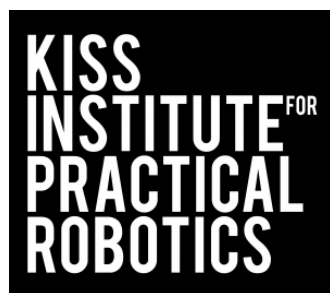


# 2018 KIPR Open Game Review



Version 1.0 04/19/18

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# Revision History

Version 1.0 – April 19, 2018 – First draft review of game document

## Game Design Committee

- Steve Goodgame
- Tim Corbly
- Nathan Ashley
- Dr. Gary Mayer
- Jeff Majors
- Roger Clement
- Creighton Eddington

# Sponsors

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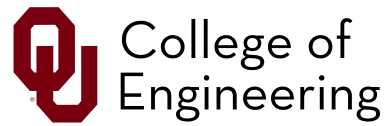


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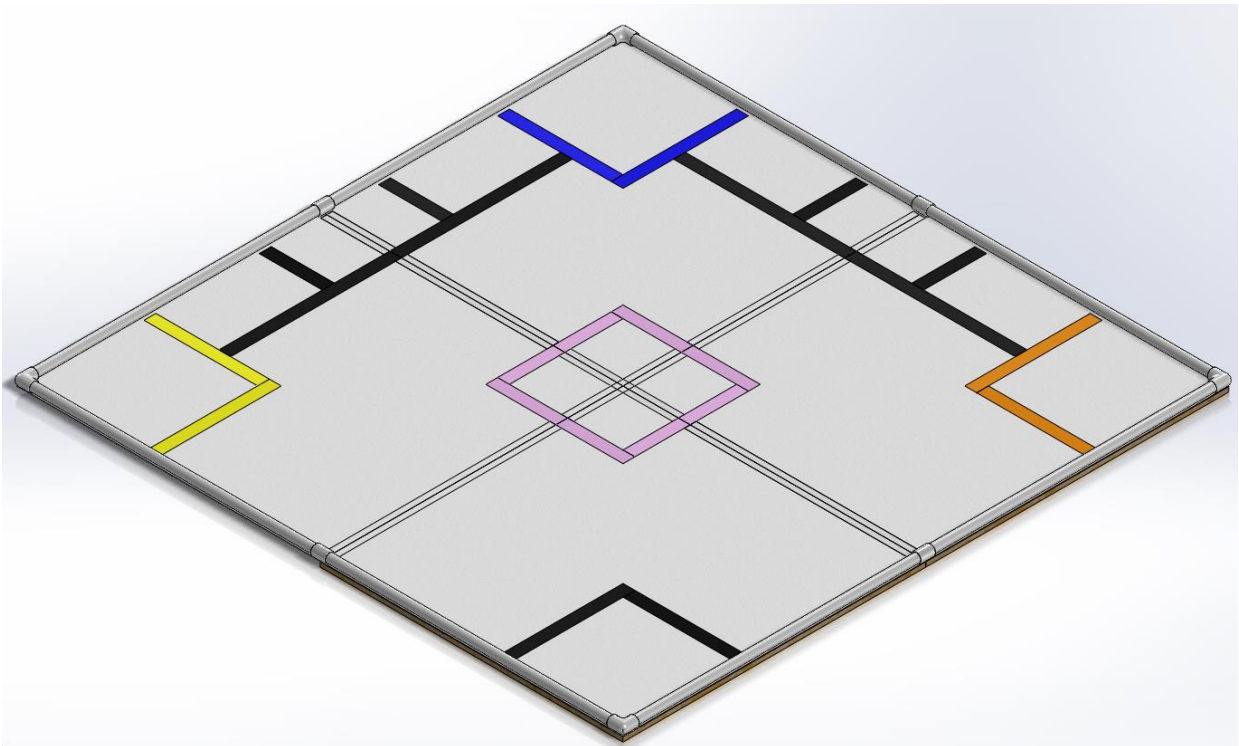
# This Year's Game

## Botguy Visits the Valley

In the spirit of the JBC challenges, this year's KIPR Open will be a set of challenges that teams may perform and gain points from. This year we wanted to emphasize algorithmic thinking as well as a real world focus on wind and solar energy.

