



*Our Future:*  
**Built Better Together**

## Robot Design Judging – New Format

At the 2019 World Festivals, FIRST piloted a judging effort to no longer use the robot game table in the Robot Judging rooms. The pilot was a big success. Going forward all Northern New Jersey events will follow this new practice. Previously we saw teams using the game table to run their missions; this was never the intention of the robot judging session. The purpose of the robot judging session is to have students explain the “how” and “why” of the robot, the reason behind the programming and design choices. Robot performance rounds are the place where your teams robot will prove that they can do the missions.

In the past we know many of your teams were worried about how the setup of the tables in the judging rooms were done, and we know that you felt that your scores were low because your missions did not work. This new setup will insure that the students are able to just explain in detail how their robot works. In theory there should be no reason to have your team even power the robot on in the judging room. We will now recommend that the team create an Executive Design summary and bring it with them to robot judging. Teams will be given 2 minutes to explain this document to the judges and then the students will be required to describe their work. This judging session will not be scripted like project judging is. The most important thing is for the students to talk about what they did. Included in the robot judging room will be one erasable white board that displays the field layout, this can be used to assist in describing how the robot works during missions.



# Robot Design Executive Summary (RDES)

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To help the Robot Design Judges quickly and consistently learn about your robot and the design process used, we are requiring a short presentation. An “executive summary” is often used by engineers to briefly outline the key elements of a product or project. In other words, the purpose of the RDES is to give the Robot Design Judges an outline of your robot and all that it can do. The RDES is intended to help your team consider in advance the most important information to share with the Judges. What you chose to share will enable the Judges to effectively evaluate your team and provide more helpful feedback.

Your team is free to determine how much time you invest, but realistically it should only take a few hours to develop and practice the RDES. The RDES is NOT intended to be as extensive or time consuming as your Project.

Your team will present your RDES at the beginning of your Robot Design judging session. The entire presentation, including the trial run, should not take any longer than **four (4) minutes**. Following your Robot Design presentation the Judges will pose questions for your team to answer. You are not required to provide a written version of the RDES to leave with the Judges.

**Basic Outline:** The RDES should include the following elements: *Robot Facts*, *Design Details*, and a short *Trial Run*.

**Robot Facts:** Share with the Judges a little bit about your robot, such as the number and type of sensors, drivetrain details, number of parts, and the number of attachments. The Judges would also like to know what programming language you used, the number of programs and the amount of memory used by each program, and your most consistently completed mission.

## Design Details:

1. **Fun:** Describe the most fun or interesting part of robot design as well as the most challenging parts. If your robot has a name, who chose the name and why. If your team has a fun story about your robot please feel free to share.
2. **Strategy:** Explain your team’s strategy and reasoning for choosing and accomplishing missions. Talk a little bit about how successful your robot was in completing the missions that you chose. Judges may like to hear about your favorite mission and why it is your favorite.
3. **Design Process:** Describe how your team designed your robot and what process you used to make improvements to your design over time. Briefly share how different team members contributed to the design and how you incorporated all the ideas.
4. **Mechanical Design:** Explain to the Judges your robot’s basic structure, how you make sure your robot is durable and how you made it easy to repair or add/remove attachments. Explain to the Judges how the robot moves (drivetrain), and what attachments and mechanisms it uses to operate or complete missions.
5. **Programming:** Describe how you programmed your robot to ensure consistent results. Explain how you organized and documented your programs, as well as, mention if your programs use sensors to know (and ensure) the location of the robot on the field.
6. **Innovation:** Describe any features of your robot design that you feel are special, different or especially clever.

**Trial Run:** If a Robot Game table is available, demonstrate the operation of your robot for the Judges performing the mission(s) of your choice. Please do not do an entire robot round; time will be needed for Judges to ask questions of your team.

***FIRST<sup>®</sup> LEGO<sup>®</sup> League***

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# ROBOT DESIGN JUDGING WITHOUT A ROBOT GAMETABLE

SESHAN BROTHERS

# NO TABLE IN JUDGING. NOW WHAT?

- Many regions around the world, including World Festival, are moving towards eliminating the FIRST LEGO League game table in the Robot Design judging room.
- The judges provide a laminated image of the field for teams to refer to
- While this may seem like an alarming change for existing teams, it is not
- Robot Design judging focuses on process, not the performance of the robot
- You should be able to talk to the judges about your engineering design process, and how you came up with your ideas and decisions, without the use of the table
- This lesson provides several questions that your team may want to answer as part of your Robot Design Executive Summary (RDES). Be sure you cover all aspects of the rubric (Mechanical Design, Programming, Strategy & Innovation).



