ELECTRICAL TEAM TRAINING

TASK 3

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PREFACE

Once **Gru's** audacious scheme to steal the moon is set into motion, a crucial piece of the puzzle remains: obtaining the coveted **Shrink Ray gun** from his formidable rival, Vector. With his elaborate moon heist plan in motion, Gru's attention turns to the intricate task of infiltrating Vector's heavily fortified lair once again. This time, the stakes are higher than ever before, as the success of his moon-stealing endeavor hinges on acquiring the remarkable technological device.

Vector has the **shrink ray gun**, a special gadget. He keeps it in his **super-dangerous house,** filled with traps and tricks to stop anyone from taking it. This shows that Vector is proud of his skills and wants to make sure nobody can easily get the shrink ray gun from him. Vector's boldness shines as he orchestrates the theft of the iconic **Great Pyramid of Giza**, showcasing his unmatched control over technology and daring villainous nature.

TASK3.1- Signal to Engage

About

Gru hatches a clever plan to use the three orphaned girls from Miss Hattie's Home for Girls to distract Vector, the cunning and tech-savvy villain who possesses the Shrink Ray Gru desperately needs. Recognizing that Vector has a soft spot for cookies, Gru sends the girls—Margo, Edith, and Agnes—selling boxes of cookies at Vector's doorstep. Gru sends the three girls to get Vector's attention while he sneaks in to steal the shrink ray.

He needs to communicate with the girls to know when Vector is distracted to activate the cookiebot to steal the shrink ray. He come to you and Dr. Nefario, to create a communication system between him and the girls inside vector's house

Requirement

- Write 2 Arduino codes, one that interface with two push buttons, and the other one communicates with the first one by receiving data about buttons state, using I2C communication protocol.

- In the receiving side we need to interface with indicator LED and write a message on the Serial Monitor

- Send message and control the intensity of LED light according to the show table.

Push buttons	LED	Serial Monitor
B1=0, B2=0	0% of Maximum	No message
B1=1, B2=0	50% of Maximum	Vector focused
B1=0, B2=1	75% of Maximum	Vector distracted
B1=1, B2=1	100% of Maximum	Glitch

- Does the communication between two Arduinos through I2C will sustain without regard to the distance between the two Arduinos?

Output

- Two (.ino) files one for each Arduino
- TinkerCAD schematic and simulation of this system

Appendix

- Arduino Basics: Arduino basics - YouTube
- Communication Protocols: Video details - YouTube Studio
- PWM in Arduino: PWM in Arduino (tutorialspoint.com)
- Interrupts in Arduino: Arduino - Interrupts | Tutorialspoint
- Communicate two Arduinos I2C: I2C Between Arduinos : 5 Steps (with Pictures) - Instructables

TASK3.2- Cookiebot

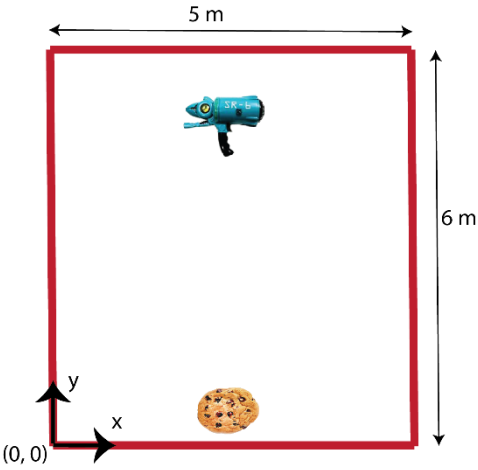
About

Cookie Bots are clever robots that work on their own. They're programmed to go to the room where the shrink ray gun is and break down the wall, helping Gru take the gun. These robots are like little helpers that follow their mission without needing anyone to control them. Their job is to make a way for Gru to get the shrink-ray gun by breaking into the room.

You have the vector's house footprint and need to program the cookie bots to go to a specific position on the shrink rays champer to break down the wall to Gru.

Requirements

You have the cookie bot with four ultrasnoic that measure the distance each up to 8m positioned as shown. Specifically, positioned at (0°, 90°, 180°, 270°) from the Cookie headings.



The Shrink ray champer is (5m x 6m), and we need to localize the position of the cookie bot on that champer (localization in this problem means to get (x,y) of the robot with respect to the room).

- Assume the cookie bot only moves in forward or lateral (there is no rotation).
- Assume the origin of the chamber on the left-down corner

Bonus

CHALLENGING

In this task we have know the map, but what if you don't know the map and you need to localize the robot to reach a specific position, search about this problem and just write what sensors may be needed and what algorithm should implement?

SLAM

Simultaneous Localization and Mapping, often abbreviated as **SLAM**, stands at the technological crossroads of **robotics and computer vision**. This remarkable innovation allows machines to navigate and understand their environment with an almost human-like sense of awareness. Imagine a robot venturing into an unfamiliar room—it employs SLAM to create a map of its surroundings while simultaneously pinpointing its own location within that space. This intricate dance between mapping and self-awareness is akin to a robot developing its own cognitive map, providing it the ability to traverse complex terrains, from the mundane to the extraordinary, all while learning about the world around it.

SLAM is a crucial technology in today's world, driving progress across different fields. It's especially important in robotics, like **self-driving cars** and **drones**, where SLAM helps these machines navigate and build maps of their surroundings. This is used for tasks like **search and rescue**, **warehouse automation**, and **farming**. **Self-driving cars** also use SLAM to safely drive by understanding their environment. In **augmented reality**, SLAM puts digital objects into the real world, enhancing experiences in **gaming, design**, and **education**. SLAM is also used in mapping and archaeology to create detailed **3D maps**. Overall, SLAM is transforming industries and how machines interact with our world.

Output

- (.ino) file with the localization code
- (Bonus) Pdf in which you explain how could we localize the robot without known map of the environment.

Appendix

Ultrasonic:

- Arduino - Ultrasonic Sensor | Tutorialspoint

SLAM

- Introduction to SLAM (Cyrill Stachniss) - YouTube
- What Is Autonomous Navigation? | Autonomous Navigation, Part 1 - YouTube