

**5TH ANNUAL
LIGHTNING ROBOTICS
SUMO BOT COMPETITION**

May 9th, 2009
Kickoff March 18th, 2009

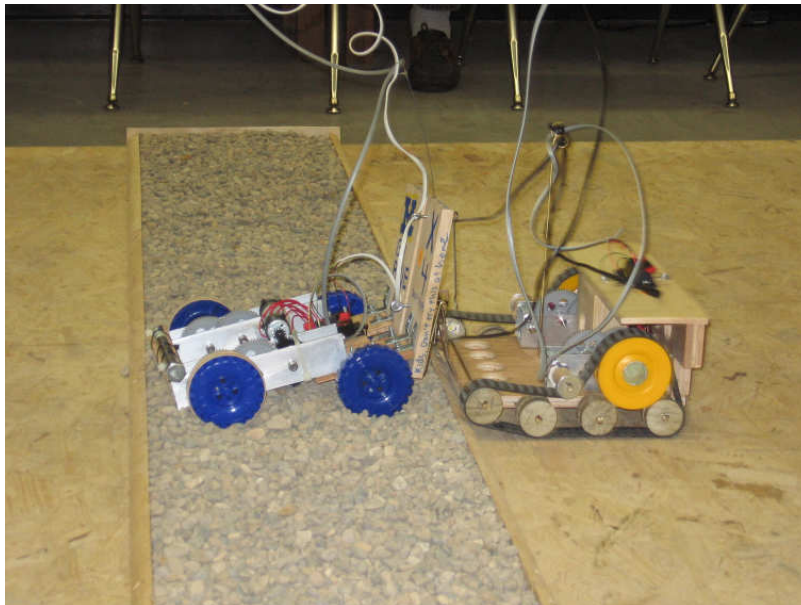


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Revisions

Rev. A -- 3/18/2009 Initial Release

Highlighted parts are new additions to the rules
~~Lined-Out~~ parts are no longer a part of the rules

Sumo Arena Description

Arena Floor. The Sumo Arena Floor measures 8 feet by 7 feet 11 inches and is made of two 4 foot x 8 foot sheets of 23/32 inch thick particle board. The divide between the two field halves will be covered with a single strip of black duct tape. The two sheets are framed underneath along all four sides by 2x4s. The two floor halves are held together by five 4 inch long .5 inch thick bolts. The Sumo Arena Floor sits on the floor of the competition venue.

Wire Tower. The Sumo Arena Wire Tower is made of 1 inch PVC pipe. Four vertical poles stand in the corners; these poles mount to the Sumo Area Floor through 4 end caps which are bolted to the floor 2 inches square from the corners by ¼ inch thick bolts. The vertical poles end in 90 degree elbows. 4 horizontal poles run from the elbows to a central 4-way connector above the center of the field. On these horizontal poles a 2" binder ring will hang roughly every 16 and 1/8 inches (three per pole), these will be used to hold the wires above the field. The Wire Tower structure stands about 4.5 feet above the Sumo Arena Floor.

Playing Field. The 2009 LRSBC playing field is composed of four corner assemblies. Two foot long sections of 2x4 lumber are mitered together to create a two foot square box in each corner Called the Barrier Wall. These boxes will be double stacked so they create three inch tall barriers. Each side of a corner box will hold a two foot tall piece of two inch Schedule 40 PVC pipe, called the Ball Tower, each Ball Tower and its corresponding Barrier Wall will be painted either Orange or Blue. Atop each Ball Tower an orange or blue ball called Life Balls, will be placed. The area inside of each Barrier Wall is called the Dead Zone. There will be a total of four Orange and four blue Ball Towers and Life Balls. They will be alternating so when you look at the playing field from and of the four sides the closest Ball Towers will be as follows Orange to your left Blue to your right. Starting Boxes will be fifteen inches square, centered along each eight foot side of the field, they will have either a Blue or Orange strip of Duct Tape to denote which robot they belong to, Drivers Stations are located behind their robots starting box. Ball towers will be numbered 1 through 4. The #1 tower of each color will be to the right of that colors starting box and continuing clockwise around the field.

