VIGIWHEELS

Your autonomous sentinel

Table of contents

What makes **Vigiwheels** so **Amazing?**

A connected autonomous vehicle that **ensures the security** of an industrial building

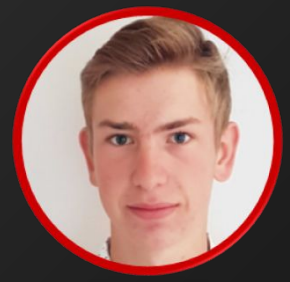
16 000
Fire incidents on average
In industrial areas in a year

200 000
Attempts of break-in
In 2022

Tahani team

Moad

Johann



Raphael

Oysho

Axel

Aïssatou

Eduardo

01

Sprint 2 summary

- Objectives
- What we have done
- Planning management

Objectives

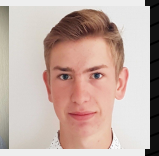
Sprint 2 summary

01 **Indoor Car Navigation & Smart patrol**

- Improve RPM control & speed control
- Angular control turn
- Navigation system (ROS2 Nav)


02 **Instrument reading**

- Camera rotation control
- Integration of camera (Jetson)
- Integration of AI

03 **Fire Detection**

- Integration of fire sensors

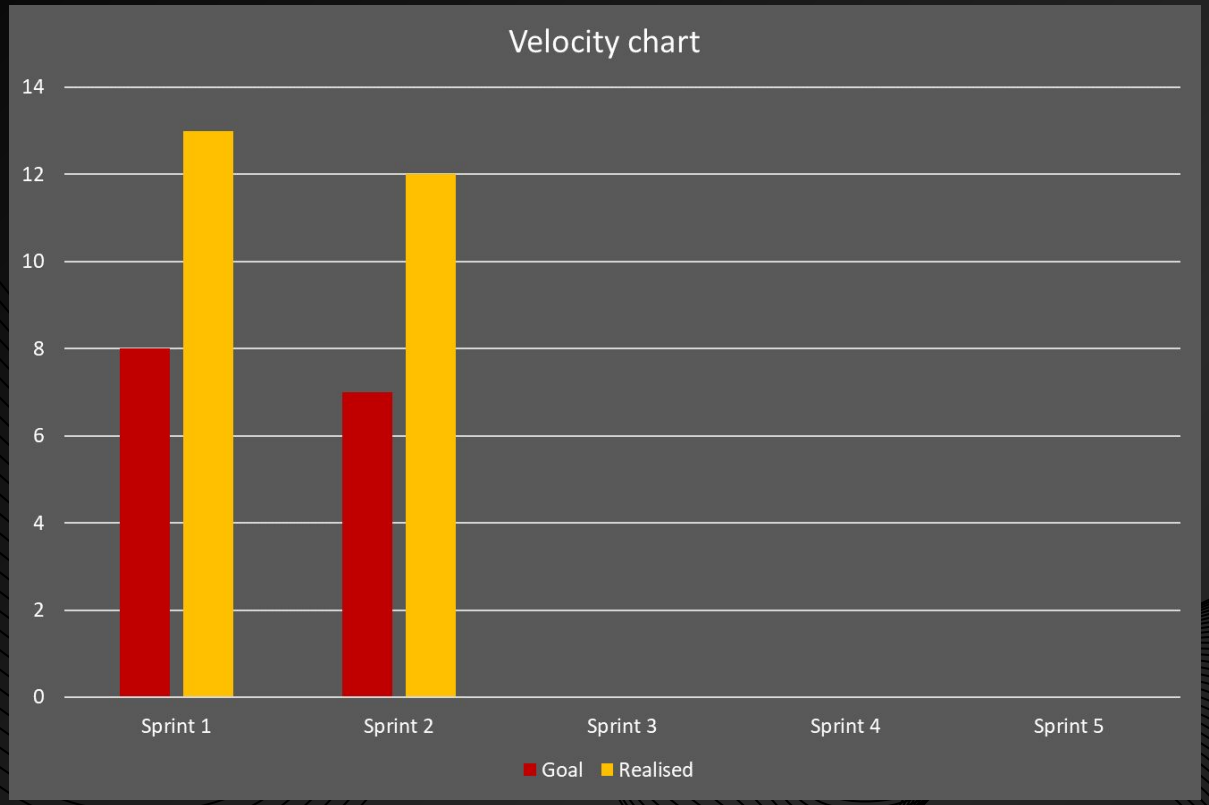
Sprint 2 summary

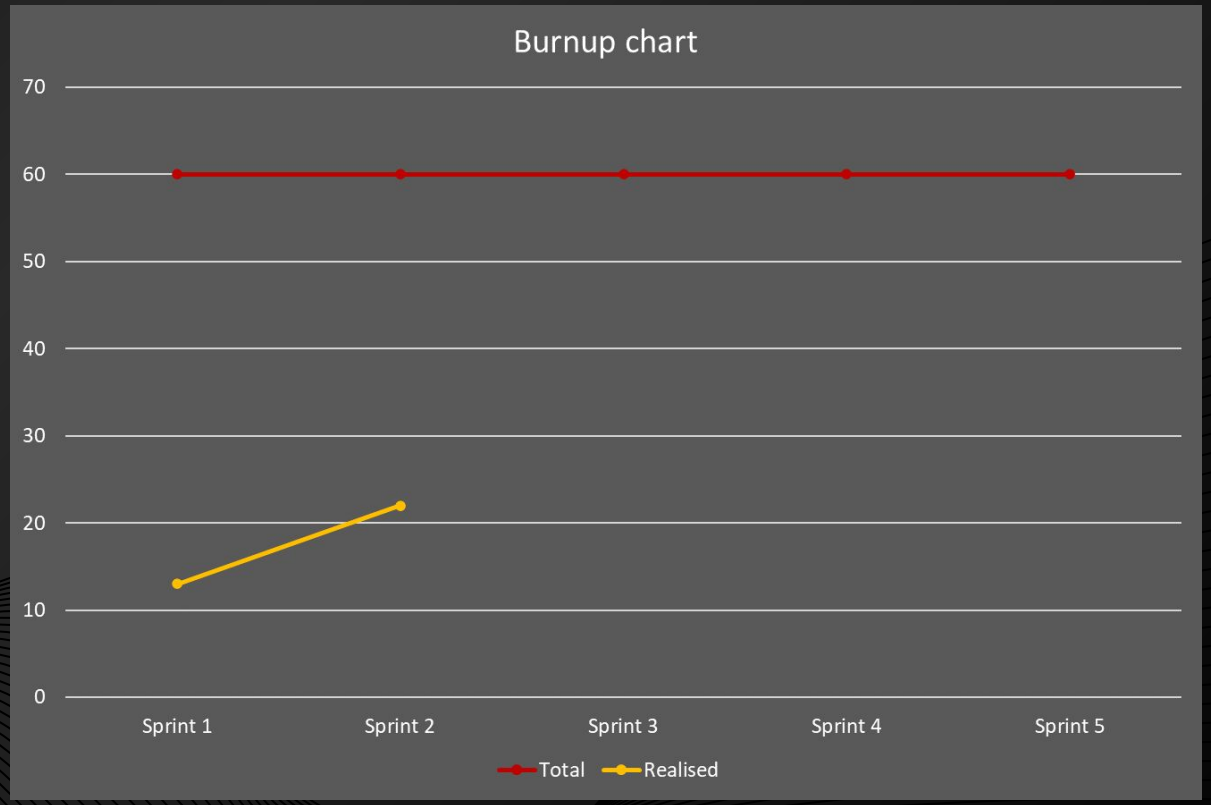
What we have done

- ✔ Control the rotation speed of the wheels
- ✔ Integrate of the AI to the car
- ✔ Control the position of the camera
- ✔ Integrate the fire sensor to the car

