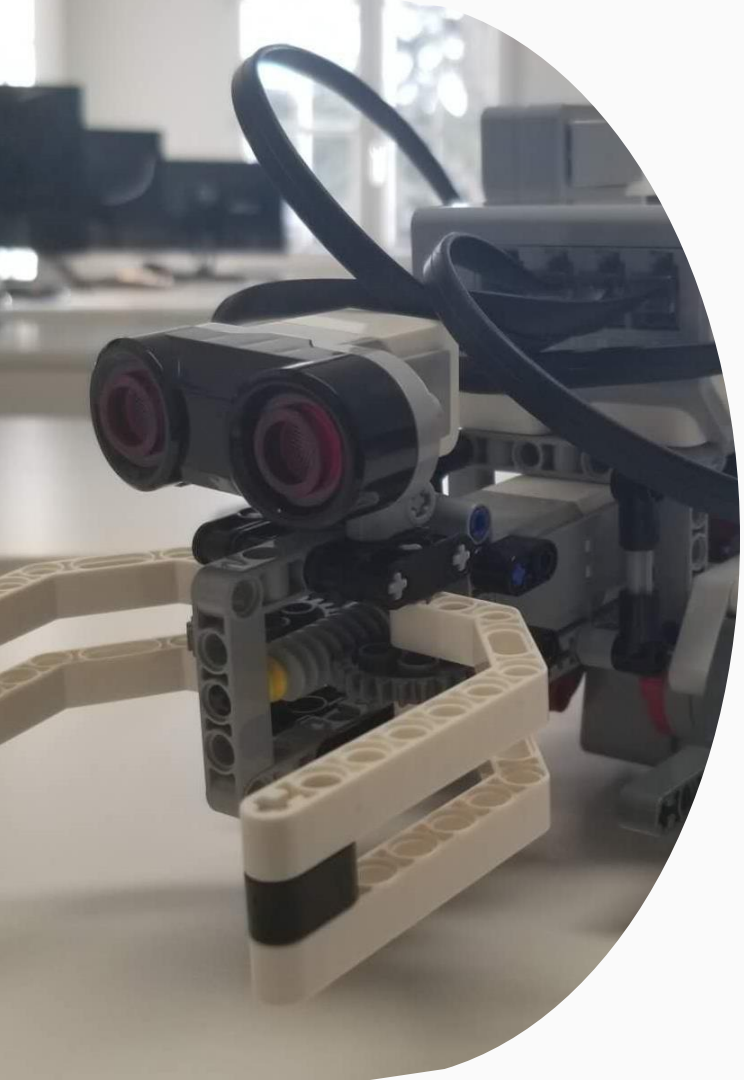


SYSTEM MODELLING LESSONS

ISEP Dynamics

Search and Rescue

Team members: **Juan BOYER**
Marina KIESSE-SAMBA
Arthur POCHART
Sudharshan ANJUGAM VARUN RAJ
Wenqi ZHAI

15/01/2024

Table of contents

01

Introduction

Our mission

ISEP Dynamics aims to solve unmanned rescue operation in small defined areas once and for all!

