

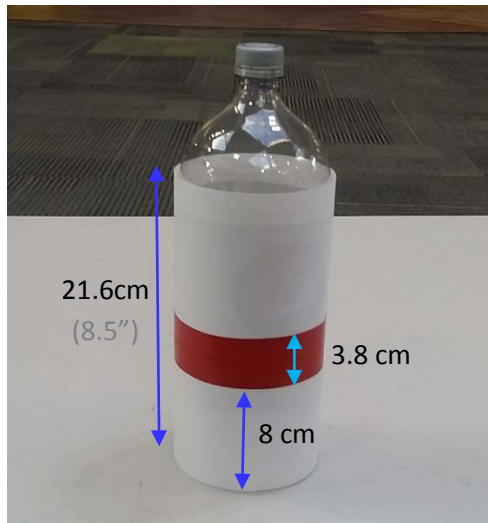
Robofest 2017 BottleSumo

Kick-off version (Draft)

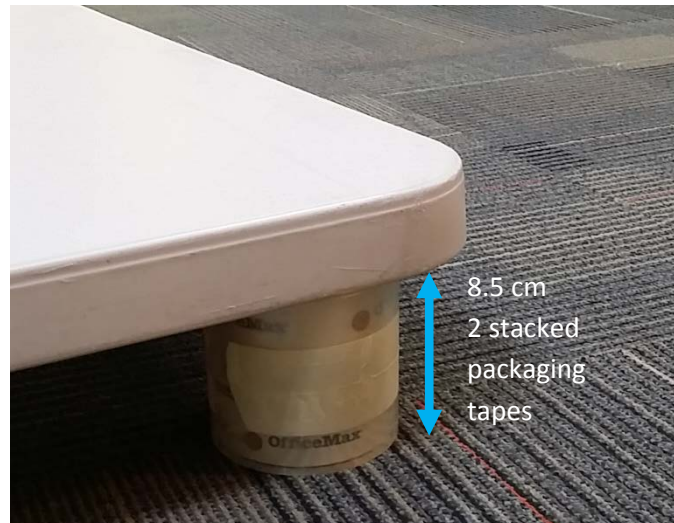
10-3-16, V1.0



(Figure 1) An example of BottleSumo Game Initial Configuration, Junior Division



(Figure 2) Bottle Dimensions



(Figure 3) Raised Table Setup

1. Game Objective and Synopsis

The objective of BottleSumo is to **EITHER** be the first robot to find and *intentionally** push a 2 liter bottle (filled with 1 liter of water – see Figure 2) off the table **OR** be the last robot remaining on the table. The bottle will be placed at a location that is the same distance away from the two robots.

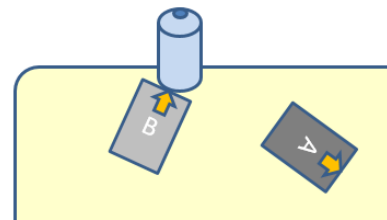
A robot is considered off the table when any of its parts are touching the floor, including parts that have become detached from the robot, whether it was pushed off the table by the other robot or it fell off the table on its own.

A robot is declared the winner of a match if one of the following criteria is met:

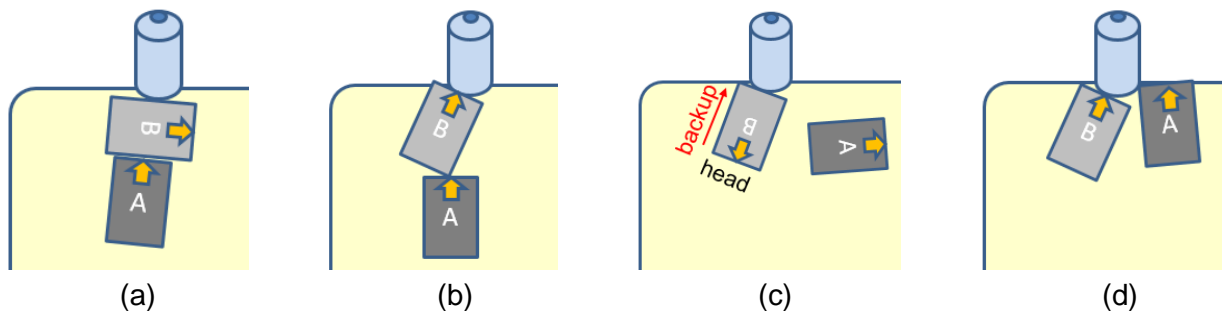
- It intentionally pushes the bottle off the table and then remains on the table for at least 3 seconds. **NOTE:** Judge must count to three to insure time requirement has been met before declaring a winner.
- It intentionally or unintentionally pushes the opponent off the table and then remains on the table for at least 3 seconds. **NOTE:** Judge must count to three to insure time requirement has been met before declaring a winner.
- It remains on the table for at least 3 seconds after the opponent has committed “Sumocide” by falling off the table. **NOTE:** Judge must count to three to insure time requirement has been met before declaring a winner.
- If its opponent first pushes the bottle off the table but then commits “Sumocide” before the judge reaches the end of the 3 second count, the robot must remain on the table for an additional 3 seconds to win the match. **NOTE:** Judge must begin a new count to three after the opponent’s “Sumocide” to insure time requirement has been met before declaring a winner.