Planning management

Sprint 2 summary





02 Demonstrations

Explanation

I - ROS integration of the AI model

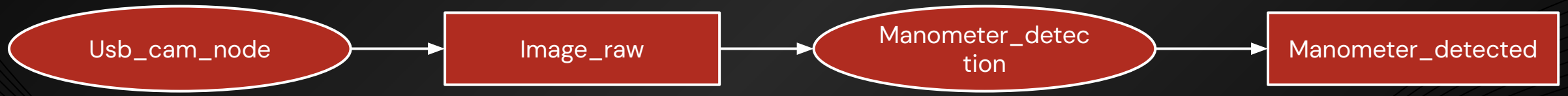


Image retrieval

Image storage

Detection of manometers in real time

True ⇒ Manometer detected

False ⇒ No manometer

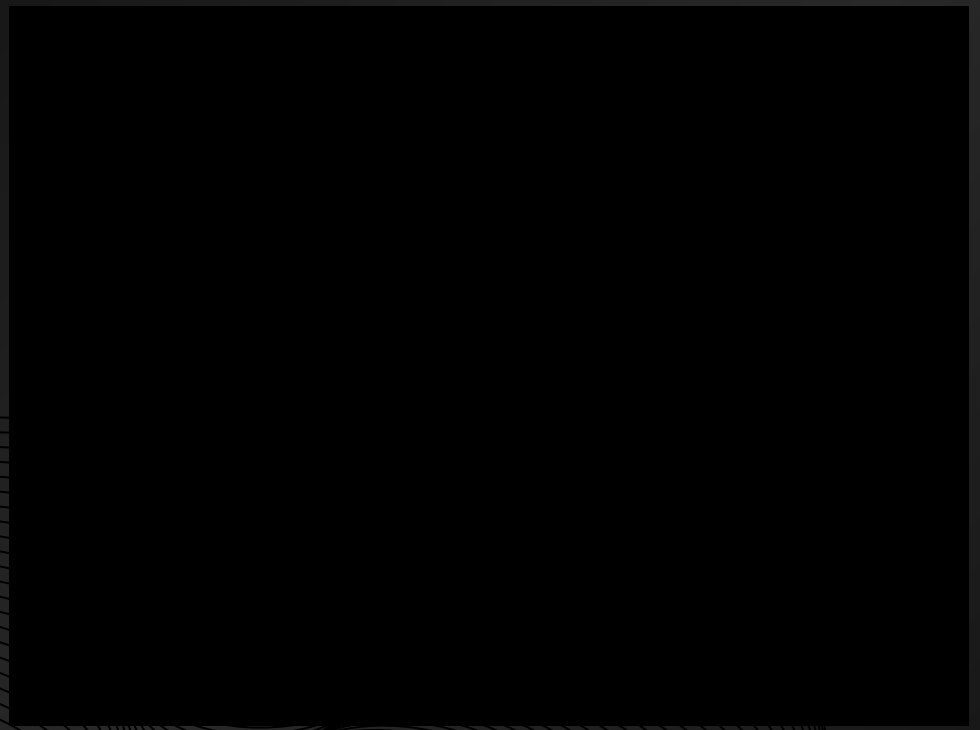
Approval Test

Detect a manometer about 20 cm

Inference rate of 8 frames per second

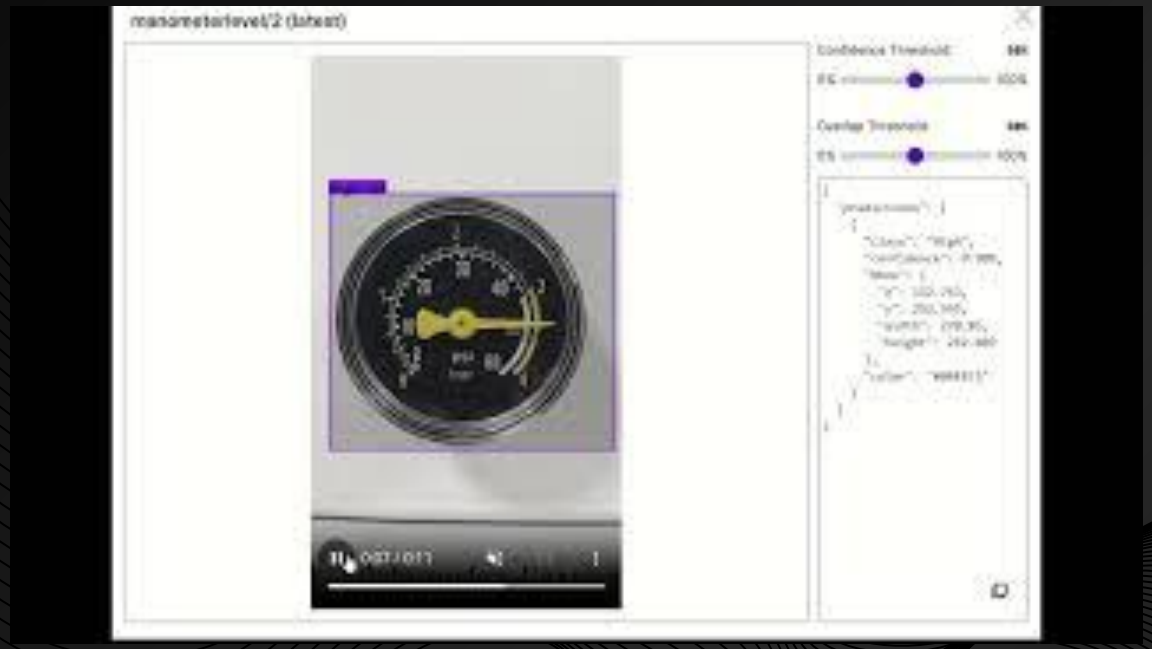
Low false positive detections with a confidence level of 70%

