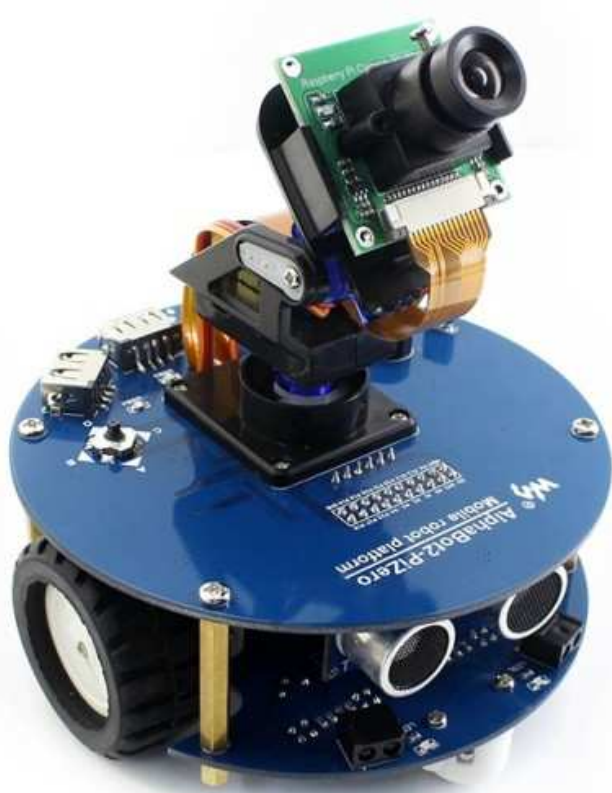# Explobot

2023-2024

CONTEXT

The Thales TSN EE4 department aims to present their activities to external audiences without compromising confidentiality.

To achieve this, the department intends to utilize a demonstrator to showcase its three key areas: Radio, Electronic Warfare, and Encryption.
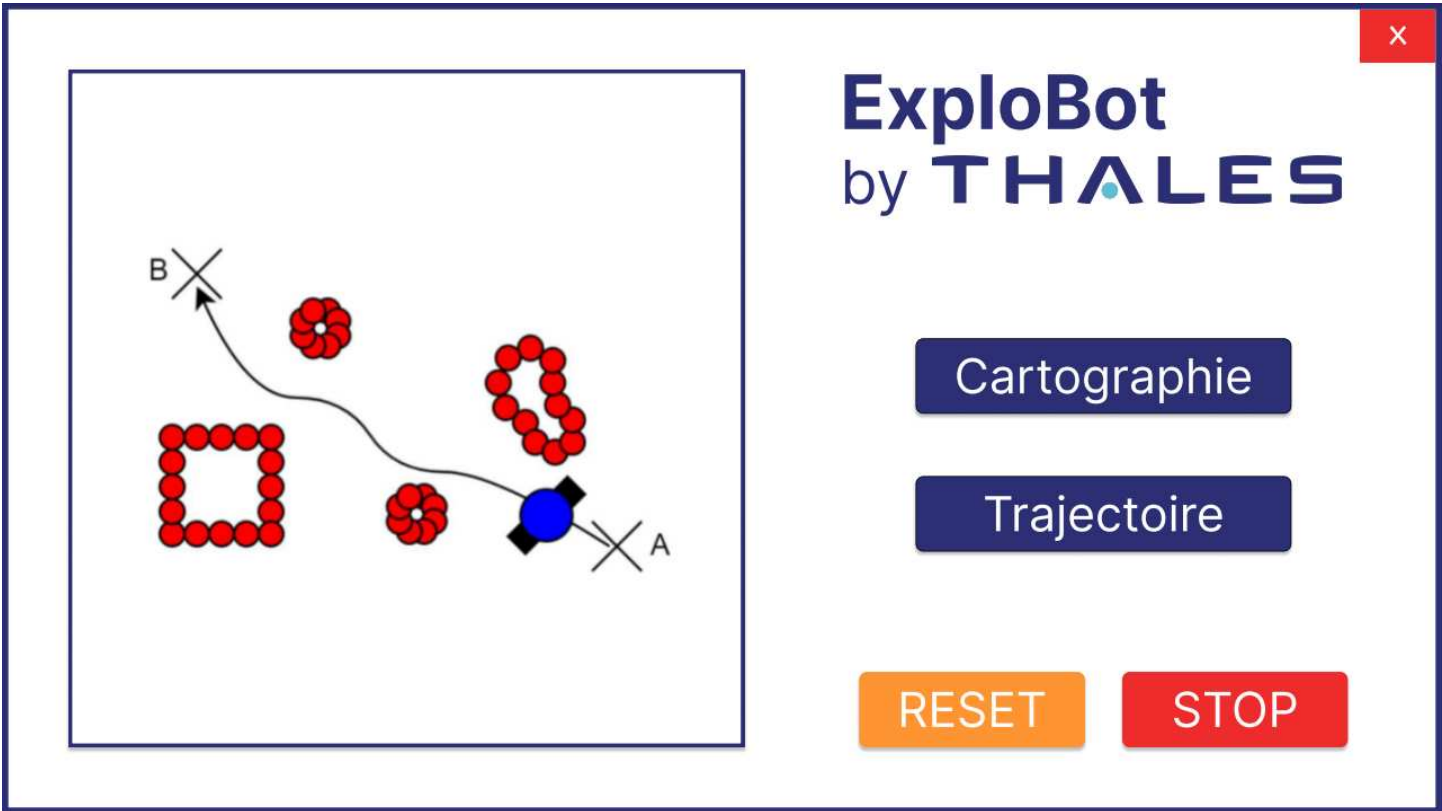
SOLUTION