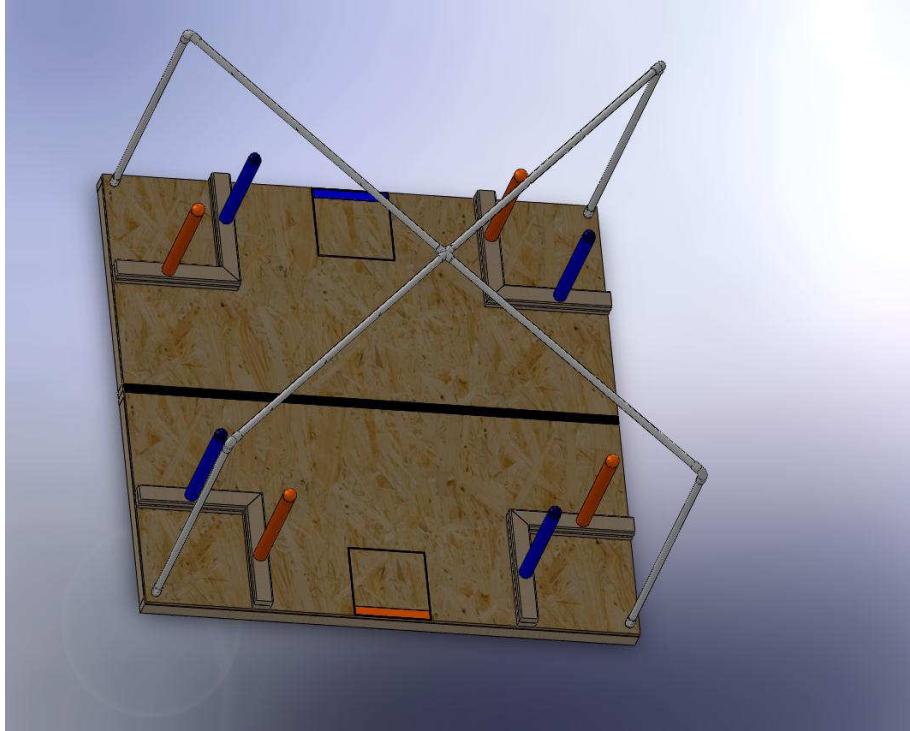


Fig. 1 2009 LRSBC Playing Field

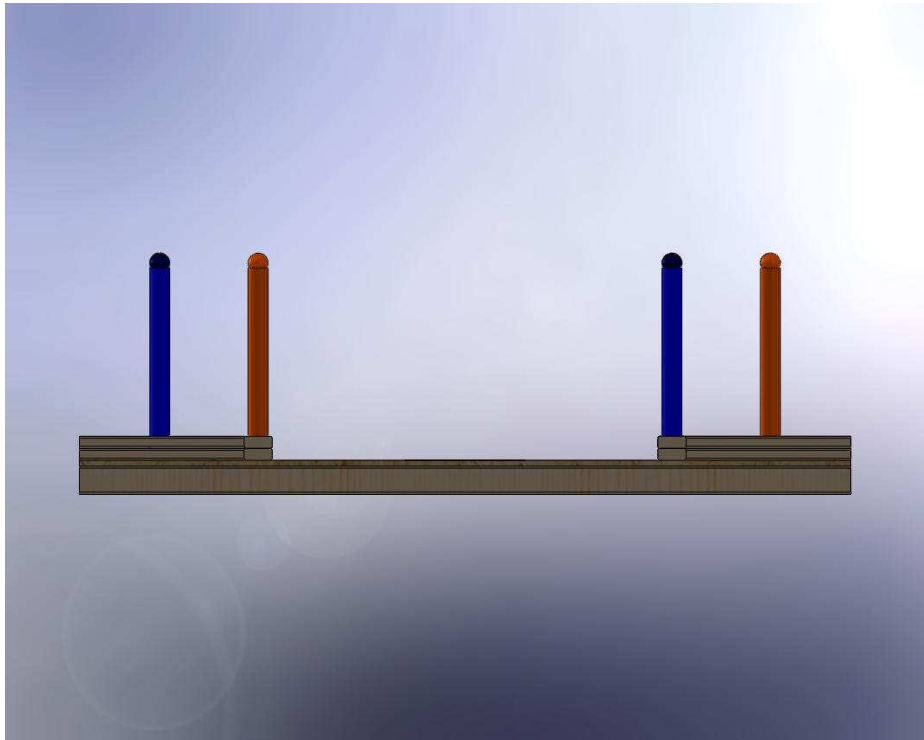


Fig. 2 Side view of 2009 LRSBC Playing Field without Wire Tower

