

2021 IEEE Region 5 Annual Conference

Rules for a Remote Student Robotics Competition

The competition is open to teams of 1 or more undergraduate students who are enrolled in a College or University with a student chapter within IEEE Region 5. Only one team member is required to be a current IEEE Student Member.

Competition Motivation

This year's competition has been redesigned to accommodate social distancing restrictions on group sizes and the availability of on-campus facilities. Each team will be provided a 7-minute time slot to complete the course during a Zoom (or similar) video call with the judges.

The objective of the competition is to demonstrate autonomous operation of a designated educational drone primarily operated indoors.

Introduction and Setup

The course will require teams to have access to a 3-meter by 3-meter floor space with at least 2-meters of headroom. The space should be indoors if possible. A grid consisting of 1-meter by 1-meter squares should be marked and numbered using non-conductive materials such as rope, caution tape, 2x2 construction lumber, or similar and of sufficient size and contrast to be easily observed by the judges via Zoom (or similar). See Figure 1 for the grid dimensions and numbering. The grid must be aligned with the team-provided camera assigned to the judges as shown in Figure 2.

The team will have on-hand six (6), movable helium-filled balloons. Each balloon will have a weight on a string to keep the balloon suspended between 1-2 meters above the floor. The required colors are RED, GREEN, BLUE and YELLOW. The Judges will display via screen sharing the location of each balloon within the grid. The judges will then display via screen sharing the order in which the balloons are to be popped by the drone. When a Judge signals the team to begin, a team member will hand launch their drone and allow it to AUTONOMOUSLY pop the balloons in the required popping order within 3-minutes of launching.

The team-provided camera assigned to the judges (Judge's Camera in Figures 2 – 3) must be stationary and enable viewing of the entire grid. It must also allow the judges to reliably discern the colors of the balloons and the grid markings. Please test this in advance.

Points will be awarded for incremental progress popping balloons in the required order. Bonus points will be awarded for landing with any portion of the drone landing skids clearly touching any deflated balloon.

