Robot Tour

Division C

Georgia Tech Event Workshop Series
2024-25

Science Olympiad
at
Georgia Tech®

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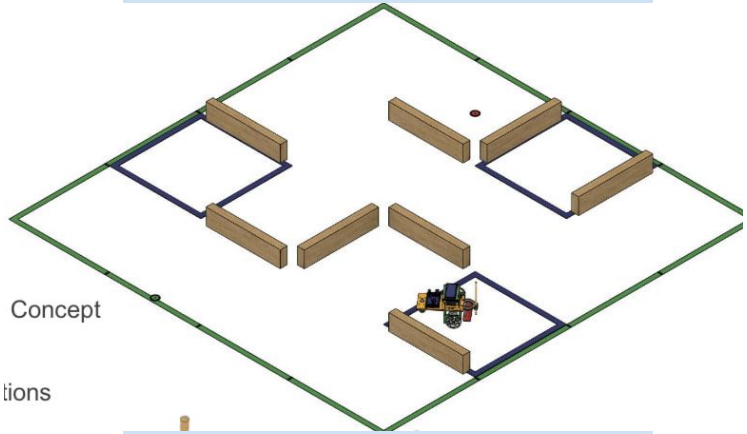
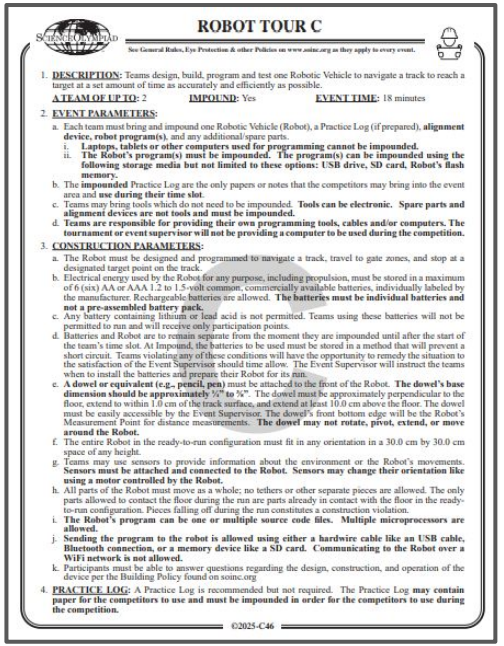



RULES

General Goal

- Navigate a robot through a track avoiding obstacles and hitting as many gate zones as possible
- Do so in an amount of time determined by the ES at start
- Goal is to get **as few points** as possible



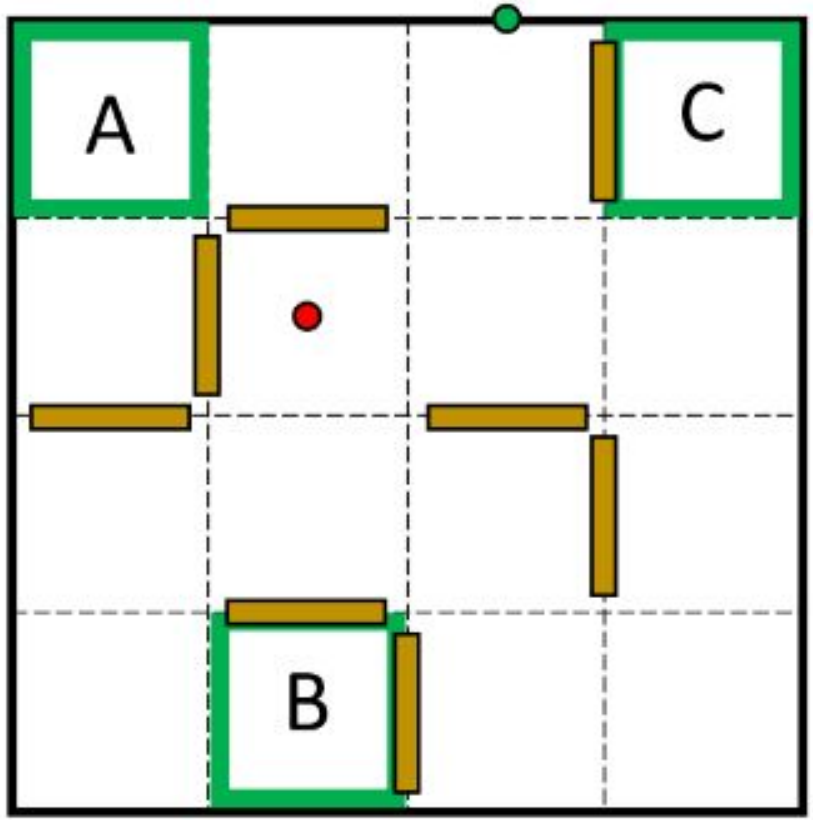
ROBOT TOUR C

See General Rules, Eye Protection & other Policies on www.soinc.org as they apply to every event.

