BOTTLESumo

Push the Bottle Off the Table or be the Last Robot Remaining

V 1.3 – *Updated* Final Version for 2020 season. Changes after V1.2 Final Version are in red on pages 4-5.

This file can be found under the **Get Involved→BottleSumo** Page on the website
Coaches are responsible for communicating rules updates to participants

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1. BottleSumo Overview

Learning Objectives

- STEM subjects including physics
- Autonomous navigation
- Computer programming logic
- Edge detection
- Object detection
- Autonomous search algorithms
- Adjusting to environmental conditions
- Problem solving

Synopsis

- An Open Category competition, which will take place at the World Robofest Championship
- Local events may host BottleSumo, but there are no qualifying competitions. (Teams must re-register for World Championship event)
- The objective of BottleSumo to EITHER
    - be the first robot to intentionally push a two-liter bottle off the table
    OR
    - be the last robot remaining on the table

2. BottleSumo Age Divisions and Team Size

- Three Divisions
  - Junior Division (Grades 5-8)
  - Senior Classic Division (Grades 9-12)
  - Senior Unlimited Division (Grades 9-12)

- Team Size: Maximum three (3) members per team for Jr. Division and both Sr. Divisions

- Team Registration Fee: $50

- Related important document - Robofest 2020 General Rules at robofest.net

- Each team member, as well as the coach, must bring the signed Robofest Consent and Release Form on the day of the event, if not completed on-line

3. Robot Requirements (1/2)

- Robot must be fully-constructed upon arrival to the competition
- Robot must be fully autonomous. No human control, signal, or remote computer control (tele-op)
- One robot per team (same robot must be use entire tournament)
- Robots must have labels clearly indicating their team ID number and FRONT of robot (side with sensors)
- Teams will need to bring laptop computers to modify their programs for unknown starting task and to adjust for conditions that are unknown until the competition day

	Junior Division	Senior Classic	Senior Unlimited
Maximum robot weight	0.9 Kg	1.5 Kg	3 Kg
Robot Brain	LEGO NXT, LEGO EV3, Lego Spike Prime or Vex IQ		Any
Maximum robot width, length, and height	Must fit in 20x20x20cm box. Robots may **NOT** expand their dimensions during the game.	Must fit in 30x30x30cm box. Robots **may expand** their dimensions, but the maximum dimensions allowable is 35x35x35cm.	
# of robot brains per robot	One brain only	Any	
Traditional sensor types	Any unless it can be harmful to humans.		

3. Robot Requirements (2/2)

	Junior Division	Senior Classic	Senior Unlimited
On-board vision sensor system	**NOT** allowed	Examples of allowed vision sensors: • NXTcam: • Pixicam: • Others such as smart phone vision:	
Number of sensors	At least one sensor that can detect dark/light contrast on the plane of the table AND at least one sensor that can detect objects in front . These may be needed for unknown start		
	Maximum 4 sensors (Sensor Multiplexer NOT allowed)		Unlimited (Sensor Multiplexers ALLOWED)
Number of motors	Maximum 3		Unlimited
Motor types	LEGO NXT(9842), LEGO EV3 (455202), LEGO Spike Prime (45602,45603) or Vex IQ (228-2560) only. Voltage altering over default voltage is **NOT** allowed. Other motors such as Lego Power Function and EV3 medium motors **NOT** allowed		Any
Wheels, tread, or legs (the parts driven by motors which touch the ground)	Must be standard Lego or Vex IQ parts that are completely unmodified. Vacuum or sticky material **NOT** allowed		Vacuum or sticky material **NOT** allowed
Other Material	Any. You may use tape, glue, rubber bands, etc. to construct the robot		
Programming language	Any		

4. BottleSumo Playing Field Table(s) (1/2)

- Competition tables 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

https://www.lifetime.com/lifetime-2901g-6-foot-folding-table-commercial

- The four corners of the table are rounded. The radius of the corner circle is 4cm ~ 7cm

