

# TexLUG LEGO Robotic Sumo Contest

## Rules Created by David J. Perdue and Tim Rueger

**Description:** Robotic sumo is a competition where two robots, known as *sumo-bots*, attempt to push each other out of an arena using mechanisms, cunning, and brute force. The arena for the contest is a 4-foot diameter circle, and the time given for each round is 3 minutes. Your goal is to create a sumo-bot that can push its opponent out of the arena before being pushed out of the arena by the competing sumo-bot.

### Location and Time:

- Location: Little Walnut Creek library, 835 W. Rundberg Lane, Austin, TX 78758 (near the intersection of Rundberg and North Lamar).
- Date and Time: Sunday, June 12, 2005, from 2:30pm to 5:30pm.
- Optional test and debug sessions will be held on Sunday, April 10, 2005, and Sunday, May 8, 2005; location and time as above.

**The Sumo-Bots:** All participating robots, known as sumo-bots, must be constructed out of LEGO pieces *only*. They must also be **completely autonomous**—that is, acting independently of humans.

**Weight and Size:** For all participating sumo-bots, the maximum weight allowed is **2 pounds**. In addition, there are maximum **width** and **length** specifications:

- **Maximum Width:** 30 LEGO studs
- **Maximum Length:** 35 LEGO studs

All sumo-bots must comply with these size limitations at the beginning of a bout, **but can expand beyond these limitations after the bout has begun.**

Please note that your sumo-bot(s) will be checked for weight and size specifications before being admitted. You will be given one chance to reduce your sumo-bot's weight and/or size if it exceeds the 2-pound weight limit and/or the width and length limits. Sumo-bots that fail to meet these specifications will not be allowed entry.

**Allowed Parts:** The robots for this robotic sumo competition revolve around the use of the Robotics Invention System (RIS) and the RCX microcomputer contained in the RIS. Only stock Lego-manufactured parts may be used - no part may be altered or modified. The allowed parts are:

- **CPU:** one RCX from one RIS kit (version 1.0, 1.5, or 2.0).

- **Sensors:** the sensors from one RIS kit (2 touch sensors, 1 light sensor), plus not more than one other Lego-manufactured sensor of any type.
- **Motors:** the motors from one RIS kit (2 9V motors with gear reduction), plus not more than one other Lego-manufactured motor of any type.
- **Wires:** unlimited Lego-manufactured wires.
- **Other components:** unlimited non-electrical Lego-manufactured parts.

**The Programming:** All contestants must use the standard firmware (versions 1.0 or 2.0) for their RCX—no custom firmware please. Multiple programs on the RCX are allowed. If, during the event, any contestant deems it necessary to change or update his or her program(s), he or she may do so, as long as the contestant's sumo-bot is not currently participating and is not currently needed on the arena. The programming languages, within the RCX's standard firmware, admitted are:

- **RCX Code.** The programming language that comes with the RIS.
- **NQC (Not Quite C).** A text-based programming language based on C.
- **Robolab.** A graphical programming language that can be used on the RCX.
- **Visual Basic.** A text-based programming language that can be used on the RCX.

**The Robotic Sumo Arena:** The competition takes place in a circular arena 4 feet in diameter. The surface is painted glossy white and is bordered with a black, glossy line 2 1/2 inches wide. The arena is made out of 3/4-inch BC grade plywood sanded smooth on one side; the smooth surface will be used for the sumo-bots. During play, the arena will be raised approximately 3 inches above ground.

**Judging:** The judges for the competition will be Tim Rueger, David Perdue, and a volunteer to be named at the competition. A single judge will oversee each match. Tim will act as the primary judge. For matches where Tim competes, David will be the active judge. For matches where both Tim and David compete, the volunteer will be the active judge.

In any match, the judge will have sole discretion and in any dispute the judge's decision is final.

**Prizes:** The winner and runner up of the competition will receive Lego prizes. Prizes will have a retail value of \$30-\$50, and will be announced prior to the competition.

## **The Play:**

At the beginning of a round, the sumo-bots will be placed approximately 5 inches apart from each other in a parallel position. The sumo-bots **must begin** the round by moving in **opposite directions**; active searching is enforced in this way. The judge of the round will verify with the current contestants that their sumo-bots are positioned on the arena in a way which will result in them **initially** traveling in opposite directions. Please note the following:

- **Sumo-bots will be started manually.** Please design and program your sumo-bot(s) to be activated upon the press of bumper, switch, etc.
- **Sumo-bots are not allowed to have random start-up directions.** Please program your sumo-bot to **begin** a round by traveling only in **one** direction—away from the other sumo-bot
- Each round will be **3 minutes**.

