ELECTRICAL TEAM TRAINING

TASK 10

Intelligent Pet

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PREFACE

Batman, always seeking the extraordinary, has grown weary of the traditional companionship offered by real pets. In his relentless pursuit of innovation and perfection, he desires a pet that matches his intellect and unique lifestyle. This time, however, Batman envisions something far beyond the usual—a small, mobile robot that embodies intelligence, agility, and loyalty. This robotic pet would not only be a companion but also a partner in his nocturnal endeavors, capable of understanding complex commands, adapting to various situations, and assisting in his crime-fighting missions. It would be equipped with state-of-the-art technology, blending stealth with high functionality, and serving as an extension of Batman's own abilities. This mechanical marvel would be more than just a pet; it would be a trusted ally in his never-ending battle for justice.

GROUP TASKS

TASK10.1- Kalman Bot

About

Upon discovering a wide range of small mobile robots already on the market, it becomes clear that purchasing and upgrading an existing model would be more efficient than building one from scratch. By enhancing its hardware, refining AI, and customizing its features, an ordinary robot can be transformed into the ideal intelligent companion for Batman, saving time and resources while meeting his unique needs.

Requirement

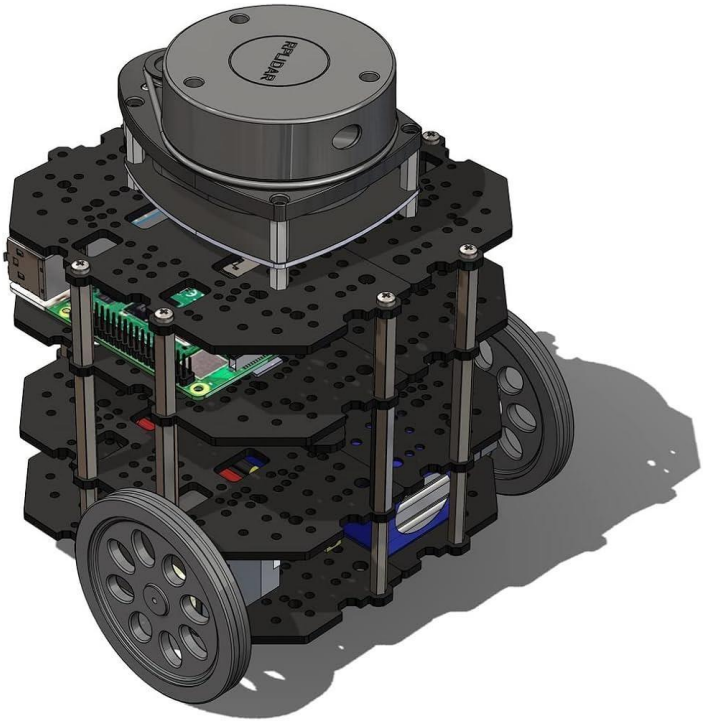
- Deploy TurtleBot3 simulation on Gazebo and control it with the turtlebot keyboard node.
- Read IMU data from the turtlebot and visualize the LiDAR data on RVIZ.
- Convert the IMU readings from Quaternion to Degree and publish them on a new topic.
- Add gaussian noise to the IMU data from the configuration files (.urdf).
- Implement 1D-Kalman Filter on YAW angle from the IMU by fusing previous YAW angles with latest YAW angle.
- Visualize the filtered data after Kalman filter and the noisy data on rqt_multiplot.
- Document and explain in clear, organized and stylish manner the process taken, the output, and your own observations in the previous points in a markdown file on as a readme for the github repo. (There will be a ranking between groups based on how clear and stylish their README files are.)

Appendix

- Turtlebot3 Docs: Turtlebot3 Docs
- Gazebo Docs: Install Gazebo
- RVIZ: RVIZ
- Markdown Tutorial, README

TASK10.2- Enhance the Turtle

About



To elevate the capabilities of the TurtleBot, you will be enhancing its embedded system by designing and integrating a more advanced power and speed control module from scratch. This custom module will provide the TurtleBot with greater precision in movement, enabling it to navigate more complex environments with improved responsiveness and efficiency. By carefully optimizing the power distribution and implementing a sophisticated speed control algorithm, the TurtleBot will not only achieve faster and smoother operation but also gain the ability to adapt to varying terrain and dynamic obstacles. This enhancement will transform the TurtleBot into a more versatile and powerful platform, suitable for a wide range of robotics applications.

Requirement

- Implement GPIO, ADC, TIMER, EXTERNAL INTERRUPTS(INT0,INT1) pins and SPI protocol Drivers for atmega328P.
- Use these drivers to control the speed of a motor using a potentiometer to set the motor speed and encoder to calculate motor speed in rpm.
- Print the motor current speed on SPI Debugger on PROTEUS.

Appendix

- Transistors: Transistors BJT and MOSFET - YouTube

TASK10.3- Keep me updated

About

You and your team are experiencing challenges in managing communication and staying aligned on tasks. To address this, you've agreed that each member will send routine updates periodically, ensuring everyone stays informed and on the same page. This approach will help improve coordination, reduce misunderstandings, and keep the team working efficiently towards your goals. Regular updates will also foster better collaboration and accountability within the group.

Requirement

- Each team member must upload regular (daily) updates for the following in GROUP tasks:
  1) Plan (What you will be achieving).
  2) Result. (What you have achieved.
  3) Problems faced and their solutions if any.

- Try to stick with M.I.A. Pretty updates standard.

Appendix

- M.I.A Pretty Updates Standard

NOTE:

- **The updates MUST be made regularly for every task from now on till the end.**

INDIVIDUAL TASKS

TASK10.4- Your Favorite

Requirements

- Choose your favorite task from M.I.A Electrical phase 1 and write it's updates on the your group's updates channel (Try to stick with Pretty Updates standard).

Appendix

- M.I.A Pretty Updates Standard

TASK10.5- Every Step Counts

Requirements

- Write an Arduino code (.ino) that reads yaw from an MPU6050 IMU using I2C without using any library for IMU. [ONLY Wire.h Library is allowed]

SUBMISSIONS:

- Upload a video on google drive viewing the workings of task 10.1.
- Github repo link for any modified or newly created files that has been used in task 10.1 with readme explaining the content of each file.
- Upload the drivers files and application file and proteus file on a github repo for task 10.2.
- Upload a video on google drive viewing the workings of task 10.2 on proteus.
- Task 10.4 will be submitted on discord group updates channel.
- Upload the Arduino code on a github repo for task 10.5.

- THE TASK DEADLINE IS 2/9 11:59 PM.
- SUBMISSION FORM: https://forms.gle/9kC6zFwqQFb3iB9R7

- CHEATING IS SEVERELY PENALIZED.