Each challenge will be on a different day of GCER totaling to 3 different challenges. The first challenge will be to collect randomly scattered foam blocks that will be on the board and sort them into 4 different areas. The second day's challenge will be to gather different colored blocks from their predefined locations and arrange them in patterns on the board. The third day's challenge will be to measure the strength of the wind coming from different spots on the board and to create your own wind turbine that will attach to the movable structures on the board.

Each challenge may be performed as many times as there is available time during that day's rounds at GCER. These challenges are meant to test to the algorithmic thinking, mechanical prowess, and programming capabilities of the participants. Good luck to all of our participants this year!



## Game Board Areas

Official game board specifications will be released in a separate document online. All tournament boards and game pieces will fulfill the following specifications within +/- 0.5 inches or up to 1% of the specification.

The game board is composed of four 4' x 4' (reusable) modules whose surfaces are pebble grain white fiberglass reinforced plastic panel (FRP). A fully assembled game board will be ~8' x 8'. A panel channel or black or white duct tape is used to close exposed seams where modules abut.

*Starting Box* – the 18" x 18" square in the bottom right corner of the board. The area is defined by the **inside** edge of the black tape and the inside edge of the PVC.

*Blue Zone* – the 18" x 18" square in the top left corner of the board. This zone is opposite the starting box along the diagonal of the board. The area is defined by the **outside** edge of the blue tape and the inside edge of the PVC.

*Yellow Zone* – the 18" x 18" square in the bottom left corner of the board. This zone is on the corner to the left of the starting box. The area is defined by the **outside** edge of the yellow tape and the inside edge of the PVC.

*Orange Zone* – the 18" x 18" square in the top right corner of the board. This zone is on the corner to the right of the starting box. The area is defined by the **outside** edge of the orange tape and the inside edge of the PVC.

*Pink Zone* – the 18" x 18" square in the center of the board. The area is defined by the **outside** edge of the pink tape. Each side of the square will be 9" from the center lines of the board.

*Fan Zones* – the areas for the fans that will be on the board will be defined by the inside of the black tape that is 10" from the edge of the PVC and the edge of the PVC. These areas will be between the blue and yellow zones and the blue and orange zones and their short edges will end at the outside edges of the blue, yellow, and orange tape.

