NORTH AMERICA

RoboGrinder at Virginia Tech
Season 2023

Sponsorship Brochure

ROBOGRINDER

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Thank you Letter

We are RoboGrinder at Virginia Tech, a robotics organization formed by a team of students. RoboGrinder is an advanced design program accredited by Virginia Tech's mechanical engineering department and Bradley Department of Electrical and Computer Engineering. Students with different engineering backgrounds like Mechanical, Electrical, Robotic and Computer Vision can apply and enhance their knowledge and skills in the RoboGrinder.

RoboGrinder is preparing for RoboMaster University League North America 2023 and DJI RoboMaster International region Competition 2023. We are looking for sponsors to help fund the technology and equipment necessary to make the robots. In return for your sponsorship, we will provide your company with a variety of benefits, such as being featured in our future promotional videos and printing your company's name on our team shirt and robots.

We would greatly appreciate your sponsorship and thank you for your consideration.

Best regards,

RoboGrinder

Content

1. Intro to Robomaster

1.1 Competition Overview

RoboMaster is a yearly robotics event hosted by DJI, a technology company located in Shenzhen, China. This competition gives undergraduate students real world experience beyond the classroom by providing them with opportunities to build, develop, and maintain terrestrial and aerial robots. Additionally, since the competition specializes in team battles, students will learn about team dynamics and facilitating cooperation through effective communication.

RoboMaster University League is a competition that promotes the robotic advancement of various universities. The league supports the robotic technology of these universities through the 7v7 competition, 3v3 confrontation, and the RoboMaster University championship. Every collegiate team needs intellectually diverse team members to complete the mechanical, electrical, and computer vision robot functionality.

1.2 Competition Features

1) Real-world robot confrontation

2) All participating robots are independently designed, developed, assembled, and operated by the participating teams

3) Through the wireless local area network, obtain the individual information of each robot, and retrieve the health of each robot in real time.

4) Vision processing application and self-stabilizing pan/tilt application to achieve high-precision tracking of targets

5) Mechanical drawings, circuit schematics, and control codes are all open source, creating a top-notch robot platform.

7) Utilization of SLAM, navigation, mapping, and automatic decision to allow sentry robots to act autonomously on field with only onboard sensors.

1.3 Link of Competition Video

Virginia Tech vs University of Washington (RMNA 2021 Final):
https://www.youtube.com/watch?v=WzxwzunuHWU&t=3612s
Virginia Tech vs Texas A&M University (RMNA 2021 Semifinal):
https://www.youtube.com/watch?v=qNf4PuviQKw
BBC News:
https://www.youtube.com/watch?v=qrhvZhPaxQ4

