorithms to assist the driver
- **Warn** in case of danger

- Avoid personal injury or material damage
- React faster than humans
- Automation of conditional driving

Sprint 4

Organization and Tasks repartition

LIDAR

Detection of nearby objects

If object, send XYZ coordinates of nearby points

Data processing & coordinates transfor-mation

Camera

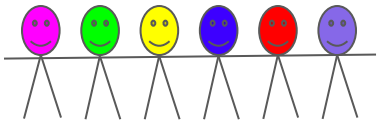
Identify the position of the blocks of objects found

associate the distance to them

Object Tracking

Trajectory prediction

Display node: GUI*

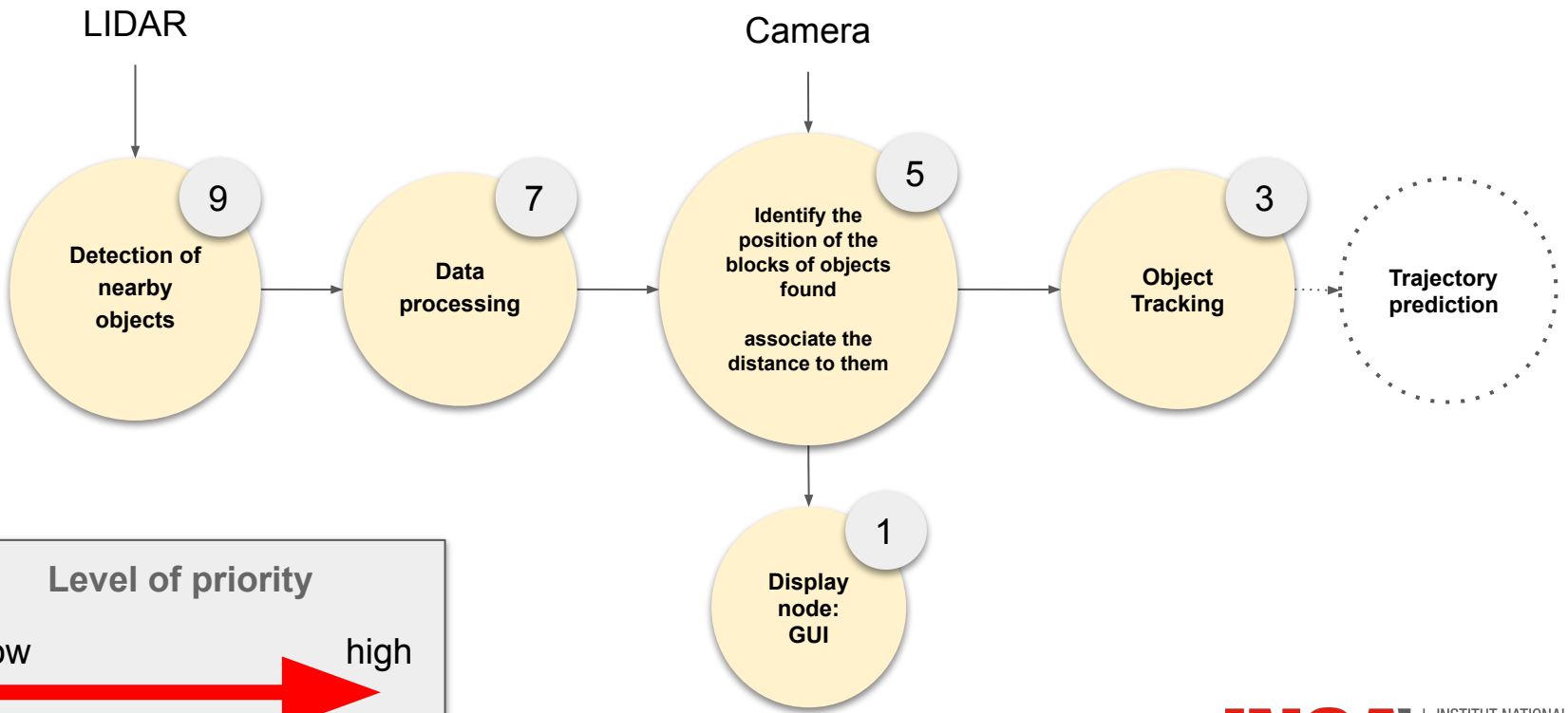


*GUI = Graphical User Interface

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Sprint 4

Organization and Tasks repartition

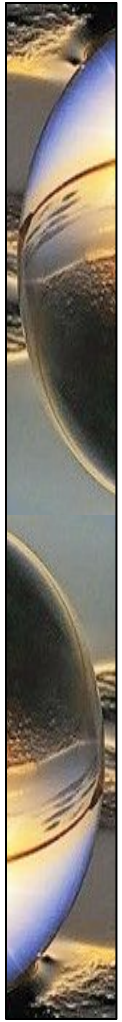


Level of priority

low → high

1 → 9

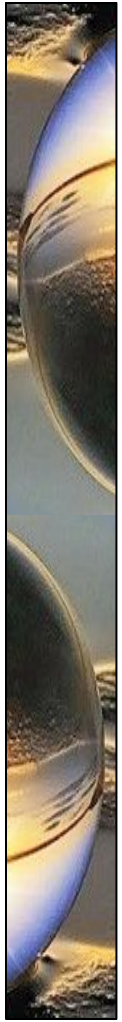
INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE



Interface

Why ?

- Easier to present our work 
- Make debugging great again 
- See every information we want (Camera, Lidar) with an external device, remotely

