ELECTRICAL TEAM TRAINING

TASK 6

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PREFACE

As the days turned into weeks and the weeks into months, WALL-E cared for the plant with unwavering dedication. He diligently collected rainwater, tended to the soil, and even played old songs to keep the plant company. Gradually, the plant grew stronger, its leaves turning greener, and its roots digging deeper into the earth.

One day, while scanning the horizon for signs of life, WALL-E spotted a gleaming spacecraft landing nearby. Out came EVE, a sleek, advanced robot designed to search for signs of sustainable life on Earth. WALL-E was fascinated and smitten by EVE's graceful appearance and advanced technology.

TASK6.1- Precise Self-Localizing

About

In the heart of their extraordinary adventure, EVE recognized the importance of aiding WALL-E in his quest to care for their precious plant and to ensure their journey's success. She knew that to navigate the ever-changing landscapes and challenges of Earth, WALL-E needed enhanced sensory capabilities. Inspired by their shared mission, EVE decided to equip WALL-E with additional sensors, including an **Inertial Measurement Unit (IMU)**, to provide him with crucial data for their journey.

Requirement

- Interface with the famous and cheap IMU sensor MPU6050, and retrieve the **Yaw angle** which angle along the z-axis (It's preferred to interface with the sensor register, and **don't use a library**)

-

- Q: If the Sensor is surrounded by a noisy environment, what type of filter could used and what is the recommended cutoff frequency depending on the sensor datasheet?

Output

- (.ino) file added to Task6 branch
- Markdown file to document your work and to answer the Question

Appendix

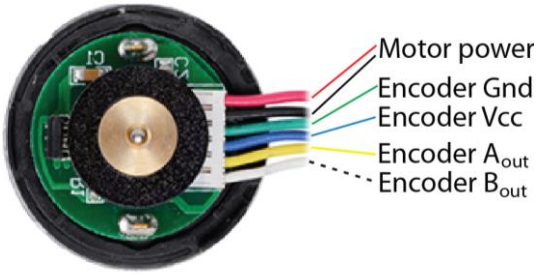
- **Sensor Basics**
  - Sensors Basics - YouTube
- **Filters:**
  - Introduction to Filters - YouTube
- **IMU:**
  - MPU-6050 pdf, MPU-6050 Description, MPU-6050 Datasheet, MPU-6050 view ::: ALLDATASHEET :::
  - 14 | Measure angles with the MPU6050 accelerometer - YouTube
  - DIY Gimbal | Arduino and MPU6050 Tutorial - YouTube
- **Markdown Documentation:**
  - Technical Documentation - YouTube
  - Markdown Tips & Tricks 2022 - Markdown Crash Course - YouTube

TASK6.2-Every Step Matter

About

As a diligent tracked robot navigating through the intricate landscapes of Earth's reclaimed wilderness, WALL-E recognized the paramount importance of **precise** self-localization to fulfill his mission of caring for the planet and safeguarding their cherished plant. In this pursuit, WALL-E identified the need for a rotary encoder, an essential sensing device, to provide him with accurate and **real-time position data**, further enhancing his navigational capabilities.

Requirement



- Interface with **rotary Encoder** and get the **number of counts** from the train of impulse from **A**, and **B** signals

- We need to design a **Software Practical Low Pass Filter (LPF)** what is the proper cutoff **frequency (fc)** If WALL-E has Specs:
  - Encoder has **540 pulse per revolution**
  - Track has three wheels only one motorized, with **40cm diameter,** (The one that has encoder)
  - And Maximum speed of WALL-E **0.5 m/s**

Output

- (.ino) file added to Task6 branch and it's documentation in **MD**

Appendix

Encoder:

- Sensors Basics - YouTube

Filters:

- Introduction to Filters - YouTube
- MIA-United/Filters (github.com)

TASK6.3-Route Optimization

About

WALL-E, the steadfast and environmentally conscious robot, found himself facing an increasingly complex and challenging task as he embarked on his mission to care for the Earth and protect the small green plant he had discovered. The need for path planning became evident as he encountered a **rapidly changing** and often treacherous landscape filled with **obstacles**, **debris**, and **uneven terrain**.

WALL-E's primary objective was to **navigate this harsh and dynamic environment** efficiently while ensuring the **safety** of both himself and the delicate plant he cared for. Without an effective path planning system, he risked encountering insurmountable obstacles, getting stuck in debris, or facing hazards that could jeopardize his mission.

Requirement

- Write article about Path planning using LaTeX (you could use stylish template).
- Try to cover this topic in your article:
  - Introduction to Path Planning
  - Types of Path Planning Algorithm
  - Local planner and Global planner
  - Challenges and Future Trends in Path Planning
  - Practical Applications of Path Planning
  - Conclusion and Resources

Output

- (.pdf) file that contain the article and upload it in Task6 branch

Appendix

Path Planning:

- Use connected papers site to search about most influential papers in any field: A Survey of Path Planning Algorithms for Mobile Robots (connectedpapers.com)
- (Path Planning with A* and RRT | Autonomous Navigation, Part 4 - YouTube
- Robot Motion Planning using A* (Cyrill Stachniss) - YouTube

Latex Article

- LaTex - YouTube
- LaTeX – Full Tutorial for Beginners - YouTube
- How to Write Articles (with Pictures) - wikiHow