- Table thickness is about 4.5cm

- Table surface is light in color, for example, almond, tan, or gray

- Exact size, color, brightness, and edge shape are unknown until the day of the competition

- The table(s) are placed on a dark colored floor with the legs folded under and raised up with rolls of packing tape, (a stack of three recommended)
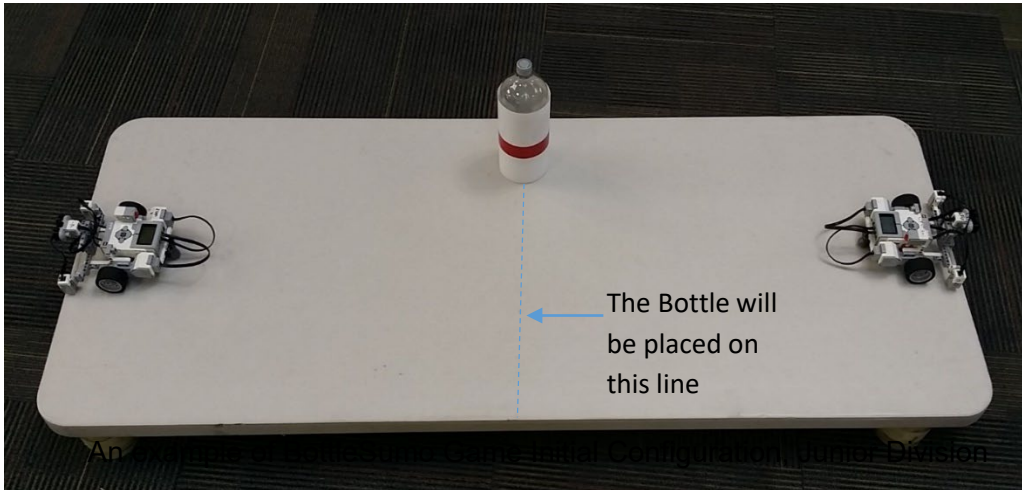

12.75 cm 3 stacked packaging tapes

Raised Table Setup for all Divisions

4. BottleSumo Playing Fields (2/2)

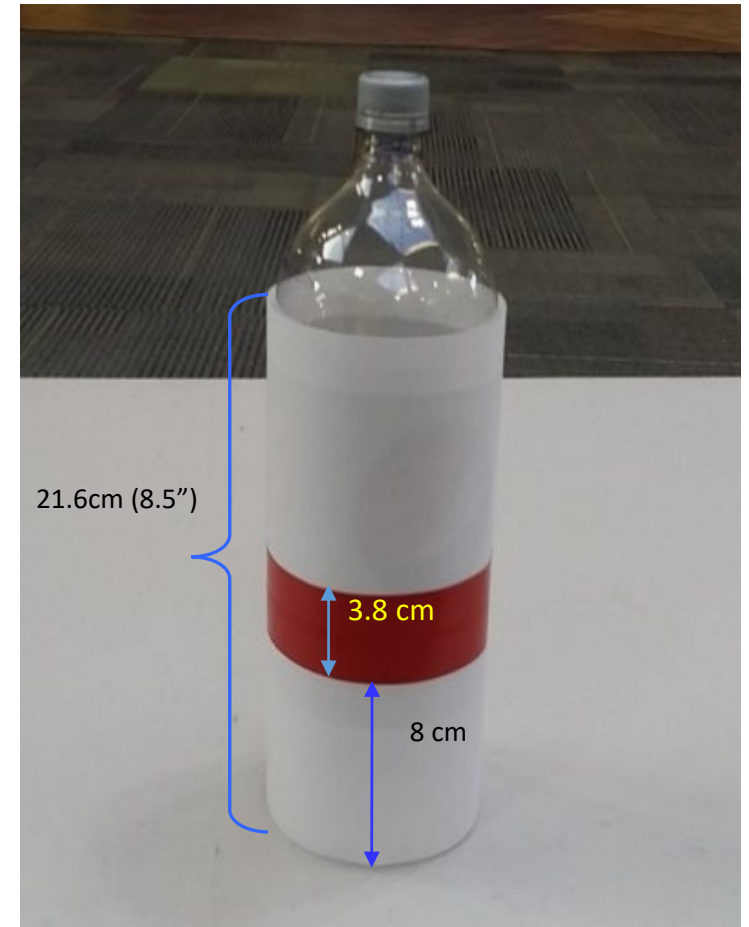- **Junior Division**: Made up of one table