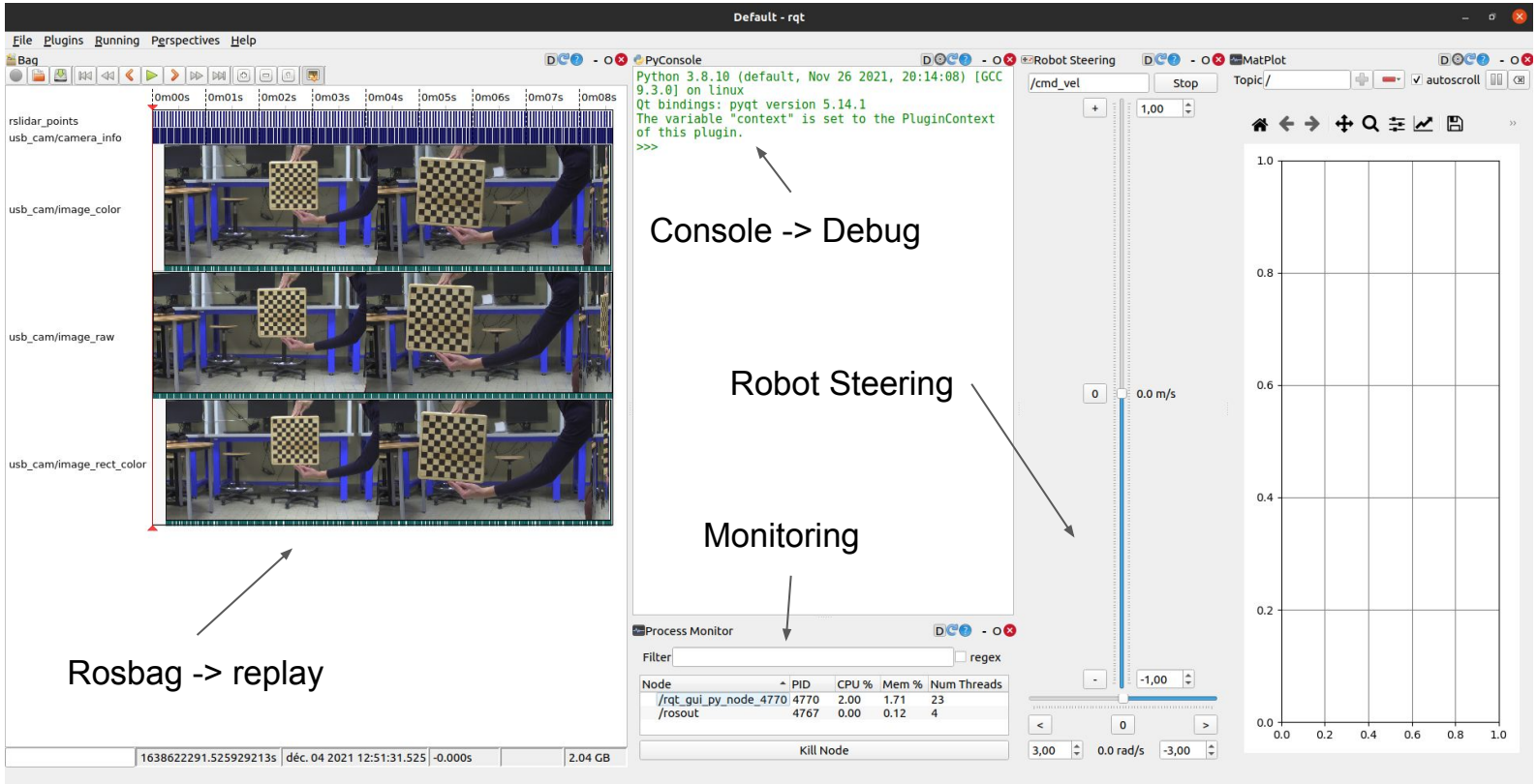


Interface

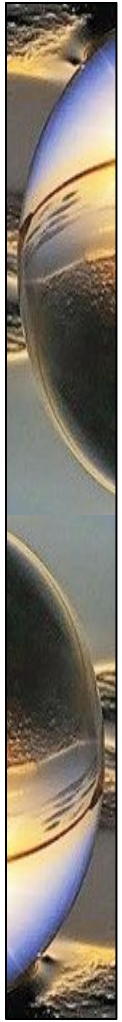
How ?

- Research : qt
  - Their moto : “*One framework. One codebase. Any platform.*”
- We could use it on a smartphone to control remotely the tricycle
- Many advantages, like all the add-ons already integrated to ROS