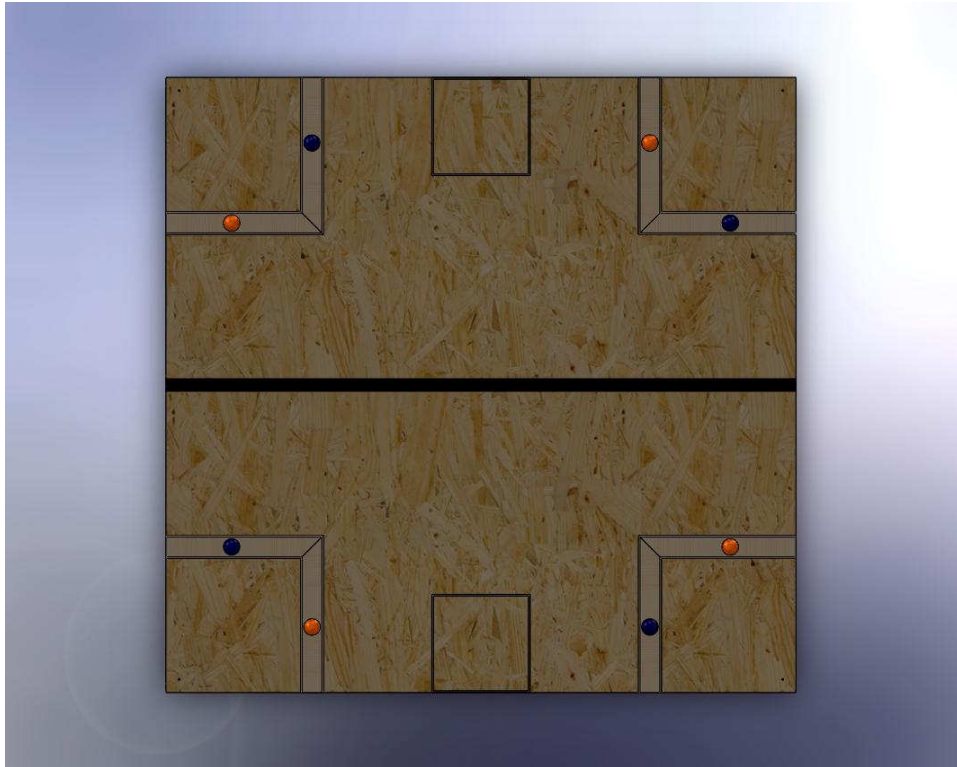


Fig. 3 Top view of 2009 LRSBC Playing Field without Wire Tower or Starting Box color stripes