## Game Pieces

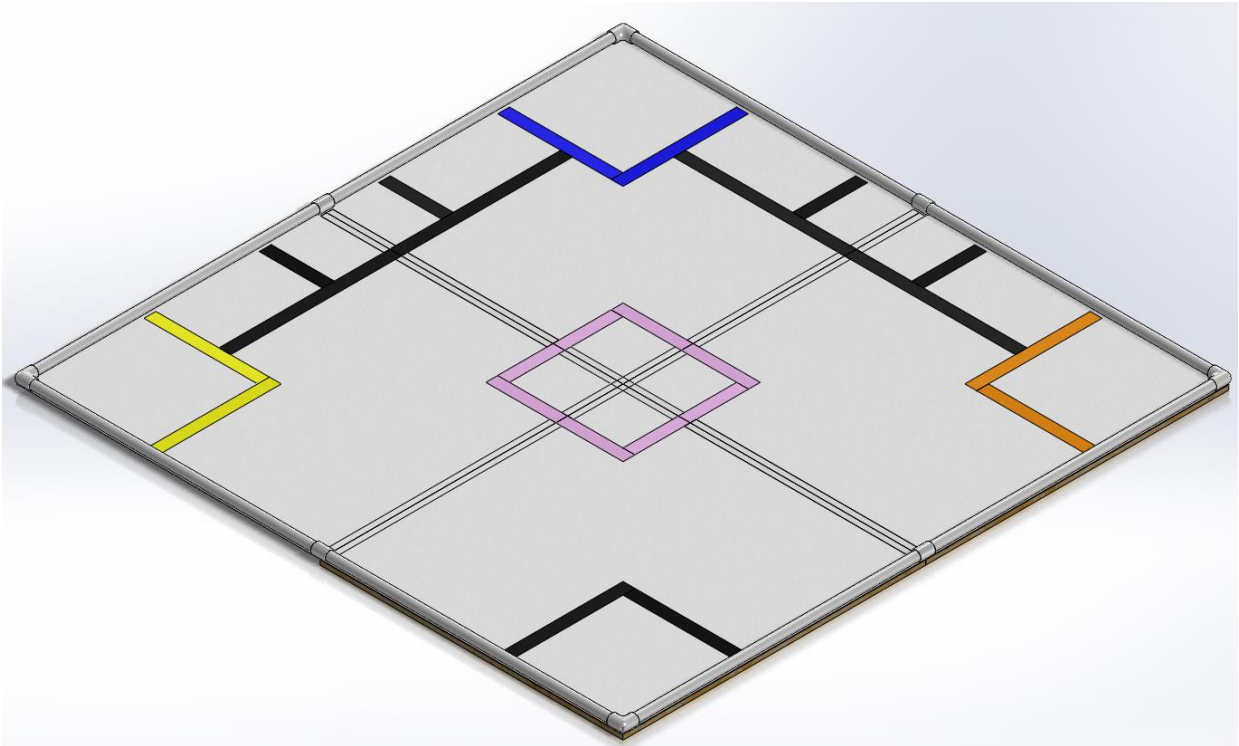
### *Scoring Pieces*

- 1 – Botguy
- 5 – 2" x 2" x 2" yellow hard foam blocks
- 5 – 2" x 2" x 2" orange hard foam blocks
- 5 – 2" x 2" x 2" pink soft foam blocks
- 5 – 2" x 2" x 2" blue soft foam blocks
- 5 – 2" x 2" x 4" blue soft foam blocks