Interface



INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE



Interface

DESIGN AND FEATURES

Simple and easy to use

Connect to ROS

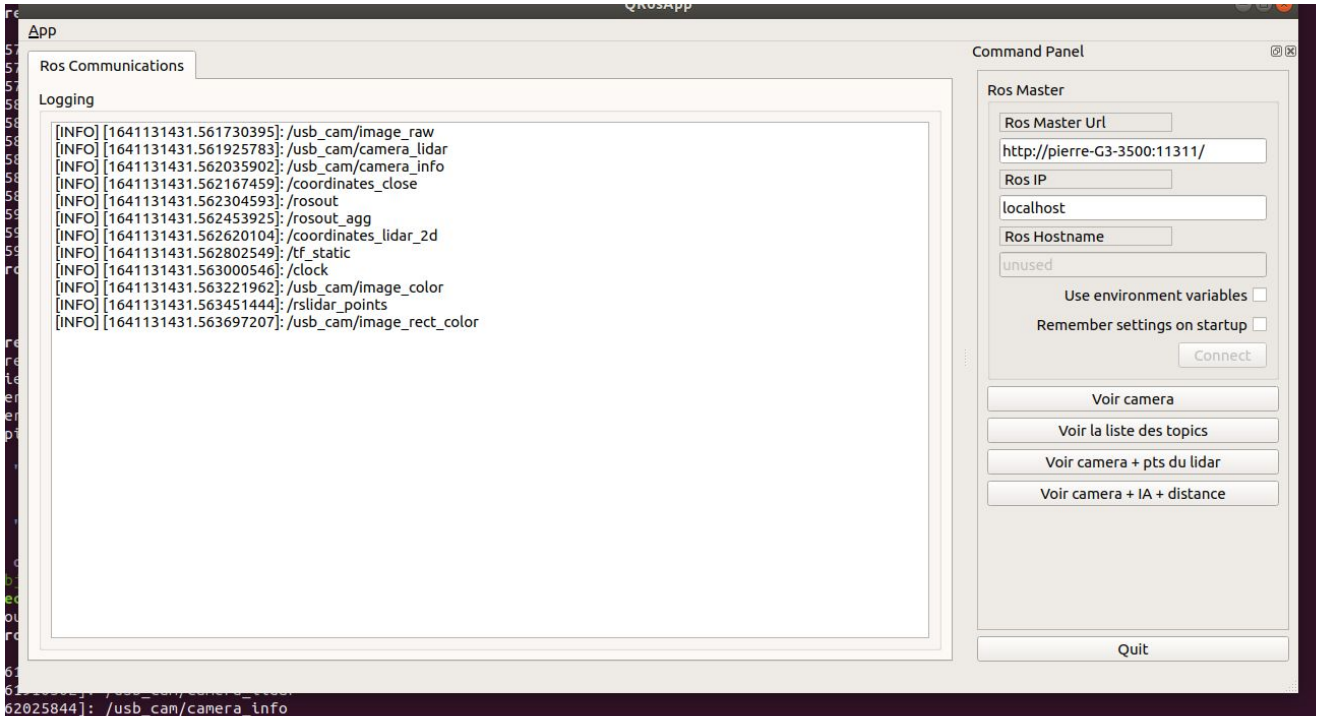
Check the messages exchanged

Check the output of our sensors (camera and LIDAR)