Our team

Marina kiesse-samba

Project manager

Arthur Pochart

Software chief engineer

Wenqi Zhai

Hardware chief engineer

Juan Boyer

Testing chief engineer

Sudharshan Anjugam
Varun Raj

Documentation manger

02

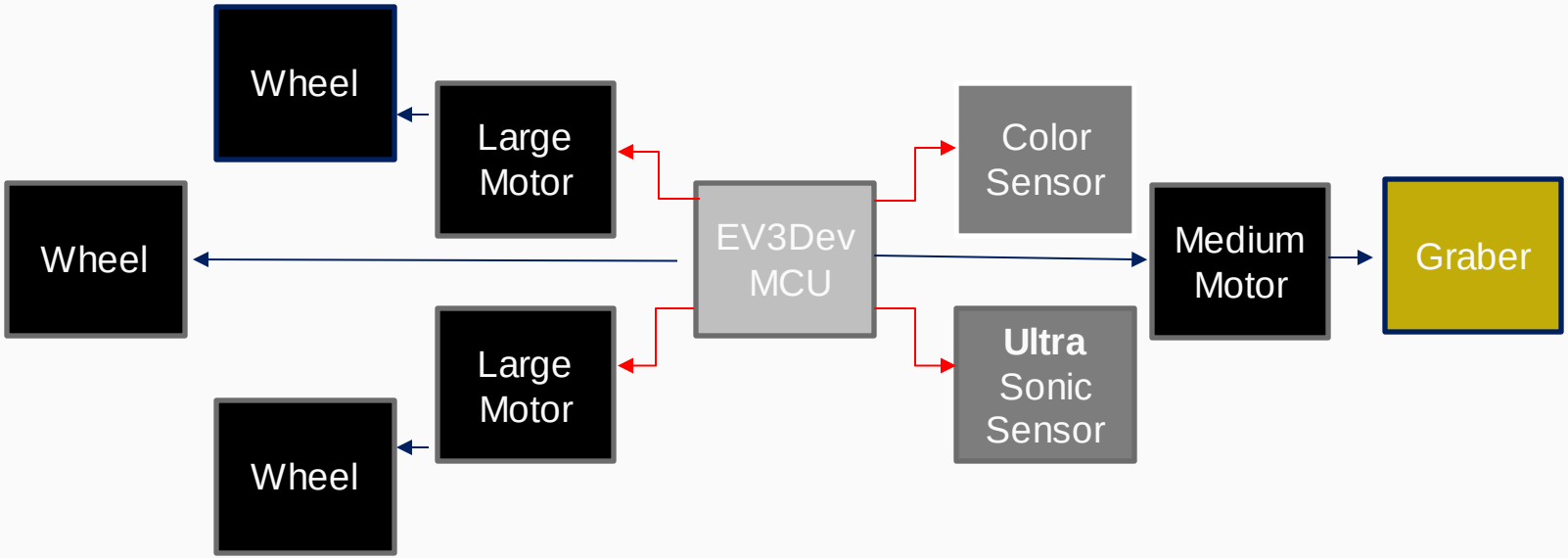
Specifications and Tests

Specifications

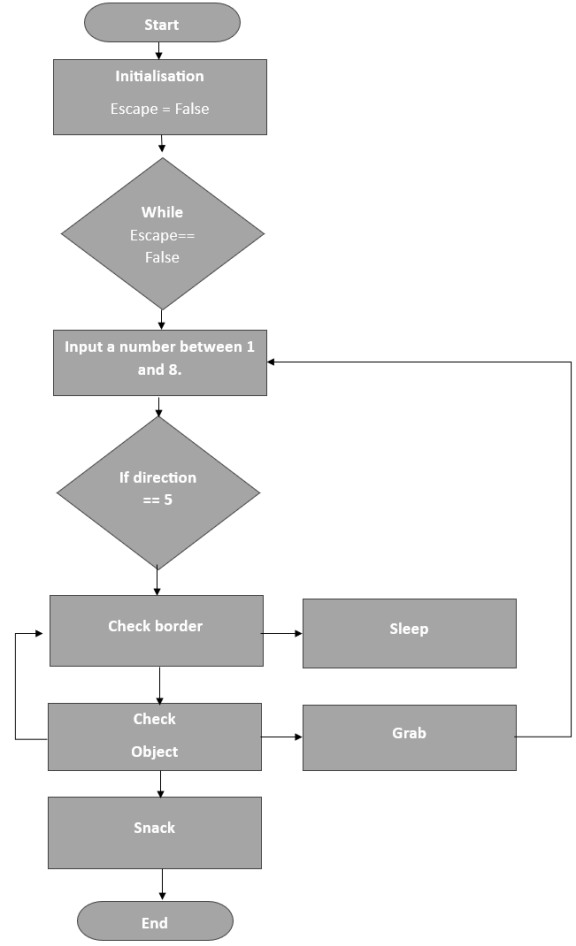
Bronze Level

Problem to solve	- The robot is able to autonomously explore a square 1.5m x 1.5m area and detect the target - The robot is able to home in on the target
Conditions of test	- The area is a square on the ground of 1,5x1,5 Meters, demarcated by any means (colored tape, cardboard, …) ; - Drop one object inside, for example a red ball, a soda can (catchable) ; - The robot starts at the corner of the square.
Verifications	The robot should explore the area (with the pattern of your choice – example of the "snake" pattern on the scheme below), and stop when it detects the object ; - The robot has a coordinates system (polar, Cartesian, …) with (0,0) being his starting point ; - When the object is detected, the robot register the coordinates of the target and comes back directly to his starting point ; - The robot has to be able to communicate the coordinates (on screen, by voice, …) to the user