1. **DESCRIPTION:** Teams design, build, program and test one Robotic Vehicle to navigate a track to reach a target at a set amount of time as accurately and efficiently as possible.
   A TEAM OF UP TO: 2 **IMPOUND:** Yes **EVENT TIME:** 18 minutes
2. **EVENT PARAMETERS:**
   a. Each team must bring and impound one Robotic Vehicle (Robot), a Practice Log (if prepared), **alignment device, robot program(s)**, and any additional/spare parts.
      i. **Laptops, tablets or other computers used for programming cannot be impounded.**
      ii. **The Robot's program(s) must be impounded. The program(s) can be impounded using the following storage media but not limited to these options: USB drive, SD card, Robot's flash memory.**
   b. The **impounded** Practice Log are the only papers or notes that the competitors may bring into the event area and **use during their time slot**.
   c. Teams may bring tools which do not need to be impounded. **Tools can be electronic. Spare parts and alignment devices are not tools and must be impounded.**
   d. **Teams are responsible for providing their own programming tools, cables and/or computers. The tournament or event supervisor will not be providing a computer to be used during the competition.**
3. **CONSTRUCTION PARAMETERS:**
   a. The Robot must be designed and programmed to navigate a track, travel to gate zones, and stop at a designated target point on the track.
   b. Electrical energy used by the Robot for any purpose, including propulsion, must be stored in a maximum of 6 (six) AA or AAA 1.2 to 1.5-volt common, commercially available batteries, individually labeled by the manufacturer. Rechargeable batteries are allowed. **The batteries must be individual batteries and not a pre-assembled battery pack.**
   c. Any battery containing lithium or lead acid is not permitted. Teams using these batteries will not be permitted to run and will receive only participation points.
   d. Batteries and Robot are to remain separate from the moment they are impounded until after the start of the team's time slot. At Impound, the batteries to be used must be stored in a method that will prevent a short circuit. Teams violating any of these conditions will have the opportunity to remedy the situation to the satisfaction of the Event Supervisor should time allow. The Event Supervisor will instruct the teams when to install the batteries and prepare their Robot for its run.
   e. **A dowel or equivalent (e.g., pencil, pen)** must be attached to the front of the Robot. **The dowel's base dimension should be approximately ¼" to ⅜".** The dowel must be approximately perpendicular to the floor, extend to within 1.0 cm of the track surface, and extend at least 10.0 cm above the floor. The dowel must be easily accessible by the Event Supervisor. The dowel's front bottom edge will be the Robot's Measurement Point for distance measurements. **The dowel may not rotate, pivot, extend, or move around the Robot.**
   f. The entire Robot in the ready-to-run configuration must fit in any orientation in a 30.0 cm by 30.0 cm space of any height.
   g. Teams may use sensors to provide information about the environment or the Robot's movements. **Sensors must be attached and connected to the Robot. Sensors may change their orientation like using a motor controlled by the Robot.**
   h. All parts of the Robot must move as a whole; no tethers or other separate pieces are allowed. The only parts allowed to contact the floor during the run are parts already in contact with the floor in the ready-to-run configuration. Pieces falling off during the run constitutes a construction violation.
   i. **The Robot's program can be one or multiple source code files. Multiple microprocessors are allowed.**
   j. **Sending the program to the robot is allowed using either a hardwire cable like an USB cable, Bluetooth connection, or a memory device like a SD card. Communicating to the Robot over a WiFi network is not allowed.**
   k. Participants must be able to answer questions regarding the design, construction, and operation of the device per the Building Policy found on soinc.org.
4. **PRACTICE LOG:** A Practice Log is recommended but not required. The Practice Log **may contain paper for the competitors to use and must be impounded in order for the competitors to use during the competition.**

The Track

- Made up of 50 cm squares
- Up to 10 obstacles
- +70 for hitting an obstacle
- +50 for removing obstacles
- -15 per gate, -45 for hitting the last gate



