2014 Botball Game Review

Version 1.1

1/13/14

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This Year's Game

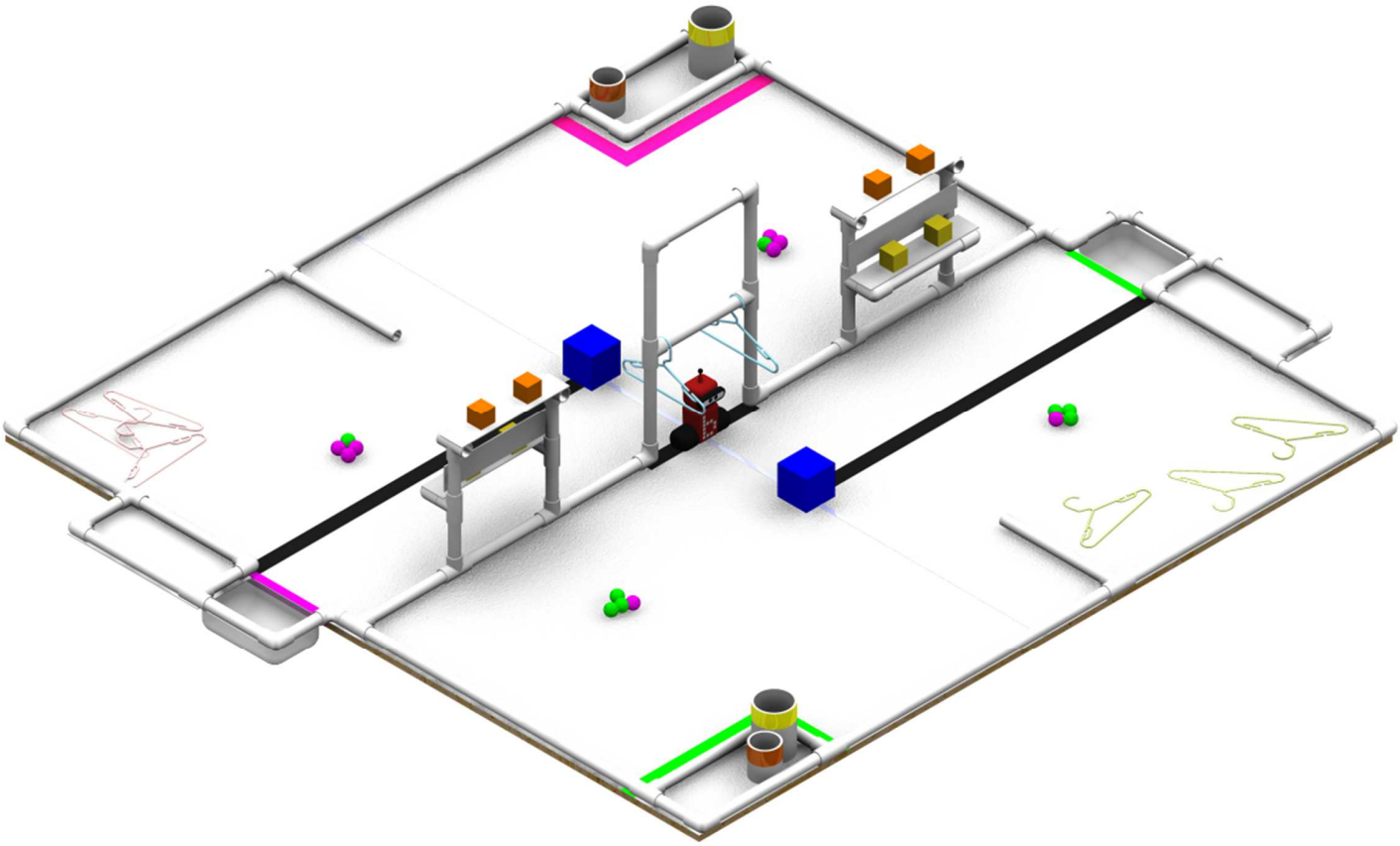
Assistive Robotics

Botguy has returned from last year's successful Mars Sample Return (MSR) mission, and requires physical therapy (PT) to re-acclimate to Earth's gravity after spending so many months in zero-G (zero gravity). Botguy's human physical therapist has proposed a new style of training regimen that utilizes experimental autonomous robot technologies to assist and guide Botguy in PT activities. These assistive robots must manage the equipment in the facility and be able to demonstrate to Botguy the various activities that he will need to perform to recover from his time in zero-G. Yet again, the world space community has turned to Botball students to develop effective robot technologies to solve these state-of-the-art problems. The tasks to be illustrated by these assistive robots and to be performed by Botguy are targeted at "activities of daily living" designed to improve Botguy's range-of-motion. These tasks are:

