

Antbotica[®] Rules of Competition

Updated 8/1/2007

1. Overview

Antbotica is a multi-phase competition for small remotely operated robots that emphasizes speed, control, and power. Competitors will challenge each other across multiple arenas that will test the robot and challenge the operator with constantly changing choices of strategy and tactics.

The safety of competitors and spectators is of primary concern in the operation of the event. Robots must pass technical and safety inspections prior to any attempt to qualify and compete. The event marshal may remove a robot from competition at any time based on safety concerns. Decisions of the event marshal concerning the ability of the robots to compete safely are final.

2. Tournament Structure

2.1 Qualifying and Pairing

2.1.1 – Competitor robots will compete in assigned pairs for the first three games. Pairings are based on rankings determined thru qualifying trials.

2.1.1.1 – The qualifying trials will take place on the Shuttle Race field (see Appendix 'C'). Six pyramid stacks of six one-inch wooden blocks (3-2-1) are on the field – 10" in from each side on both goal lines and the center line. The stack closest to the blue square and to the right as viewed from the red square will be topped with a red block.

2.1.1.2 – Each robot begins the qualifying trial from within the red starting square. The robot has one minute to knock the block stacks down to one-block high. The stack with the red block on top must be attacked first. A two-point penalty will be assessed if blocks from any other stack fall before the red block falls. Each stack knocked down scores two points.

2.1.1.3 – If time remains following the demolition of the last stack, the event marshal will place a hockey puck in the center of the field. Pushing the puck into either goal zone scores an additional three points.

2.1.2 – If multiple robots complete the entire trial, the total time to complete is the tie breaker. If remaining ties involve the last-qualifying position in an odd-numbered field of competitors, a showdown will be held with the tied robots – first robot off is eliminated. Any remaining ties will be broken by random draw.

2.1.3 – If there are an odd number of competitors, the robot with the lowest qualifying score will be eliminated, but may be called upon as an alternate. Remaining robots will be paired as follows:

- 1st qualifier – last qualifier
- 2nd qualifier – next-to-last qualifier
- ...

2.2 Advancement

2.2.1 – Pairs of robots will compete against each other in three preliminary games: Shuttle Race, Scramble, and Pushover. Following the preliminary games, the robot from each pairing with the lesser number of points is moved into the reserve pool and the robot with the greater number of points will move on to face another 'points leading' robot in the fourth 'showdown' game.

2.2.2 – Should a pair of robots each have the same number of points the tie will be broken based on the number of preliminary games won. Should the tie still be unresolved, a ‘Showdown’ will be held between the tied robots to see who moves on. If there are empty slots available in the ‘Showdown’ game round, robots from the reserve pool shall be called up to fill them – highest point total robots first.

2.2.3 – If four or more winning robots remain following the first round ‘Showdown’ round, the four–game process will be repeated to produce a single champion. If three or two robots remain, a second ‘Showdown’ round will determine the champion. A sample tournament tree for 12 robots is shown in the appendix to this rule set.

3. Individual Games

3.1 Shuttle Race

3.1.1 – Two robots start on opposite ends of the 4’ by 8’ Shuttle Race field (Appendix ‘C’) within their ‘goal zone’. A puck¹ is in a marked area in the center of the field. Points may be scored in two ways:

- The robot may traverse the length of the field and touch the end-board at the back of their opponent’s ‘goal zone’ for 5 points. The robot may then return to their ‘goal zone’ and touch the end-board for another 5 points. This may be repeated to a maximum of 100 points.
- Should any part of the ‘puck’ be within a player’s ‘goal zone’ at the end of the game, the opponent will be given 20 points. The line designating the goal zone is placed 8” from the end-board and is considered a part of the goal zone.

3.1.2 – A puck that leaves the playing field will be retrieved and replaced at its starting place in the center of the field by the event marshal. The clock will not be stopped while this takes place.

3.1.3 – The game is over when either robot scores 100 ‘end-board’ points, or 2 minutes have elapsed. Maximum points for the game: 120.

3.2 Scramble

3.2.1 – Two robots roam the 4’ by 8’ Scramble field (Appendix ‘D’) attempting to conquer six obstacles and return to their starting square within the allowed time.

3.2.2 – Choice of the two starting squares will be given to the robot entering this game with the greater number of points. Should point totals be tied, a coin flip will determine the choice of starting square.

3.2.3 – Obstacles have variable point values assigned based on difficulty. Obstacles may be attempted in any order by either robot. Every obstacle may be completed by both robots for points² and each robot may collect points for a given obstacle only once per game. Robots may enter either end of obstacles³. Obstacles may have as much as a 1/8” raised lip at the entrance and exit.