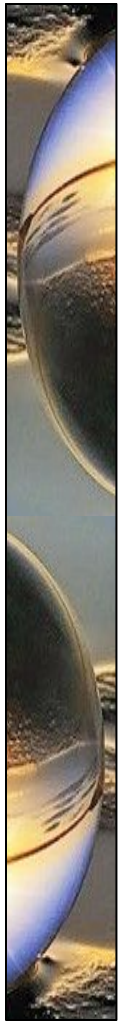
Check the outputs of our software (LIDAR points in 2D, distance of detected object, etc)

Interface

DEMO



INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE



Detection of near objects by LIDAR

Objective: Filtrate the detected objects by the LIDAR at a distance of 2 meters and make them compatible with the camera

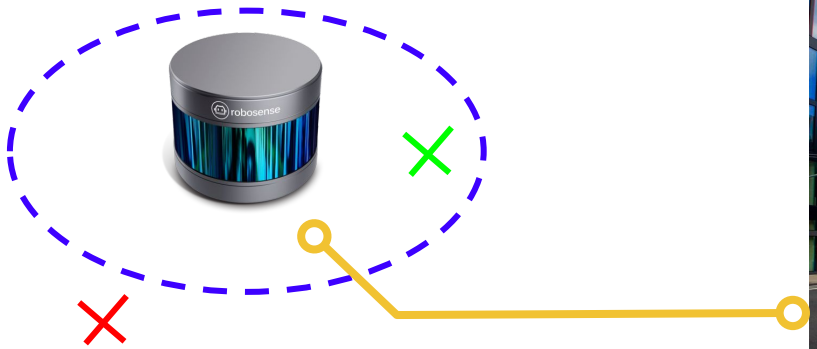
Whole environment of the LIDAR → Points at less than 2 meters → Points in 2D

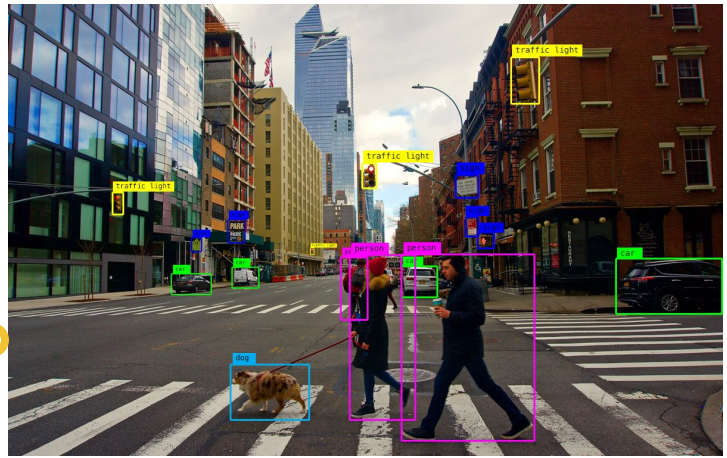
This filtering allows us among other things to have less points to calculate in 2D. We only look at the closest points and thus the potentially dangerous ones.