1. **Gross Motor Task:** Botguy has become physically weaker during his time in space and must train with the Green and Pink Exercise Equipment. The robotic assistant must demonstrate to Botguy how to properly use and store the Exercise Equipment (as well as any other unused PT objects). The Exercise Equipment must be placed into an Upper and Lower Storage Areas for later use. Ideally, the Exercise Equipment should be sorted for ease of retrieval for later use.
2. **Raising & Placing Task:** To extend Botguy's range-of-motion, the human physical therapist has created an exercise that requires Botguy to place Hangers on a Hanger Rack at different heights to vary the challenge level. The robotic assistant must demonstrate how to place a set of Hangers on the Rack. To elevate his challenge level, the robotic assistant must demonstrate how to move up to two (2) Blue Hangers from the Lower Hanger Rack to Upper Hanger Rack.
3. **Picking & Lowering Task:** Botguy's dexterity has been severely degraded due to his time in space, so his human physical therapist has created a task to him help place complex objects into bins. The first part of this exercise is a picking task, in which PT Cubes are sitting on the shelf and Botguy must retrieve them. The assistant should demonstrate how to grasp and lower the cubes, and transport these PT Cubes to the Fine Motor Task Area for the next phase of the exercise.
4. **Fine Motor Task:** To perform his Fine Motor Task, Botguy will need his Exercise Bench. The assistant should help Botguy onto his bench, and navigate him to the Fine Motor Task Area. The assistant should then demonstrate to Botguy how to finely place the Yellow PT Cubes into the larger Yellow PT Bin, as well as place the Orange PT Cubes into the smaller Orange PT Bin.

The human physical therapist (the judges) will be evaluating how well the assistive robot systems are performing as a PT assistant to Botguy. The space community is relying on you to get Botguy back in shape for next year's mission!