# DESCRIBE YOUR ROBOT

- How did you come up with the design for the base robot? Did you start with an existing design (your last year's robot or something from the Internet/book)?
  - Experienced judges can recognize standard designs. Therefore, always cite your sources.
- Did you test your design(s) before picking it?

What are the features on it?

Why?

What features on the robot make it sturdy and balanced?

What features are you proud of?

Did the design change over time?

Two well-separated, aligned color sensors

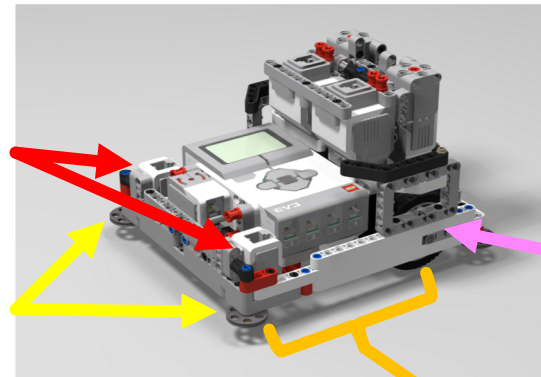
Wall riding wheels

Low center of gravity

Outer walls that support wheels







Level construction – notice caster is level with drive wheels

Color sensors well in front of driving wheels



# DESCRIBE THE SENSORS & MOTORS

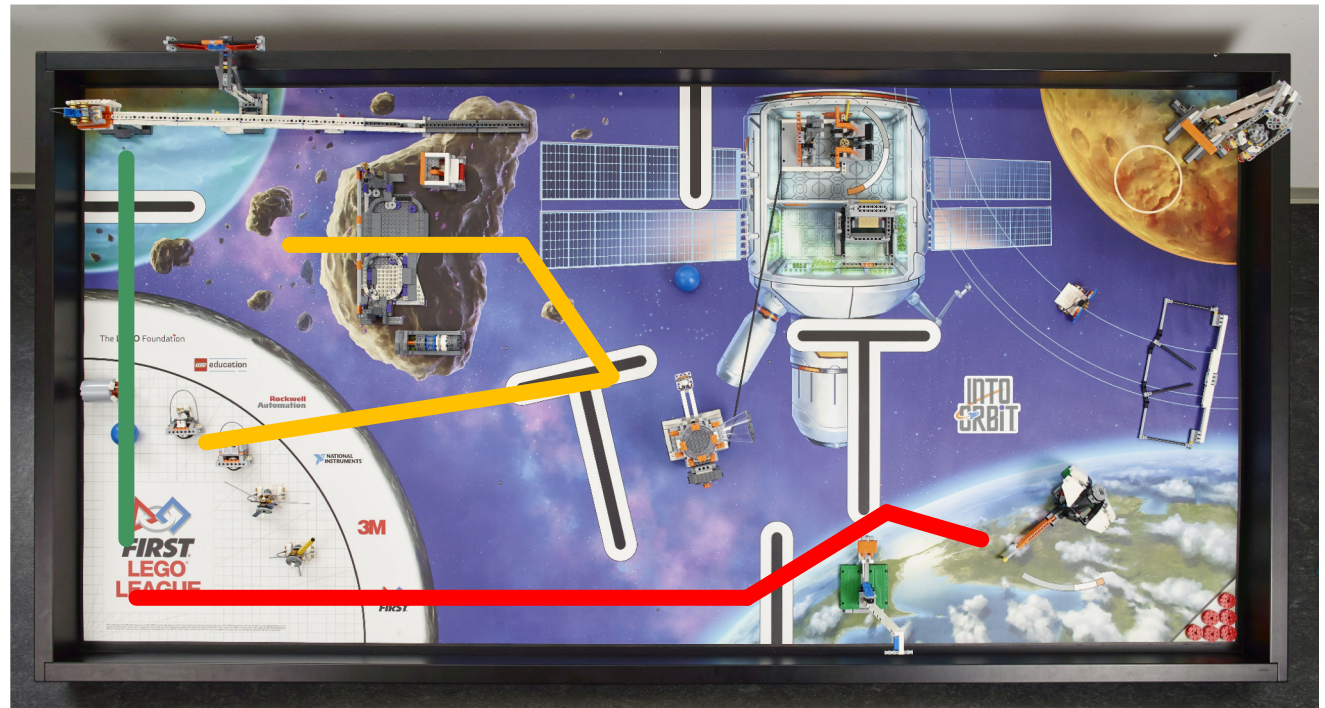
- How many motors and sensors do you use? Which ones?
- Why did you chose to use those? Which missions do you use them on?
- How do you use sensors and do you use them in any novel way?

