



VigiWheels Project

Team Tahani

Our vision.

Building the autonomous safety car of tomorrow.

Our Team.



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Product description

A connected autonomous vehicle **ensures the security** of an industrial building by performing the following tasks:

- **Monitoring** the building
- **Reading** sensors
- **Detecting** intruders/fires





January release objective

- **Moving** in a known indoor environment
- Reading **manometer** (pressure-gauge)
- Detecting **intruders** (unauthorized people)
- Detecting **fires**





Final release features



Indoor Car Navigation

Guide the car from a point A to a point B and ensure positioning



Detecting and Avoiding Obstacles

Spot obstacles, stop or adapt trajectory



User Communication

Send important information and alert



Smart Patrol

Follow a default route, while looking to security elements



Instrument Reading

Detect and interpret manometer



Fire Detection

Spot fire along the patrol



Intruder Detection

Control authorization and detect abnormal event

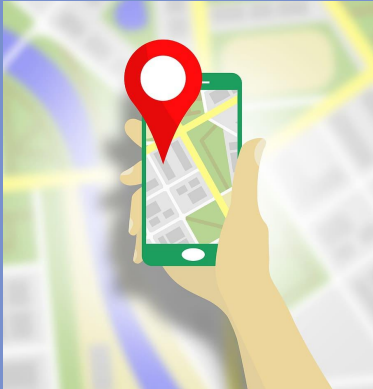
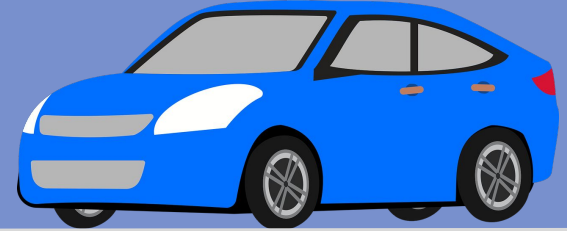


Operational Requirements



Move in an indoor environment

- Move in a straight line over a specified distance
- Able to take a turn
- Maximum error 5%



Locate the car

- The car can be geolocated within a range of 25 cm
- Able to locate the car from the control room



Operational Requirements

Fixed obstacle detection



- Detect fixed obstacles within its trajectory and stop
- Detection of obstacles from 30cm

Moving obstacle detection

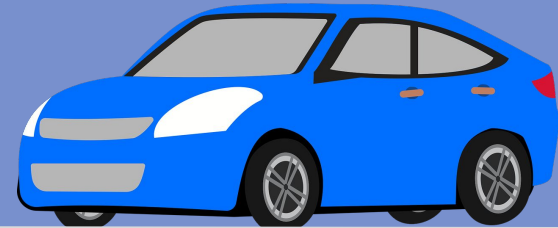


- The car is able to stop when it detects moving obstacles until its departure
- Detection of obstacles from 30 cm

Avoiding obstacles



The car can determine the size and position of an obstacle and adapt its trajectory to avoid them





Operational Requirements

Physical sensor detection

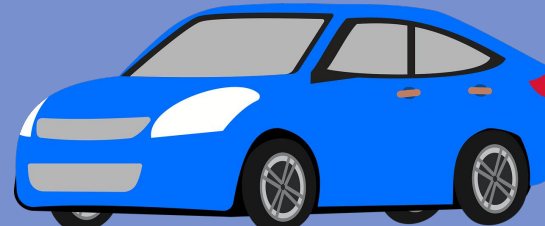


- Detect the presence of a sensor with its camera
- Detection within 1 meter range

Physical sensor value extraction



- Extract values from the sensor
- Reading with 0,5 bar precision
- Analyze if the sensor exceeds the threshold





Operational Requirements



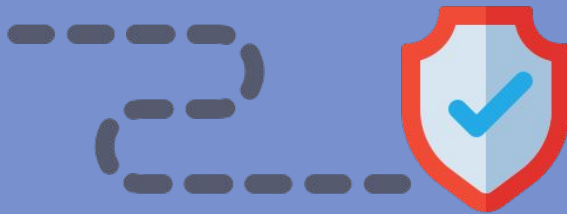
Smart patrol

Conduct a round inside the building along a predefined route in a specific order to detect manometers, stop, and identify fires, among other tasks.



Emergency alert

Send the emergency location
In danger reports it sends the route section where it occurs even without waiting for the patrol to finish.





Operational Requirements



Fire detection

- Connected to fire alarm building system.
- Detection 90% by using machine learning technics
- Immediate alert upon detection



Intruder detection

Face recognition or pass reading (QR code)
No **misidentification** between authorized and unauthorized person