This demonstrator is a robot capable of simulating a vehicle in the field. The robot **autonomously navigates to map an area** and transmit the coordinates of obstacles, which can then be visualized on a map.

Once the area is mapped, the robot can navigate from point A to point B in the **safest and most optimized manner**.

CARTOGRAPHY   # SHORTEST PATH

ExploBot
by **THALES**

Cartographie

Trajectoire

RESET   STOP

ROBOT

The robot is an Alphabot 2 driven by a Raspberry Pi and equipped with an ultrasonic sensor to detect obstacles.

CARTOGRAPHY

An authentic algorithm was developed and employed to map the entire area where the robot operates, enabling it to calculate and avoid obstacles. This algorithm is inspired by the SLAM (Simultaneous Localization and Mapping) method, which serves a similar purpose.

VISUALISATION

The user will command the robot through this software interface, but the robot will move autonomously. The user will then observe the robot as it independently maps the area or follows an automatically calculated path, and see the results on the screen.

The user will need to position the robot at an exact location to initialize its understanding of the environment, thereby clarifying its starting point

PROCESS

Cartography

Employing a Simultaneous Localization and Mapping (SLAM) algorithm alongside ultrasonic sensors facilitates the creation of an intricate map of the robot's surroundings.

Visualization of obstacles on the map

The map generated is displayed through a user interface, which highlights the explored areas and the detected obstacles.

Setting the destination point

The user can choose a destination point on the map through the user interface.

Autonomous movement

The system employs the A* algorithm for efficient path planning to a selected destination, ensuring smooth navigation and obstacle avoidance, thus optimizing the robot's movement.

TIMELINE

September	October	November	December	January
A research study on an algorithm for shortest path finding and mapping.	Specification and design + test plan	Development	Tests	Delivery to customer

DEHOUX Antoine, TRAORÉ Fatoumata, LAGUÉRIE Jean-Eudes, FÉDÉLI Simon, ROCHER Thomas
Option : Embedded Systems - Clients : CHENU Thomas, MADDONINI Pierre, ROCOURT Bastien,
RAJAOARISOA Maryo - Teacher : BRUN Matthias