2. RoboMaster Importance

2.1 Competition Regulation

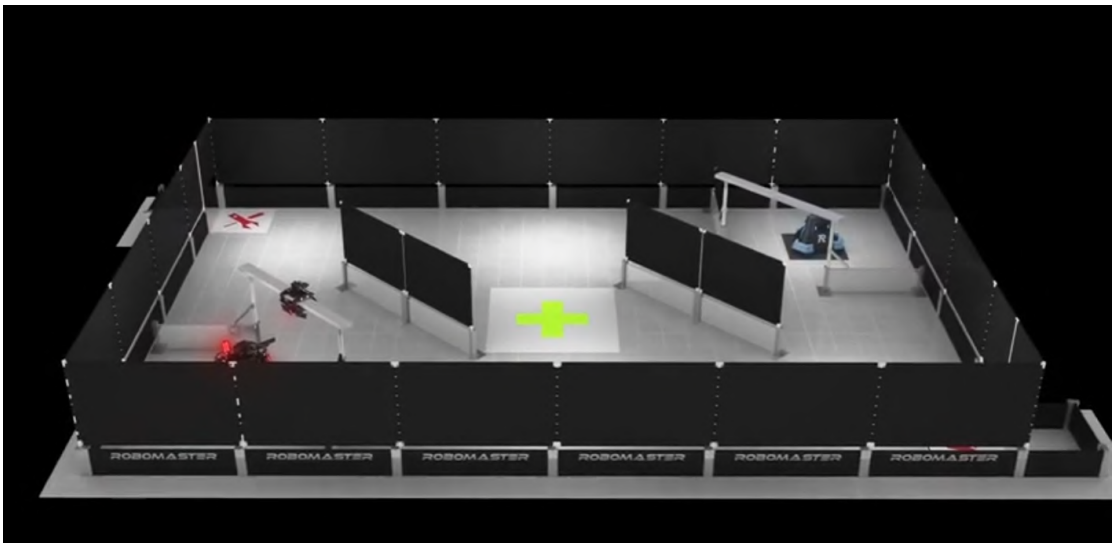

Figure 1. *Rendering of the 2021 competition field.*

This competition adopts the form of confrontation between red and blue. The participating teams need to develop their own hero robots, infantry robots, aerial robots, engineering robots, and bases to conduct coordinated operations. This year, the sentry robot has changed from an automated aerial robot to a terrestrial robot similar to Hero and Infantry. The competition field is divided into the red and blue camps by a horizontal line. In addition to the red and blue camps, there is a supply area at the location marked with a tools sign where the robots can be resupplied with projectiles and recover their health. There is also a buff area at the location marked with the green plus sign that can be occupied by the robots to provide their team with extra energy points, which

equates to the overall health value of the team. The competition teams need to compete within the specified time, and at the end of the game, the team whose base is destroyed or whose base is low in health loses the match.