## Game Piece Starting Positions

### Challenge 1

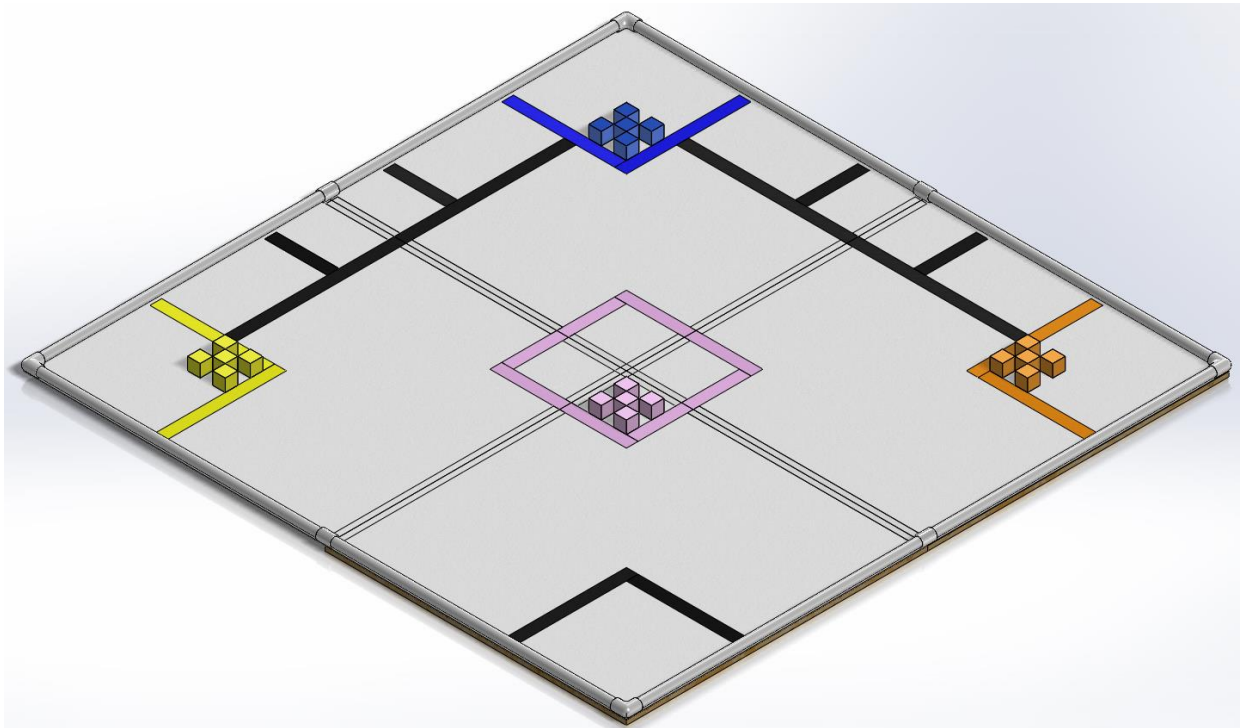
In the first challenge, blocks will be dumped from a 2ft x 1ft bin onto the table from the corner opposite the starting box. Any blocks in any of the colored zones or the starting box will be pushed outside the zones to the closest edge of the box by the judges.