How many Motors and Sensors are on your robot? (See the Robot Game Rules for allowable types)					
Large Motors		Medium Motors		Color / Light Sensor	
					
Ultrasonic Sensor		Touch Sensor		Gyro / Angle Sensor	
					

# EXPLAIN YOUR TEAM'S STRATEGY

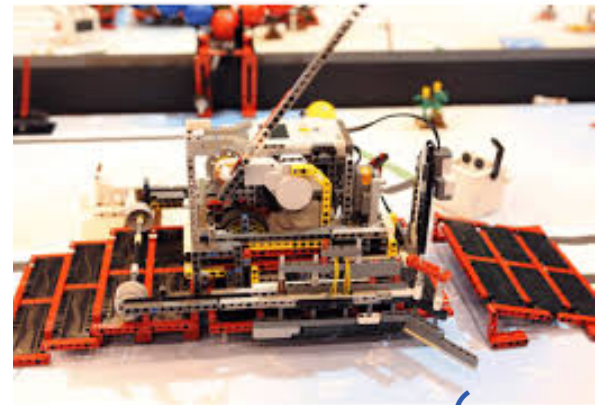
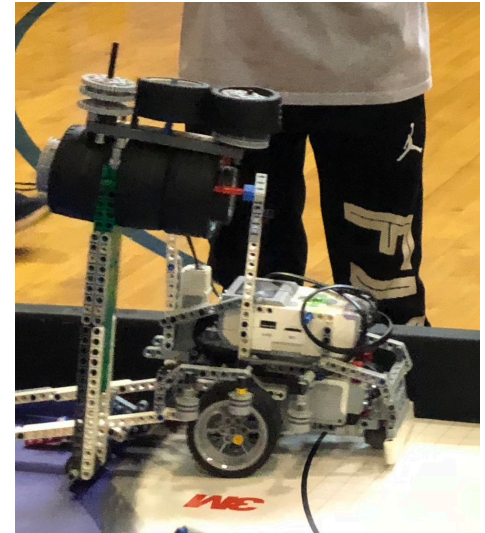
- How did you come up with your strategy?
- How did you decide on which missions to accomplish?

Use the laminated sheet provided in judging or create a diagram ahead of time to show the robot's paths and explain your strategy



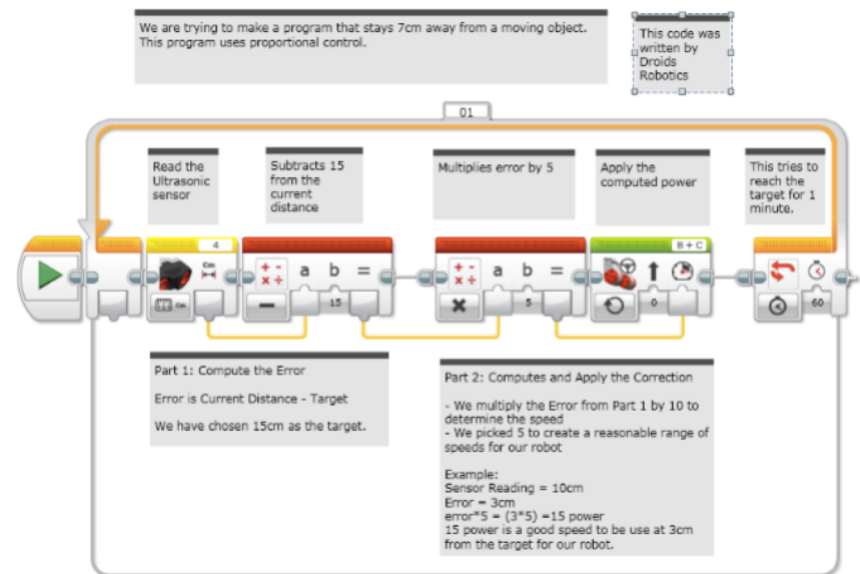
# EXPLAIN YOUR ATTACHMENT DEVELOPMENT

- How do you solve the missions?
- How did you come up with that solution?
- How did that solution change over time?
- Do you solve a particular mission in an unusual way?