Each robot must be fully autonomous. No human control, signal, or remote computer control (tele-operation) is allowed.

(*) **Intentionally** pushing the bottle off the table is defined as “the robot pushes the bottle off the table with any side of the robot that has a sensor, while neither the robot nor the bottle is in contact with the second robot.” See the right figure. Robot A is not in contact with B or bottle.



Unintentionally pushing the bottle off the table is defined as “when the bottle falls off the table while both robots are in contact with each other [see (a) and (b) below], or when a robot pushes the bottle off the table with a side that does not have a sensor, as in the case when a robot is spinning [see (c) below], for example.”



As shown in figure (d) above, suppose B pushed the bottle off the table. It is an unintentional (not a clean) push, since the bottle was touched by robot A.

The game continues without the Bottle as head-to-head sumo wrestling when:

- The bottle is unintentionally pushed off the table
- It is *not* clear which robot pushed the bottle off the table

How to start the game (the way to start the robot moving) is an **unknown task** that is unveiled 30 minutes prior to impounding robots – *An example of the unknown task: a robot must wait 5*

seconds after the game is started during which a judge will place a bottle on the table approximately equidistant from each robot.

2. Age Divisions and Competitions

Junior (Grades 5-8) Division teams will be using one table shown in Figure 1. Senior (Grades 9-12) teams will use two tables with an unknown configuration and has different robot requirements. See Figure 4 and Section 4 below.

3. Team Size

Maximum three members per team for both Jr. Division and Sr. Division.

4. Robot Requirements

Teams must bring a fully-constructed robot to the competition with a label clearly indicating their team number and the “front” of their robot. Teams will need to bring laptop computers to modify their programs to solve the unknown starting task as well as to adjust their programs for the lighting conditions, floor color, and table color, etc. that are unknown until the competition day. The following table shows details about robot specifications.

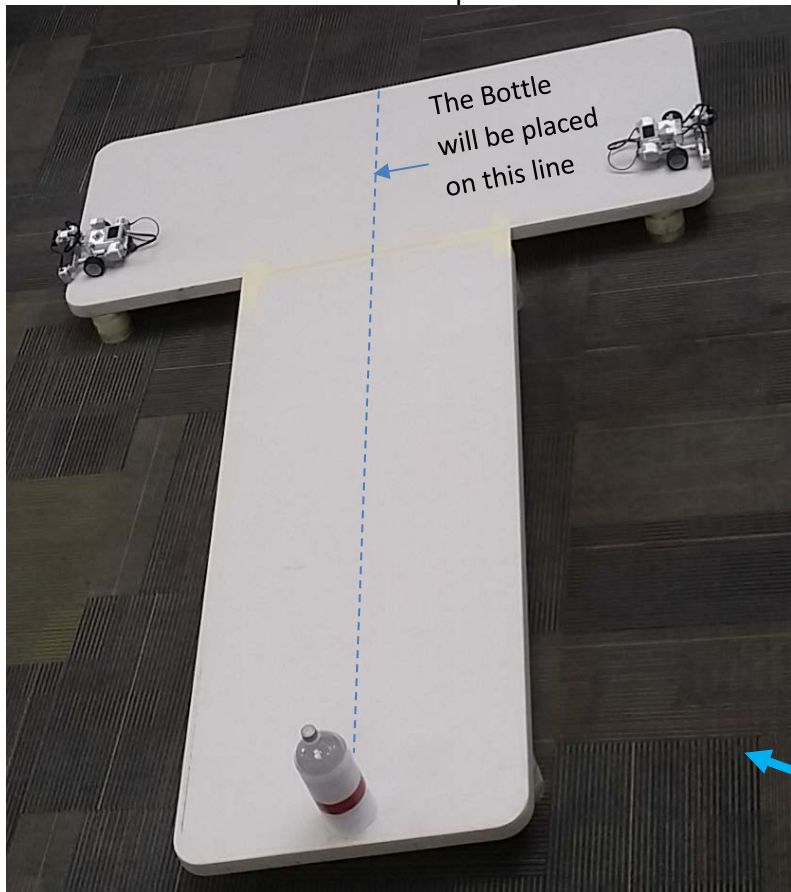
	Junior Division	Senior Division
Maximum robot weight	1 Kg	
Robot Controller	Lego NXT or EV3	Any
Maximum robot width, length, and height	Must fit in 25x25x25cm box. Robots may *NOT* expand their dimensions during the game.	Must fit in 25x25x25cm box. Robots may expand their dimensions, but the maximum dimensions allowable is 35x35x35cm.
Number of robot controllers per robot	One controller only	Any
Traditional sensor types	Any unless it can be harmful to humans.	
On-board vision sensor system	Not allowed	Allowed
Number of sensors	Any	
Motor types	Any	
Number of motors	Maximum 3	
Wheels or legs	Either	
Material	Any. You may use tape, glue, rubber bands, etc. (However, you cannot glue/tape the robot to the sumo ring floor.) Vacuum or sticky tires are not allowed.	
Programming language	Any	