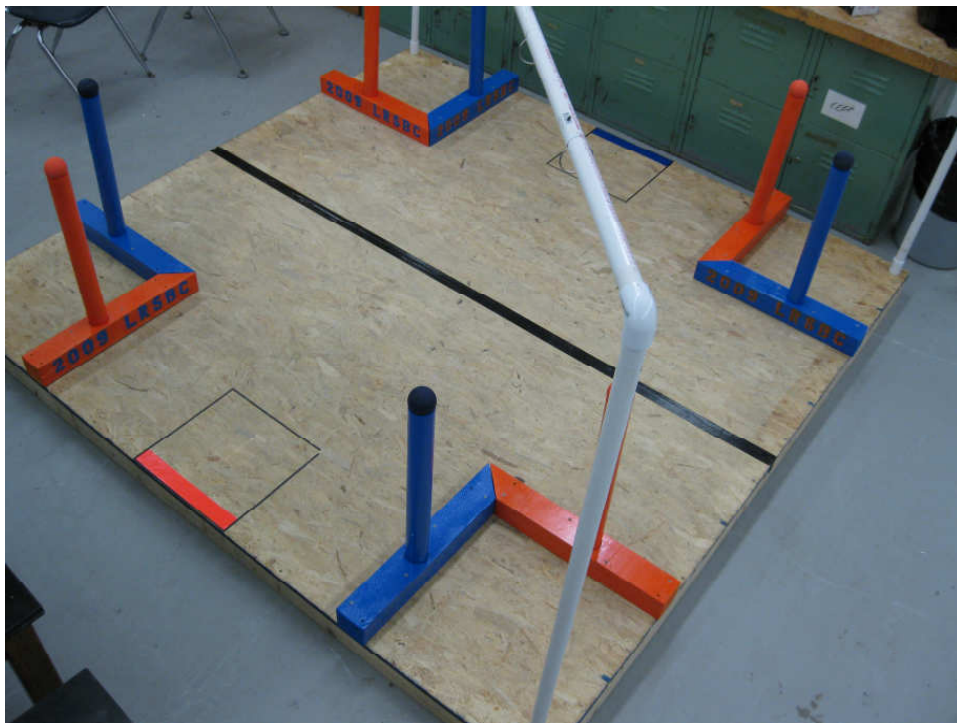


FIG. 4 2009 LRSBC field

Flags. Robots will be required to carry either an Orange or Blue Flag to denote their color during a match. The Flag poles will be twelve inches long and mostly 0.25 inch diameter fiberglass, the bottom of each pole will have a metal sleeve which is expanded slightly at the end for a depth of about one inch. This will allow the Flag to be simply dropped on a piece of 1/4" diameter bolt. The Flags themselves will be six and a half inches long and about three and a half inches tall, and triangular in shape.



Fig. 5 Competition Flags

Wires. The Wires are 17 feet long CAT – 5e cables with eight solid, 24 AWG wires per cable. Cables have both ends cut off and the inner wires split and the ends stripped. There are a total of two cables on the Sumo Arena one per robot.

Driver Stations: Each of the two Sumo Arena Driver Stations is 2 feet long by 1.5 feet wide three level carts, with the top level 3.4 feet above the room floor. Driver Station's will be positioned opposite each other so that

their 2 foot long side is parallel to & about 1.5 feet away from the 8 foot long sides of the table. Each Sumo Arena Driver Station has one Controller Box and one Controller Pad.

Controller Boxes. The Controller Boxes are KELVIN Wired SUMO® Wrestler Controller, Deluxe. They have the ability to control 4 motors each; they have a high or low power selector switch; drivers may choose to use either high or low power.

Controller Pads. The Controller Pads are KELVIN Apache Controllers. They have two plugs that connect to two ports on the Sumo Arena Controller Boxes. Each has two sets of four buttons. Depending on how you wire your robot in one set of four buttons, one will drive both motors forward, one will drive one forward and the other backward, one will do the reverse on previous one, and one will drive both motors backward.

Match Timer. The Match Timer is a computer program that will keep track of the two-minute time limit of matches. It has Start, Pause, & Reset functions. At the start of the match (2:00) a gong will sound as the clock begins. At 1:30, 1:00, & 0:30 the gong will sound signifying the automatic Life Ball removal. At 0:10 a warning sound will play & at 0:00 a buzzer will sound signifying the last automatic Life Ball removal & the end of the match.

