INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

# Tricycle Project
# Dick Dastardly
# Crystal Ball

**Review**

23/11/2021

-Sprint 2-


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# Presentation plan

- Project Purpose
- Sprint 2
- Camera
- LIDAR
- Tests and performances
- Sprint 3

# Project Purpose

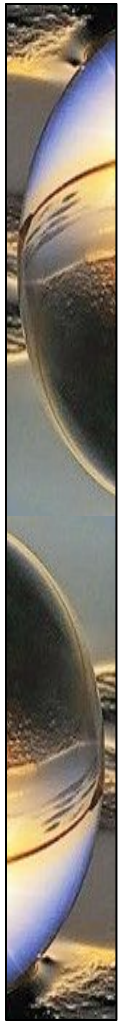
A tricycle with multiple integrated sensors and actuators. It is conscious of its surrounding.

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

## Organisation

**Camera**
Pierre Calmettes
Yixia Liu
Gautier Martin

**LIDAR**
Romain Choulot
Nikita Mikhin
Valentin Piqueras



# Sprint 2

CAMERA

**Stories**

- List everything the algorithm can recognize
- Eliminate the ‘False Positives’
- Train the algorithm for the missing elements
- Use the algorithm in the ROS environment

WEEK 1

WEEK 2



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# Sprint 2

## LIDAR

1. Extend the azimuth to 360°


2. Use the LIDAR with the Jetson & ROS

3. Alarm when an object is detected

ROS

4. Calibrate & filter false values



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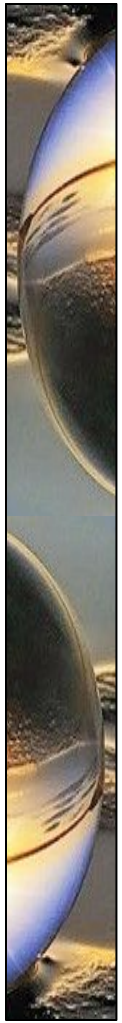

# Camera

## Story : Add new objects to the recognition AI

Not working on the Jetson Nano, not powerful enough


This story is optional



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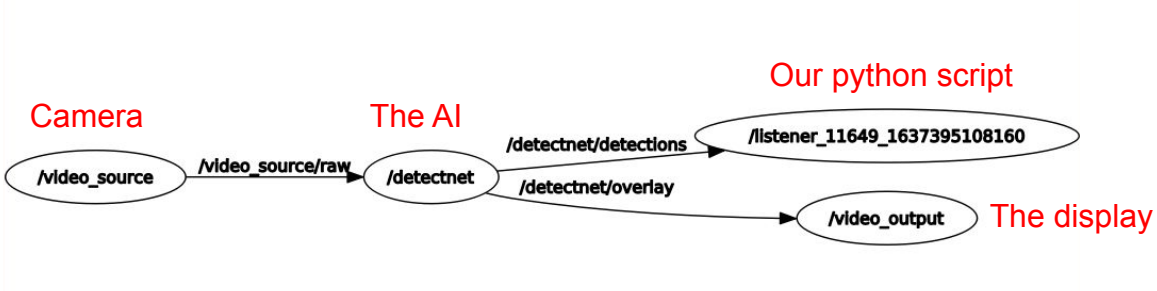
# Camera

## Story : Use ROS with the camera and the recognition AI




**ROS Graph, obtained with rqt_graph**



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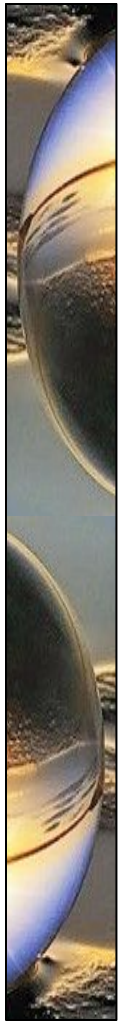