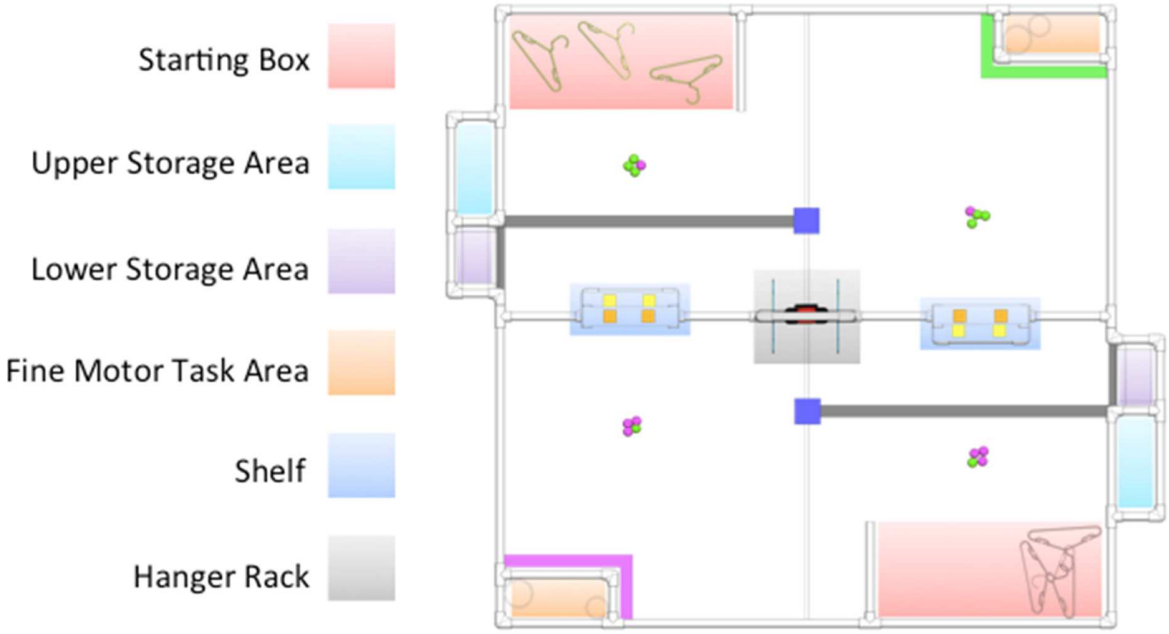
Game Board Picture



The Game Board Areas

Official game board specifications are on the Team Home Base – all parts are available at Home Depot or Lowes. All tournament boards will match these specifications within +/-0.5 inches or 1%, whichever is greater.

The game board is composed of four 4'x4' (reusable) modules whose surfaces are pebble grain white fiberglass reinforced plastic panel (FRP). A fully assembled game board will be ~8'x8'. A panel channel (rounded side up) is used to close exposed seams where modules abut. Each side has a Starting Box, a Shelf, an Upper and Lower Storage Areas, and a Fine Motor Task Area. They also share a Hanger Rack.



Starting Box – The boundary of the *Starting Box (36 x 15 x 15 inches high)* is defined by the **inside edges** of the pencil line, and PVC that surrounds the *Starting Box*.

Upper Storage Area – the boundary of the *Upper Storage Area* is defined by the **inside edges** of the PVC that surrounds the *Upper Storage Area.*

Lower Storage Area – the boundary of the *Lower Storage Area* is defined by the **inside edges** of the PVC that surrounds the *Lower Storage Area*, and the outer edge of the black tape (i.e. adjacent to your side).

Fine Motor Task Area – the boundary of the *Fine Motor Task Center* is defined by the **inside edges** of the PVC that surrounds the *Rehabilitation Center.*

Game Pieces

- 1 Botguy
- 2 Blue Cubes, “Exercise Bench” (4” poof cube)
- 4 Orange Cubes, “Physical Therapy Cube” (2” hard foam cube)
- 4 Yellow Cubes, “Physical Therapy Cube” (2” hard foam cube)
- 8 Pink Recyclables, “Exercise Equipment” (1.5” poms)
- 8 Green Recyclables, “Exercise Equipment” (1.5” poms)
- 3 Pink Hangers
- 3 Green Hangers
- 2 Blue Hangers
- 2 Orange Cube Receivers, “Physical Therapy Bins” (4” tall 3” PVC with orange tape band)
- 2 Yellow Cube Receivers, “Physical Therapy Bins” (6” tall 4” PVC with yellow tape band)

Game Piece Starting Positions

- Botguy will be placed in the middle of the game board, directly beneath the Hanger Rack. The orientation will be randomly determined after “hands off”. Botguy will be positioned so that his wheels are both on the centerline.
- The four (4) Orange Cubes will start on the top shelves in designated locations (determined after “hands off”).
- The four (4) Yellow Cubes will start on the middle shelves in designated locations (determined after “hands off”).
- Three (3) of your side’s color Exercise Equipment (pink or green), and one (1) of the opposing side’s color Exercise Equipment will be placed in each of the two (2) 4” diameter circles on your side.
- The Blue Cube Exercise Bench will start one on each side centered at the end of the tape line on top of the divider strips.
- The two (2) Blue Hangers will start hung on the lowest rung of the center bar each touching a side T connector. The Hanger closest to your starting box will be hung so that open end of the hook is on the side of your starting box.
- Prior to “hands off”, teams may reposition the Physical Therapy Bins in their *Fine Motor Task Areas* with the stipulation that they must touch the game surface, and not extend outside the vertical projection of their *Fine Motor Task Areas*.
- Prior to “hands off”, teams may position their three (3) colored hangers anywhere inside their *Starting Box* (including on their robots), so long as everything is within the boundaries of their *Starting Box*. Neither the robot, nor anything it is carrying in the starting box, may extend above the 15” virtual ceiling until after the start of game play.