Detect, recognize, associate, and react

First step
Detection

DRAR



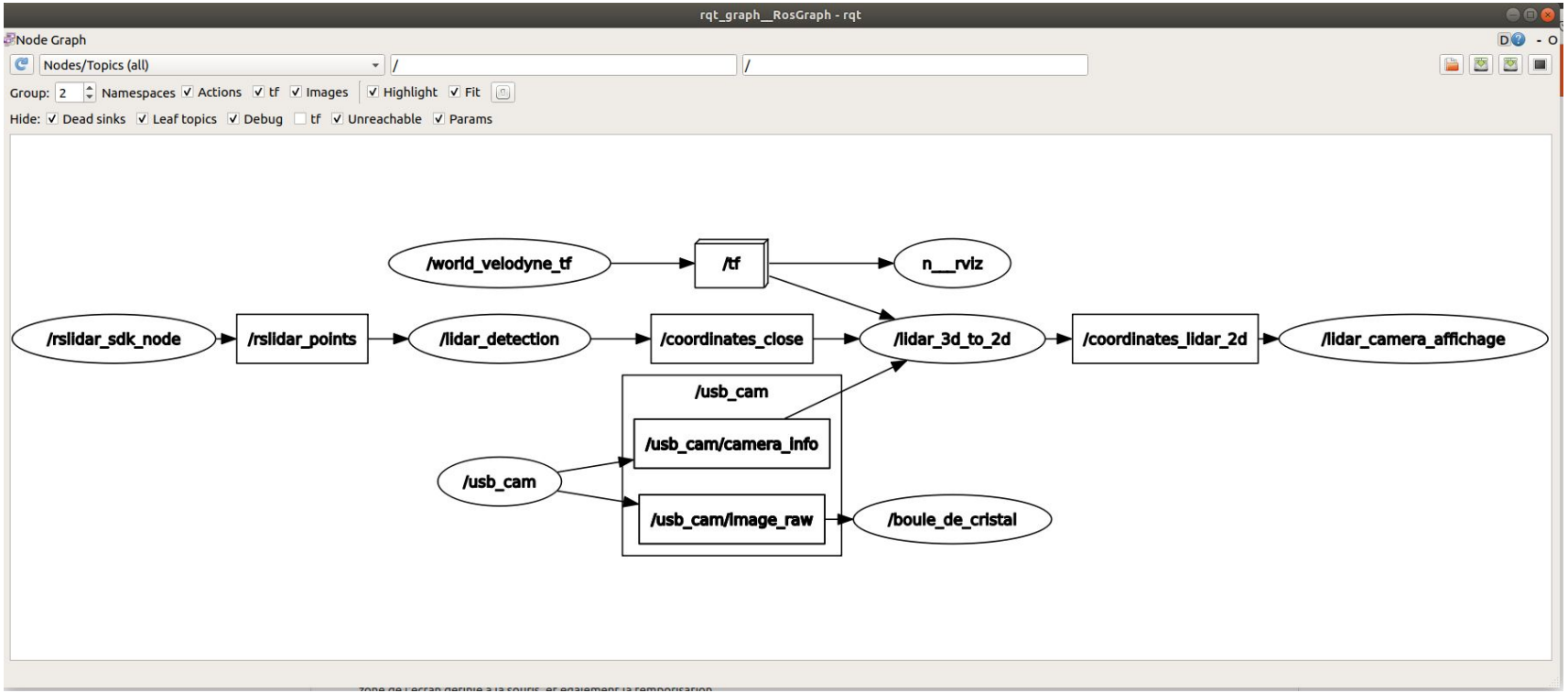


Second step
Recognition

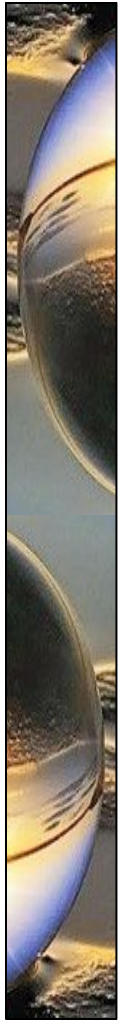
Final step : associate and react
Unrecognized/Moving object ? -> Raise the alarm

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Detect, recognize, associate, and react



INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

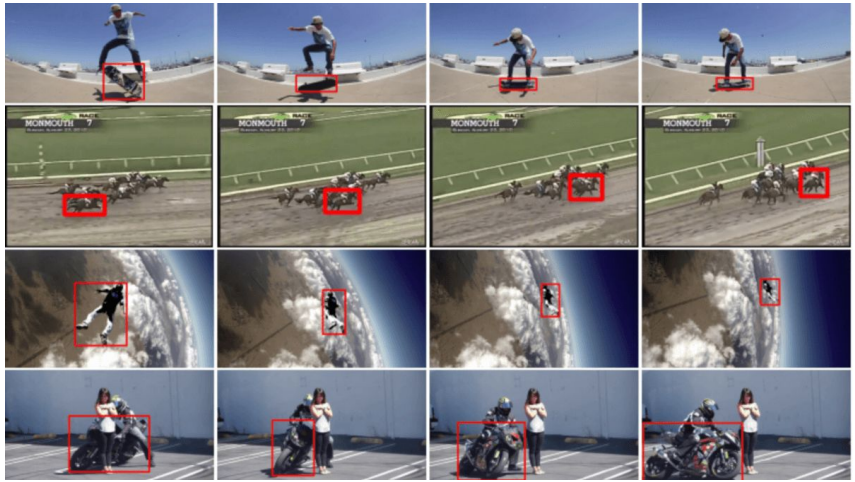


Detect, recognize, associate, and react

DEMO

Tracking : Researches

Objective: Linking a same recognized object through camera frames as time goes on