5. Game Playing Field Table

The tables that are used for the competition are 30”x72” (actual size is about 75 cm x 182 cm) plastic folding tables. The recommended brand is “LifeTime” which can be found at <http://www.buylifetime.com/Products/BLT/PID-22901.aspx>. The four corners of the table are rounded. The radius of the corner circle is 4cm ~ 7cm. The thickness of the table is about 4.5cm. The surface is light in color, for example, almond, tan, or gray. The exact size, color, brightness, and edge shape are unknown until the day of the competition. The table is placed on a dark colored floor with the legs folded under. The table can be raised up as shown in Figure 3.

A two liter bottle is covered with Legal size (8.5"x14") white paper. Red electrical tape or color paper is used to create a red stripe as shown in Figure 2. The exact color of the red tape is unknown until the competition day.

The Senior Division field is made up of 2 tables. An example of a possible setup is shown in Figure 4. Figure 5a and 5b show how to connect them using masking tape similar to the color of the table. The exact color of the tape is unknown until the competition day.



(Figure 5a, 5b) How to connect two tables with masking tape

(Figure 4) An example of a possible Sr. Division table configuration. Two tables are taped together with masking tape.

6. Competition Procedures

- 1) Immediately after opening ceremonies, the method of starting the robot is unveiled. 30 minutes will be given to teams to work on their robot. No adult help is allowed at this time.
- 2) After the 30 minute student work period, all the robots are impounded. At that time, robot size and weight will be checked. Judges will also inspect the robot for any illegal materials.
- 3) **Time Trials:** The Judge will measure the time taken for each robot (one per table) to push two bottles (for Junior Division) or three bottles (for Senior Division) off the table. The maximum time given is 2 minutes. If the robot itself falls off the table, 2 minutes 1 second will be recorded. Special prizes may be awarded based on these Time Trial results.
- 4) After each team's Time Trial, their robot must be returned to impound.
- 5) After the Time Trials of all the robots, judges will allow teams to take the robots back to the team table to work on the robot for about 10 minutes. During this time, robots will be ranked based on the time taken to complete the time trial. Using these rankings, Single Elimination Seeded Tournament Brackets will be made. (See <http://www.printyourbrackets.com>)

- 6) Before the competition begins, all the robots must be impounded again. The size and weight of each robot will be checked again.

7. Game Match Rules

- 1) A match consists of up to three games.
- 2) At the start of each game, the judge will announce (a) the location of the robots on the table and (b) the orientation of the robots (For example, see Figure 1 and 4).
- 3) Immediately after the Judge gives the signal to start the game, *each robot must satisfy the unknown starting requirements, the Unknown Task, mentioned in section 1*. Students/judges must move at least **1 meter** away from the table edges and may not approach the table until after the end of the game.
- 4) The Unknown task will require the robot to wait for a starting signal such as a timer-out or a sensor event. The bottle is placed at an unknown location equidistant from the two robots during this wait period. The bottle location can be different for each Game. (See the blue dashed line on Figure 1 and 4).
- 5) If the robot violates the starting requirements, the robot automatically loses the game.
- 6) If the bottle is pushed off the table unintentionally (by chance), the game continues with head-to-head sumo wrestling. (See section 1)
- 7) A maximum of 2 minutes is given for each game. A tie game will be declared if the judge determines that:
 - Both robots at the same moment have any of their parts touch the floor.
 - The last remaining robot on the table falls off less than 3 seconds after the first robot falls off, or if it is unclear which robot fell off first.
 - NO progress has been made in 30 seconds.
 - The robots fail to touch each other for 30 seconds.
 - The robots are hopelessly entangled or otherwise deadlocked.
 - BOTH robots fail to start.
 - There is no winner after two minutes.
- 8) If the match is a tie, then the tie breakers will be (1) the time trial result (2) additional game(s)

The Judge will use his/her discretion to make any decisions for the situations not documented in these rules. The Judges' rulings are final.

FAQs

- 1) Can a robot have multiple programs to select from when a game is started? **Yes. However, the selection must be done quickly. Teams will not have maintenance time between Games.**