# Camera

## Story : Eliminate false positive

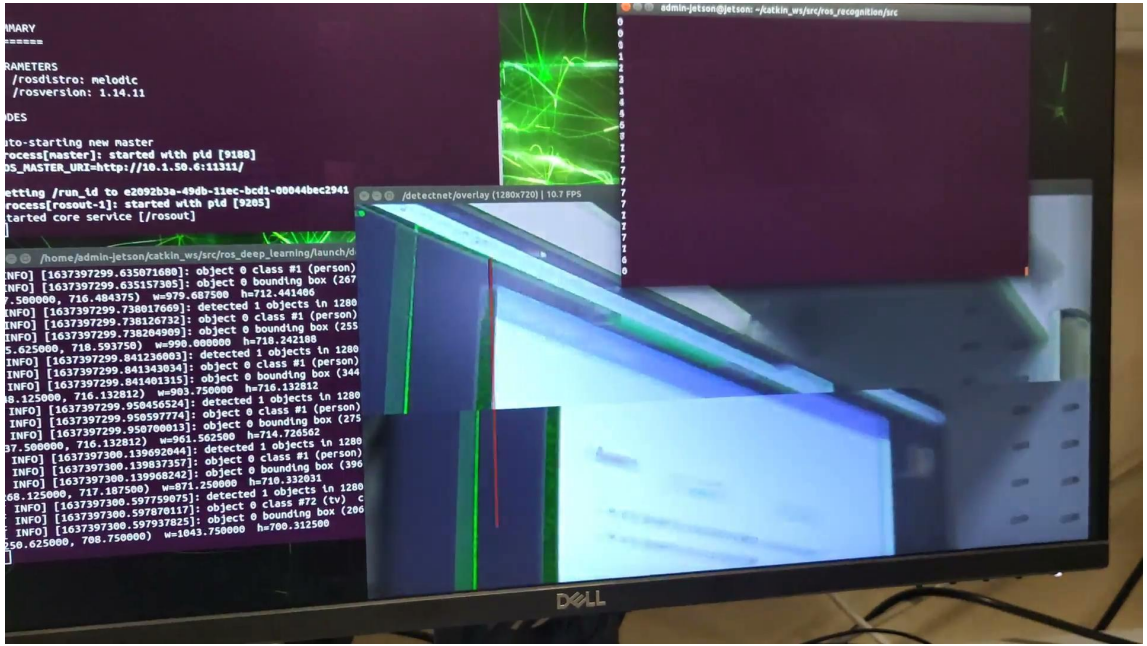
Camera output
~ 30 frames per second

Detecnet
Wrong classification during 1 or 2 frames

**Solution**
Use a counter :
if *Person_Detected* with duration > x frames
then *alert*

# Camera

DEMO



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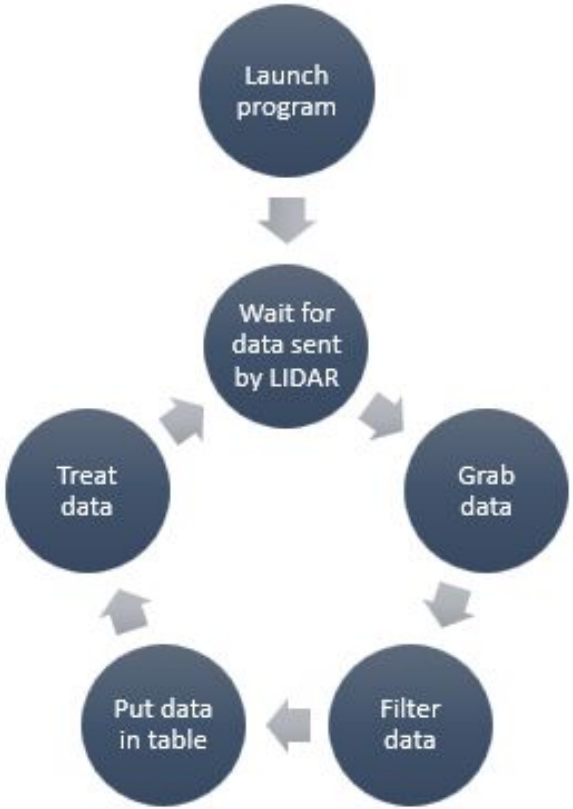
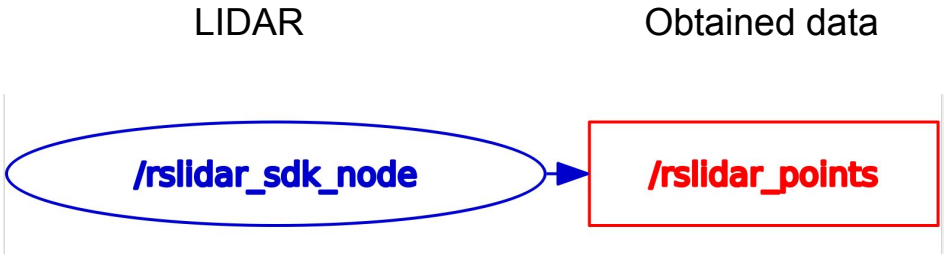
## State machine diagram