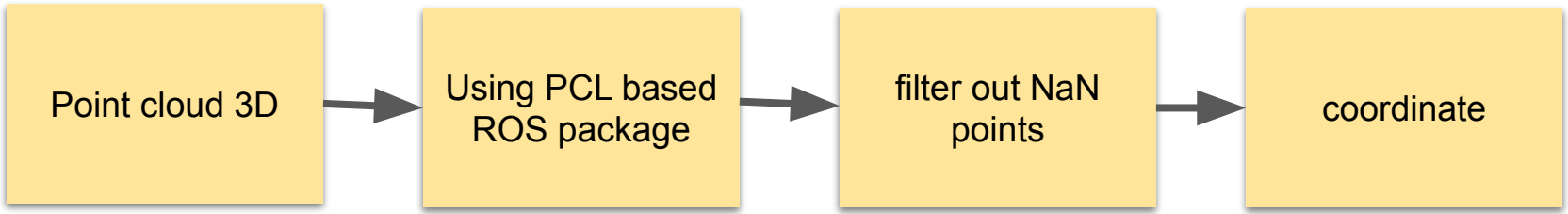
Motive : Trajectory prediction.
We want to extrapolate the future position of an object based on its present position and its past position(s), so we have to be able to follow it through time.

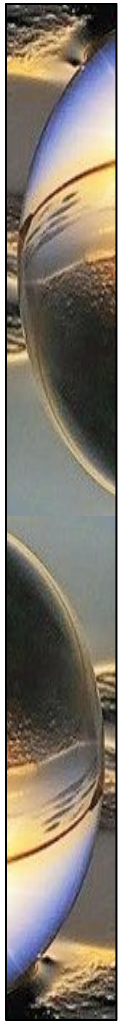
How ?

2 potential solutions:

- calculate the speed of an object from the displacement of the points included in the object
- machine learning model

Follow a GitHub for tracking using a LIDAR and ROS





Tests and performances

What we want to know

- An easy to use graphical user interface
- All of the points at less than 2 meters are transferred and treated

