NORTHSTAR ROBOTICS

Sponsorship Information Packet

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About Us

What is GOFIRST Robotics?
GOFIRST Robotics is an award-winning student organization at the University of Minnesota Twin Cities focused on robotics competitions and the promotion of STEM fields. Our group was founded with the purpose of supporting the FIRST robotics programs in the Minneapolis and St. Paul areas. In addition, we mentor teams, volunteer at regional competitions, and facilitate workshops for students in Minnesota.

GOFIRST Robotics also participates in several robotics competitions including VEX U, Autonomous Snowplow, and Robot in Three Days. As a result, University of Minnesota students are able to take skills learned in the classroom and apply them to real world projects, network with sponsors in the program, and develop teaching and communication skills.

Our group is the proud recipient of the 2016-17 Lind Legacy Award, a lifetime achievement award for student groups in the University of Minnesota's College of Science and Engineering. Our leadership has also been recognized, receiving Outstanding Student Group Leader in the 2015-16 Tin Man CSE student organization awards.

What is Northstar Robotics?
In looking to remain a leading force in the promotion of STEM, GOFIRST Robotics has chosen to organize a new team, Northstar Robotics, for the NASA Robotic Mining Competition. Our team currently consists of eight members. The majority of our members are pursuing STEM educations and have been involved in various robotics projects including FIRST Robotics Competition, field tests of an unmanned military vehicle at the Yuma proving grounds, Autonomous Snowplow Competition, VEX Robotics, and many others. We are very excited for our first year as competitors in the NASA Robotic Mining Competition!

Our NASA RMC Robot Design
Our team's strategy for the competition focuses on autonomous reliability. Our plans for maneuvering the robot and collecting material both reflect this focus. The drivetrain will feature treads in order to handle the uneven terrain, and the mining system will consist of a continuous rotating bucket system similar to those used in other industrial applications.

Community Outreach
As a part of GOFIRST Robotics, the Northstar Robotics team will continue the student group's legacy of mentorship and volunteering in the Twin Cities community. By presenting to middle school and high school students as well as volunteering at FIRST robotics events across the country, we can greatly increase engagement in robotics and STEM.

About NASA Robotic Mining Competition

The Competition
The goal of the competition is to collect gravel, used as a simulant for icy rocks found on Mars, and deposit the collected material in a hopper. The arena consists of a substantial layer of fine dust called BP-1 on top of the gravel, which provides the primary obstacle to collection. Material is collected over two runs of 10 minutes. The runs are expected to be fully autonomous, but teleoperated control is available after a portion of the run.

The Arena
The arena and collector trough are depicted below. The robot is required to start in one of the two randomly chosen starting zones. The robot then must travel through the obstacle area, which contains large rocks and craters, before collecting material in the mining area. This materials is then transported and dumped into a collector tough adjacent to the starting area. The total size of the arena is 12.4 x 24.2 ft.

The Surface/Mining Material
The arena contains two layers of material. The top layer is a material known as BP-1, which is a rocky material with very small particle size. The layer below is a gravel used to simulate icy Martian soil.

The Robot
The robot is required to weigh less than 176 lb and the starting configuration must fit inside a 60 x 30 x 30 in box, but may expand to any size. The robot must also not contain systems that would not work on Mars such as open pneumatic systems or foam wheels.

Scoring
The scoring system of the competition presents challenge in efficiency. Points are not only gained by collecting and scoring material. Additional points can be earned by designing a dust resistant robot and maximizing the autonomy of the robot, while points are lost for robot weight, average bandwidth usage, and energy consumed.

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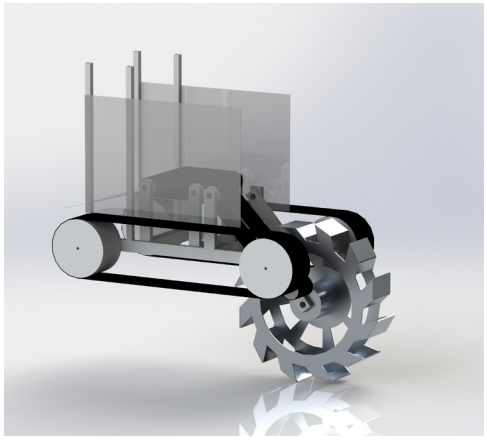
Our Robot

Strategy
Our strategy revolves around the bulk collection of the below-surface gravel material. In order to collect the material, we will use an exceptionally large rotating drum with buckets attached. The advantage of using this system is that material can be collected in long, continuous paths. The system will initially be used to dig down into the BP-1. This material, which is not worth any points, will be filtered out and deposited away from our robot. Once the drum has moved down and started to collect gravel, the robot can simply move forward and continue collecting material for nearly the full duration of the run, before returning and depositing the gravel.