Bronze Solution – Hardware Design



Bronze Solution – Code structure



Bronze solution

Achievements

- ✓ The robot explores the area with a snake pattern
- ✓ The robot communicates with the user

Milestones

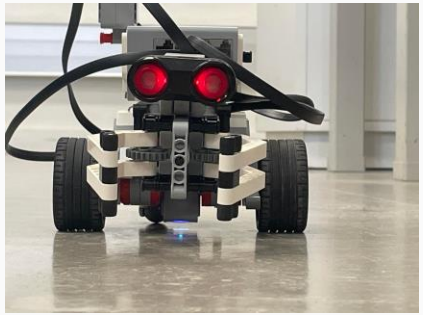
-The robot struggles to maintain a straight path.

-Difficulty in staying within the designated square.

-Precision issues observed during rotation phases.

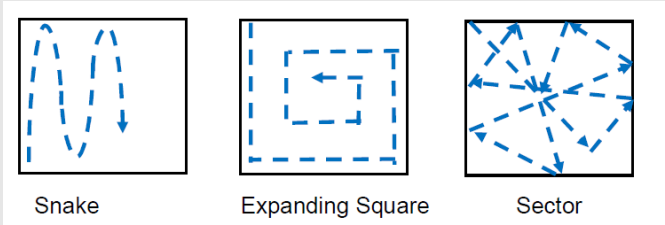
Tests

-Motor test
-Straight directional test
-Sensors testing
-Rotation angle test
-Grabber test