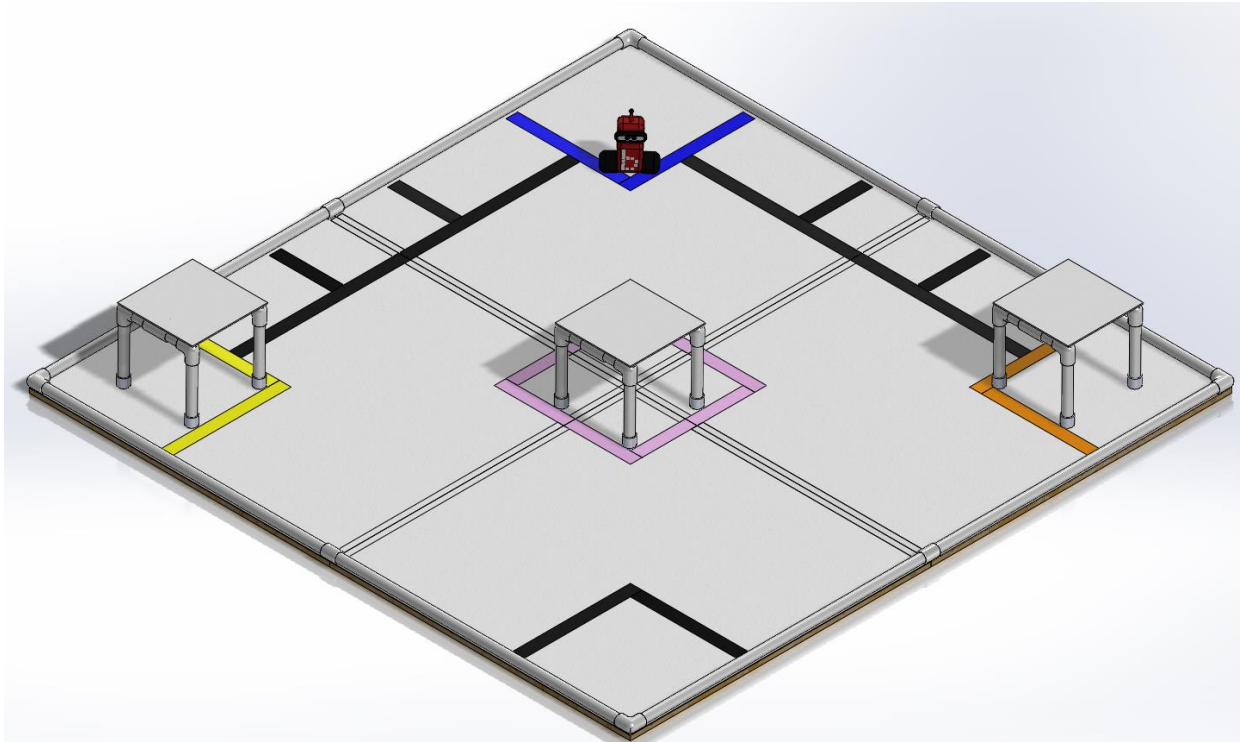
## Challenge 2

Blocks will be placed in their matching color zones with one in the corner closest to the starting box or farthest from the edges of the PVC. The rest of the cubes will be placed in a checkered pattern next to the first cube of their box.



### Challenge 3

In this challenge the wind turbines will be placed in the yellow zone, the orange zone, and the pink zone. One leg of each of these will be placed in the corner of their box closest to the PVC corner of the starting box. The leg that is closest may be picked by the team at the table. Botguy will start in the corner closest to the starting box in the blue zone, facing the starting box.



## Scoring Rules

### Challenge 1

Summary: In the first challenge, game pieces will be dumped from a bin over the center of the board. These pieces will be pushed out from any scoring areas if they are in them. The goal of this challenge is to sort the pieces into their matching colored zones and points will be awarded based on how many blocks are sorted into zones and how many zones have sorted cubes in them.

1. Teams will have 3 minutes of setup time for the challenge and the round will last 5 minutes. Robots must start autonomously with a starting light.
2. Pieces only score if they are touching the surface of the game board and must be touching some part of the area they are scoring in.
3. Pieces in the incorrect zones will negate one of the other pieces in the zone. If it is the only piece in the zone it scores zero.

### Challenge 2

Summary: In the second challenge, game pieces will start in their colored zones in a checkered pattern. In the fan zones the fans will be replaced by colored diagrams. These will be ordered by the number of cubes in the pattern. In the zones closest to the starting box, there will be a pattern using 3 cubes. In the next difficulty zone, there will be a pattern using 5 cubes. In the last difficulty zone, there will be a pattern using 7. These patterns will be the same in each of the groups of fan zones. The patterns will be randomized at the start of each round by the scoring Wallaby. In all of the created patterns, the cubes will be placed next to each other so all cubes will have at least one edge touching the edge of another cube.

1. Teams will have 3 minutes of setup time for the challenge and the round will last 5 minutes. Robots must start autonomously with a starting light.
2. Pieces only score if they are touching the surface of the game board and must be touching some part of the area they are scoring in.
3. The diagrams showing the patterns will be on 7"x7" white cardstock that is laminated. The squares on the diagrams 2"x2" and will be attached to pieces of white Velcro to create the patterns. There will be a ½" margin on all sides of the diagram.
4. The randomized patterns will be created by randomizing the order of all the cubes and then placing them on the cards in the zones in a random pattern by the table Wallaby. Therefore 15 of the 20 cubes will be used in the patterns.
5. To score, teams must have all their cubes within the boundaries of the black tape.

6. The cubes do not necessarily have to be touching to score. However they must be within a quarter inch of the cubes next to them to score within the pattern.
7. Orientation does not matter for the how the patterns are placed in the zones.

### Challenge 3

Summary: This challenge requires teams to build their own turbine blades for the challenge that can mount onto a Lego axel that is 1.25" long and 12.5" off the surface of the game board. These will mount into the whole turbine which can be moved around the board and in front of a fan. A Wallaby on top of the turbine will be counting the number of rotations that the turbine blades make.

Also in the challenge Botguy has been living in the blue box and is tired of listening to the fans around him all the time and wishes to relocate. If he is relocated to the orange, pink, or yellow boxes he provides 2 times multiplier to the score of the turbine that was in that box. If he is relocated back to the starting box then he provides a 1.5 times multiplier to all the fans.