Design Specifications

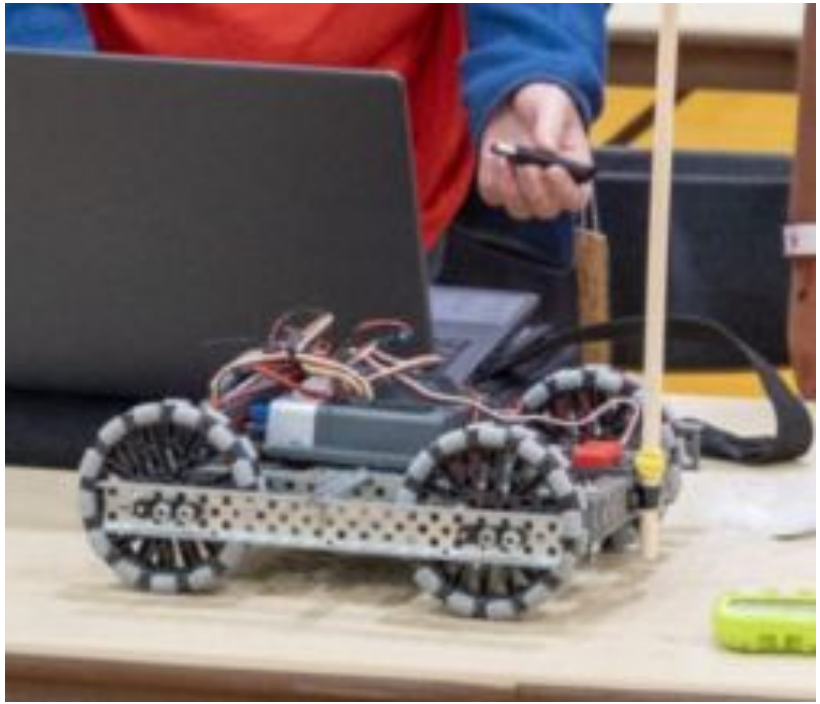
- MAKE SURE YOUR DOWEL IS CORRECT!
- Dowel can be anything, even a pencil, but must be less than 1 cm above the ground and at least 10 cm above
- As a general rule, always make sure your device fits well within standards (30x30 cm). ES's might measure things differently, so make sure you give no room for error.
- Don't let things fall off your robot.

COMMON DESIGNS

Ward's Science

Science Olympiad™ 2024-2025 Robot Tour Kit | Ward's Science

- $100 but is very reliable
- Basic but sturdy and has a two motor-controller

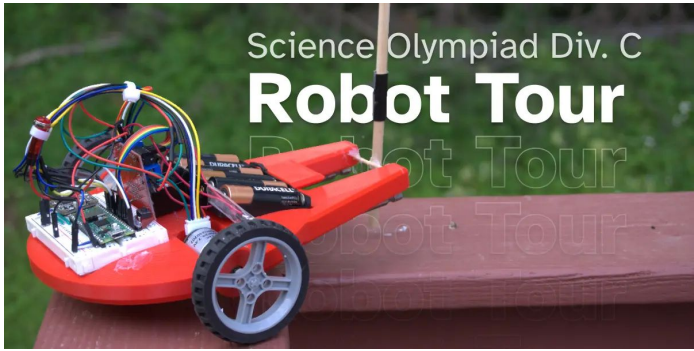


Any Other Robot Online

- Minestorms and other commercial robots work too!
- This is unfortunately a pretty expensive event, but simpler kits are less expensive
- Links to ones I've seen:
  - Smart Robot DIY Kit Intelligent Programmable Robot Kit with Arduino System Obstacle Avoidance Tracking STEM Wireless Vehicle Direction Control for Boys Girls Christmas Educational Gift - Walmart.com
  - https://www.amazon.com/Elecfreaks-Microbit-Smart-Cutebot-Micro/dp/B081ZSCZTV/ref=asc_df_B081ZSCZTV?tag=bingshoppinga-20&linkCode=df0&hvadid=80264440653340&hvnetw=o&hvqmt=e&hvbmt=be&hvdev=c&hvlocint=&hvlocphy=&hvtargid=pla-458386398734261 6&psc=1
  - Amazon.com: FREENOVE Micro:Rover Kit for BBC Micro:bit (Not Included, Work with V1 & V2), Obstacle Avoidance, Light-tracing, Line-Tracking, Remote Control, Playing Melody, Colorful Lights, Blocks and Python Code : Toys & Games

Build Your Own!!

- Objectively more fun
- A robot is basically 3 things: a body, controller, and motors
- You can use any arduino for programming, which easily interface with most DC motor drivers
- After that, you can build a body using simple tools and wood or cardboard.
- Grippy wheels are a must!! You don't know what material you will be navigating.



NAVIGATION

Should I use autonomous sensing?

No.

- Autonomous sensing, from what I've seen, is hard to get right.
- If you really want to use it, I recommend it as a fall back for in case you are about to hit an obstacle. It is **very hard** to use for true navigation.

Coding

- Use whatever software interfaces with your robot best, I've mostly seen scratch and Arduino
- Make code blocks ahead of time
  - Ie "Move forward" and "turn left 90 degrees"
  - This allows for quick programming by creating sequences of code
  - Small code blocks are also easy to test lots! You can go over one chunk to make sure it turns exactly 90 degrees instead of 91

Timing

- Slow down your wheels, as stalling is prohibited and it is hard to make a course that is exactly as long as you need.
  - The official term for this is PWM'ing your motors
  - This should follow about a linear relation to the voltage supplied to your motors
  - Put this graph in your impounded sheets and you can use it to backwards calculate what voltage to supply
- Go over time, not under! Under is x2 points added to your score.

Common Issues

Improper Termination

Dowel Issues

Hitting too many Obstacles

Leaving the Track

Additional Resources

Robot Tour | Science Olympiad

RobotTour24 SampRegTrackSetups.pdf - Google Drive

Robot Tour (T) (C) — Science Olympiad

Robot Tour - Wiki - Scioly.org

THANKS!