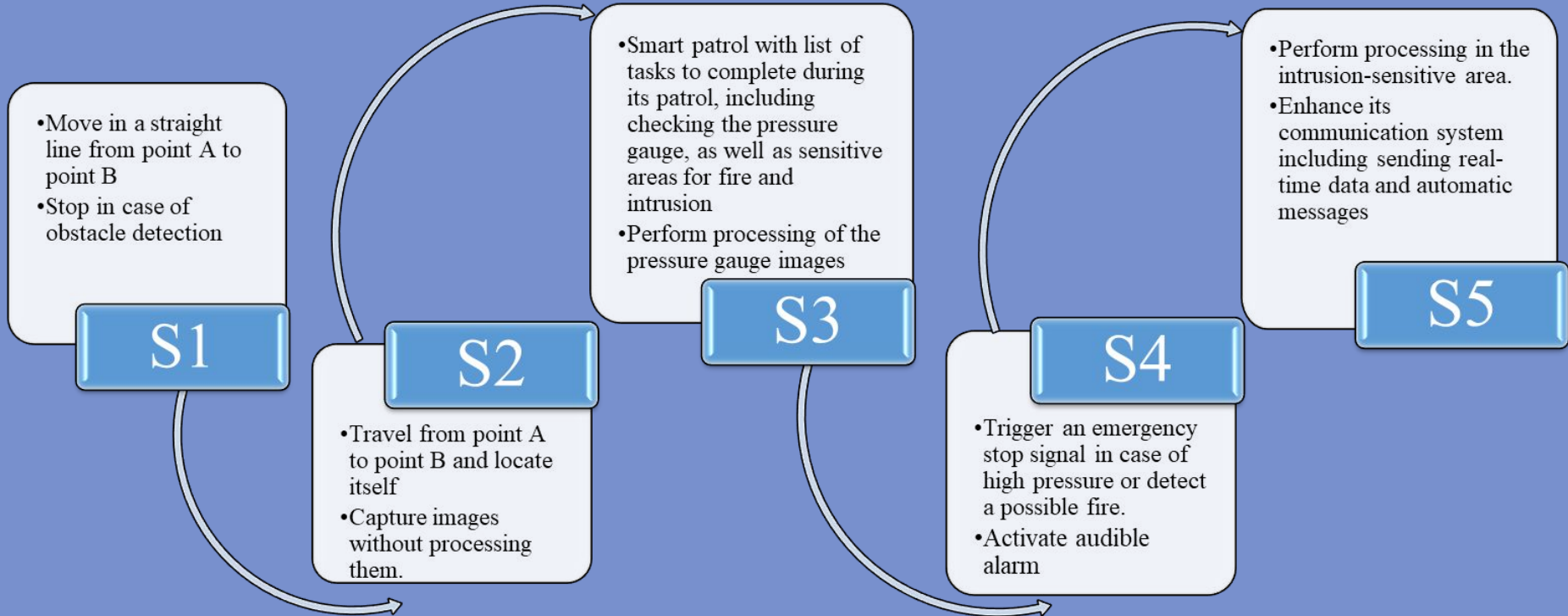
Abnormal event detection

Detection and report of any **abnormal sound**





Validation plan





Backlog

1) Urgent tasks



a) Follow a predefined trajectory

The car can travel from one location to another following a specified path



b) Obstacle identification

The car identifies if an obstacle is fixed or mobile



c) Obstacle detection

The car stops when an obstacle is detected



d) Location

The car can be **geolocated** within a given range



Backlog

2) Important tasks



a) Physical sensor detection

The car can detect objects around its perimeter using sensors



b) Physical sensor value extraction

The camera takes a scan of the reading



c) Emergency alert

Send a message to the user with the location of the emergency



d) Periodic patrol report

Send a report periodically to the user



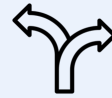
Backlog

3) Secondary tasks



a) Position transmission

The car sends its position when an alert is detected



b) Smart patrol

Establish a default route trajectory for indoor navigation within a building



c) Intruder detection

The car is able to distinguish intruders from employees.



d) Abnormal event detection

Detection and report of **any abnormal** sound



First Sprint objectives & planning

4 features → 4 teams



Indoor Car Navigation

The car can move in a straight line



Detecting and Avoiding Obstacles

To be capable of detecting a basic obstacle and stopping the vehicle.



Instrument Reading

Prepare the data to train the AI model to recognize manometers







Fire detection

Find a solution to detect a fire start, using an infrared sensor. Develop the low-level driver and retrieve data from the sensor





Objectives & tasks

Objectives	Tasks
 <p>Moving the car</p>	<ul style="list-style-type: none"> Moving in a straight line <p>Movement with the console</p> <ul style="list-style-type: none"> Make sure that we can move in a straight line <p>Autonomous movement</p> <ul style="list-style-type: none"> Velocity control/ Position control
 <p>Dataset manometer</p>	<ul style="list-style-type: none"> Build image dataset for labeling Start image labeling for one class (manometer) Prepare the data to train an AI model to recognize manometers
 <p>Detecting a basic obstacle</p>	<ul style="list-style-type: none"> The car is able to detect fixed obstacles and stop
 <p>Fire detection</p>	<ul style="list-style-type: none"> Find the best sensor Study the sensor's technology and specifications. Implement a low-level driver for the sensor Process the sensor data to obtain the temperature of the area.



Risk Management

Proactive Risk Management



Identifying

seek out and identify potential risks that may affect our organization



Analyzing

evaluate and assess risks to understand their potential impact and likelihood



Mitigating

implement strategies to reduce or minimize the potential negative impact of identified risks



Risk Management

High Criticality

Team issues	comprehensive documentation and regular knowledge sharing
Component shortage	Maintain a supply of spare parts
Lack of components	Early ordering to prevent delays due to insufficient components.



Risk Management

Moderate and Low Criticality

Modules incompatibility	Utilize effective version control systems integrate ROS to streamline module compatibility issues
Lack of skills	Allocate project tasks based on team members' expertise arrange training sessions with tutors
Misunderstanding of user requirements	Implement user-centered design principles to ensure alignment with user expectations.
Pandemic	flexible work arrangement that allows for remote work in case of unforeseen circumstances
Budget	estimate project costs and maintain a vigilant approach towards budget management

VigiWheels Indoor navigation Technology
Communication Sensor Autonomous Smart
Agile IoT
Team Safety Mobility
Actuator Fire Future Patrol
Intruder



Your Thoughts, Please?