There will be six fans running on the game board, one in each of the fan zones. These will not be able to move. The fans will be able to set to one of three levels. Levels 1, 2, and 3 will be randomized for each group of fans and the pattern will be mirrored on the board. So two fans will be at Level 1, two at Level 2, and two at Level 3. To score more points teams should devise a way of detecting the speed of these fans.

1. Teams will have 3 minutes of setup time for the challenge and the round will last 5 minutes. Robots must start autonomously with a starting light.
2. Pieces only score if they are touching the surface of the game board and must be touching some part of the area they are scoring in.
3. Teams may select which leg of their turbine will be in the corner of the starting box.
4. Turbines may not be spun by the robot of the team.
5. Teams will receive points for the number of rotations created by the turbines. The fans being used for the challenge will be the Honeywell Power Air Circulator. The model number for the fan is HT900D1.

If your team does not agree with the score as calculated, they must immediately notify the table judge(s) before leaving the table and before any items have been moved on the table. If they do not agree with the table judge's ruling, then they may ask to speak with the head judge. The head judge will spend no more than 5 minutes on the decision. Teams will be required to initial the score sheet before leaving the table, signifying acceptance of the ruling. If they do not agree with the ruling, then the head judge is permitted to sign for the team to proceed with any following round.

# KIPR Open Tournament Rules

## Team Membership

- At least one team member must be beyond High School in their educational careers.
- College students, professional engineers, hobbyists, poets, and anyone else fulfilling the criteria above are all encouraged to participate.

## Game Length

Game duration is 300 seconds.

## Tournament Logistics

1. If the judges determine that a robot violates the construction rules, whether or not a challenge has been made, that robot will not be allowed to run until it has been modified to meet the rules.
2. Construction rules apply only to what is brought to the game table.
3. Teams cannot use wireless links to program their robots within 10 yards of the game board and cannot use wireless links to send information or commands to a robot during a game.
4. During setup teams may adjust starting lights:
  - a. Starting lights may not be in physical contact with any robot
  - b. Starting lights must be outside the bounds of the game board area.
5. During setup teams perform any necessary calibrations needed by their robots.
6. Setup time should be two minutes or less.
7. When teams are ready, or judges decide that adequate time has been allowed for calibration, teams will activate their robots and then -- Hands off!
8. After hands off, no part of a team's robot(s) may leave its Start Box until the starting lights turn on.
  - a. If this happens, the judges will call a fault on the team and they will be forced to return to the line to run again.
9. After hands off, judges will activate the game table controller to turn on the starting lights signaling game start.
10. After hands off, teams may not broadcast ANY physical or electromagnetic signals to robots.
11. When the starting lights turn on, the robots must autonomously start, whether or not they leave their start boxes.
12. Lights will remain on for 5 seconds, turn off for 290 seconds and flash the last 5 seconds.
13. Once the starting lights turn on, the round counts unless a judge rules outside interference.
14. Robots must cut power to their motors and turn off or stop issuing motion commands to servos by the end of the round or risk forfeiting the round.
15. Scoring is based on the location of pieces at the end of the round, not how the pieces got there.
16. There are no instant replays, and attempts to use videos to question a decision will be ignored.
  - a. If a team is unhappy with a judge's decision, they should challenge it then and there.
  - b. Challenges to scoring after the team has left the table, will not be considered.
17. Teams cannot touch, borrow or modify equipment robots or computers, or beam commands to another team's stuff (including their pit area) without the permission and presence of a member of that team.