# LIDAR

**Story : get the LIDAR data via ROS**

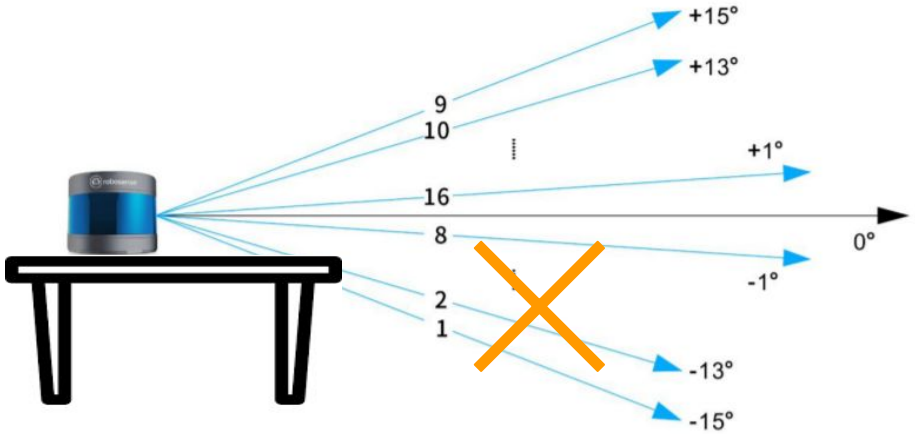



**ROS Graph, obtained with rqt_graph**

The data processing algorithm will be connected to the **/rslidar_points** topic

# LIDAR

## Demo of story : Extend azimuth to 360°



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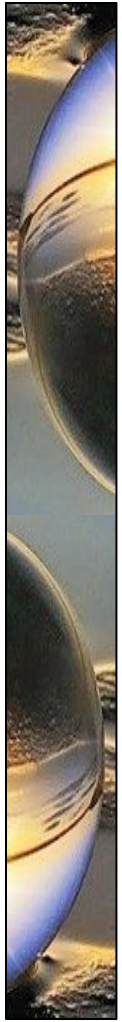
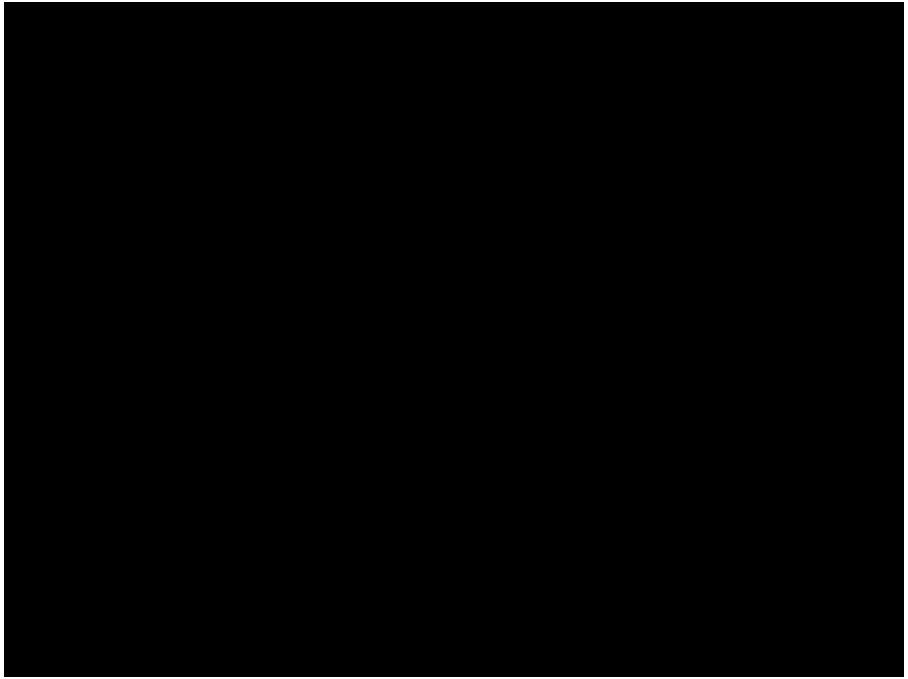