Demonstration



Read sensors

Demonstration



Manometer level detection

Read sensors

Objectives

✔ Communicate if there is a manometer in the image taken from the camera

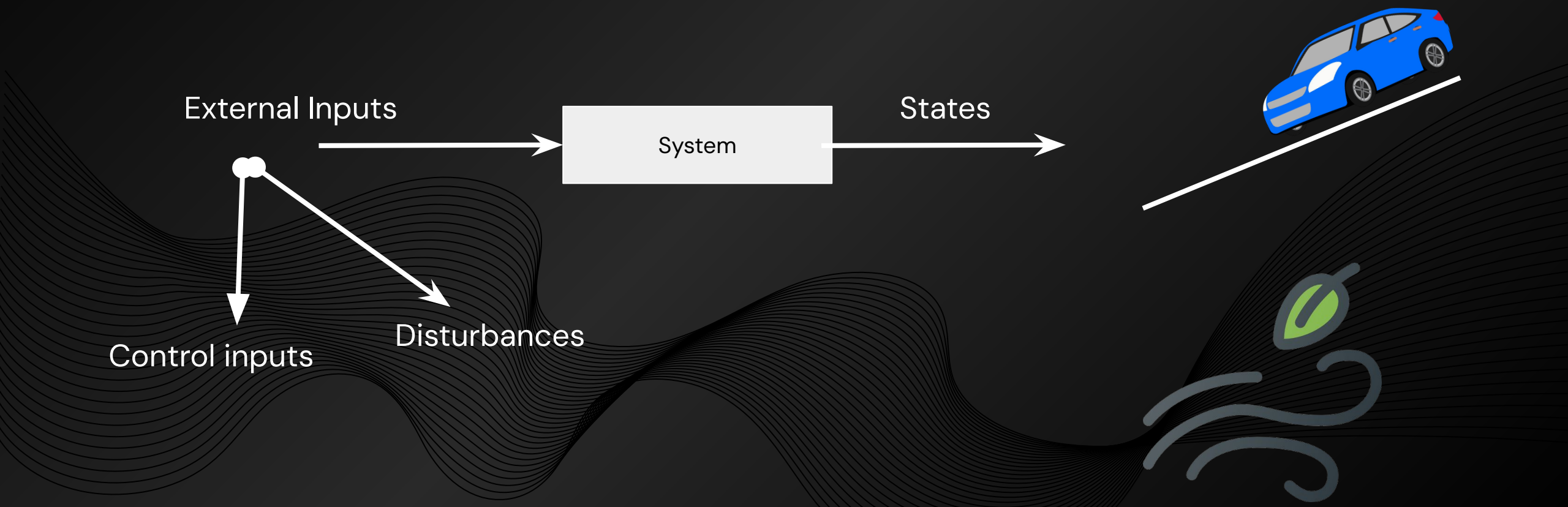
✔ Improve model inference speed

✔ Classify the pressure level of the manometer

Movement control

Explanation

How do we get the Motor to turn at the speed we want ?