## Construction Rules

The following rules apply to all robots to be entered in the KIPR Open Robot Game:

1. A team's entry (all materials placed on the game-board) must mass less than 10kg (22 pounds).
2. A team's entry (all materials placed on the game-board) must fit within their (virtual) Start Boxes without restraint (other than pressing against interior edge of any game board PVC bordering a Start Box). Each team has one start box on their side as specified (each with a 18" virtual height) and can use either or both, but for starting can only use the two lights provided.
3. The team's entry may not contain or release pressurized materials at greater than 7 bar (100 psi).
4. The team's entry may not release any liquids before, during, or after the game while the team is at the game table.
5. The team's entry may not release any gases while at the game table that are considered hazardous by the judges, or that are at a temperature below 0°C (32°F) or above 50°C (122°F).
6. Robots may not contain features (manipulators, protrusions or materials) that are designed to, or are deemed by the judges likely to, cause damage or destruction to the game board, or to game pieces; in particular, things like needles serving to penetrate game objects or otherwise, or the use of a sticky substance to pick up game objects are prohibited.
7. Robots cannot use external power or control from outside of the game board area. During the game, teams may not take any action which breaks the vertical projection of the game table.
8. Robots must operate autonomously.
9. Each team is limited to a maximum of five independent structures on the game board at a time.
10. Each robot must have a name suitable for broadcast over a PA system.
11. Team entries may NOT contain parts that may reasonably be confused with game pieces or table elements.
12. A team's entry may be made out of any materials or parts (including Botball and non-Botball kits) as long as the entry conforms to the construction rules above.
13. No projectiles can be used other than game pieces and once collected may be launched by the team's robots with no restrictions.
14. Electrical tape (either black or white) may be used (or required to be used by judges) to cover metal pieces that are deemed to otherwise be a safety risk to robots or humans.
15. For any robot whose safety is in question, judges will decide whether or not the robot is allowed to compete. All judging decisions are final.

## Robot Logistics

1. Each robot if named must be a G-Rated name.
2. Multiple processors (such as two KIPR robot controllers) may exist on a single robot.
3. Each starting box is 18" x 18" x 18" tall.
4. The starting box boundaries are given by the interior edge of the PVC and interior edge of the black tape that delineates it.
5. The starting box extends vertically **18 inches (45.72 cm)**.
6. **All elements of a team's entry must be within the volume of the starting box at game start.**
7. After game start, robots are allowed to expand in size.
8. Starting light sensors may be shielded and neither sensor nor shielding may extend outside the starting box.

## External Communication

1. No external communications (e.g., IR, Bluetooth, wireless, or semaphores) may be used during tournament play with the exception of robot to robot.
2. Communications among the robots forming your team's entry is allowed
3. Your robot controller may have WiFi turned on or off at the tournament, however we strongly advise teams to use USB communication at all times as teams can remotely access your wallaby and gain your password.
4. Any teams found in violation of any communication hacking or tampering with another team's robots or equipment is in violation of the "Spirit of Botball" and may be disqualified from the rest of the tournament.

Teams found in violation of any communication rule may be disqualified from the tournament.

# Overall Winner Calculations

A team's overall score is calculated as the sum of their Challenge scores and will be between 0 and 3.

## Challenge Scoring Formula

$$\text{ChallengeScore} = \frac{2}{3} \left( \frac{n - \text{ChallengeRank} + 1}{n} \right) + \frac{1}{3} \left( \frac{\text{TeamBestChallengeScore}}{\text{MaxTournamentChallengeScore}} \right)$$

## Advice for Tournament Participants

Test your robots from start to end:

- a. Go through the entire starting sequence
- b. Make sure you can calibrate to the starting lights
- c. Make sure the robots stop when they are supposed to: verify with a stop watch!
- d. Does the starting sequence work with very different lighting conditions? (tournament tables may or may not have lights above them)
- e. Test the shielding of your sensors!

Clarifications and adjustments to the game or game rules will be made via the KIPR Open web site <http://www.kipr.org/kipr-open> and may appear in the form of notifications or answers to FAQs.

The KIPR Open Robotics Game discussion board and FAQ are accessed via <http://www.kipr.org/kipr-open>.

Check <http://www.kipr.org/kipr-open> regularly for rules updates that may or may not appear with a FAQ answer or as updates to this document.

Good Luck!