Scoring

Game Piece	On Your Side	@ Fine Motor Task (FMT) Area (touching tape)	On Exercise Bench	On Exercise Bench @ FMT Area	Lower Storage Area	Sorted in Lower Storage Area	Upper Storage Area	Sorted in Upper Storage Area	Fine Motor Task Area	Orange PT Bin	Yellow PT Bin	Lower Hanger Rack	Upper Hanger Rack
Botguy	5	15	50	100									
Blue Cube*1		10			1	5	3	10					
Green Poms					1	5	3	10					
Pink Poms					1	5	3	10					
Your Hanger												10	25
Blue Hanger													Your Upper Hanger Score x2 (for each blue hanger)
Yellow Cube	2	5			1	5	3	10	6	6	25		
Orange Cube	3	5			1	5	3	10	6	100	6		

*1 without Botguy

Scoring Rules

The official scoring rules for the 2014 Game are made up of this 2014 Botball Game Review document **and** any updated scoring rules on the team home base. Posts on the 2014 Team Home Base in the Game Rules Question Area will be used to update this document and provide notice of any rule changes or adjustments.

1. The boundary of the *Starting Box* is defined by the **inside edges** of the pencil lines and PVC that surrounds the *Starting Box* and a virtual 15" ceiling.
2. The boundary of the *Lower Storage Area* is defined by the **outside edge** of the black tape and PVC that surrounds the *Lower Storage Area*.
3. Game pieces must be in the vertical projection in the *Lower Storage Area* to score.
4. Game pieces must be in the vertical projection in the *Upper Storage Area* to score. All *Upper Storage Area* points are **negated** if any part of **your entry** resides in the vertical projection of the *Upper Storage Area* when time is up
5. The boundaries of the *Fine Motor Task Area* and *Upper Storage Area* are defined by the **inside edges** of the PVC that surrounds the *Fine Motor Task Area* and *Upper Storage Area*, respectively.
6. Game Pieces in either *Storage Area* **only** count as sorted if they are in scoring position **and** there is only **one color** of game piece in that area **and** neither Botuy nor Hangers in that scoring area.
7. Some part of the *Physical Therapy Bins'* PVC must touch the game surface in the *Fine Motor Task Area* in order for the pieces within it to score within th*e Physical Therapy Bin*.
8. Game pieces score in the *Physical Therapy Bin* if any portion of the piece is within the volume of the PVC defining the *Physical Therapy Bin*.
9. Some part of the Blue Cube Exercise Bench must be touching your side's colored tape around the *Fine Motor Task Area* to score as being at the *Fine Motor Task Area.*
10. Hangers score as being on a Hanger Rack if the inside edge of the hanger hook is touching the horizontal PVC member of the Hanger Rack. The tip of the hanger hook does **not** count as touching.
11. Botguy can score on a side only if no part of his body is in contact with the Black Tape underneath the Hanger Rack.
12. Botguy scores on the Blue Cube Exercise Bench if any part of him is touching the top of the top-most face of the Blue Cube and no part of his body is on the game board surface.
13. Botguy can be supported/touched by a robot, or any game piece while on the Blue Cube.
14. If **one or both** of the Blue Hangers make it to the Upper Hanger Rack, then points are multiplied for **only** Hangers on the Upper Hanger Rack.
15. The score is determined only where objects finish up, and not by how they got there. Judges will wait until any scoring objects still moving have come to rest before scoring a game.

If your team does not agree with the calculation of the score they must immediately notify the table judge(s) **before** leaving the table and **before** any items have been moved on the table. Teams will be required to initial a score sheet before they leave the table – this signifies that they accept the score.

Tie Breakers & Special Scoring Conditions

If one team never breaks any border of the starting box (including the 15” ceiling), they lose the round. If both teams break the boundary of their starting box and one team's robot does not shut down their motors or does not stop commanding their servos to move at the end, they lose the round. In the case of a tie score, a team wins if none of the above conditions apply **AND** they are the (first condition to apply):

1. Team with the most points scored with Orange PT Cubes in the Orange PT Bin.
2. Team with the most points scored with Yellow PT Cubes in the Yellow PT Bin.
3. Team with the most points scored via hangers.
4. Team with Botguy on the Exercise Bench.
5. Team with the Exercise Bench pushed up to the *Fine Motor Task Area.*
6. Team with items correctly sorted in the *Upper Storage Area.*
7. Team with the largest number of items in the *Upper Storage Area.*
8. Team with the largest number of items in the *Lower Storage Area.*
9. Team with the fewest PT Cubes on their Shelves.
10. Team with Botguy completely on their side.
11. Team with the robot (defined by the KIPR Link power switch) closest to Botguy.