3.2.4 – Points are awarded only to a robot that passes completely thru the obstacle – entering and exiting thru different openings – within the allotted time.

3.2.5 – Obstacles on the playground are:

¹ The puck is a regulation hockey puck or a similar item as approved by the event marshal.

² See ‘Walls of Lasagna’ for an exception.

³ See ‘Push Box’ for an exception.

- **Walls of Lasagna** (15 points): two sheets of uncooked lasagna noodles are supported on each end with approximately four inches between the sheets. Two 'Walls of Lasagna' are available – one near each starting square. Either robot may attempt to crash thru either set of walls, but will only score points for the first set they complete. A robot may complete both sets of walls to prevent their opponent from scoring those points.
- **Speed Bumps** (15 points): a series of raised bumps, rectangular in cross-section and measuring approximately 1/2" in width by 5/16" high are spaced on 2" centers.
- **Turntable Bridge** (15 points): a section of the bridge roadway rotates on a turntable at approximately 6 RPM. The central portion of the bridge is approximately 4" high and the rotating section is approximately 12" in diameter.
- **Push Box** (15 points): a box blocks the side exit to a corridor. The box is centered along the length of the corridor at the start of the round. Each robot must enter through the color-coded entrance that matches their starting square color and must exit via the side corridor exit. Restraints prevent the box from being pushed out of the corridor.
- **Robot Fishing** (20 points): an overhead array suspends an assortment of fishing tackle on lines. Lead weights, lures, bobbers, hooks, and other related items hang in the air or trail on the bumpy sea floor. Pick your way thru without getting hooked.
- **The Pit** (20 points): a raised pit approximately 1/2 inch deep filled with hulled millet seed. Ramps lead up to the pit entrances from the outside, but no assistance is provided in climbing back out.

3.2.6 – After scoring all available obstacle points a robot may, if time permits, return to its starting position square to end the game and earn an additional 20 points. There is a 3 minute time limit for the event. Maximum points for the game: 120.

3.3 Pushover

3.3.1 – Two robots compete to push objects of various sizes off the edge of the Pushover field (Appendix 'E'). The field consists of two 4' by 4' areas separated by a 2" tall wall. There are no walls around the outside edge of the field. Each area has four sets of objects which must be pushed over the edge of the area to fall onto the ground below to score. The objects are:

- A '3-2-1' stack of 6 small wooden blocks (~1 inch each – all must fall to score);
- Four AA batteries, standing on end in a group (all must fall to score);
- An apple; and
- A '1-1-1' stack of three 6 oz. tuna cans (all must fall to score).

3.3.2 – The objects may be dealt with in any order. Each object or complete group of objects pushed off the field and falling scores 20 points.

3.3.3 – Robots must remain in their own side of the field during the first game stage. If a robot crosses the center barrier into the opponent's area during the first stage it must be removed and placed back in the start square in its own area. The event marshal may stop the game and the event clock to return a robot to the correct side of the field.

3.3.4 – Once either robot clears all objects from its area, a signal will sound and both robots may move to the second stage of the game⁴. A large can sits in a gap in the wall separating the two areas

⁴ A robot may continue scoring points by clearing objects from their area during the second stage of the game if they wish, but all scoring ends when the large can is pushed clear of the painted square.

of the field. If either robot can push the can out of the painted square in which it sits and into their opponent's area, they will earn 40 points for the can and the match will end.

3.3.5 – The large can may not be moved prior to the second game stage. The can will be returned to its starting place by the event marshal if prematurely displaced.

3.3.6 – The game ends when the large can is pushed clear of the painted square or at the end of the time limit (2 minutes). Maximum points for the game: 120.

3.4 Showdown

3.4.1 – At the end of the three preliminary games the higher scoring robot from each pair will move on to meet another winner from another pair in the Showdown arena (Appendix 'F')⁵. The arena is 4 feet square with truncated corners and is surrounded by a boundary wall 2" in height. The boundary wall is cut away for a distance of 8" from each corner of the arena, leaving a gap. Robots will start in painted squares at the centers of non-adjacent walls.

3.4.2 – The last robot remaining in the arena wins. Robots may be pushed thru the corner gaps or may be ejected over the arena boundary walls. A robot may also lose the match if it is declared immobile by the event marshal, even if the other robot is unable to push the immobile robot from the arena.

3.4.3 – Should both robots be unable to display translational motion, the event marshal may allow a repair period of specified length. The repair period may be repeated until at least one robot can display translational motion at which time the match will resume with the robots in the positions they occupied at the time the match was halted.

