University of NORTH ALABAMA

STEAM
Outreach Initiative

presents

Roaring onto the Raceway
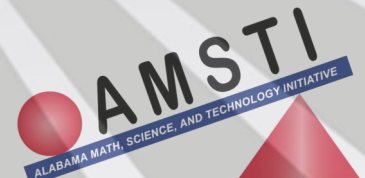
Robotics Competition

Join us to ROAR on to VICTORY!

February 29, 2020

12PM - 4PM   UNA Flowers Hall

University of NORTH ALABAMA
ACADEMIC AFFAIRS and PROVOST

AMSTI
ALABAMA MATH, SCIENCE, AND TECHNOLOGY INITIATIVE
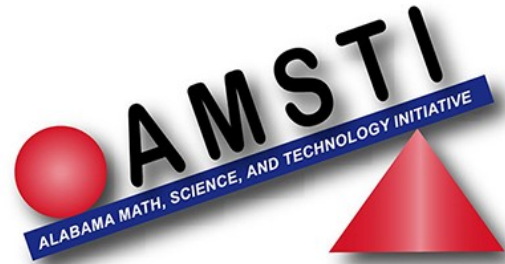
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The program would not be possible without their support .

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Roaring onto the Raceway

In 2025, Space X will be sending human explorers to Mars. Setting up the first human colony will be difficult. It has been decided that the best way to do this is to send supplies to the Mars surface before the humans leave. Explorer robots will go ahead of the humans in order to prepare the surface and to organize the material.

Since Mars is over 54 million kilometers away at the closest, Driving the explorer using a controller is out of the question. Radio waves that the controller would have to use will take between 8 and 48 minutes round trip. Also, if the explorer is on the side of Mars not facing Earth, we will have no communication. Therefore, the explorer must be autonomous (self-driving).

> "self-driving cars are the natural extension of active safety and obviously something we should do."
> -elon musk
>
> EverythingSupplyChain.com

Satellite photos of the area will allow you to practice driving here on Earth and create a program that can be uploaded to the explorer on Mars. Use your time here to develop the best program to have the Explorer complete each of the three tasks.

Game Specifics

1. All fields are no more than 10m^2
2. If a robot leaves the field, their turn is over immediately. Team will pick up the robot. No score will be awarded.
3. If the robot leaves the field AFTER entering the exit point, they will be given a score.
4. Drawings are not to scale. Dimensions are given to help teams. All measurements are within 3cm tolerance.
5. Cup placement will be approximate (within tolerance). A sticker will mark the position on the field, cups will be approximately centered on those stickers.
6. Crossing the tape means that at least one wheel is completely across the tape and no longer touching the tape.
7. Cups are placed at the same place each time.
8. All fields of the same task will be oriented in the same direction.
9. Three fields of each puzzle will be available
10. Teams have exactly 3 hours to compete. At the end of 3 hours, any robots on the competition field will be allowed to finish. Teams in line will not get to start.

Task 1: Robo Drag Race

On Your MARK Get Set GO!!

FASTEST TIME WINS!

1. 10 points for each 50cm (indicated by red dots) with a bonus of 90-time if the course is completed in less than 90 seconds.

2. Race stops at 90s or when finish line is crossed*. DQ for leaving field. Play stops if center line is crossed.

Crossed means part of the wheel crosses the plane of the finish line.


40cm

250cm

40cm

F

S

50cm
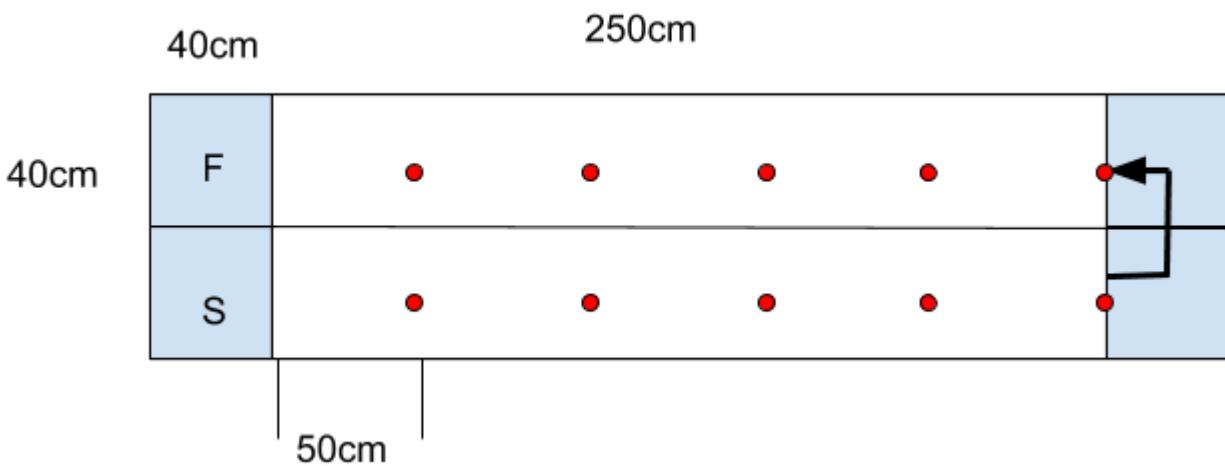
Task 2: Autonomous Parking

Autonomous car-maneuvering system that moves a vehicle from a traffic lane into a parking spot to perform parallel, perpendicular, or angle parking. The automatic parking system aims to enhance the comfort and safety of driving in constrained environments where much attention and experience is required to steer the car. The parking maneuver is achieved by means of coordinated control of the steering angle and speed which takes into account the actual situation in the environment to en-sure collision-free motion within the available space.