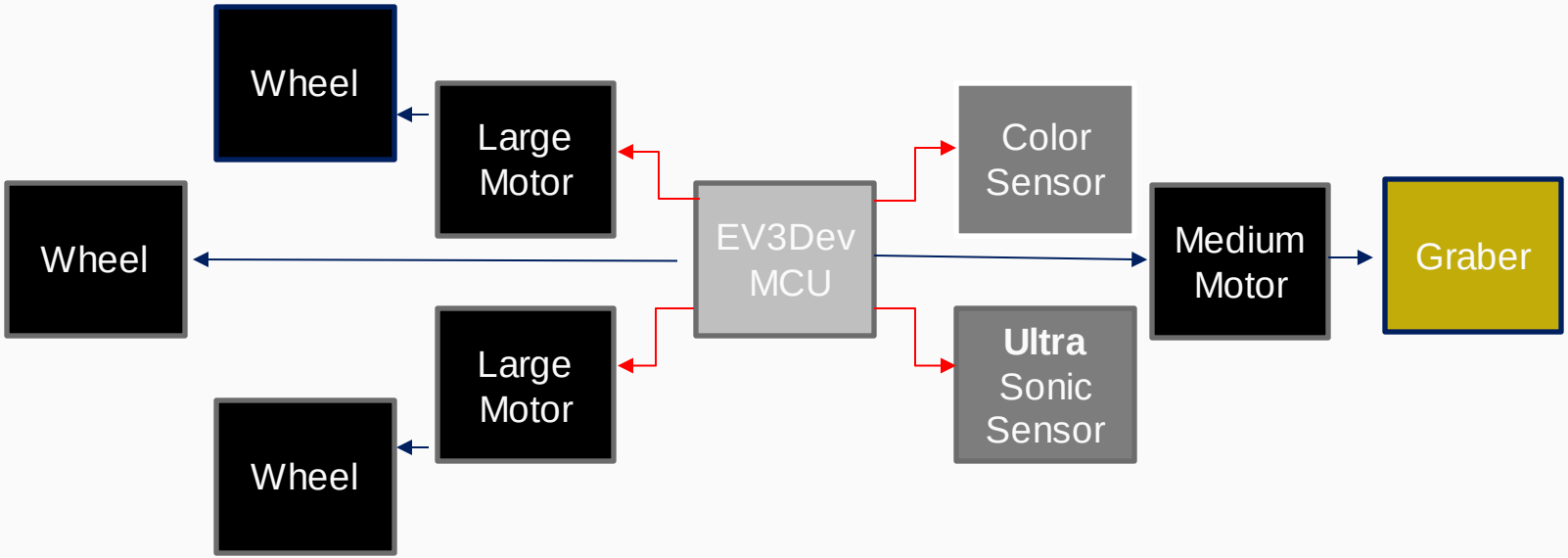


Specifications and Tests

Silver Level

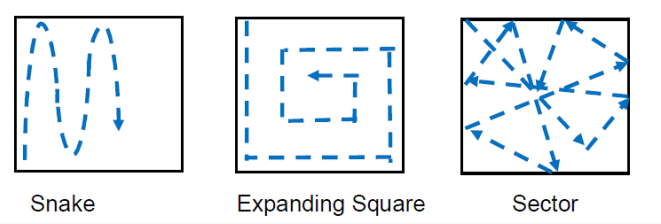
Problem to solve	-The robot is able to pick up the target and get back to his starting point - He is able to choose between multiple search path (at least 3) depending on the situation
Conditions of test	The area is a square on the ground of 1,5x1,5 Meters, with one object inside, for example a red ball (catchable) ; - We can choose between 3 search patterns before start (snake, Expanding square, Sector…etc) ; - The robot starts at the corner of the square.
Verifications	- Same as bronze but with 3 different patterns. 

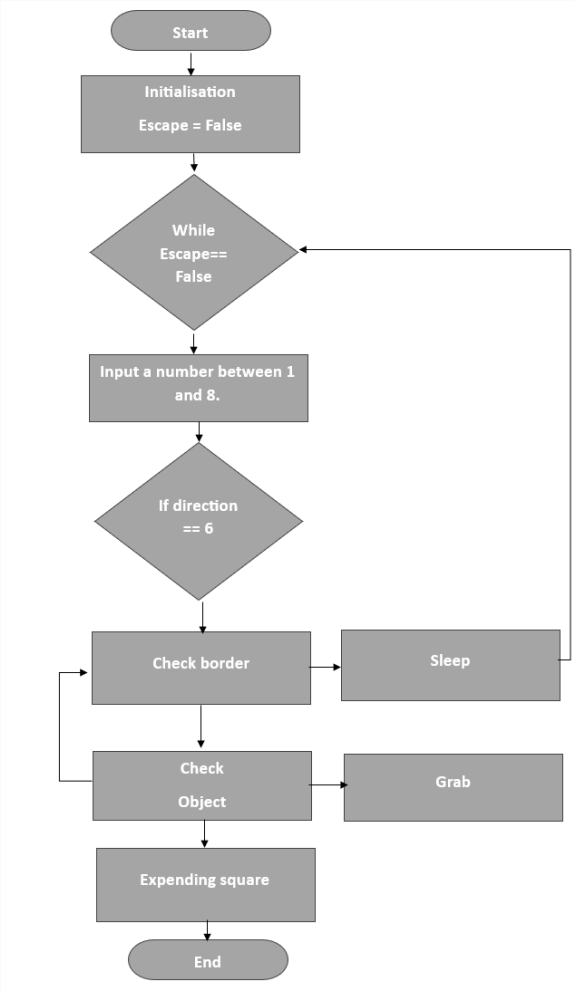
Siver Solution
– Hardware Design



Silver Solution – Code structure

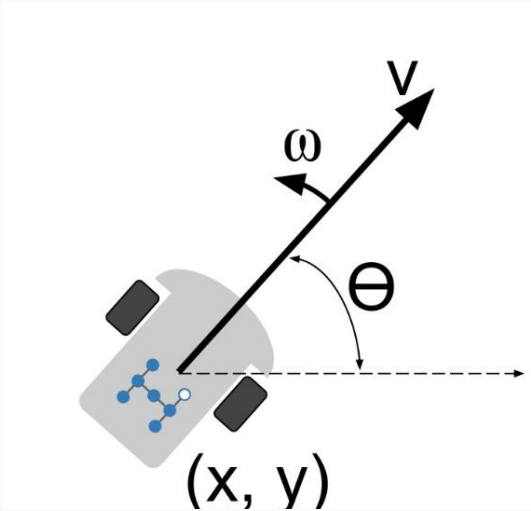
The function ' Expanding square' depends on the pattern choosen