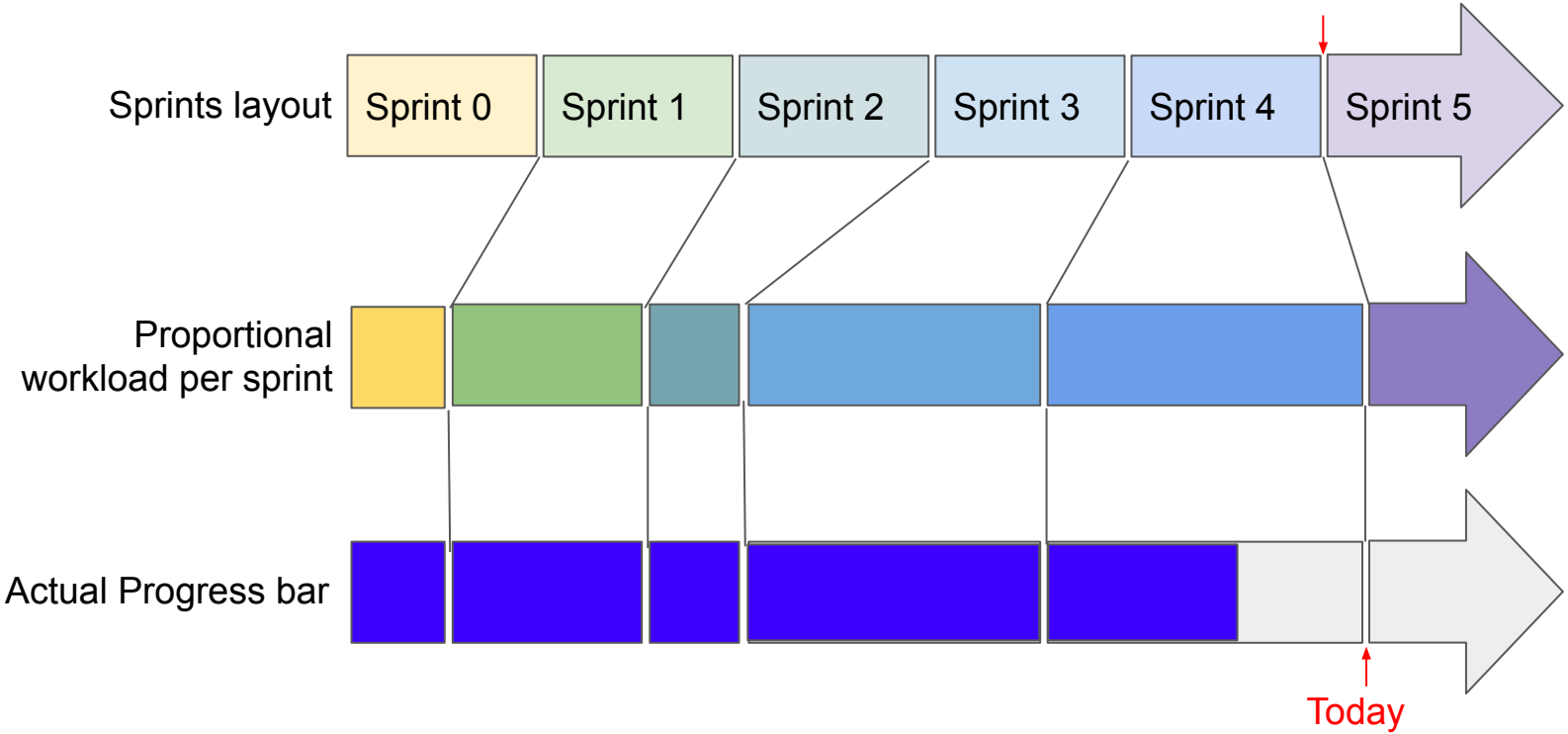
Tests

- Launch the UI and click on buttons to start the camera and LIDAR display
- Put one object at less than 2 meters and one at 3 meters

Performances

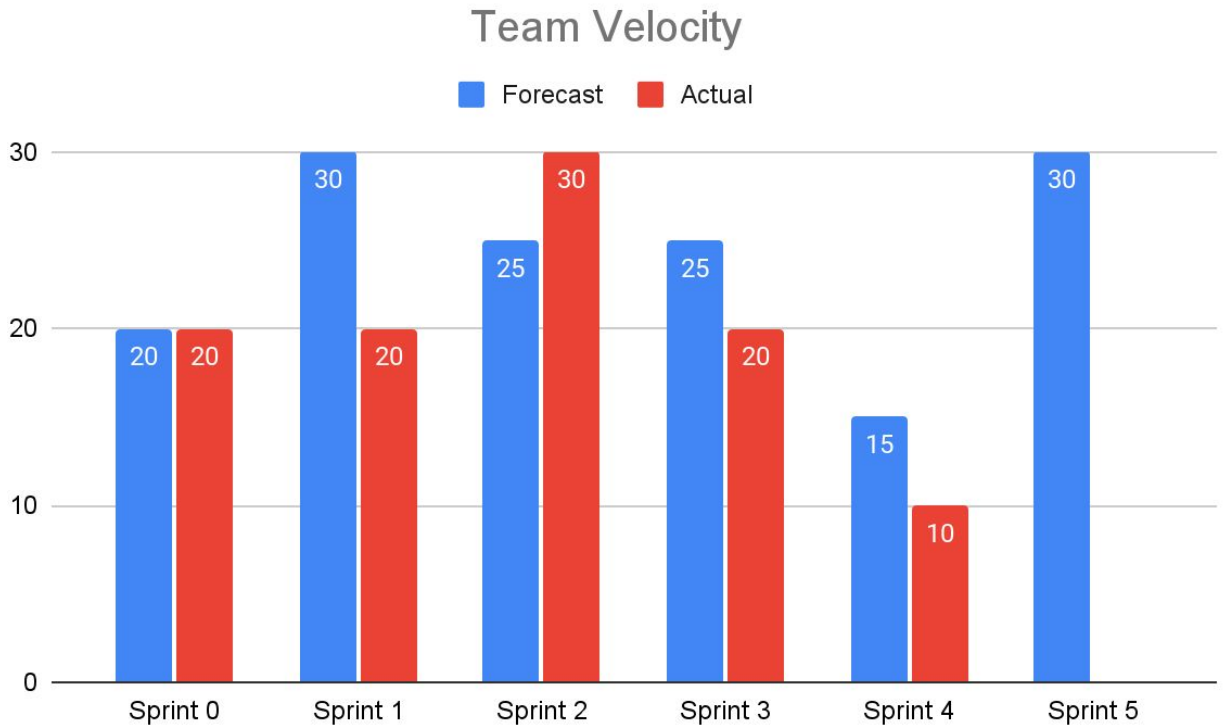
- The ROS nodes are created and the display is working
- Verify that we receive only the data about the first object