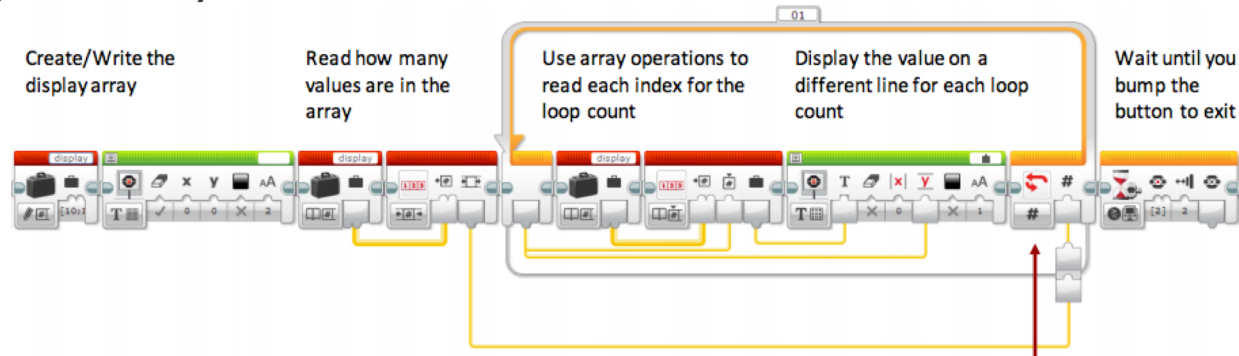
# EXPLAIN YOUR PROGRAMMING

- Since the table is not in the room, you cannot rely on “showing your programs in action” to explain automation and consistency
- Therefore, learn to explain your code clearly
- No matter what programming language you used, you should be able to communicate your programming techniques to the judges
  - Make sure you have pseudocode and comments
- You should be able to explain your code on a laptop or using a printout



# EXPLAIN YOUR PROGRAMMING

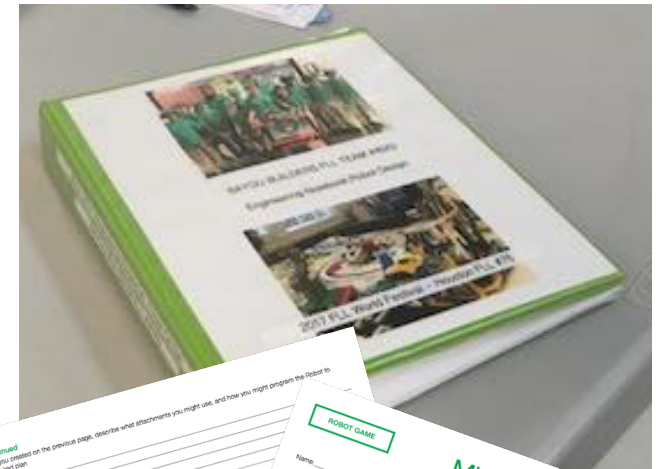
- Explain how your code is organized
  - How do you know what a block is doing? Are there comments?
  - Do you use My Blocks (or equivalent Functions in another language)?
  - How do you keep track of changes to the code?
- Explain any interesting algorithms your team came up with
- Explain how your code helps your robot be more reliable. What coding techniques/sensors do you use?
- Again, experienced judges will recognize code from others
  - If you used code from some source, always remember to cite it, explain how it works, and how your team modified or used it





# NOT REQUIRED, BUT HELPFUL

- Consider having a team Engineering Journal to document your process
- Consider sharing any testing your team may have done
- Some teams create a poster board with examples to point to
- Consider printing out your code as well as pictures of your development process and current robot
- Consider leaving a one-page summary of your presentation with your judges to help them remember your team (include a picture of your team, your robot and the key information you want to communicate)



# CREDITS

- This tutorial was created by Sanjay Seshan and Arvind Seshan
- More lessons at [www.ev3lessons.com](http://www.ev3lessons.com) and [www.flitutorials.com](http://www.flitutorials.com)



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