3.4.4 – There is no specific time limit for this game. Should the game take an unreasonable length of time the event marshal may take action to resolve the apparent stalemate.

4. General event rules

4.1 – Except where specifically noted above, robots may interact and attempt to slow or block their opponent from scoring points. Robots may not, however, hold an opponent pinned to the sides or ends of the field or to objects within the field. Failure to release a volitional pin when requested by the event marshal may incur penalties including disqualification from the game or match.

4.2 – Robots becoming entwined with each other and mutually incapable of freeing themselves may result in a stoppage of the event clock while the event marshal frees and replaces the robots on the field as close to their last positions as practical.

4.3 – Should a robot fall or be thrown out of the field, the operator⁶ may, with exceptions, return the robot to the field. The clock will not be stopped while this takes place. The place on the field where the robot may be replaced and the penalty for the replacement depends upon the game:

- Shuttle Race: the robot may be replaced within the 'goal zone' the robot last occupied as soon as it is retrieved without additional penalty.
- Scramble: the robot may be replaced within the 'start square' the robot initially occupied as soon as it is retrieved without additional penalty *unless the robot has completed all of the available goals* – in which case the game ends when the robot leaves the field.

⁵ Tournament trees for some small numbers of competitors call for three robots to meet in the showdown arena. The third robot will start at the center of one of the remaining walls.

⁶ A robot operator may, prior to the start of the match, designate someone to retrieve their robot for them if there are factors that restrict the ability of the operator to retrieve their own robot. Consult the event marshal.

- Pushover: the robot may be replaced within the 'start square' the robot initially occupied, but there is a 20 point penalty for doing so.
- Showdown: the event ends when a robot leaves the field.

4.4 – Failure of arena apparatus will be dealt with at the discretion of the event marshal. Failures or blockages caused by robot actions do not automatically call for stoppage of the event.

4.5 – Withstanding the above exceptions, no one is allowed to touch or otherwise physically influence the robots or the game field while a game is in progress. Touching your own robot to assist it while it is on the game field will result in a 20 point penalty for each infraction. Touching your opponent's robot is grounds for disqualification.

5. Robot design and function

5.1 – The safety of drivers and spectators are of primary concern in the design and operation of robots at this event. Specific safety exclusions are listed below, but any robot determined to be unsafe by the event marshal shall be prohibited from competition. A determination of unsafe condition may be made at any time. Decisions of the event marshal concerning safety are final.

5.2 – Robots will be constructed to conform to the Antbotica Technical Regulations – attached as Appendix A.

6. General

6.1 – Drawings of the playing fields are concept drawings only. Actual playing field layout and dimensions are subject to nominal variation.

6.2 – Antbotica[®] is a trademark held by Mark Joerger.

6.3 – The Antbotica[®] rules are copyright 2004, 2005, 2007 by Mark Joerger.

7. Appendices

Appendix A: Antbotica Technical Regulations

Appendix B: Sample tournament tree for 12 competitors

Appendix C: Shuttle Race Arena Diagram

Appendix D: Antbotica Scramble Arena Diagram

Appendix E: Antbotica Pushover Arena Diagram

Appendix F: Antbotica Showdown Arena Diagram

Appendix A:

Antbotica Technical Regulations

Updated 8/1/2007

(Derived from the Robot Fighting League rule set)

1. General

- 1.1. All participants build and operate robots at their own risk. Combat robotics is inherently dangerous and no amount of regulation can encompass all the dangers involved. Please take care to not hurt yourself or others when building, testing and competing.
- 1.2. If you have a robot or weapon design that does not fit within the categories set forth in these rules or is in some way ambiguous or borderline, please contact the event organizer. Safe innovation is encouraged, but surprising the event staff with an unanticipated design may cause your robot to be disqualified before it ever competes.
- 1.3. Compliance with all event rules is mandatory. It is expected that competitors stay within the rules and procedures of their own accord and do not require constant policing.
- 1.4. The safety of the participants and event audience is paramount. It is at the sole discretion of the event organizer that your robot is allowed to compete. As a builder you are obligated to disclose all operating principles and potential dangers to the inspection staff.
- 1.5. Cardinal Safety Rules: Failure to comply with any of the following rules could result in expulsion.
 - 1.5.1. Radios may not be turned on at or near events for any purpose without obtaining the appropriate frequency clip or explicit permission from the event.
 - 1.5.2. Proper activation and deactivation of robots is critical. Robots must only be activated in the arena, testing areas, or with expressed consent of the event and its safety officials.
 - 1.5.3. It is expected that all builders will follow basic safety practices during work on the robot at your pit station. Please be alert and aware of your pit neighbors and people passing by.

