TrailerMate

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Context

Freight represents **30%** of **French road transport**

in **2021**, French truck drivers **travelled an average of 467 km per day**, equivalent to **11h and 22 min** on the road

500,000 road accidents are caused by tractor-trailers, resulting in **5,000 deaths**, **every year in the US**

20% of truck drivers admit to **have fallen asleep while driving**

Product description

Autonomous truck modelized by a car and its trailer

Making truck driver's lives and works easier thanks to a **reverse gear library**

Helping reduce accidents thanks to **an autonomous nagivation** and **a security system**

Main features

Reverse maneuver & Parking assistance

- Perform a **straight reverse gear** during at least 10 meters
- Perform a **reverse gear** with a **90 degrees angle** turn and no constraint concerning the width of the road
- Be able to **detect** the parking slot and **park automatically**

Autonomous navigation

- The vehicle can **detect obstacles** while going **forward**
- The vehicle (trailer) can **detect obstacles** while **reversing**
- The vehicle can **autonomously** go from point A to point B using **GPS**

Security

- **Emergency** stop switch in the controller
- **Switching** to **manual control** when the vehicle is in automatic mode

Release vision and backlog

Project separate into 6 sprints lasting 2 weeks

- Sprint 0 : discovering the project, the car and the expectations of our teacher-clients and project plan development

- Sprint 1-2-3-4-5 : product development according to the user story and the planification made in the sprint 0

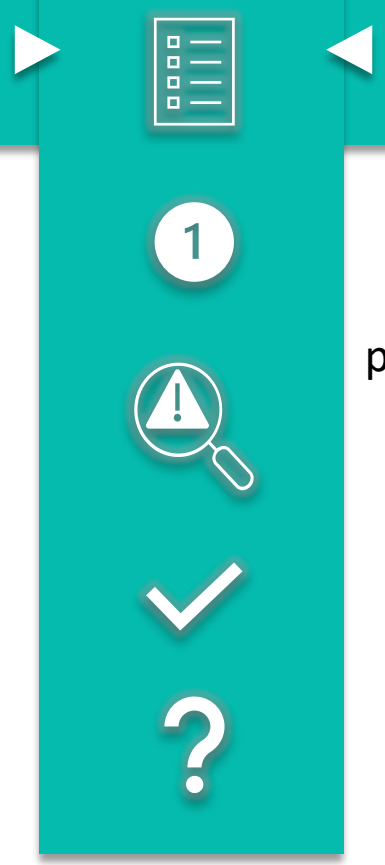
Release vision and backlog

SPRINTS

1. Familiarize oneself with the car's structure
2. Focus on the control laws of the car
3. Obstacle detection and addition of the trailer to the system
4. Automatically park the car with the trailer
5. Implement a GPS function in our fin al product

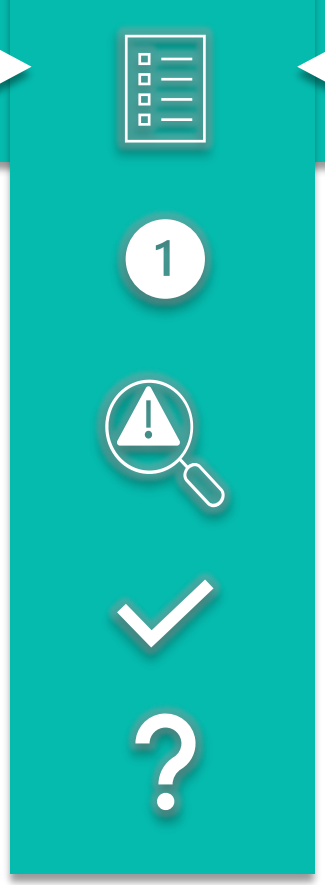
...GOAL!

Release vision and backlog



	Sprint 1	Sprint 2	Sprint 3
High priority	Moving forward with a fixed speed	Make a model of the car in Matlab/Simulink	Car can detect obstacles
	Get an emergency button in the controller	Implement basic controls to controller	Ride a straight reverse gear during at least 10 meters
	Understand the pre-existing code	Car adapt its speed to a manually or automatically	Trailer can detect obstacles
	Centralizing the code on ROS 2	Implement all the control laws in Matlab	Get back the controller manually when the car is in automatic mode
	Get values from sensors	Car take curves following the sensor value	
Low priority	Looking for existing trailers control loops		

Release vision and backlog



	Sprint 4	Sprint 5
High priority	Ride a reverse gear with a 90 degrees angle and no constraint	
	Make an interface to give error information to user	
	Be able to detect the parking slot and park automatically	Go to point A to point B autonomously using GPS
		Make an application to get the planned trajectory in top view
	Car can stop itself when there is an obstacle	Ride a reverse gear with a 90 degrees angle and a constraint
Low priority	Car can avoid obstacles	Detect traffic signs and adapt the behaviour of the car to it

Sprint 1

SCRUM Master : Killian Gonet

3 goals

Understand car structure	Design basic tasks	Use sensors/controller
Existing code	Move forward/backward	Emergency button
ROS2 structure	SoA reverse control loops	Get values from sensor

Risk analysis

Prevent project's problem

4 example of tools

XProgramming : program in pairs

Test Driven Development

Early Feedback : communication with client

Error detection management

Risk analysis

The five Essential Characteristics of Risks

1. Scope of the risk (Internal ,External, Material)
2. Description of the risk
3. Probability of occurrence
4. Criticity
5. Action to solve