2.2 Robot Fleet

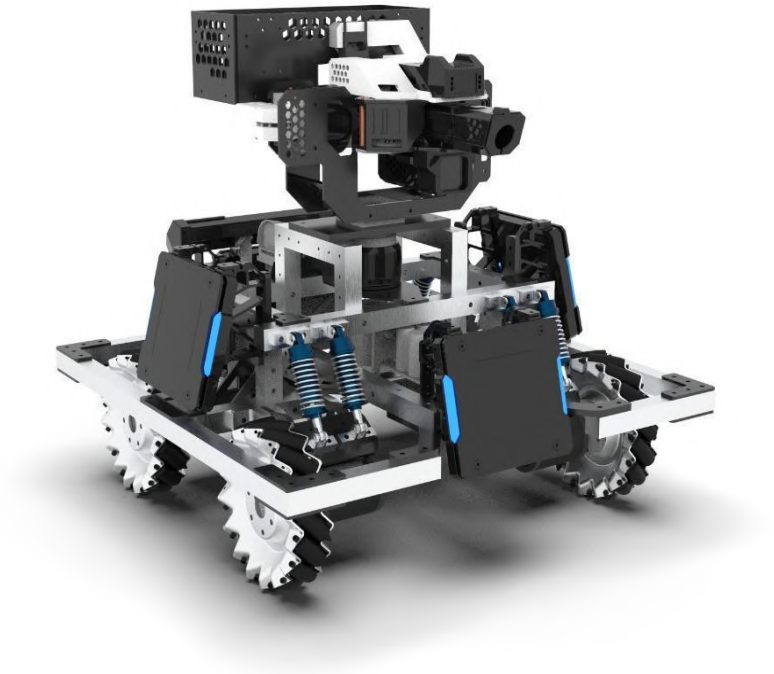

Figure 2. *A photo of the Hero robot, which shoots 42 mm projectiles.*

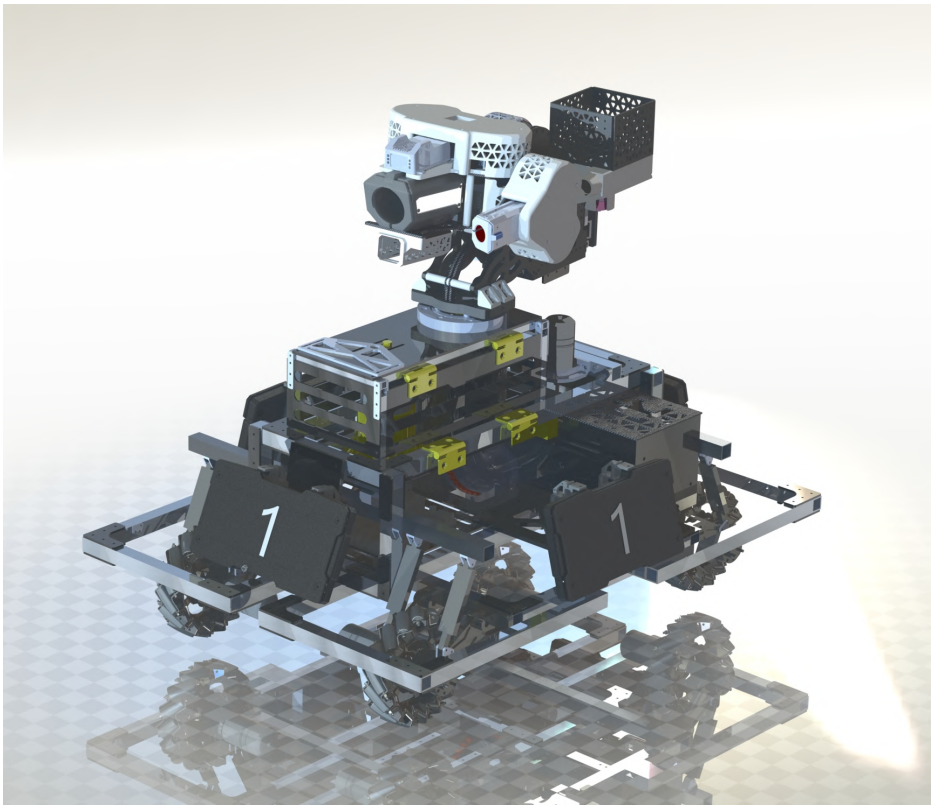

Figure 3. *A photo of the Infantry robot, which shoots 17 mm projectiles.*

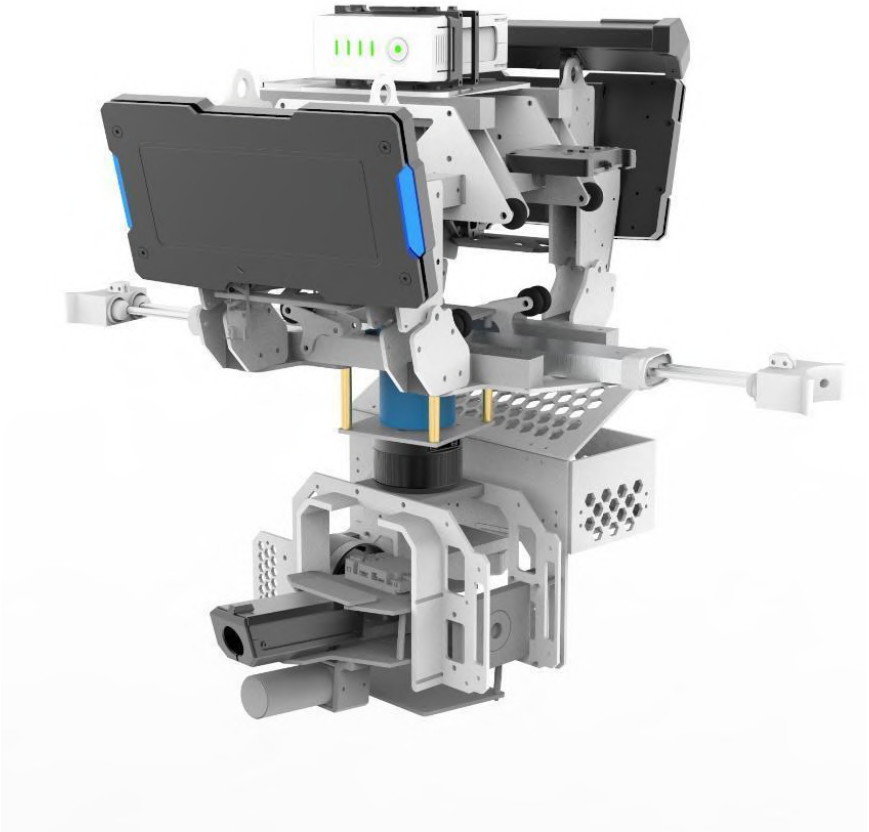

Figure 4. *A photo of the 2021 Sentry robot, which shoots 17 mm projectiles and serves as the guardian of the base. This year, the Sentry robot will be terrestrial.*

2.3 Influence of Competition

Robomaster North America 2022 has attracted more than 20 teams from universities around the world, such as the University of Washington, New York University, Pennsylvania State University, University of Illinois Urbana-Champaign, and Polytechnic University of Turin from Italy.