Movement control

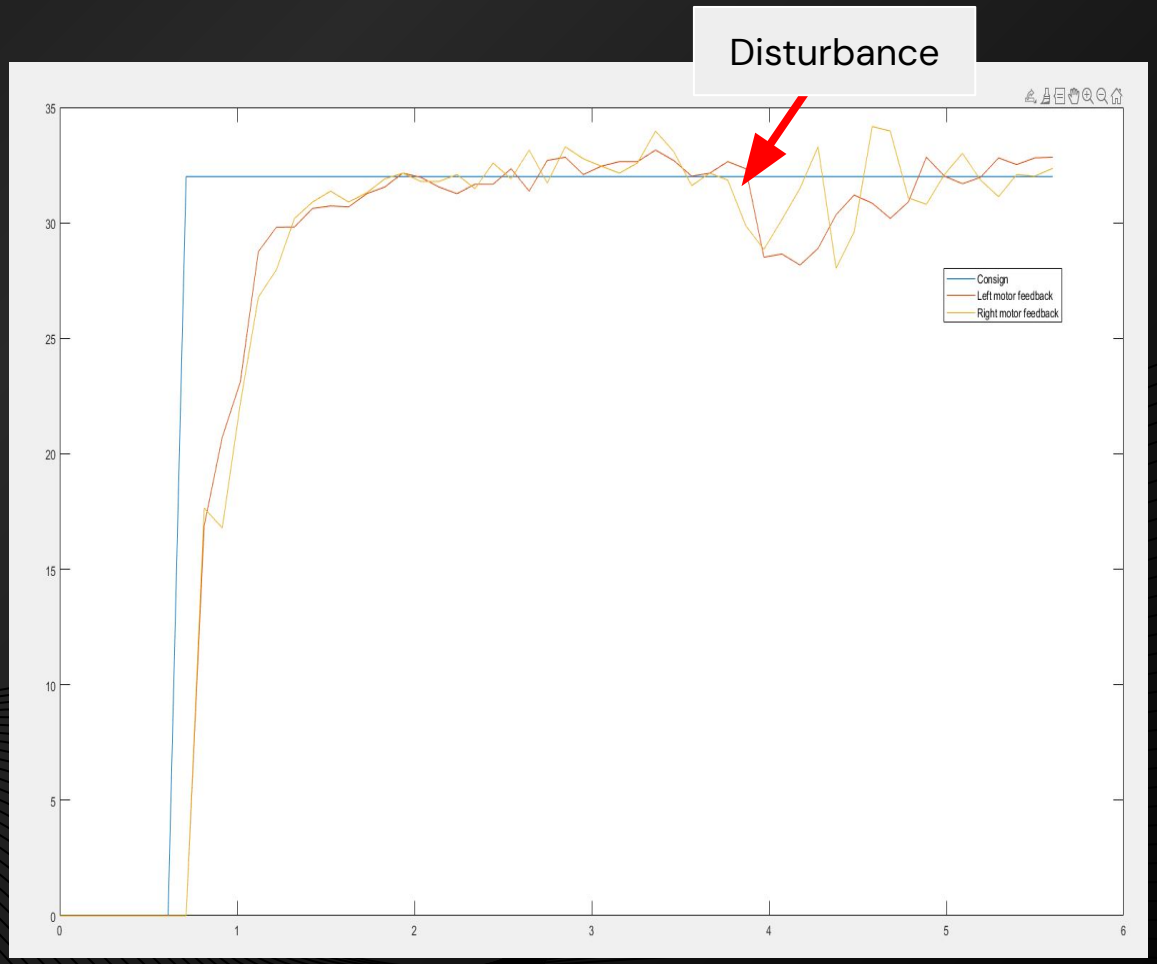
Approval Test

- Follow the given instruction : 0.5 (instruction) -> 32 rpm (wheel speed)
- Move with constant speed for about 5 - 10 -15 m
- React to constant disturbances by accelerating or decelerating under 2 seconds

