**RFA**

**Team Members**

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**Problem Statement**

According to the guidelines PDF, we must ensure that the robot adheres to several key requirements. The robot must weigh no more than 2lbs and be constructed using 3D-printed thermoplastics. It should also feature a locomotion system and a fighting tool, with wireless control enabled via WiFi. The main goal of the competition is to design a Battlebot capable of disrupting the functionality of opponents' robots using its fighting tool while maintaining its own operational integrity.

**SOLUTION**

We plan to create a Battlebot using 3D-printed components, equipped with two omni wheels that will enable the robot to move in any direction. The Battlebot itself will spin like a beyblade, powered by brushless motors for smooth and efficient control. Additionally, we aim to incorporate a flipping mechanism, which will be driven by a combination of a spring and motor. A sliding plate, attached to a motor, will allow the plate to maneuver under the opponent’s robot. Once in position, the spring will activate, flipping the opposing robot to disrupt its functionality. The ESC will serve as the central control system for the robot, managing the motor's speed and direction. Additionally, communication with the bot will be established via WiFi, allowing us to remotely control its movements and operations during the competition.

**SUBSYSTEMS**

**Power Module**

We would be using LiPo batteries in our battlebot. As of now, we plan to use 16V batteries but we may consider using slightly lighter batteries or batteries of lower voltage as we need to ensure that the weight of all components combined is less than 2lbs and so that all our hardware pieces can handle the voltage level.

**WiFi Controller**

We will use the ESP-32 to enable communication between the robot and a PC via WiFi. Our plan is to program the ESP-32 to create a wireless connection, allowing the robot to send and receive commands from the PC. The controller will manage the rotation and directional changes of the wheels, allowing the Battlebot to navigate effectively. Additionally, the controller will feature buttons to extend and retract the slate based on user input. Another button will trigger the slate to lift and flip the opposing robot during battle. All of these motions will be triggered by keyboard inputs.

**Driving System**

The battlebot will have DC motors connected to 4-6 wheels (still deciding) to control movement. The wheels will be omnidirectional wheels to allow for the robot to turn in place and move with ease. However, there is a concern that the bot might be able to be pushed around easily, so if time permits we will install a locking mechanism or mix the type of wheels that we use, such as adding grip wheels.

**Spring System and Flipping Motion**

The flipping mechanism will feature a high-torque DC motor to control the extension and retraction of a sliding slate, allowing it to move outward and inward beneath the opponent's robot. A compression spring will be released when triggered to execute a powerful flipping motion. Together, the motor and compression spring will provide precise control over the slate's movement and a strong, reliable flipping action. This will happen when the user presses the button on the PC control.

**Rotating System**  
The T-Motor MN2212 Brushless Motor is a lightweight and efficient motor and we plan to use it for our rotating motion. It provides a good balance of torque and RPM, making it ideal for a small that needs to be less than 2lbs. Its durability and precise performance allow for smooth rotational motion, which is crucial for agile and responsive movements in competitive settings. The motor will be connected to the main part of the bot only allowing for the main shell to spin.

**Criterion for Success**

We would consider our project a success if we can establish effective communication between the PC and the various motors, particularly for the extending and retracting of the slates and the flipping mechanism. Since the opponent's Battlebot will also weigh 2 lbs, it is crucial that the slate has enough strength to lift this weight during the flipping action. For this project to succeed, obtaining this degree of authority and control will be essential.