Game Play

Fair Play and Spirit of Botball

Botball is about the development of **student** skills. Once a team enters the pits with their robots, they should not leave the pits for any robotics purpose until the conclusion of the tournament or suspension of play for the day. Adults are not allowed into the pits and all adults accompanying a team should understand that responsible Botball mentorship does not include working on the robot entries or programming the robot entries for the students.

Setup (before "Hands Off")

Up to two students from a team bring the team's robot(s) to the tournament table and perform the set up. Teams will place their robot(s) within their starting box as desired. Teams may arrange the *Physical Therapy Bins* within their *Fine Motor Task Area,* as long as they are touching the surface and are within the vertical projection of the *Fine Motor Task Area*. Prior to the start of the game, teams may position either or both of the starting lights on their side as they wish, provided:

- Starting lights must be attached to the outside edges of the game board on your side.
- Starting lights may **not** break the vertical projection of the game board (the vertical projection of the PVC may be crossed).
- **Teams cannot touch starting lights after *Hands Off*.**
- There are two starting lights for each team, so each KIPR Link controlled robot can have its own starting light; both lights will turn on and off at the same time and cannot be controlled individually.

Teams will give a friendly nod, wish of good luck, and visually inspect each other's robots **before calibration**. Inspection is limited to a maximum of one (1) minute unless a specific challenge is made. Teams must notify table judges **before the end of "Hands Off"** if they believe the table is not set up properly. When both teams are ready, or judges decide adequate time has been allowed for calibration, each team positions/activates its robots and then -- **Hands Off!**

If the judges feel a team is taking too long to calibrate, they will issue a 30 second warning. At the end of the 30 seconds, if either team is not ready for "Hands Off", that team will be assigned a fault, and the setup clock will be reset. The target setup time (which may be extended at judges' discretion) is 90 seconds.

Before the Game Begins (after "Hands Off")

Once "Hands Off" has been declared, students will stand by their *Starting Box* or kneel/sit around their side of the table. No part of a team's robot(s) may leave the starting box until the round has begun (movement is OK so long as the starting box boundary isn't violated); If this happens, the judges will call a fault on the team. Team members may not move the starting lights any time after

hands off, however robots may. If a team receives a 2nd fault in a round, they forfeit the round. Team members may not signal to their robots after "Hands Off" in any way to start their robots or otherwise.

After "*Hands Off",* but before *"Lights On"*, the judges randomly select (with the assistance of a KIPR Link) the position and orientation of *Botguy* as well as the initial positions of the Orange and Yellow PT Cubes on the shelves. There will be seven (7) marks on the shelves numbered from 1 to 7 on the top shelves and 8 to 14 on the bottom shelves; Each of the marks will be two inches apart and the first will be 1.5" from the outside edge of the shelf, the next at 3.5" (two inches from the first mark) and so on up until 13.5" for the last mark (see the 2014 Game Build Document for more details). The random placement of the two Orange and two Yellow PT Cubes will be done in a way that ensures no two PT cubes will be immediately next to each other (meaning positions 3+4 is not valid but 3+5 is valid for the top shelf). One final item about the PT Cubes is that they will be placed "square" with the "front" edge of the shelves closest to the respective starting boxes.

Timeout Card

Each team will be given a single red Timeout Card, labelled with their team number, when they register at the tournament site. At any time **before** "Hands Off" a team may turn in their timeout card and get a 3 minute timeout. The team may spend that time in the pit or at the table, but not to practice at the table (but may practice the starting sequence). Only a single timeout per team is allowed for the entire tournament. Teams are advised to save their timeout card for the double elimination rounds, since seeding rounds are best 2 out of 3.