Explanation

Movement control

Simulation result



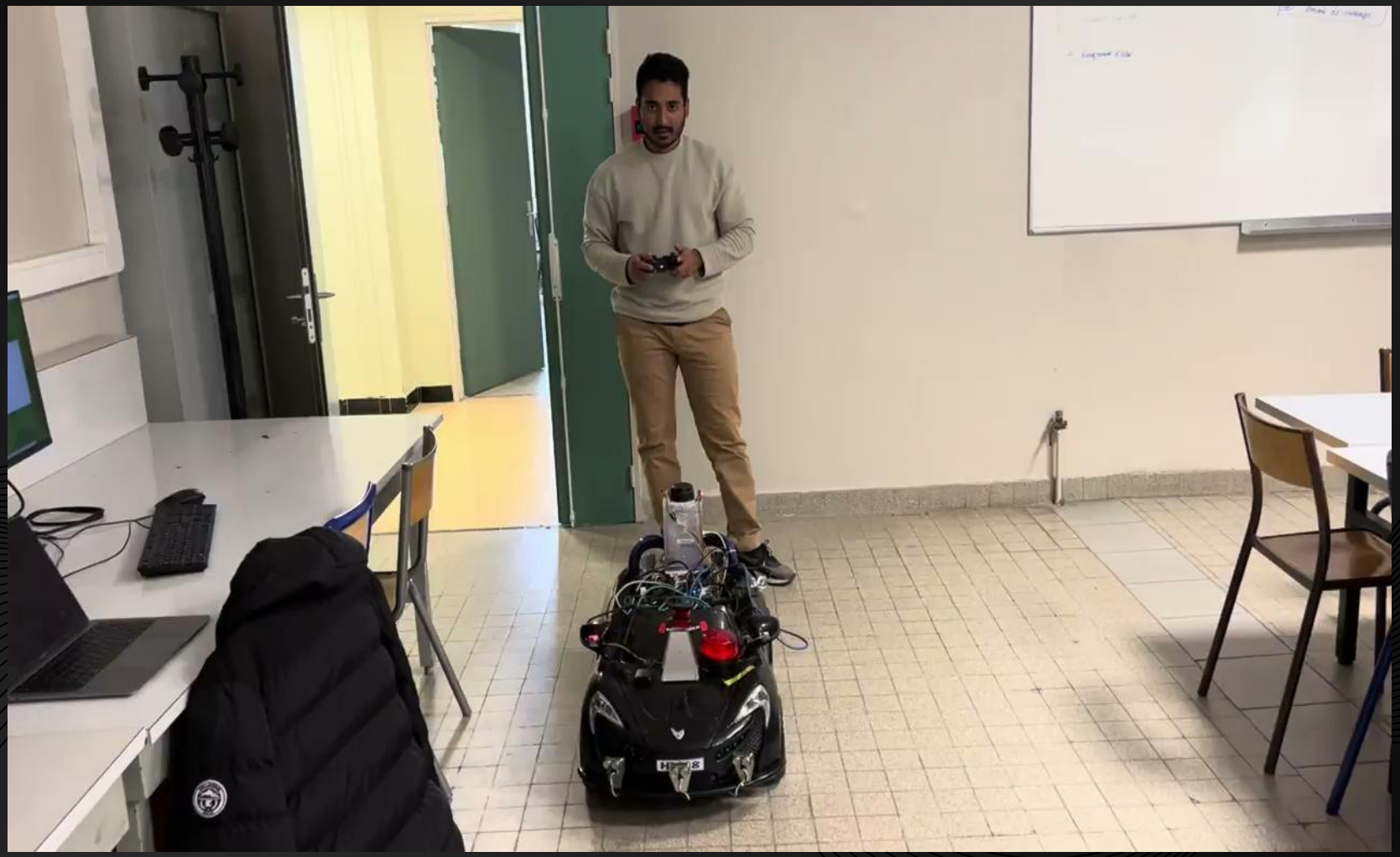
Real test values

Movement control

Demonstration

Demonstration

Movement control



Demonstration

Camera rotation control

Objectives

- ✔ Adjust camera position based on provided angles
- ✔ Create sequences of instructions for specific uses

→ *Scan mode*

→ *fixed mode*

Approval test

- ✔ The camera turn to the request angle (± 2°)

Fire Detection

Explanation

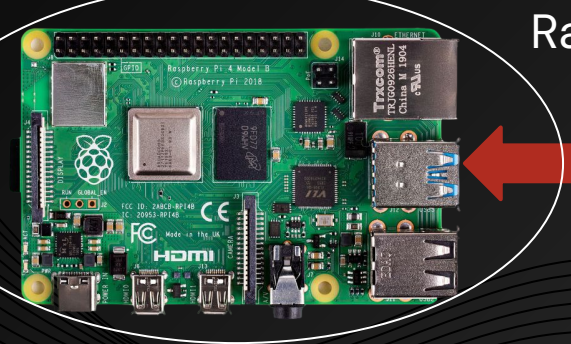
Integration of Sensors on the Car

- Implementing another STM32 connected via USB to the Raspberry Pi
- Transmitting data through a serial port
- Gives the customer the ability to plug in a fire module or not, based on their preference.