The Bottle will be placed on this line

- **Senior Division** : Made up of two tables

The Bottle will be placed on this line

Connect tables with tape of a matching color

BottleSumo 2020 Rules

5. BottleSumo Bottle

- 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 3.8cm red stripe as shown 8cm from the bottom of the bottle

- The exact color of the red tape or paper is unknown until the competition day

- Bottle is filled with 1 liter of water

21.6cm (8.5")

3.8 cm

8 cm

Bottle Dimensions

6. Unknown Start Task – Example

- The way to start the robot moving is an **Unknown Task** that is unveiled 30 minutes prior to impounding robots

- The same unknown task will be required for the Time Trials and the Elimination Tournament

- *Unknown Task Example :*
  - *Robot will flash an LED for 1 second after the Judge states "GO" then wait 5 seconds. Judge will place a bottle on the table approximately equidistant from each robot during the 5 second period*

- *Additional examples can be found at robofest.net*

7. BottleSumo Competition Procedures (1/2)

- BottleSumo competition has two sessions
    - Time Trial to rank robots and seed a tournament bracket
    - Single elimination tournament with "head to head" games
- Definitions
    - Game- a single head to head round
    - Match- a series of two or more games to determine which team advances in the tournament
    - Match Winner-The first team to win two games

BottleSumo 2020 Rules

7. BottleSumo Competition Procedures (2/2)

- Only participants are allowed to access the pit area, team tables, practice fields and official game fields throughout the competition day
    - Includes setup time before opening ceremony, work time and breaks
    - Adult may assist with transporting team materials, but can not stay in pits
- Immediately after opening ceremonies, the Unknown Task is unveiled. 30 minutes will be given to teams to work on their robots
- After the 30 minute work period, all the robots will be impounded
- During impound robot size, weight, and labels will be checked. Judges will also inspect the robot for any illegal materials
- Battery charging is not allowed in impound
- Participants should not pick up their robot until instructed by a judge

8. Time Trial (1/2)

- Judge will measure the time taken for each robot (one per table) to push 2 bottles (Jr. Division) or 3 bottles (Sr. Divisions) off the table

- Maximum time given is 2 minutes

- Unknown Task must be used to initiate the robot or it will be ranked at the bottom of the trials

- Bottle pushes can be intentional or unintentional (see sections 12, 13)

- Time will be recorded to 1/100 of a second

- If a robot commits "Sumocide" by falling off the table, survival time and number of bottles pushed off the table will be recorded

- Robot must remain on the table for at least 3 seconds after the last bottle is pushed off or it will be ranked below robots with equal bottle scores that survive at least 3 sec

- Teams will be ranked based on 1) Unknown task completion, 2) Number of bottles, 3) Staying on the table for at least 3 sec after the last bottle off, 4) Time

8. Time Trial (2/2)

- Time Trial ties will be determined by team ID# (Lower ID# is ranked higher)

- Special prizes may be awarded based on Time Trial results

- After each team's trial, their robot must be returned to impound

- After all robots have completed their time trial, one team member may retrieve their robot from impound

- Teams may then work on the robot until the tournament bracket is ready

- During this time (approx. 15 min), a single elimination seeded tournament bracket will be created based on the time trials (See http://www.printyourbrackets.com)

- Before the elimination tournament rounds begin, all the robots must be impounded again. The size and weight of each robot will be rechecked