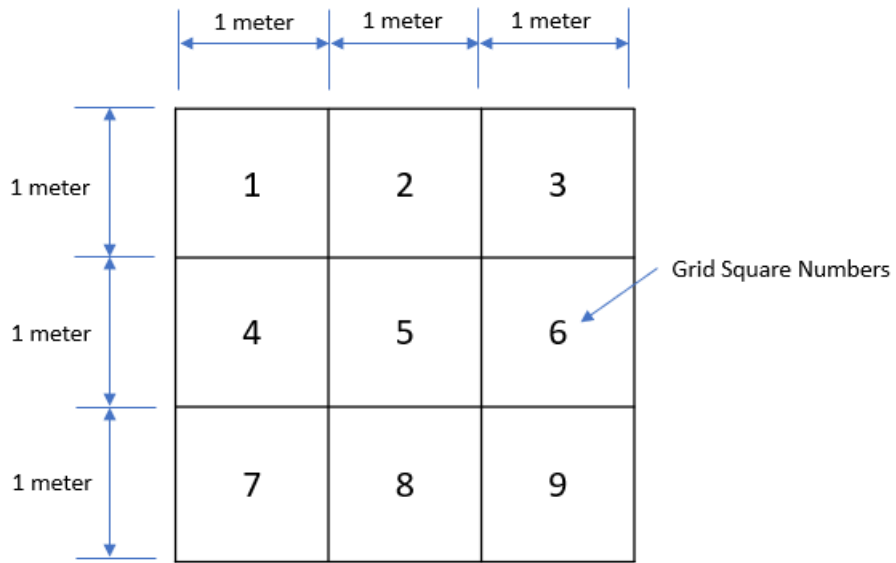


Figure 1 - Gameplay Grid

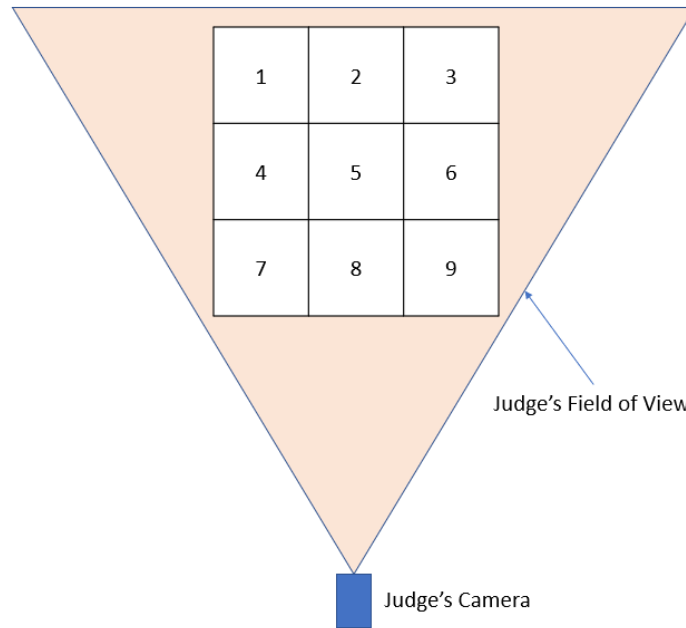


Figure 2 – Overhead (Plan) View of Judges Camera with Respect to Grid

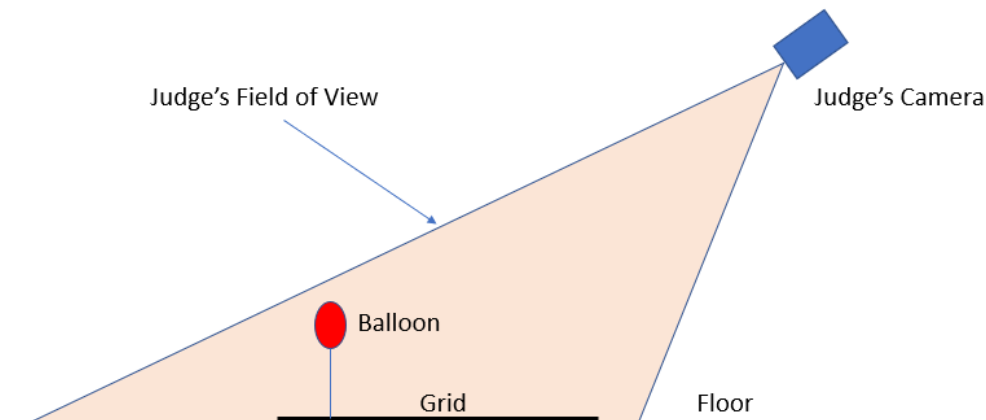


Figure 3 - Elevation (Side) View of Judges Camera with Respect to Grid

Competition Divisions

After a team initiates their video call with the judges, they must immediately display their team number and the Division they intend to compete in. The Divisions are described below.

Division A – The drone operates autonomously with no communications or assistance with any other device. No human interaction allowed during a competition round after hand launch.

Division B – The drone operates autonomously and only communicates with an Unmanned Standalone Computer (USC) for off-board processing positioned within view of the judges. The USC must never communicate with any other device or human. No human interaction allowed during a competition round after hand launch.

Drone - must be a (RYZE) DJI Tello or DJI Tello EDU. The factory propellers, motors, motor drive system and batteries cannot be modified.

Gameplay

Each team's participation will proceed as follows:

1. Connect with the Judges via video call
2. Hold up a sign for the judges that clearly states their team number and division
3. The five (5) minutes available for the team begins
4. A judge will screen share the balloon colors and where they should be placed within the grid
5. A judge will screen share the order in which the balloons should be popped
6. The team will give the judges a clear view of the grid to ensure the balloon are placed correctly
7. A judge will ask the team to hand launch their drone within view of the judges
8. When the drone clearly leaves the hand launch, elapsed time begins
9. The drone proceeds to pop the balloons in the correct order
10. Gameplay ends if any one of the End of Gameplay Conditions are met

End of Gameplay Conditions

1. A team member touches the drone after hand launch
2. Three (3) minutes have elapsed after hand launch
3. Drone pops a balloon in the wrong order
4. Drone lands or impacts anywhere before all of the balloons are popped
5. After all of the balloons are popped, in any order, the drone lands on a balloon for bonus points
6. Drone leaves the field of view of the judges

Scoring

- 1 point for every balloon popped in the correct order
- 1 bonus point for landing on any popped and deflated balloon lying on the grid after all of the balloons are popped

Award Determination

- Total points obtained during the elapsed time
- If the head judge determines a team has communicated with their drone during gameplay, they risk forfeiting awards

Awards

- Monetary awards will be given to the top five (5) finishers in each Division. A monetary award for team participation will be given to any team that pops at least one balloon. The amounts and disbursement process will be displayed on the Region 5 Student Competition website.

Tie Breakers

- Tie breaker – Shortest elapsed time
- If a second tie breaker is required, the award will be shared

Honor and Cheating – extraordinary efforts have been made to allow interested undergraduate students to compete in a friendly, remote competition without exposure to Covid-19 risks. The remote gameplay and judging will make cheating very easy. Region 5 expects all participants to honor and respect the hard work invested by all of the teams and avoid cheating at all costs.

Team Registration – will be provided on the Region 5 Student Competition website

Video Call-in Details – will be provided on the Region 5 Student Competition website

Preview of Possible Q & A

1. The balloons can be made of any common balloon material.
2. Consider your safety when choosing a method to pop the balloons.
3. Wear Personal Protective Equipment (PPE) as appropriate. Eye protection, hand protection, etc.
4. Any shade of RED, BLUE, GREEN and YELLOW are acceptable as long as the judges can discern them. This allows teams to learn and/or train on their own equipment.
5. One of many advantages of the remote approach is local control over lighting and backgrounds

Glossary of Key Terms and Abbreviations

Head Judge – A Denver Section Robot Committee Member who makes all final rule decisions and award determinations

Scoring Judge – Records and reports all points and penalties

Timing Judge – Controls and reports elapsed time

Elapsed Time – The time interval between the drone clearly leaving the hand launcher and the moment when any End of Round Condition occurs.

Field Clock – The timing device controlled by the Timing Judge

Grid - Consists of (9) 1-meter x 1-meter squares arranged in a 3-meter by 3-meter square