Arena Material Specifications

Life Balls: Warrior Brand Lacrosse Balls

Orange Paint: Rust-Oleum® Painter's Touch Gloss Real Orange # 1953830

Blue Paint: Rust-Oleum® Painter's Touch Gloss Brilliant Blue # 1926830

Black Paint: Rust-Oleum® Painter's Touch Semi-Gloss # 1974830

Primer: Rust-Oleum® Painter's Touch White Primer # 1981830

Drawing Revisions

2009 Ball Tower - Rev. A

2009 Barrier Block - Rev. B

2009 Field Layout - Rev. A

2009 Arena Layout - Rev. A

Kit of Parts

Kits are KELVIN Wired SUMO® Wrestler Kit, Deluxe. The Kit typically contains the following, but actual kits may vary slightly.

1 wood blank
1 piano wire
8 eight inch wires
2 three inch diameter wheels (yellow or blue)
1 castor
2 castor mounting screws
4 pulley packets
4 gear packets
2 motor brackets (metal)
2 Large Motors
2 Small Motors
1 terminal block
4 rubber bands
6 bolts
2 axle rods
8 small screws
2 large screws
4 eye screws
2 spacers
2 adapters (2mm to 3mm)
1 two inch piece of tubing
1 Instruction Packet

2009 Additions to the KOP

1 1/4-20 2" long Carriage Bolt
1 1/4-20 Nut
2 Johnson motors 1020199A (3E382223)

Robot Rules

- R1.** At the beginning of every match, the MAXIMUM allowed size of your robot is 12 inches by 12 inches by 15 inches tall.
- R2.** Your robot MAY NOT weigh more than 4 pounds. This rule excludes the allowed onboard batteries. **Please be advised the KOP Drivetrain may not be powerful enough to move a robot that weighs more than about 2 lbs!**
- R3.** You may spend a total of \$60 on materials not in the kit to use on your robot. You must provide a Bill of Materials per **C11**.
- R4.** In addition to the eight wires coming from the Controllers Boxes, you may utilize two nine volt alkaline (PP3) batteries to power your robot and you may control them however you wish. These are the only electrical power sources allowed on your robot. Any custom controller system counts towards your spending limit outlined in rule **R3**.
- R5.** The only motors you may use are those found in the KOP or their identical replacements, in any combination up to a grand total of 6 motors. Exception: you may only use two of the Johnson motors.
- R6.** You may only use one robot through out the entire competition. Multiple configurations of said robot are allowed.
- R7.** You MAY NOT use a previously built robot.
- R8.** You may NOT use any fabricated parts from previously built robots.
- R9.** You may not have any device that interferes with the electronic workings of your opponent's robot; mechanical, electrical, or otherwise.
- R10.** These items don't count towards your \$60 limit: paint, glues/ epoxies, solder, and any non-functional decorations.
- R11.** Only materials ON your robot count towards your \$60 limit. (i.e. spare or replacement parts or other configuration parts don't count). With the exception of a custom controller as outlined in **R4**.
- R12.** You may not use any device that causes severe damage to your opponent's robot. Severe damage is defined as completely destroying your opponent's robot in one hit. Remember to goal is to PUSH your

opponent off the Field or KNOCK their Life Balls down, devices should be used to help achieve these goals.

R13. Devices may not be designed to leave your robot.

R14. Devices may not have sharp blades. (Must be able to run finger along edge without cutting skin.)

R15. No flames or explosives are allowed to be used on your robot.

R16. No compressed gasses or liquids may be used.

R17. Robots will be required to have a 1" minimum section of ¼" diameter bolt sticking up vertically so it can support the 12 inch long flag pole so that its top is between 15 and 17 inches above the arena floor. (Top of bolt between 3 and 5 inches above arena floor) An example can be seen in Figure 8.