After the Game Begins (after Lights on)

Once the starting lights have turned on, the round counts unless a judge rules otherwise. At the start of the game the starting lights turn on and robots are allowed to leave the starting box as soon as the lights turn on.

The round lasts two minutes (120 seconds). The lighting Sequence is:

- 0 seconds: lights turn on; robots can leave start boxes
- 15 seconds: lights turn off
- 115 seconds: Lights blink for five seconds.
- 120 seconds: lights turn off; game over; robots must turn off motors and freeze or power down servos.

Judges may at any time after a game has started, decide that a robot is in violation of construction rules, or that team members are guilty of interference, and then disqualify the team's entry for that round.

End of Game

Robots must **cut power to their motors (including those on the Create) and stop servo motion** by the end of the round or that team will lose the round in all situations except against a team that does not break the boundary of the starting box (in seeding this condition will give a score of 0). Scoring is based on the location of pieces at the end, not how the pieces got there. Scoring takes place when the round has ended and items have come to rest.

If all motion has stopped before 120 seconds, the judges may ask the teams if their robots are done and if so may end the round at that time (both teams must agree). Incidental motion from a servo holding a position under load is OK.

If teams do not agree with a score calculation they must notify the judges **immediately**. Do not be afraid to talk to the judges about your score. Any scoring issues must be addressed while both teams are at the game table. Once both teams agree with the judges' score and a team member from each team initials the score sheet, the score is **final**.

Challenges

Challenges may only come from judges and team members at the table. If either team wants to challenge the validity of the robots they are facing, they have to bring it to the table judges' attention during the inspection period. Teams can bring the list of parts to the table to aid in the inspection. Challenges have to be specific.

Judges are the final arbiters. Judges can dismiss what they believe to be spurious or irrelevant challenges. Teams determined by the judges to be in safety or performance changing violation will be given an appropriate time period by the judges (typically a minute) to remove the offending parts or forfeit that round. A robot that is determined before the beginning of a round to be in a safety or performance changing violation of the construction rules will not be allowed to play while in that state. A robot ruled to be not human-safe will not be allowed to run until modified.

There are no instant replays; we do not want to see videos to question decisions; if a team is unhappy with a judge's decision, they should politely challenge it then and there; **challenges to scoring or robot construction after the teams have left the table will not be considered. Prior to leaving the table teams may request a table judge to fetch the head judge for a final ruling.**

Seeding Rounds

Seeding rounds take place before double elimination. There will be three seeding rounds for each team. In seeding, teams play the game unopposed, but can score on both sides. The Seeding round score is (your side score) + (your score on the other side). Note that seeding scores are the **sum** of the entire board and teams are encouraged to cross sides and use the whole board for scoring during seeding.

Seed scores of less than 0 will be counted as 0, except when a team passes on a round, in which case their score will be -1 for the round. A team's Seed Score is the average of their best two seeding

rounds. The table side used by a team for a seeding round (the side from which the robots will start) is determined when teams are called to be on deck for their next round.

Double Elimination

A team is out of the double elimination tournament when it has lost two games. Initial matches are decided by KIPR tournament software using seeding round scores. Matches and table sides during a tournament are determined as the tournament progresses using KIPR tournament software. The two teams for a match play each other and the highest score at the end of the game wins subject to tie-breakers and special scoring conditions. Double elimination scores do not affect ranking, only wins and losses.

Alliance Matches

Alliance Logistics

At selected tournaments, if a team is eliminated from the Double Elimination tournament before the Finals of Double Elimination play, that team may sign up to play in Alliance Matches. Alliance Matches will pair up two teams to play the game collaboratively with the goal of scoring the most points. Each team will bring one robot to the table to run simultaneously. The teams will place their robots in any of the starting boxes (i.e. both on the same side or split between the two sides).

Alliance Scoring

Alliance rounds will follow all of the same scoring rules as a regular Botball round. The total Alliance score is (Your side score) + (Ally's side score). The Alliance team with the highest combined score from a single run will win the Alliance Tournament. Alliance matches will be conducted until tournament officials suspend play (usually when the final double elimination rounds are reached).