Sprint 5



INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Sprint 5



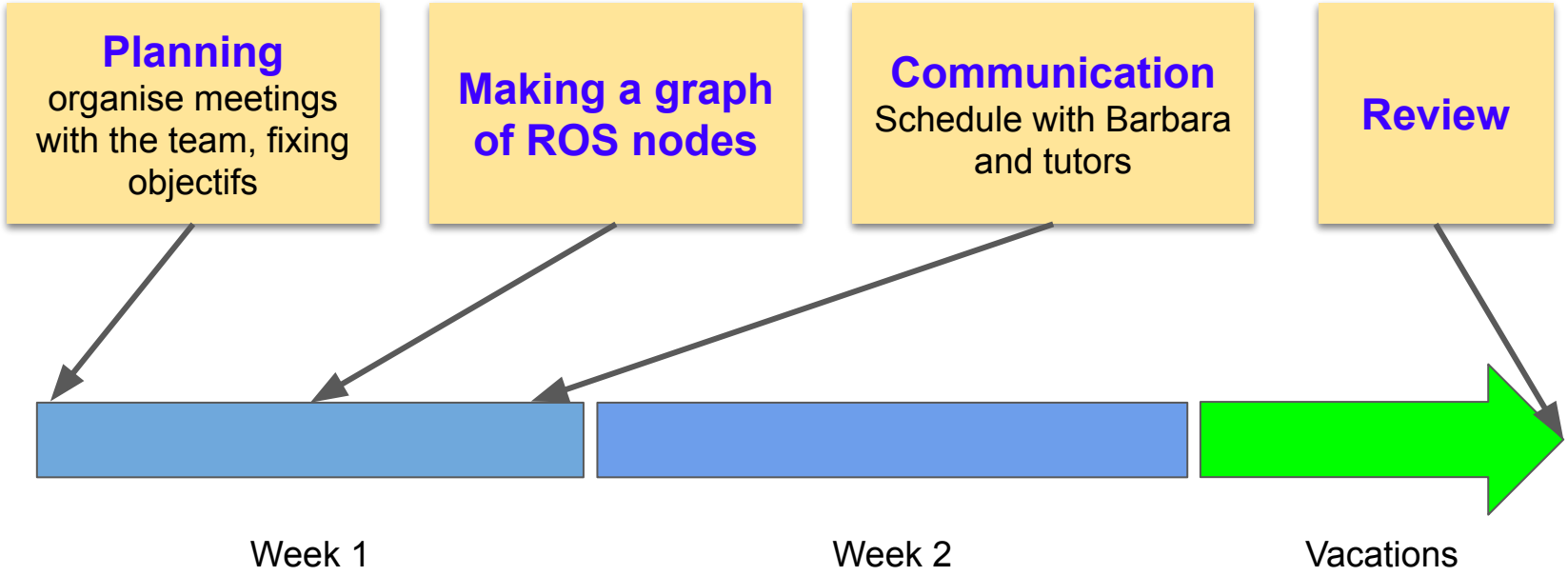
Sprint 5

Main Objective :

Stories	Tests & Demos
GUI (L)	Continue working on the interface and display the trajectory of the objects
Distance (M) Add distance to the detected objects	Display the distance to the center of the detected object by the camera
Trajectory (XL) Compute the object's trajectory	Determine the object's trajectory

Small tasks S M L XL Big tasks

Scrum Master Minute



INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Thank you !

Pierre Calmettes
Romain Choulot
Yixia Liu
Gautier Martin
Nikita Mikhin
Valentin Piqueras

Yassine Ariba
Guillaume Auriol
Elodie Chanthery
Barbara Moore
Didier Le Botlan