Drive Train
Our robot will be driven by four brushless motors and custom gearboxes, and will feature treads so that uneven terrain and obstacles will not pose as significant a threat to mobility between the mining and scoring areas.

Control
While NASA RMC robots may be controlled by a human operator, we plan to make our robot a fully autonomous system for the full 10 minute duration of the competition runs. This will allow us to earn additional point bonuses, as well as reduce our data usage communicating between human drivers and the robot. In order to achieve full autonomy, we plan to incorporate many sensors as feedback to determine proper functionality of mechanisms, avoid obstacles, and determine robot placement inside the arena. Because we only have two competition runs, a major design requirement of our robot is reliability. In addition to choosing mechanisms that have a high probability of success, we plan to incorporate redundancy into these mechanisms so that in case of unexpected failure, the robot can continue to operate as intended.

We look forward to bringing these ideas and plans to life with your generous support of Northstar Robotics.



High Level Budget

We expect to spend a total of about $31,000 throughout the season, split between materials for the robot, shop space, and travel to the competition for team members.

Budget Breakdown		Cost
Electrical	Processors	$500.00
	Motors + Controllers (DT)	$800.00
	Motors + Controllers (Other)	$1,300.00
	Sensors	$2,000.00
	Power Distribution	$500.00
	Batteries	$500.00
Mechanical	Framing	$500.00
	Enclosures	$400.00
	Excavator	$600.00
	Wheels	$1,800.00
	Power Transmissons	$1,000.00
	Linear Actuators	$500.00
	Misc. Hardware	$500.00
	Machining	$2,500.00
Travel	Hotel	$6,000.00
	Food	$2,000.00
	Transportation	$5,000.00
	Shipping Robot	$1,200.00

Summary		
	Robot	$10,900.00
	Travel	$14,200.00
	Workspace	$3,600.00
	Total	$31,200.00

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Sponsorship Benefits

Listed on Website as a Sponsor

Your company will be publicly listed and thanked in the “Sponsorship” section of the Northstar Robotics website at northstarrobotics.org. Additionally, Supernova and Big Bang Sponsors will have their company names and logos displayed on the front page of the Northstar Robotics website.

Listed on Social Media as a Sponsor (Facebook and Twitter)

Your company will be publicly thanked on all GOFIRST and Northstar Robotics social media accounts which have a combined reach of 822 followers across Facebook and Twitter. Most of these followers will be K-12 students, robotics teams, and robotics enthusiasts interested in all things STEM.

Logo on T-Shirts

A version of your company’s logo will be present both on the team t-shirts and in the team pit during competitions. Team t-shirts will be worn at all times during competitions and will provide exposure to other teams during the course of the competition and in publicized competition videos.

Logo on Pit Display

The team pit is an area for robot maintenance, prep, and presentation to other groups and offers a wide audience for exposure to STEM students from across the country.

Robot Presentation at Company (if in the Twin Cities metro area)

Presentation and/or simple demonstration.

Sponsorship Tiers

All Sponsors

Listed on website as a sponsor

Star ($500+)

Listed on social media as a sponsor
Small logo on website

Nebula ($1,000+)

Small logo on pit display and t-shirts
Listed as Nebula Sponsor on all social media
Medium logo on website

Supernova ($2,500+)

Medium logo on robot, pit display, and t-shirts
Listed as Supernova Sponsor on all social media
Large logo on front page of website

Big Bang ($5,000+)

Large logo displayed on robot, front page of website, pit display, and t-shirts
Robot presentation at company (if in the Twin Cities metro area)
Listed as Big Bang Sponsor on social media

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Thank You for Your Consideration!

We hope you will choose to support
Northstar Robotics!

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SPONSORSHIP CONFIRMATION FORM

Company Name:_____

Contact Name:_____

Company Address:_____

City, State, Zipcode:_____

Contact E-mail:_____ Contact Phone:_____

We would like to sponsor Northstar Robotics with our gift of:

___ Big Bang Sponsor ($5,000+): _____

___ Supernova Sponsor ($2,500+): _____

___ Nebula Sponsor ($1,000+): _____

___ Star Sponsor ($500+): _____

___ Other Amount: $_____

If you are interested in supporting the team with a non-monetary donation, please specify below:

___ Non-monetary donation: _____

Please estimate specific donation value: $_____

Payment:

___ Check enclosed.

Please make payable to: GOFIRST Robotics, memo: Northstar Robotics

Return this completed form and any supporting documents to:

GOFIRST Robotics
300 Washington Ave SE
Minneapolis, MN 55455