Construction Rules

The official construction rules for the 2014 Game consist of this 2014 Botball Game Review document **and** any updated game rules on the Team Home Base. Posts on the 2014 Team Home Base in the Game Rules Question area will be used to update the document.

Kit Rules

1. Robots may be constructed out of any or all of this year's kit parts except: the boxes, bags, wrapping or packing material, the chargers, download cables (including the white iRobot Create cable), wrenches, screwdriver and color stickers. Materials supplied at the workshop for creating your game board (e.g., Botguy, poms, etc) are not part of the kit and cannot be used on your entry. The included cameras are the only USB devices that may be plugged into a robot during the game.

2. Twelve square inches of UGlu have been supplied in the kit and additional UGlu may be used as desired (at team's expense). It may only be used for construction purposes; it may not be exposed for sticking things otherwise in any manner. *In particular, this means you may **not** use UGlu to contact the game board, game elements, or the other team's entry.* **Note that neither hot melt glue nor any other adhesives, other than UGlu, are allowed in robot construction.**

   – Spare UGlu may be purchased through the Botball Store or the retailers listed at:

     http://www.ugluit.com/index.php?id=73

3. Judges may require excessive UGlu to be removed. You should always try to come up with a mechanical means for construction and only resort to UGlu as a last resort!

4. Supplied servo accessories such as grommets, screws, etc may only be used to mount pieces to the servo horn.

5. Servos and motors may be mounted to structural pieces using the supplied machine screws.

6. You may trim the connector potting material as needed to ease insertion or mounting of sensors. Damaged pieces will be replaced at teams expense.

7. Servo horns may be trimmed as desired. Damaged pieces will be replaced at teams expense.

8. Extra pieces you may add to your entry are:

   a. Up to 100cm of thread or line or cable (maximum diameter 1mm) may be used as desired except for offensive measures such as entanglement and entrapment.

   b. Paper (maximum 20#) so long as the amount can be taken from a single standard letter sized or A4 sized sheet.

c. Standard ¼" thick foam board as long as the amount can be taken from a standard 8.5" X 11" or A4 footprint.

d. Up to 10 standard office rubber bands of maximum size #19 may be used (#19 is 3.5" x 1/16" x 1/32").

8. If your entry uses paper and/or foam core board, you MUST bring a template showing how the material you are using was cut out of **each** 8.5 X 11 inch (or A4) sheet. The paper/ foam core board may only be held in place through the use of other kit parts (including UGlu). **Paper and foam core board may only be black or white; only gray scale may be used for printing including official logos for sponsors of your team. Teams may print QR codes on their paper.**

10. Rubber bands may not be glued or melted. Rubber bands may be cut, but only a total of ten rubber bands or five pieces of rubber band (or any combination therein) may be used on a single entry.

11. Soda straws, paper, electrical tape and/or foil may be used as light guides for sensors (light guides may be shielded by using tape, but not in a fashion that is for structural purposes or for manipulation). Light guide materials are in addition to the allowable parts.

12. **Teams are not allowed to shield robot sensors from outside of their official entry (i.e., teams are not allowed to stand between their robots and the audience to keep the robots from sensing the audience). Teams should orient and calibrate the sensors on their robot appropriately so that this is not an issue.**

13. You are limited to ten (10) 4" white zip ties (included in the kit), and they may be used for any purpose. You may replace damaged ties with ones of equivalent size (black or white).

14. Lego parts cannot be physically modified.

15. Metal parts may NOT be cut, or broken to a smaller size. Straps and plates may be bent if desired.

    – Warning: KIPR will not provide replacements for metal parts that have been altered or damaged. Replacements may be purchased from the Botball Store.

16. Optional Create parts are the rear wheel, the drive wheel clips, and the rear cargo bay wall. These parts may be used as desired as kit parts. The rear cargo bay wall may be removed, disassembled and loaded with standard pennies for added weight, in which case it must be re-installed on the Create. The Create may not be assembled/disassembled otherwise. The green battery box may only be used as a substitute battery.

17. Teams are limited to the number and size screws as follows: eight - #6 silver screws (packed with the Create), 25 - #8-32 quarter inch, 50 - #8-32 half inch, and 40 - #8-32 three-quarter inch

screws. All #8-32 screws are black. There are 10 silver M3 x 14mm screws and six silver M3 nuts.