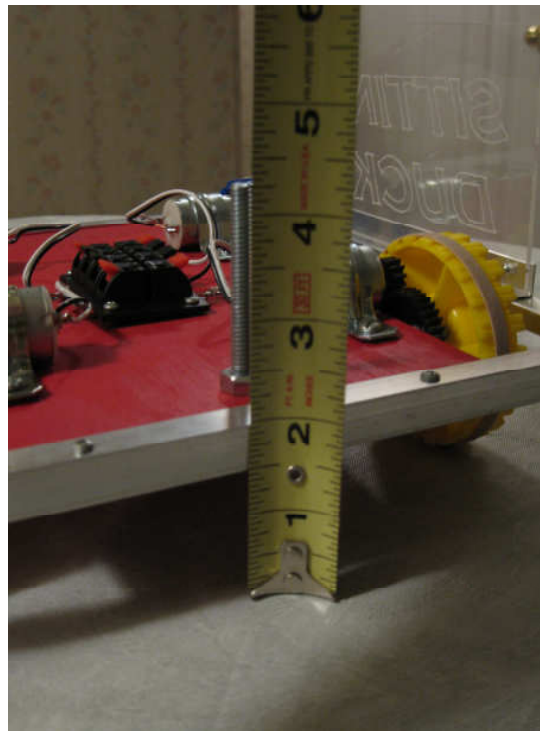


Fig. 8 Flag support example

R18. (More of a guideline than actual rule) Be creative decorate and name your robot.

R19. Robots must display their owner's LRSBC ID#, minimum text height of one inch. Rookies leave a blank space, ID#s will be assigned at competition.

Competition Rules

C1. Participants will be equally placed into the Competition Bracket positions by random selection, Competition Bracket positions will be announced the day of competition.

C2. If there is an open slot in a bracket the participant must face the Placebo Bot to advance. This is to give that participant fair field time. The Placebo Bot will be driven by a volunteer at the Referee's discretion. The Placebo Bot cannot advance.

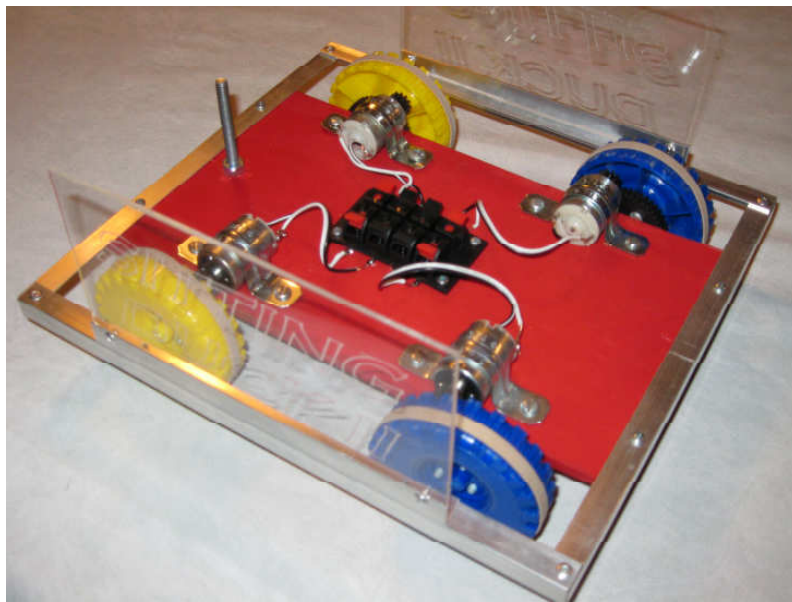


Fig.7 *Sitting Duck II* the Official Placebo Bot

C3. Matches will be played in numerical order.

C4. The following awards will be given out to those who fit the criteria listed with them:

- LRSBC Tournament Participant Ribbon – Your robot competed in at least one match
- LRSBC Tournament Coolest Robot – Voted Coolest Robot
- LRSBC Tournament Finalist– Lost LRSBC Tournament Final Match
- LRSBC Tournament Champion – Won LRSBC Tournament Final Match

C5. Safety Glasses MUST be worn when: A) Driving in a match, B) Using a power tool, C) around someone using a power tool.