2. Weight and Size

- 2.1. Antbotica is restricted to robots weighing no more than one pound. There is no weight bonus for non-wheeled (walking) robots.
 - 2.1.1. The one pound maximum weight of the robot includes any and all different components you may wish to add or swap out during the competition.

Example: if you have different front wedges for different games, the total weight of the robot and all wedges cannot exceed one pound, even though no single robot configuration uses more than one wedge.
 - 2.1.2. Components that are damaged may be replaced by essentially identical components without having the replacements included in the initial weighing.
- 2.2. Robots must fit entirely within an eight-inch square at the start of a match, ready to compete. Note that eight inches is also the minimum width and height of

passageways within the games; a full eight-inch wide robot will have difficulty negotiating some game elements.

- 2.3. Robot length may extend to a maximum of 12 inches thru active or passive deployment of weaponry or structures. Robot width may not extend beyond 8 inches.

3. Mobility

- 3.1. All robots must have easily visible and controlled mobility in order to compete.
 - 3.1.1. Ground effect air cushions (hovercraft) are not allowed.
 - 3.1.2. Jumping and hopping is allowed, provided that the robot is not considered a danger to operators or the audience.
 - 3.1.3. Flying is not allowed.

4. Robot control requirements

- 4.1. Tele-operated robots must be radio controlled, or use an approved custom system as described in 4.4.5. Radio controlled robots must use approved ground frequencies - 27/49/50/53/75/900/2400 MHz.
- 4.2. Tethered control is not allowed.
- 4.3. Pre-1991 non-narrow band radio systems are not allowed.
- 4.4. Radio system restrictions:
 - 4.4.1. Radio fail-safe systems are not required for drive or weapon controls.
 - 4.4.2. All robot radio systems are encouraged have a way to change frequencies or coded channels to prevent radio conflicts. Having at least two frequencies or coded channels available is recommended.
 - 4.4.3. Toy radio systems are allowed.
 - 4.4.4. RC systems on the AM band are allowed.
- 4.5. There are not reserved frequencies/channels for testing and safety.
- 4.6. If you are using a home built control system, or a control system not covered here, you must first clear it with the event organizer.

5. Autonomous/Semi-Autonomous Robots

- 5.1. Any robot that moves, seeks a target, or engages an active weapon without human control is considered autonomous.
- 5.2. Autonomous robots must have a clearly visible light for each autonomous sub-system that indicates whether or not it is in autonomous mode, separate from any power or radio indicator lights used.
- 5.3. A demonstration of arming, safe operation, and disarming of autonomous systems will be required during safety inspections.

6. Batteries and Power

- 6.1. The only permitted batteries are those that cannot spill or spray any of their contents when damaged or inverted. This means that standard automotive and motorcycle wet cell batteries are prohibited. Examples of batteries that are permitted: gel cells, Hawkers, NiCads, NiMH, dry cells, AGM, LiIon, LiPoly, etc.
- 6.2. All onboard nominal voltages above 48 volts require prior approval.

- 6.3. All electrical power to weapons and drive systems must have a manual disconnect that can be activated within 15 seconds without endangering the person turning it off. Relays may be used to control power, but there must also be a mechanical disconnect.
- 6.4. Reasonable effort must be made to protect battery terminals from a direct short and causing a battery fire.
- 6.5. All Robots are encouraged to have a light easily visible from the outside of the robot that shows its main power is activated.

7. Pneumatics

- 7.1. Pneumatic systems on board the robot must only employ non-flammable, non-reactive gases.
- 7.2. Robots must have a safe way of refilling the system and determining the on board pressure.
- 7.3. The maximum actuation pressure is 100 PSI. Some systems may be exempted at the event organizers' discretion.
- 7.4. All components must be used within the specifications provided by the manufacturer or supplier. If the specifications aren't available or are not applicable to the situation, the event organizer will determine if the component is being used in a sufficiently safe manner.
- 7.5. Pneumatic systems energetic enough to present a hazard to the operators or audience will be disallowed at the sole discretion of the event organizer. See section 10.3.

8. Hydraulics

- 8.1. Contact the event organizer for pre-approval of any hydraulic system.

9. Internal Combustion Engines

- 9.1. Internal combustion engines are not allowed for any purpose.