- Only the #6 machine screws should be used in the mounting holes on the Create.

Robot Logistics

18. Each robot must have a name (G rated) approved by an adult team leader before the tournament.

19. Multiple processors (such as two Links) may exist on a single robot.

20. It is not necessary to use all the parts in a kit.

21. The starting box is 36" x 15" x 15"

    - The starting box boundaries are given by the **interior edge** of the PVC and **interior edge** of the tape and pencil lines that delineates it.
    - The starting box extends vertically **15 inches (38cm)**

22. **All elements (game elements, multiple robots and other structures) being used by a team for a round must be within the volume of the starting box at game start**

    - After game start, robots are allowed to expand in size.
    - Starting light sensors should be shielded as demonstrated in the workshop slides and neither sensor nor shielding may extend outside the starting box
    - Game elements specified for the starting box must be placed in the starting box whether or not a robot is intended to manipulate them

23. All Independent structures should be clearly marked with the team's number. Maximum label size is 1" diameter (Avery #5410), or you may use permanent marker directly on the structure. Teams may only run robots with their team number on them.

24. Robot teams can have a maximum of 4 independent structures on the field at a time

    - All components together must fit in the starting box **without any external restraint** (the starting box floor and border PVC is not an external restraint) at game start.
    - Each structure must be large enough so that it does not, in the judge's opinion, constitute a jamming or entanglement hazard.
    - Examples of structures include: robots, barricades, detachable baskets, etc.
    - A team's entry can contain as many robots up to the structures limit that can be constructed from the parts in a single kit.
    - Items intentionally ejected from a robot count (judges judge intention); there are special rules regarding projectiles, discussed later.

25. No electrical modifications may be made to any Link, the Create, any sensors or any motors, except you may substitute a different battery in the Create (i.e., the green battery pack filled with alkaline batteries – an expensive alternative!)

26. No wire extensions may be used except those provided in the kit (foil may **not** be used as wire!)

Safety

27. Human & Robot Safety:

    - No untethered robot launched projectiles, other than LEGO balls and game pieces are allowed
    - No tethered projectiles containing metal pieces are allowed
    - No metal pieces are to be used in effectors that move or rotate at high speed
    - No metal protrusions are to be used that are likely to cause electrical short risks for other robots
    - Judges will judge safety. Teams may alert judges to a potential safety or entanglement hazard, but judges will interpret whether or not a robot is safe, needs to be modified, or is not allowed to run.

28. 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. NOTE: tape still may not be used structurally.

29. If a robot is not considered safe, as decided by the Head Judge, then the robot will not be allowed to run until it has been modified.

External Communication

30. No external communications (e.g., IR, blue-tooth, wireless, or semaphores) may be used during tournament play:

    - The serial cables & chargers may not be used during tournament play
    - Non-radio communications among the robots forming your team's entry is allowed
    - Teams found in violation of this rule may be removed from the tournament
    - KIPR Links must have the Wi-Fi turned off to ensure there is no question about external communication coming into play – see the workshop slides for instructions on how to ensure this is done before coming up to the table.

Overall Winner Calculations

A team's overall score is calculated as the sum of their Seeding, Double Elimination, and Documentation scores. The overall score is between 0 and 3.

Documentation Scoring Formula

$$\text{Doc Score} = \frac{3}{10}(\text{Period 1 Doc \%}) + \frac{3}{10}(\text{Period 2 Doc \%}) + \frac{1}{10}(\text{Period 3 Doc \%}) + \frac{3}{10}(\text{Onsite Doc \%})$$

Seeding Scoring Formula

$$\text{Seed Score} = \frac{3}{4}\left(\frac{n - \text{Seed Rank} + 1}{n}\right) + \frac{1}{4}\left(\frac{\text{Team Average Seed Score}}{\text{Max Tournament Seed Score}}\right)$$

Double Elimination Scoring Formula

$$\text{Double Elimination Score} = \left(\frac{n - \text{DE Rank} + 1}{n}\right)$$

Note: For all formulas *n* = Number of Teams at Tournament