Silver Solution – Code structure

Odometry

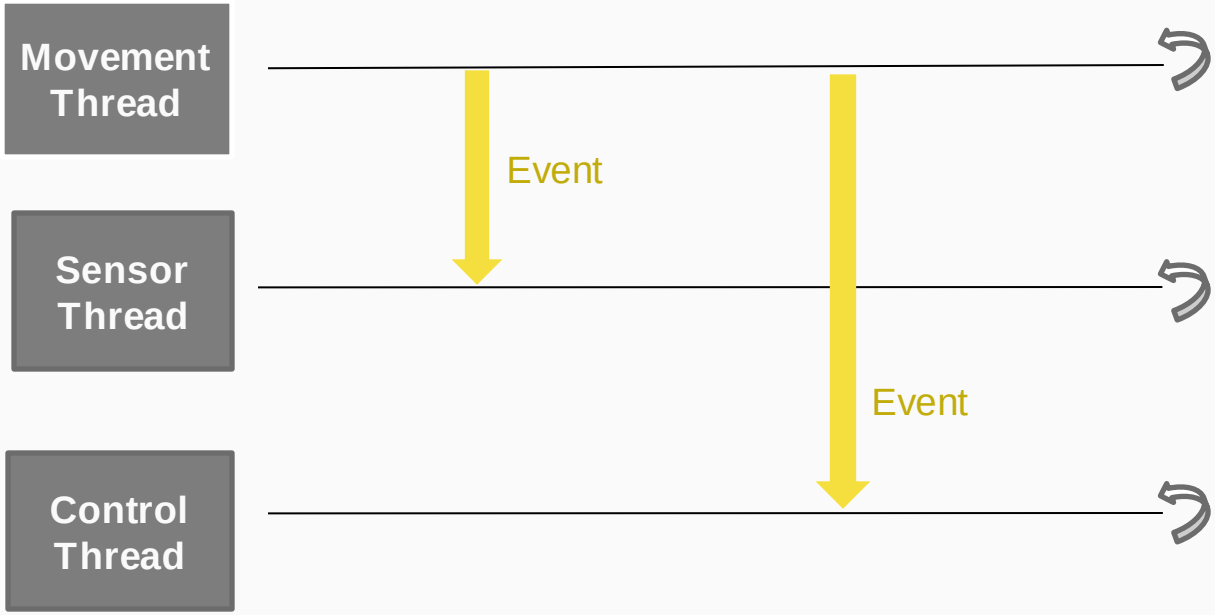


X = distanceTraveled * sin(theta)
Y = distanceTraceled * cos(theta)

Theta determined by gyroscope

Silver Solution
– Code structure

Multithreading



Silver solution

Achievements

✓ Three paths are implemented

Milestones

-The multithreading function no longer works since we changed function to advance the robot

-The grabber encountered difficulties in securely gripping the object.

-Some errors of angles during the rotation of the robot are present, which distort the movement of the robot

Tests

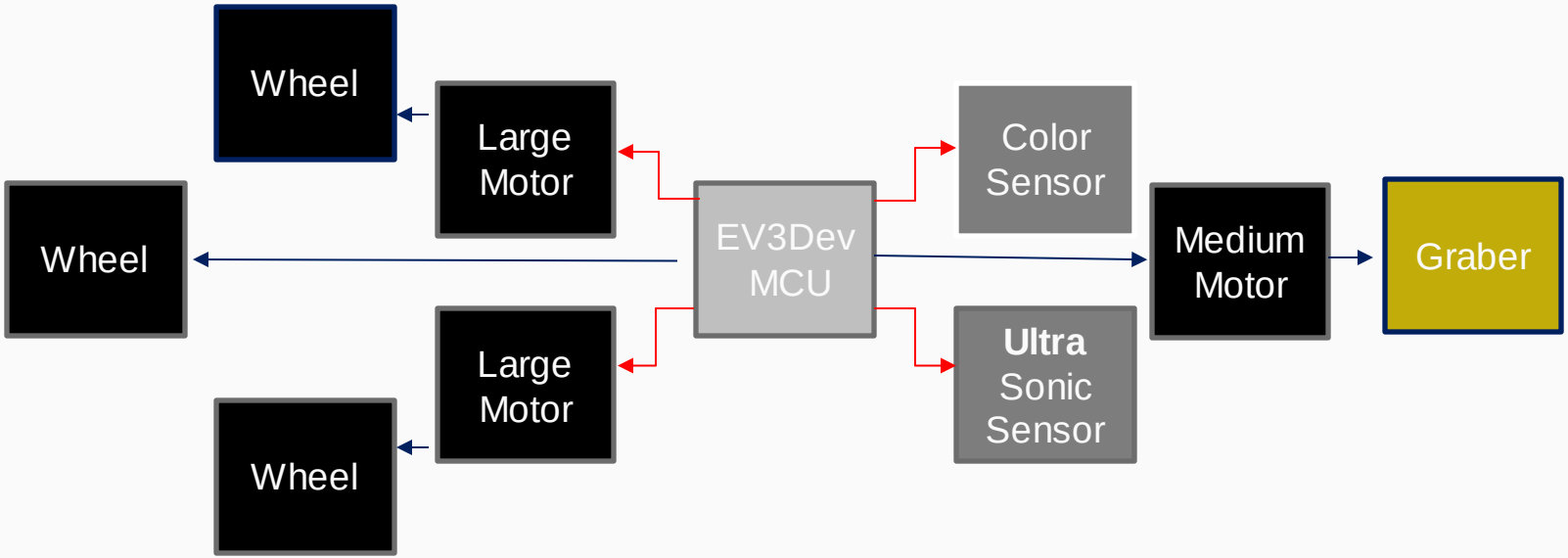
-Odometry test
-Multithreading Test
- Rotation angle test

