Risk Assessment Document

HexaPolo

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Introduction

This document outlines the risks to the success of our hexabot. It identifies technological challenges and risks that may cause the project to fail, as well as strategies to address these risks early in the project timeline.

Identified Risks and Mitigation Strategies

1. Communication Between Multiple Microcontrollers/Computers

Risk: Ensuring robust communication between multiple microcontrollers or computers using mechanisms such as WiFi, serial communication, or a combination of methods. Challenges include insufficient pins for communication and signal exchange with sensors and motor drivers. Another risk could be the speaker not working. In this case we wouldn't hear it saying "Marco" and we would have a hard time answering "Polo". **Mitigation:**

- Conduct a feasibility study to determine the best communication protocol.
- Build a prototype to test communication between micro-controllers under realistic conditions.
- Verify that micro-controllers have sufficient pins for all intended connections.

2. Power Supply and Voltage Management

Risk: Supplying multiple different voltages to various components (e.g., motors, micro-controllers) and ensuring smooth operation. The battery we are using (LiPo 7.4 2S) might not provide enough power for the tow 6VN20 motors. Furthermore, since we are connecting the ESP32-CAM to the Pi through ESP32 -¿ FTDI –(USB)–¿ Pi, there is a risk that it won't get enough power. **Mitigation:**

- As a backup for the esp32-cam, we could wire it directly or make it communicate wirelessly with the pi.
- Add a separate battery to help the initial one power the motors.
- Create a prototype including all power consumers and power supplies/converters.
- Test motors under approximate mechanical loads to ensure smooth operation.

3. Actuator Strength and Mechanical Advantage

Risk: Actuators may not be strong enough for their intended purpose, especially when working against the hexabot's weight or overcoming substantial inertia in longer kinematic chains. Indeed, the entire weight of our robot being supported by only two motors might restrict its movements. **Mitigation:**

- Make the 3d print as light as possible by having the filling lower than 30%
- Evaluate actuator strength through prototype testing.
- Experiment with gearboxes, belt reductions, or other mechanical advantages.

4. Team Weaknesses and Knowledge Gaps

Risk: Lack of expertise in certain aspects of the project may lead to overly optimistic assumptions or wishful thinking. This might occur in our software ambitions as it is hard to evaluate how many tools and resources already exist online. f there is a lack of them, we might face difficulties implementing substantial software features. **Mitigation:**

- Identify knowledge gaps and assign team members to research and address them.
- Schedule regular team reviews to critically assess progress and assumptions.
- Seek advice from mentors or experts in areas where the team lacks experience.

Planned Prototypes

The following prototypes will be developed to address the identified risks:

1. Communication prototype to test micro-controller interactions.
2. Power supply prototype to validate voltage management and motor operation.
3. Actuator prototype to evaluate strength and mechanical advantage.

Conclusion

By addressing these risks early in the project timeline, we aim to mitigate potential challenges and increase the likelihood of project success. Dependencies and planned prototypes have been incorporated into the project task breakdown.