Fire Detection

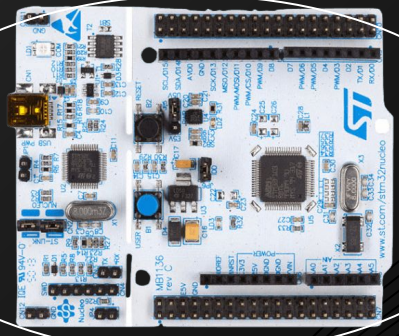
Explanation

Integration of Sensors on the Car



RaspberryPI

STM32



SERIAL PORT

Read Sensor Data

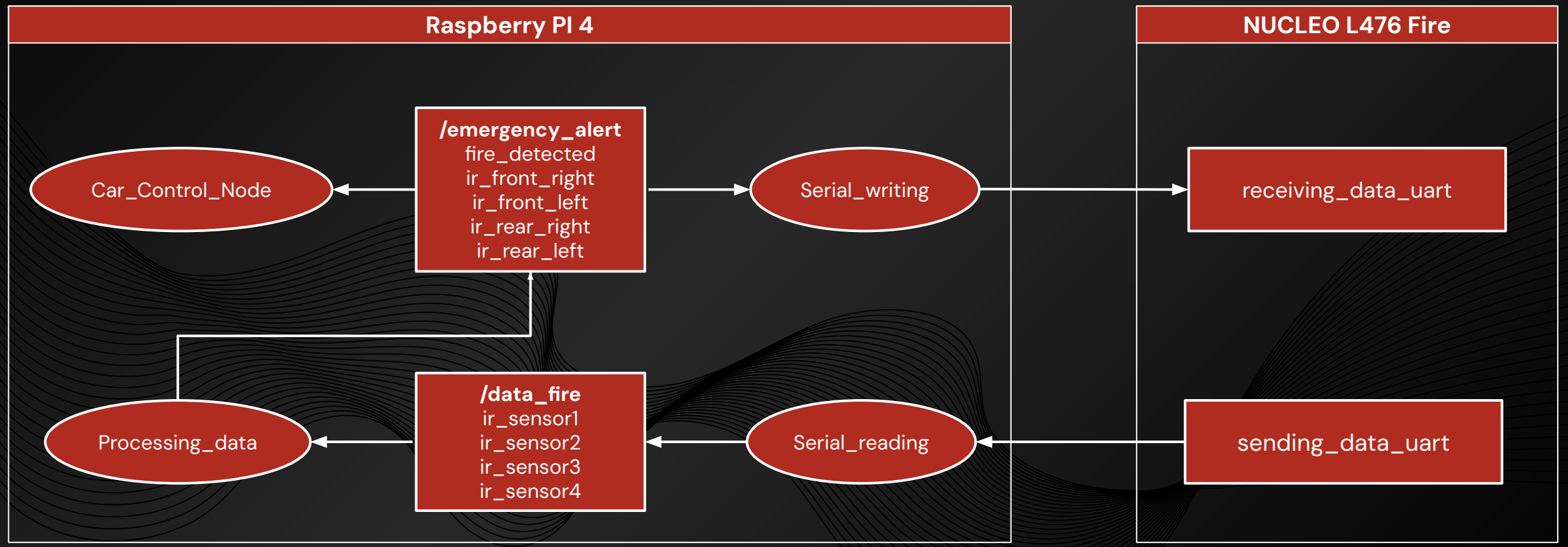
Process Data

Trigger Alarm

Fire Detection

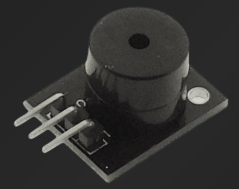
Explanation

ROS/STM32 developed architecture



Fire Detection

Approval Test



Buzzer

Light beacon

Front Right Sensor

Rear Right Sensor

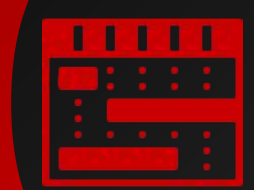
Front Left Sensor

Rear Left Sensor

Fire Detection

Demonstration

03



Sprint 3 planification

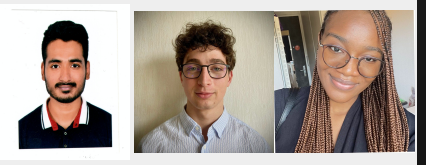
Next objectives

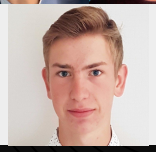
Team organisation

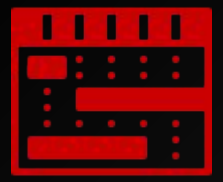
Sprint 3

Organization for sprint 3

01	**User Interface**	• Create a web page • Communication User - Vehicle
02	**Fire Detection**	• The car must be able to detect smoke
03	**Instrument reading**	• Integration of AI model in ROS • Intruder detection with QR code • Following manometers with camera