The North American community is growing rapidly and will attract the attention of more robotics enthusiasts and companies in the future. The main purpose of the RoboMaster competition is to give collegiate students the opportunity to learn and apply their intellectual skills to real world engineering challenges. Oftentimes, simply learning in college classes is not enough to grow in one's field. Applying the skills learned in the class to actual engineering competitions is an extremely effective way to learn and improve. The competition also gives students the opportunity to network with a diverse group of people from different backgrounds and majors, which promotes a cooperative environment that encourages students to think creatively.

3. Intro to RoboGrinder

3.1 Team Overview

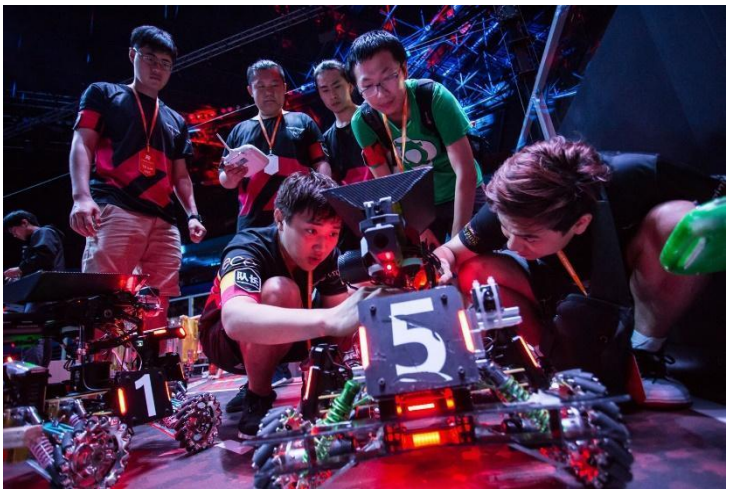

Figure 1: RoboGrinder at 2018's RoboMaster Competition

The team was founded in 2017, and the team is divided into four branches: mechanical, electrical, computer vision, and operation. The mechanical, electrical, and computer vision branches are responsible for the technical aspects, and the operation branch is responsible for the public relations aspect.

Everyone on the team collectively works towards a common goal, while making sure other members feel encouraged and supported. The team members are all outstanding students from Virginia Tech's College of Engineering, and these members have achieved fruitful results in mechanical chassis design, gimbal, circuit design, embedded control, visual recognition, drone flight and other related technical fields.

3.2 Achievements

3rd Prize in 2017's DJI RoboMaster Competition.

1st Prize in 2018's DJI RoboMaster International region Competition.

3rd Prize in 2018's DJI RoboMaster Ground Final Competition.

1st prize in 2019's DJI Robomaster International Region Competition

1st Runner Up in 2021's DJI Robomaster North American 3v3 Confrontation

1st Prize in 2022's DJI Robomaster ICRA 1v1 Standard Confrontation

1st Runner Up in 2022's DJI Robomaster North American 1v1 Standard Confrontation

2nd Prize in 2022's DJI Robomaster North American 3v3 Confrontation

3.3 Competition advantage of RoboGrinder

(1) Technical advantages

The team has been established for 5 years. The team achieved a huge advantage in the 2019 and 2021 seasons with super capacitor technology. Throughout the years, we have accumulated technical experience with circuit design and integration.

From 2020 to 2022, the electrical branch created numerous control algorithms implemented with several embedded systems. Coding embedded systems is one of our team's most competitive strengths. In addition, we have designed several circuit layouts, schematics, and PCBs layouts and have implemented them in our robots. Our circuit designs mainly focus on improving the utilization of embedded systems and high power density DCDC power supplies. With these successful designs, our robots are supported by a robust electrical system that enables better performance in competitions.

The computer vision branch designs and develops software systems that processes images and other sensor data collected from the camera to analyze the surroundings. Our program will assist operators with aiming and, depending on the type of the robot, allow robots to become fully

automated with the help of a mini pc, which acts like the “brain”, to fulfill its purpose in the competition.