10. Forbidden Weapons and Materials

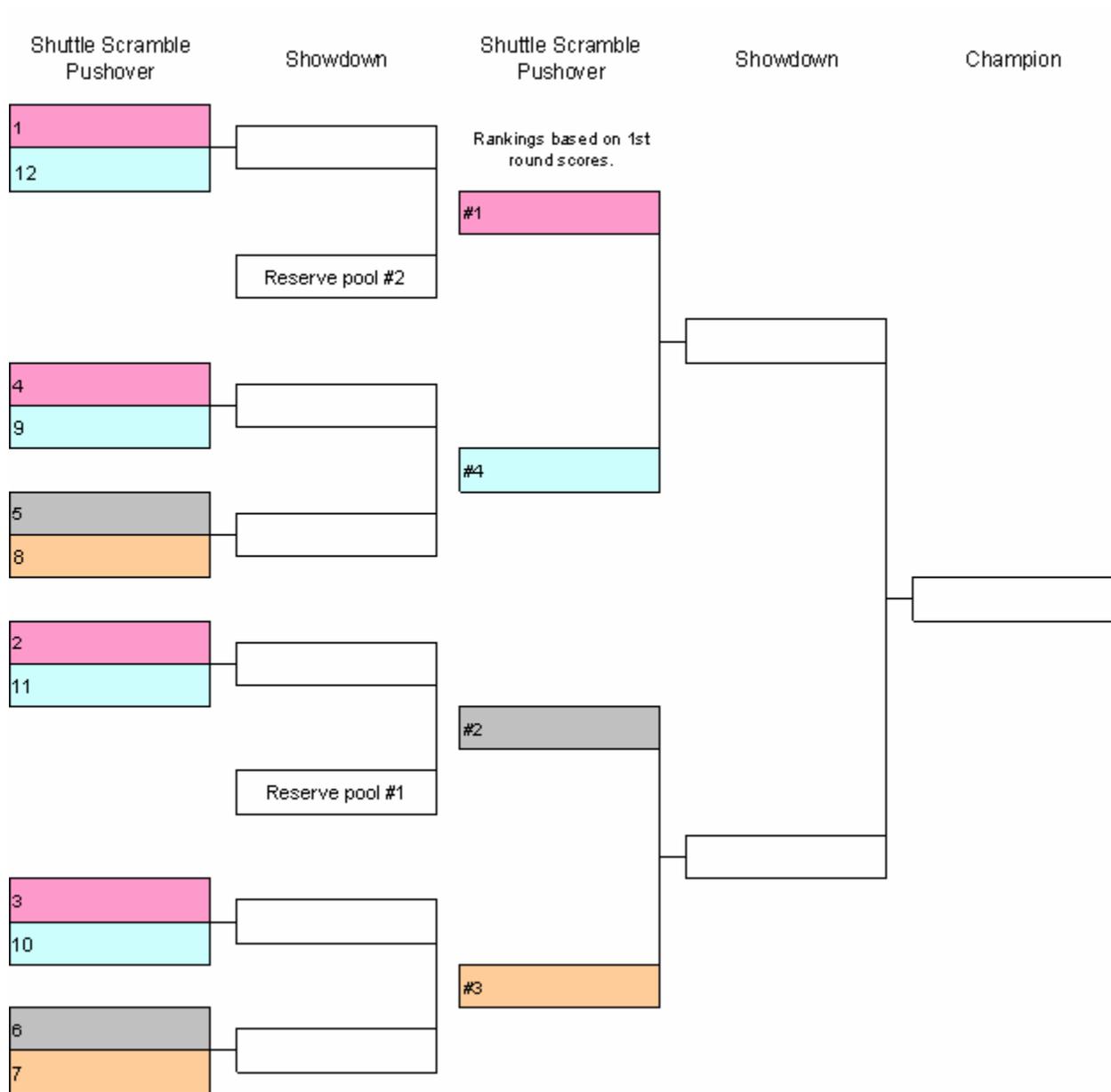
- 10.1. Weapons designed to cause invisible damage to the other robot are not allowed. These include but are not limited to:
 - 10.1.1. Electrical discharge weapons.
 - 10.1.2. RF jamming equipment
 - 10.1.3. EMF fields from permanent or electro-magnets that affect another robot's electronics.
- 10.2. Weapons that require significant cleanup, or are likely to damage the arena and require repair for further matches are not allowed. These include but are not limited to:
 - 10.2.1. Liquid weapons. Additionally a robot may not have liquid that can spill out when the robot is superficially damaged.
 - 10.2.2. Foams and liquefied gasses
 - 10.2.3. Powders, sand, ball bearings and other dry chaff weapons
- 10.3. Weapons that pose a threat to the operators or audience are not allowed. These include but are not limited to:

- 10.3.1. Projectiles – free or tethered.
- 10.3.2. Flipping weapons capable of throwing objects more than two feet from the arena.
- 10.3.3. Rotational weapons or full body spinning weapons. Slowly rotating devices (< 120 RPM) for self-righting, lifting, or object manipulation are allowed.
- 10.3.4. Heat and fire weapons including open flames, flammable liquids or gases, explosives, or flammable solids.
- 10.3.5. High speed spring-powered weapons. Small springs used within switches or other small internal operations are exempt.
- 10.4. Caustic, poisonous, or otherwise biologically hazardous materials are not allowed for use anywhere on a robot where they may directly contact humans under the expected conditions of the competition. Contact the event organizer if you have a question.

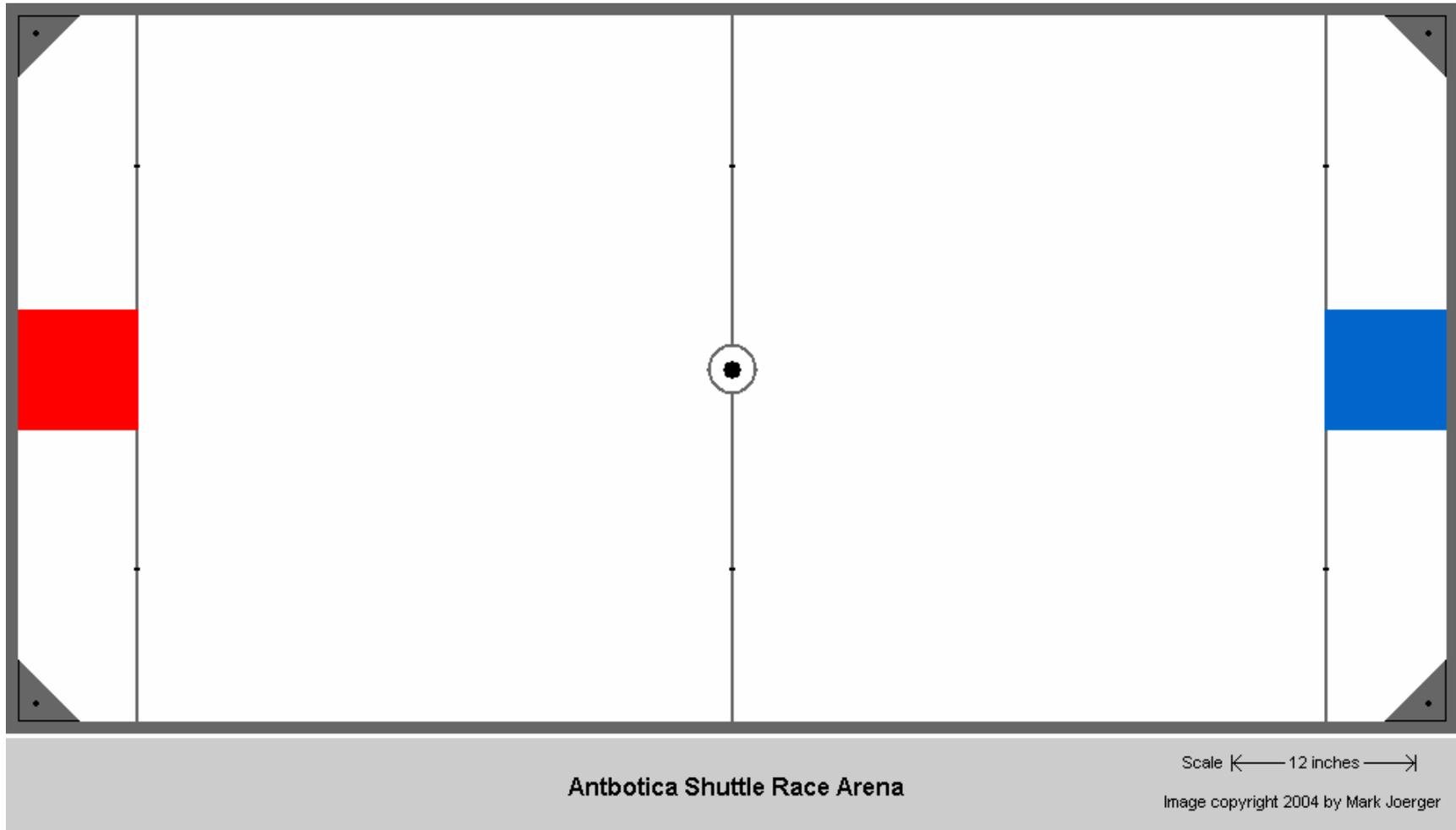
11. Specific weapons and designs

- 11.1. Sticky adhesive-based entanglement weapons are not allowed.
 - 11.2. Net or fiber-based entanglement weapons are allowed provided they are not deployed as projectiles.
 - 11.3. Light and smoke based weapons that impair the viewing of robots by an operator or official are not allowed.
 - 11.4. Devices that may impair the viewing of robots by engulfing or 'smothering' the opposing robot with a physical barrier are allowed.
 - 11.5. Multi-bots are not allowed: robots may not either start as or split into two or more independently mobile and/or controllable parts.
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Appendix B: Sample tournament tree for 12 competitors