There are three separate parking tasks.

1. Straight parking. Pull into a parking spot. Do not cross lines (Immediate DQ for the task no points). Must fully enter spot, no part of robot can extend outside of parking spot. Must stop at least 2 seconds to get points.   10 points

2. Parallel Parking. Pull into a parking spot. Do not touch car ahead or behind (-5 points per touch) Must be fully in parking spot, no part of robot can extend outside of parking spot. Must stop at least 2 seconds to get points. Robot must face the same direction as the cars and be parallel to the sides. Parallel will be determined by judges. 20 points.

3. Angle Parking. Pull into a parking spot. Do not cross lines (Immediate DQ for task, no points). Must be fully in parking spot, no part of robot can extend outside of parking spot. Must stop at least 2 seconds to get points 30 points. Angle of spot is 60 degrees as measured from the base of the parking spot. Lines for angled parking are 70cm.
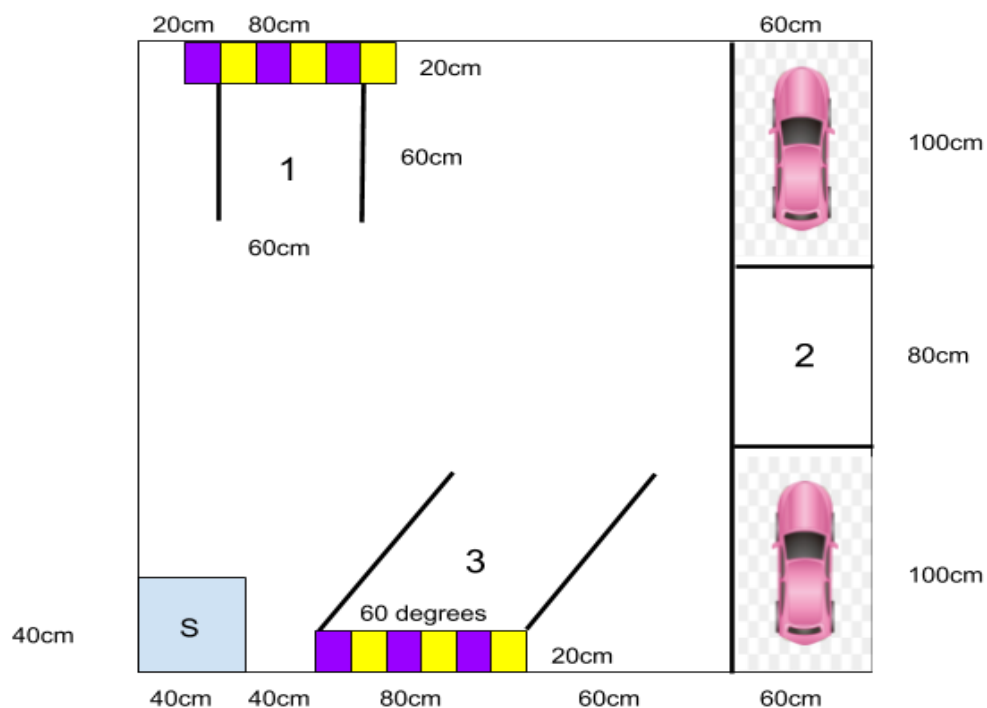
TASK 3: SPEEDY DELIVERY

TRAVERSE THE CITY AS A DELIVERY DRIVER

A. Starting Location. Driver can choose either location at the beginning of their turn.

1. Traffic Light: Light at the intersection. If the light is green, you must NOT stop. –5 points for stopping, +10 for NOT stopping. If the light is red, you MUST stop. –5 points for not stopping, +10 for stopping. The light will change randomly per field run. A dice roll or a coin flip will determine the light. The light will not change until the robot is placed.

2. Delivery: Dropping off a package for a bakery. Stop must be on the right side of the robot. –5 for left side of robot. Must stop within the marked area. No score for being outside the area. Must stop for at least *two seconds*. No score for less than 2 seconds. +20 points for making delivery.

3. Delivery: Dropping off package for hardware store. Must pull into loading area. Stop within the marked area. Must stop for at least 2 seconds. No score for less than two seconds. Must reverse out of loading area. +25 for completion.

4. Exit: Leave the city by entering the starting area you did not start from. No penalty for traffic lights on exit. Bonus for making all deliveries and exiting before 90 seconds. Time Limit: 90 minus time used.