Risk analysis

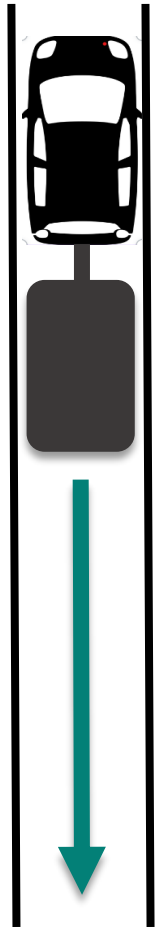
Risks identification

Internal	External	Material
A teammate is sick and can't work	The demonstration doesn't work during sprint review	A sensor stop working
High	Very high	High
Medium	High	Medium
Replan his tasks / Discuss with client	Make a backup video	Develop detection system / emergency button

Operationnal requirement

Reverse gears

Parking in a place facilitated by markers

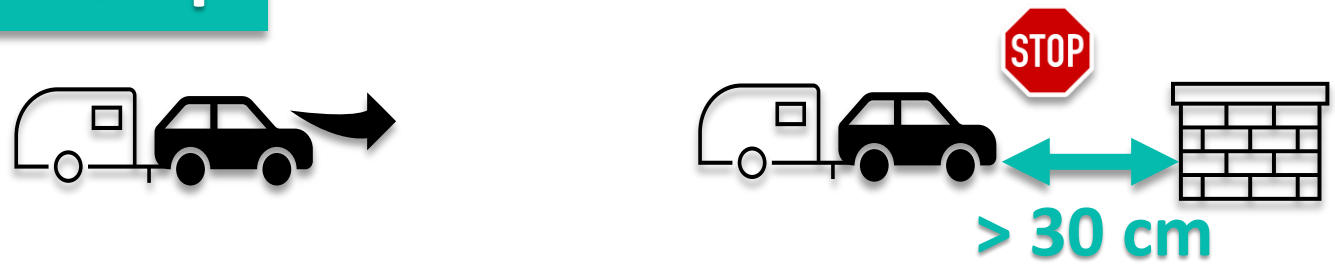


Reverse straight line for at least 10 meters without deviation

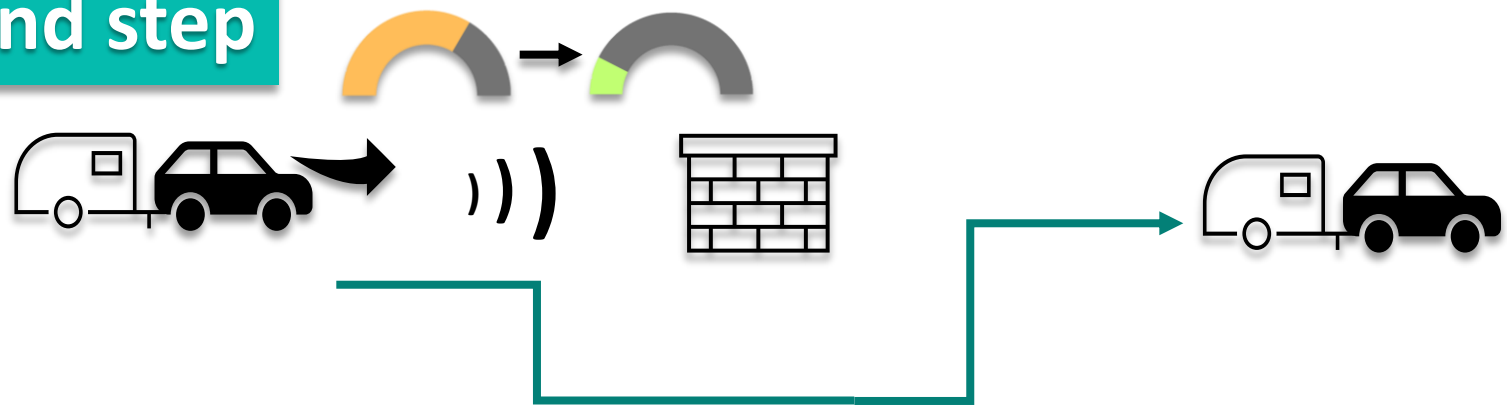
Operationnal requirement

Obstacle avoidance

1st step

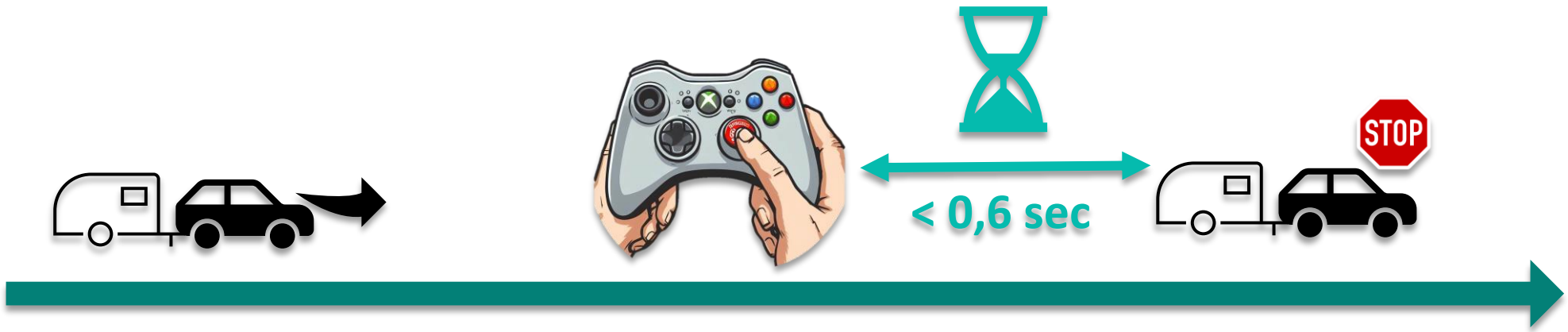


2nd step



Operationnal requirement

Emergency



Questions ?