# LIDAR

DEMO





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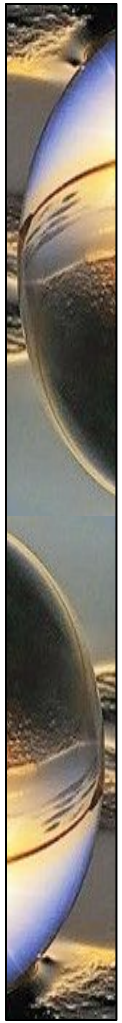


# Tests and performances

## CAMERA

### What we want to know

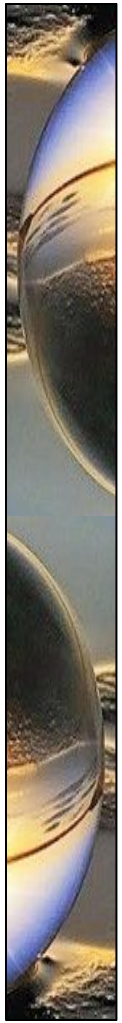
- Accuracy of warning
- ROS

### Test

- Change the counter value to find the best alarm threshold
- Test nodes of the camera ROS independently

### Performances

- Eliminate false positive
- A slight delay to stop the alarm
- Nodes are created and connect to each other automatically at runtime



# Tests and performances

## LIDAR

### What we want to know

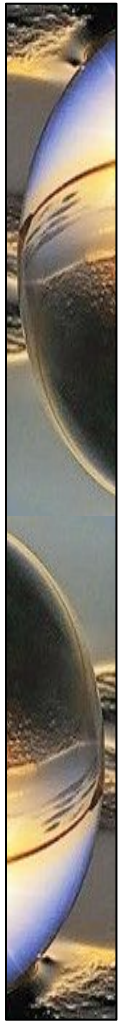
- ROS
- Extend the azimuth to see the whole environnement

### Tests

- Test the LIDAR ROS node
- An obstacle is detected at less than 1 meter at 360º

### Performances

- Node is created automatically at runtime and data is being sent
- 360º of horizontal covering and 15º of vertical covering

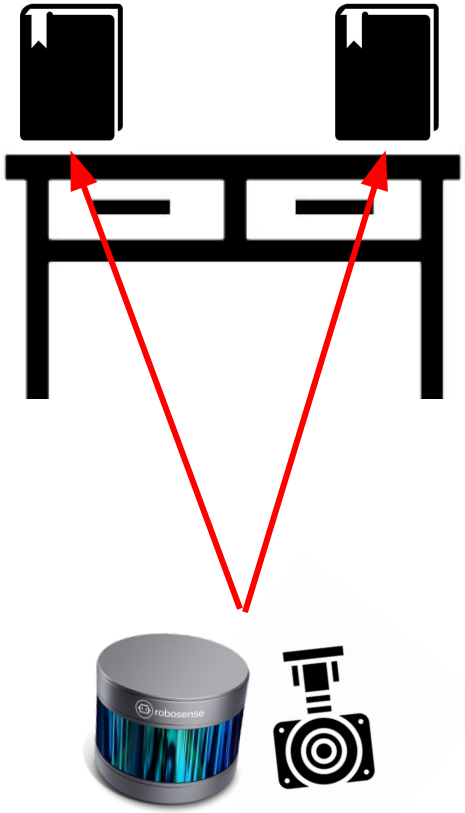


# Sprint 3

Main Objective : LIDAR & camera fusion

| Stories | Tests & Demos |
| --- | --- |
| **Planning** of how we approach it | Pseudo-algorithm showing our approach |
| **Calibration** superimpose LIDAR data and camera image | Image from camera with dots from LIDAR, in real-time |
| **Priority** Give priority to LIDAR over Camera | Use camera's recognition only when an object was first detected by the LIDAR (< 2m from it) |

# Calibration




The LIDAR detects these obstacles. We get the angles and the distance.

The camera detects the books. We get their coordinates on the image.

Correlation between measurements
=>
Superimposition of the camera image with the LIDAR data



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Thank you !

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