Sprint 3

Integration of the new AI model to ROS

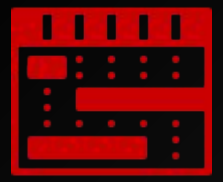
Story :

The car can read a pressure value and communicate it the level is critical using ROS.
The car should also send the coordinates of the detected manometer.

- ➢ Set up the environnement for GPU inference ~2 days
- ➢ Send manometer coordinates ~2 days
- ➢ Create the ROS nodes and packages ~3 days
- ➢ Perform the approval test and resolve bug ~4 days

Approval test :

- When a manometer is detected, its coordinates are published.
- The pressure level is read and sent.



Sprint 3

Fire Detection

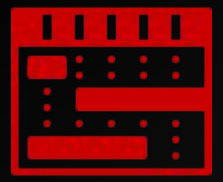
Story
The car must be able to detect smoke along its path

- Integration into the basic architecture ~1 days
- Electrical wiring ~2 days
- Testing ~2 days

Approval test

- Verification of the entire software architecture, from simulating a fire to triggering the alarm

Demonstration
The car will trigger an alarm when smoke is detected



Sprint 3

Follow manometers with camera

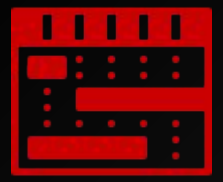
Story

When a manometer is detected , the camera move to keep it in the horizontal center of the image

- Create a new mode for the controller ~4 days
- Read the position of the detected manometer ~2 days
- Compute the new camera angle ~3 days
- Perform the approval test and resolve bug ~2 days

Approval test & Demonstration

- When the tracking mode is active, the camera follow a manometer while the car move at maximum speed
- If a manometer enter in the field of view of the camera, the camera center it



Car Dashboard

Sprint 3

Story

As a user, I want all sensor and movement options summarized on a single web page for easy access and reference.

- Dashboard Design: Create a user-friendly interface that visually organizes and displays car data.
- Filtering and Sorting: Include options for filtering or sorting the information based on user preferences or specific criteria
- Alerts: Show emergency alerts to the user (Fire detection, Intruder detection)
- Manometer Reading: Show when a manometer is detected and show the value

~9 days

~2 days

~3 days

~2 days

Approval Tests

- All information is available and accessible
- Car values are updated within a maximum of 3 seconds after the change.

Demonstration

- The web page is functional, the user can navigate between the different data received

Sprint 3

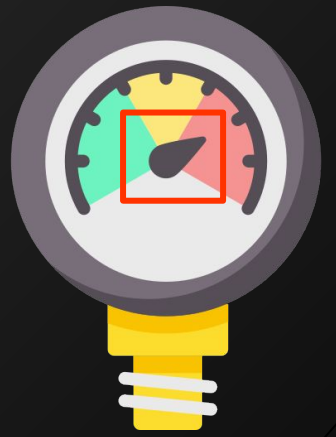
Next Demonstrations!

Virtual Dashboard

The website summarizes information and states of the car.

Read values from manometer

The can car read the value from manometer, to check if everything is fine

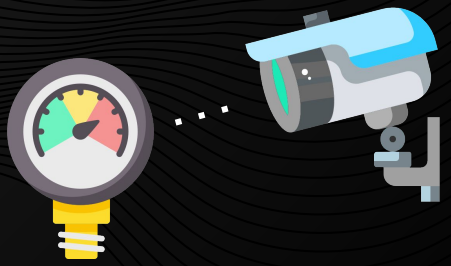


Smoke detection

The car use smoke sensors to identify and detect the presence of a fire

Manometer tracking

The car's cameras track the movement of the manometer detected during the vehicle's operation.



Indoor navigation

Technology

VigiWheels

Sensor

Smart

Communication

Autonomous

IoT

Agile

Team

Safety

Mobility

Actuator

Fire

Intruder

Future

Patrol

Your Thoughts, Please?