It is recommended that Safety Glasses be worn while watching matches (IF a match seems like it may require it everybody will be asked to wear safety glasses.)

C6. When viewing a match PLEASE sit or stand back from the edge of the Sumo Arena (i.e. Please do not sit on or lean on or against or stand on the Sumo Arena.

C7. Spectators may not interfere with any robot or its wires while it is on the field during a match. (Also stated in rule **M7**.) If this occurs the match will be restarted.

C8. The maximum capacity of participants of the 2009 LRSBC is 32.

C9. Music will be allowed to be played during matches ONLY if BOTH drivers agree to allow it. All music must be appropriate for the school setting.

C10. Competition is single elimination.

C11. Prior to your first match your robot must pass a brief three part inspection; weight in, size check, turn in Bill Of Materials. Please use BOM template provided in the LRSBC File Repository. Figure 8 shows an example of the sticker signifying a passed inspection.



Fig. 8 Inspection sticker

C12. Color assignments for each match will be assigned as follows. For each match bracket the upper name will be Orange and the lower name will be Blue for that match, this pattern will hold true for every match except the final match. The final match the name on the left will be Blue and the name on the right will be Orange. This is illustrated in Figure 9 below.

LIGHTNING ROBOTICS SUMO BOT COMPETITION

Date: May 9th 2009

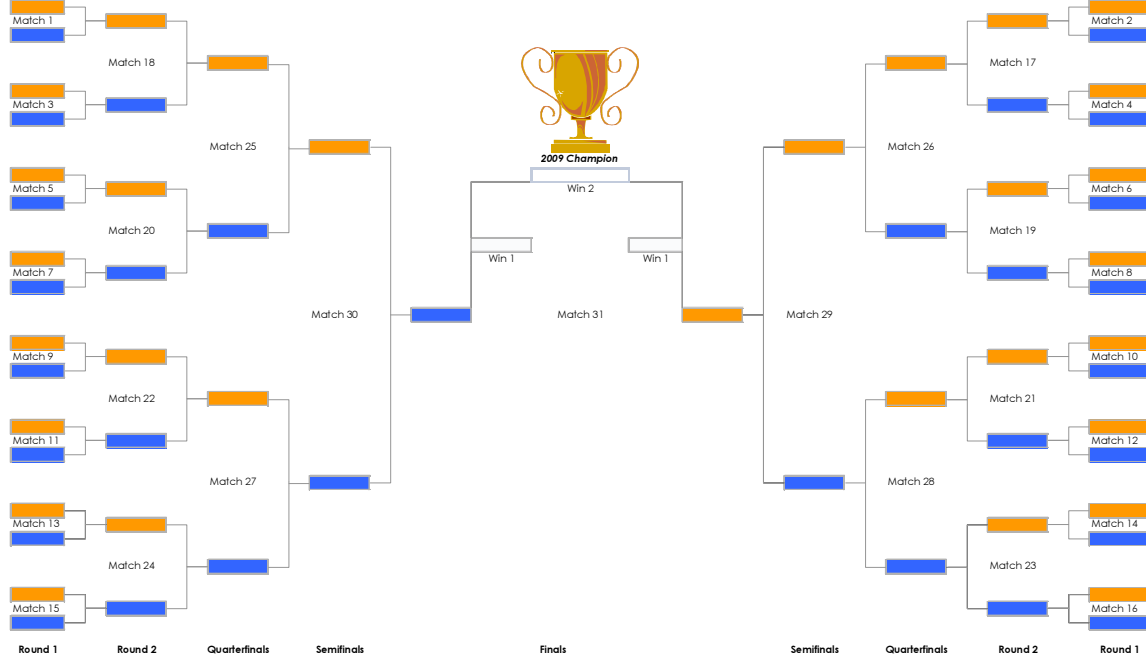


Fig. 9 2009 LRSBC Competition Bracket

C13. Only electronic copies of the latest revision of the manual, hosted on the Lightning Robotics Document Repository, will be considered official. The only hard copy of the manual that will be considered official will be the reference copy at the competition.