(2) Talent advantages

Most of the team members are outstanding mechanical engineering and electrical engineering students from Virginia Tech. Many members have extensive internship experience with companies including but not limited to BMW and Amazon. Some previous members went to strong engineering schools, such as the University of Michigan in Ann Arbor, to continue their studies, participated in the VT’s doctoral acceleration program or started their own businesses.

4. Sponsorship Plan

4.1 Sponsor Right

4.1.1 Sponsorship Package

No	Item	Description
1	Naming Rights	Obtain the right to name the Virginia Tech RoboMaster competition team
2	Uniform Ads	Print the sponsor's logo and name on the players' jerseys
3	Robot Delivery Ads	Print the sponsor's logo and name on all robots
4	Video Ads	Acknowledge sponsors in team promotional videos
5	Booth Ads	Display the sponsor’s logo and promotional material during school and RoboGrinder events
6	Team Website Ads	Advertising spot of official website of RoboGrinder
7	Unclassified Item	Other benefits can be negotiated by contacting the team

For more specific details pertaining to the sponsorship benefits, please refer to the sponsorship package document.

4.1.2 Talent cooperation

The company can network with the technical talents in the team to search for possible employees by sponsoring the team. In other words, our team teaches and trains students in a variety of areas that companies may be interested in, such as the production and design of robot parts, the usage of machine learning in programming, and the unification of different parts to create a robot.

5. Budget

Competition	Item	Amount	Cost
Robomaster North America 3v3 confrontation 2021	Standard Robot	3	$16000
	Hero Robot	1	
	Sentry Robot	1	
Robomaster North America 3v3 confrontation 2022	Standard Robot	2	$15000
	Hero Robot	1	
	Sentry Robot	1	
ICRA Challenge 2022	Standard Robot	1	
Robomaster North America 3v3 confrontation 2023	Standard Robot	3	$20000
	Hero Robot	1	
	Sentry Robot	1	

6. Contact Information

6.1 Competition Committee Contact Info

Official Website: https://www.robomasterna.com/
Official Forum: https://forums.robomasterna.com/
Email: narobomaster@gmail.com

6.2 RoboGrinder at Virginia Tech Contact Info

Team Instructor:	Alexander Leonessa	Email: aleoness@vt.edu
Team Advisor:	William T. Baumann	Email: baumann@vt.edu
Team President	Luyi Tang	Phone: 540-553-4835 Email: luyit@vt.edu
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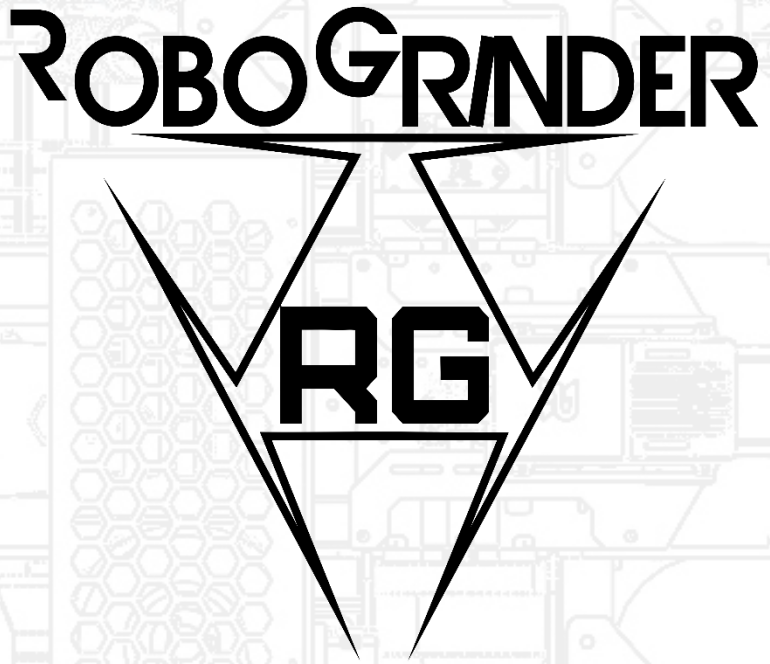

Grinding opponents since 2017