Bouts within a round are **over** when the following happens:

- **A sumo-bot is either pushed off or falls off the arena.** A sumo-bot is not considered “out” until it has entirely fallen off the arena. Hanging over the edge does not disqualify a sumo-bot.
- **The 3-minute time permitted for a round has run out and there have been no victories.** A sudden death round will be permitted (see below).
- **The sumo-bots are entangled for 10 seconds.** A replay will follow (see below).
- **One of the sumo-bots becomes disabled for any reason.** The other sumo-bot will be declared winner.

**Sudden Death:** A *sudden death* is a 1-minute round whose purpose is to resolve which sumo-bot is the winner from a previous, expired 3-minute regular round. In sudden death, both sumo-bots are repositioned and started remotely by the judge as is normally done. If no sumo-bot is found to be a winner at the end of 1 minute, the judge will toss a coin to determine the winner. All sumo-bots declared winner in sudden death will be judged by normal scoring standards, *except* those determined by flipping a coin (see below).

**A Replay:** A *replay* is always initiated at the end of a bout if the 3-minute round isn't up or if an entanglement has occurred. A replay consists of stopping the clock, repositioning both sumo-bots, starting the sumo-bots, and then turning the clock back on.

**The End of the Round:** After *three victories, 3 minutes, or a sudden death*, the round is declared **over**. Both sumo-bots will be awarded points, and the sumo-bot with the most points will be awarded a **win**. Here is the point system:

- 1 point for a victory
- 1/2 point for a victory determined by flipping a coin in sudden death
- 0 points for a loss

**The Determination of a Round:** *All* rounds will be determined by a *judge*. All of the judge's decisions are *final*. Any participant who argues may be disqualified.

**Various Rules:** In addition to the main set of rules, there are a few other rules that must be recognized for the safety and fairness of all participants:

- **Intentional damage or alteration of the arena's surface is prohibited.** Mechanisms on your sumo-bot that can harm or alter the arena's surface are prohibited; any sumo-bot that the judge deems harmful to the arena will be disqualified.
- **Intentional damage to the opponent robot or the robot arena is prohibited.** Robotic sumo is a game of pushing, not destruction. Everything from flame-throwers, to sharp objects, to liquids, to bombs are absolutely and entirely prohibited. **Only LEGO pieces are allowed in this event.**
- **Your sumo-bot may not intentionally drop any LEGO piece(s) or any other object on the arena's surface.** Anything that may be dropped on the arena, intentionally or unintentionally, will be immediately removed.
- **Only regular alkaline batteries in the standard setup, shown in the *Constructopedia* included with the RIS, are allowed.** Any other type of battery and/or custom battery setup is forbidden.
- **Electronic interference is prohibited.** This includes, but is not limited to, flooding the arena with infrared rays, or broadcasting other electromagnetic interference.
- **Electronics other than the allowed LEGO electronics are prohibited.** Only parts manufactured by LEGO are allowed in this event.
- **All participating sumo-bots must possess a form of mobility and use that mobility during play.** Immobile sumo-bots will not be admitted, and sumo-bots that do not use their mobility during play will be disqualified.
- **If, at any time, the judge decides that a participating sumo-bot should be removed, the judge has the right to disqualify that sumo-bot.** This can be due to harmful violence, disregard for the rules, or any other reason that the judge declares.

**Tournament play:** The tournament will be conducted in two rounds: round-robin matches and a single-elimination tournament. The winner of the single-elimination tournament will be declared **champion**.

**Round-robin matches:** Robots are separated randomly into small groups. Within a group, every robot plays every other robot one time. Sizing of groups and the schedule of matches will be determined based on the number of entries and announced prior to the match. Round-robin rounds are scored as described above. A robot's final score from the first round is the sum total of its scores in its round-robin matches.

**Single-elimination tournament:** Seeds in the tournament are determined by scores from the first round. If the tournament bracket is not filled, entrants with the highest scores receive "byes" in the first round. Ties in seedings will be broken randomly. Second-round matches are conducted as described above; the winner of the final match of the single-elimination tournament is declared champion of the event. The loser of the final match will be declared runner-up.