C14. Each 2009 LRSBC participant will receive a Time-Out Ticket. These can be traded in to the Referee for two separate 5 minute time-outs. Time-outs can be taken immediately before or during a reset of a match, and only by the participants of that match. Once used a hole will be punched in the ticket to show it has been used. Figure 10 shows an example of the ticket.



Fig. 10 Time-out Ticket

Match Rules

M1. Each robot will have 4 Life Balls matching it's color, these will start positioned as outline in the Arena Section. The goal is to eliminate your opponent's Life Balls. Once all of a Player's color balls are eliminated the match is over and that person has lost the match. Balls are eliminated by:

- 1) Any part of your robot touches the room floor
- 2) Your robot is no longer supported by the playing field floor
- 3) Your robot's footprint is mostly off the table and unable to pull itself back fully on.
- 4) Any part of your robot touches the arena floor inside the Dead Zone
- 5) A robot knocking a ball off a tower
- 6) Being removed by the Referee as outline in **M2**

M2. Matches will have a time limit of two minutes. Every 30 seconds one Life Ball of each color will be eliminated by the Referee. The times ball are eliminated; 1:30 left, 1:00 left, 0:30 left and at 0:00 left. Physical Ball removal will be done by the event volunteers.

M3. If at the end of the two minute time limit (0:00) both players have their last ball eliminated a stalemate occurs. In the event of a stalemate the Referee will decide who has won the match. It is their decision and theirs alone, their decisions are final.

M4. You get two minutes after your match is called to get your robot to the Sumo Arena and ready to compete. Failure to do this will result in forfeiting the match.

M5. No one may touch either robot or their wires at any point during a match, with the exception of resetting them per **M9**.

M6. Robots MUST start each match in the 15" square Starting Box directly in front of their owner's Driver Station, and in its starting position outlined in rule **R1**.

M7. Intentional damaging of the sumo arena may be grounds for a disqualification. (A driver is in full control of his robot and using devices to damage field instead of engaging opponent)

M8. Robots may not intentionally damage or remove a flag from a robot.

M9. For each situation outlined in **M1**;

- 1) Match time is paused, both robots reset to starting boxes (robots need not be returned to starting size), time restarted
- 2) Match time is paused, both robots reset to starting boxes (robots need not be returned to starting size), time restarted
- 3) Match time is paused, both robots reset to starting boxes (robots need not be returned to starting size), time restarted
- 4) Match time is paused, both robots reset to starting boxes (robots need not be returned to starting size), time restarted
- 5) Match continues, without pause or reset
- 6) Match continues, without pause or reset

M10. When the **M1.** Situations 1, 2, 3, 4, & 6 occur the Life Ball on top of the lowest numbered Ball Tower , with a Ball still on it, will be removed.

Extra Information

Full Kelvin Sumo Bot catalogues can be found at:

www.Kelvin.com

Click on the Sumo Cars link

Then click on the wired Sumo Cars link

The LRSBC Question & Answer forum can be found at

www.lightningrobotics.com

Click "Forums"

Click "Competitions"

Click "LRSBC Q&A"

Check to be sure your question hasn't been asked already

If it hasn't post it in a new thread titled

"2009 - (Insert rule number or what your question relates to here)"

Credits

LRSBC Committee

Joe Jagadics III, Founder & Committee Chairman

Brian Graham, Competition Design Advisor

Jay Obsniuk, Competition Design Advisor

Matt Korzeniowski, Competition Design Advisor

Additional Advisors

Joe Jagadics Jr., Field Construction

Paul Rabahy, Match Timer Creator

Henry Kowalski Ph.D

Event Volunteers

Jay Obsniuk, Referee

Eddie McClendon, Referee's Assistant & Field Reset

Rose Todd, Referee's Assistant & Field Reset