Specifications and Tests

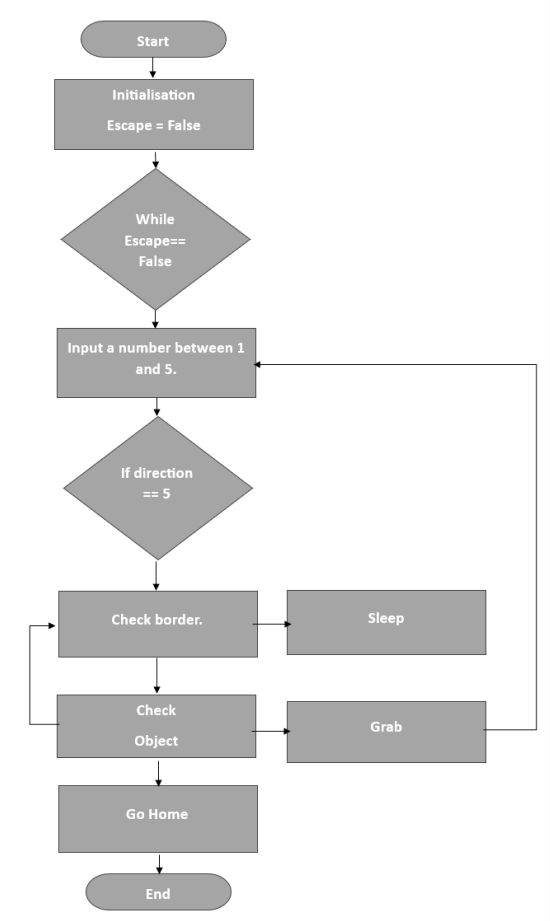
Gold Level

Problem to solve	- The robot is able to report to a remote system, with a graphical user interface.
Conditions of test	- The area is a square on the ground of 1,5x1,5 Meters, with one object inside, for example a red ball (catchable) ; - A wirelessly connected command and control computer (C2) with a graphical or command line user interface is connected to the robot ; - This C2 let the user choose between 3 search paths before start (snake, Expanding square, Sector…etc) ; - The C2 let the user send commands to the robot (start, stop, drop object, pick up, go home, etc) ; - The robot starts at the corner of the square.
Verifications	- Same as silver level ; - We can see on the graphical user interface the coordinates of the target, and different robot steps and/or status (start, search, target pick up/missed, home come back) ; - The robot acts accordingly when a command is sent.

Gold Solution
– Hardware Design



Gold Solution
– Code structure



Gold solution

Achievements

- ✓ Differents robot steps
- ✓ The robot acts accordingly when a command is sent.

Milestones

-Precision issues observed during rotation phases.

-The robot doesn't get back to his starting point

Tests

- Pattern test
- Multithreading Test
- Grabber test (grabber material structure modified)
- Check Border test

03

Problems encountered

Problems encountered

Type	Name	Comment
Technical	Multithreading	Multithreading no longer worked because of the integration of move differential and especially the feedback of information not taken into account by it
	Angle Error	Angle calibration is not perfect and still has errors
Environmental	Testing environment	The test environment created for the occasion was lacking in the focus of the robot including the color sensor
Human	Management	Allocation and time spent on tasks was poorly studied Not enough time compared to previous sessions (apprenticeship...)

04

Demonstration Gold Level

Thanks!

Do you have any questions?