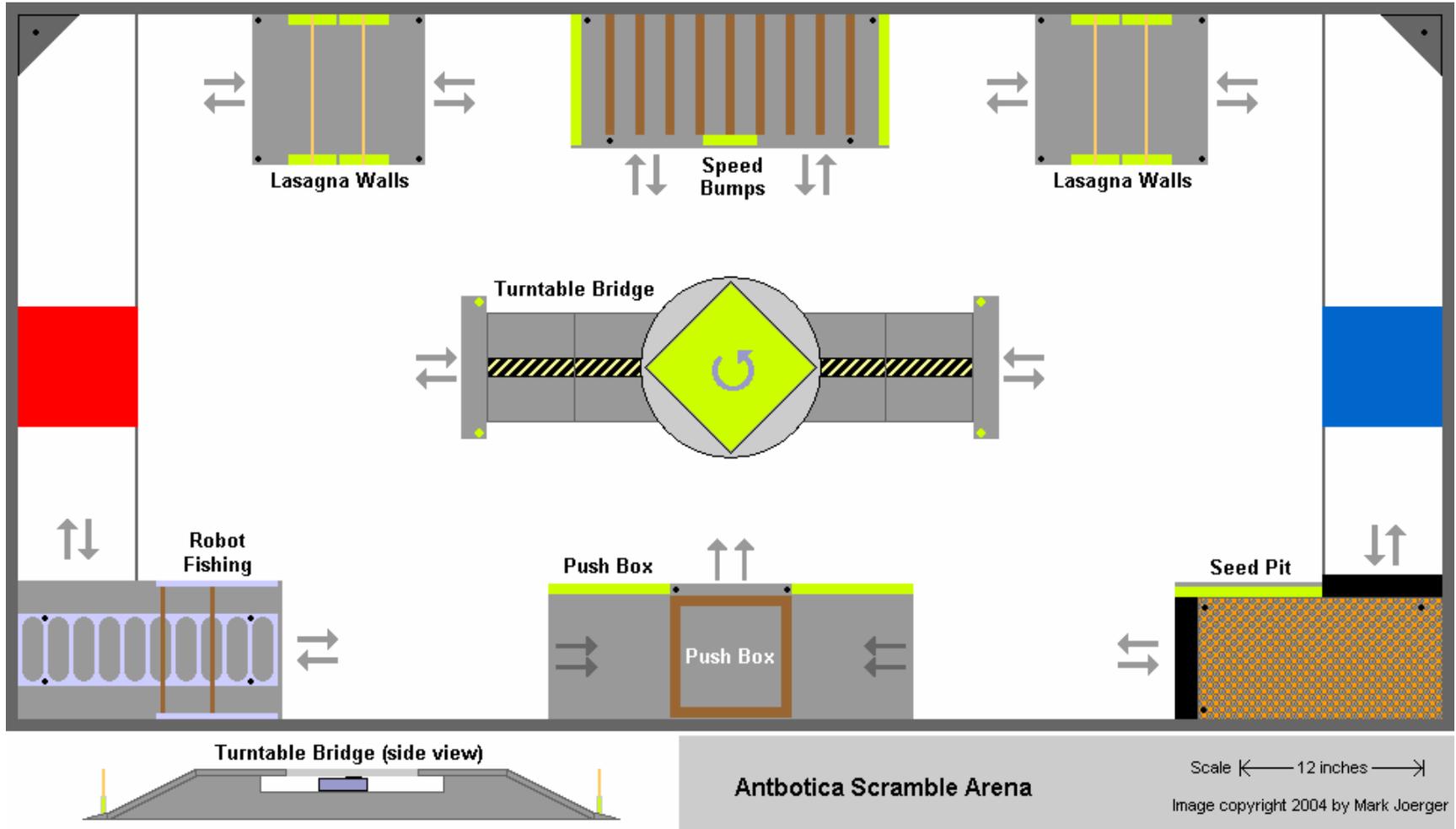


Appendix C: Shuttle Race Arena



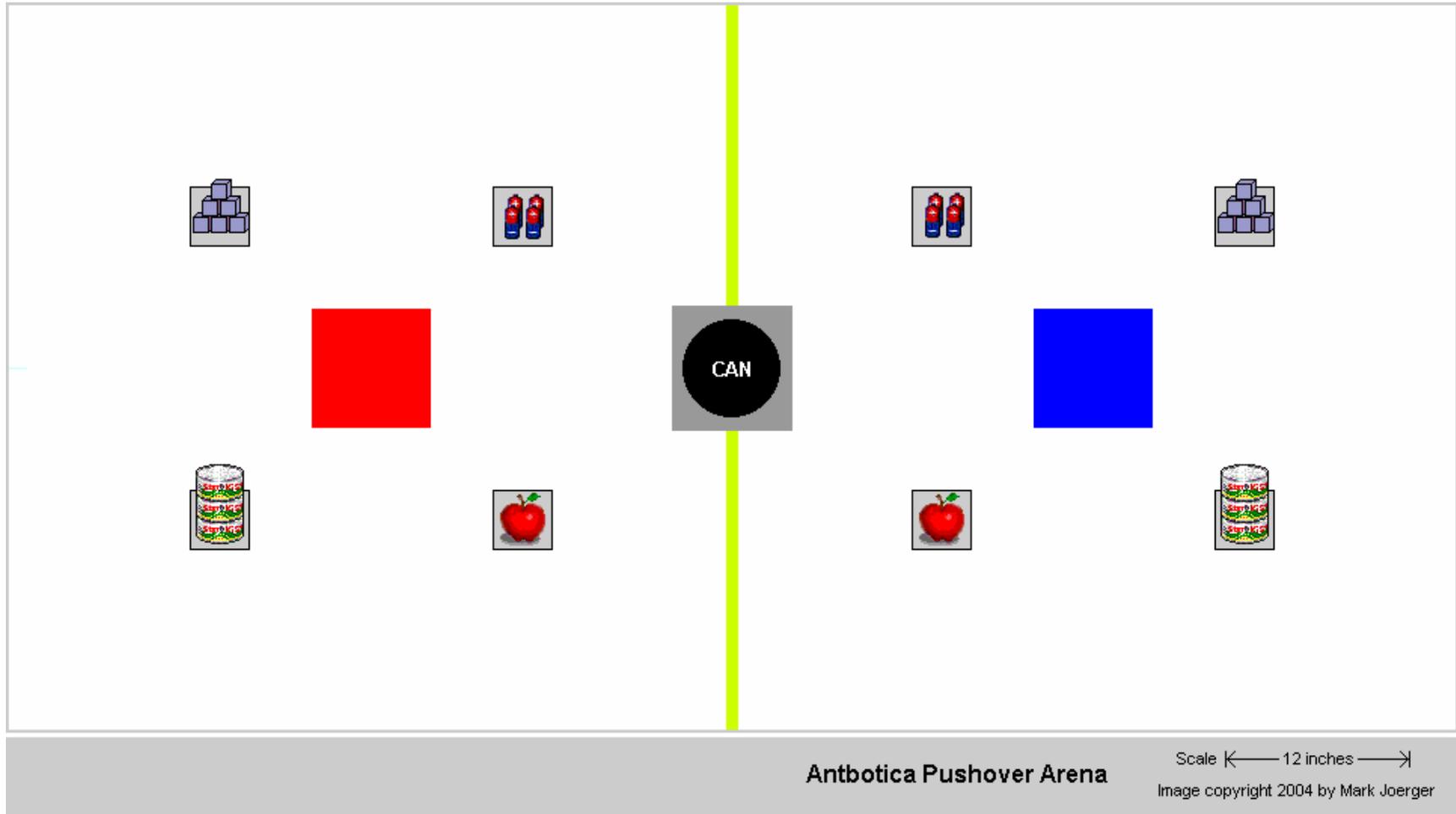
Appendix 'C' – Shuttle Race Arena Diagram

Appendix D: Antbotica Scramble Arena



Appendix 'D' – Scramble Arena Diagram

Appendix E: Antbotica Pushover Arena



Appendix 'E' – Pushover Arena Diagram

Appendix F: Antbotica Showdown Arena