9. BottleSumo Time Trial Score Sheet

| Division (circle one) | Team ID _____ |
| Jr   Sr | Team Name _____ |

Unknown Start was Correct?	Y N
Number of Bottles pushed off	0 1 2 3 (Sr Only)
Did the robot stay on the table for 3 sec after last bottle?	Y N

Completion Time (if all bottles off and robot on table; do not include 3 sec after bottle off)

OR

Survival time (if bottles left or robot falls off table)

Elapsed (from Zero)	Remaining (from 120 sec)

Record BOTH times
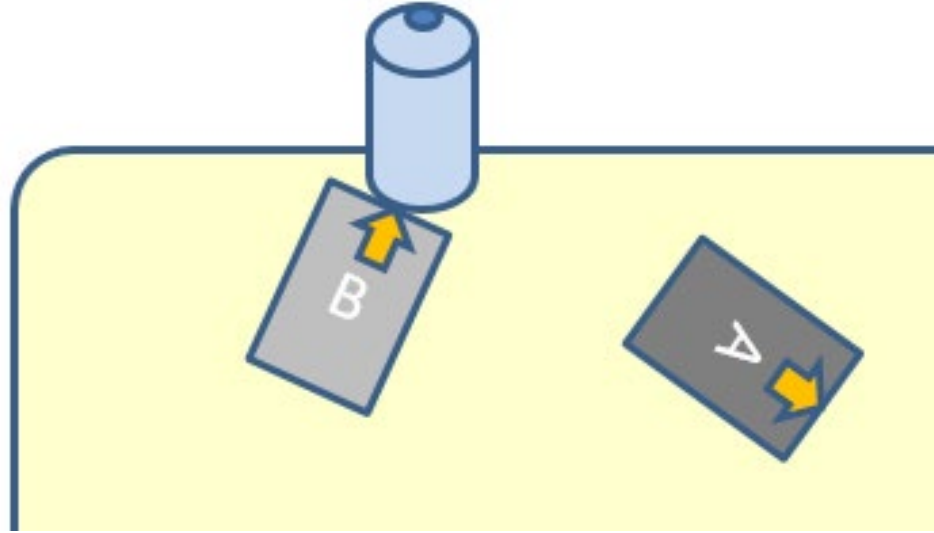
Judge's Initials _____

Team Member's Initials _____

10. Game (Head to Head) Rules

A. A maximum of 2 minutes is given for each game

B. At the start of each game, the judge will announce (a) the location on the table and (b) orientation of the robots on the table (For examples, see Game Field images)

C. Teams will place their robots on the field according the judge's instructions

D. The Unknown Task must be used to start the robot

E. If the robot fails to move, the robot automatically loses the game, unless the other robot also fails to move, in which case it is a tie

F. If the robot fails the unknown starting requirement, the robot automatically loses the game, unless the other robot also fails the unknown starting requirement, in which case it is a tie

G. The bottle is placed at an unknown location equidistant from the two robots. The bottle location can be different for each game

H. After the start, students/judges must move at least 1 meter away from the table edges until after the end of the game

I. If the bottle is pushed off the table unintentionally, the game continues with head-to-head sumo wrestling

J. If any piece/part of the robot comes off the robot, and subsequently falls on the floor, the opposing robot will be IMMEDIATELY declared the winner

K. One battery change is allowed during the head to head matches

11. Determining the Winner of a Game

- A robot is declared the winner of a game if one of the following criteria is met:
  - It intentionally(see Sec 12&13) pushes the **bottle** off the table and then remains intact and on the table for at least 3 seconds
  - It intentionally or unintentionally pushes the opponent off the table and then remains intact and on the table for at least 3 seconds
  - It remains intact and on the table for at least 3 seconds after the opponent has committed "Sumocide" by falling off the table
  - 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 intact and on the table for an additional 3 seconds to win the game
  - If the result is unclear, the game will be declared a tie and replayed
- **NOTE:** Judge must use a timing device such as the display timer, cell phone app, or stopwatch to insure time requirement has been met before declaring a winner
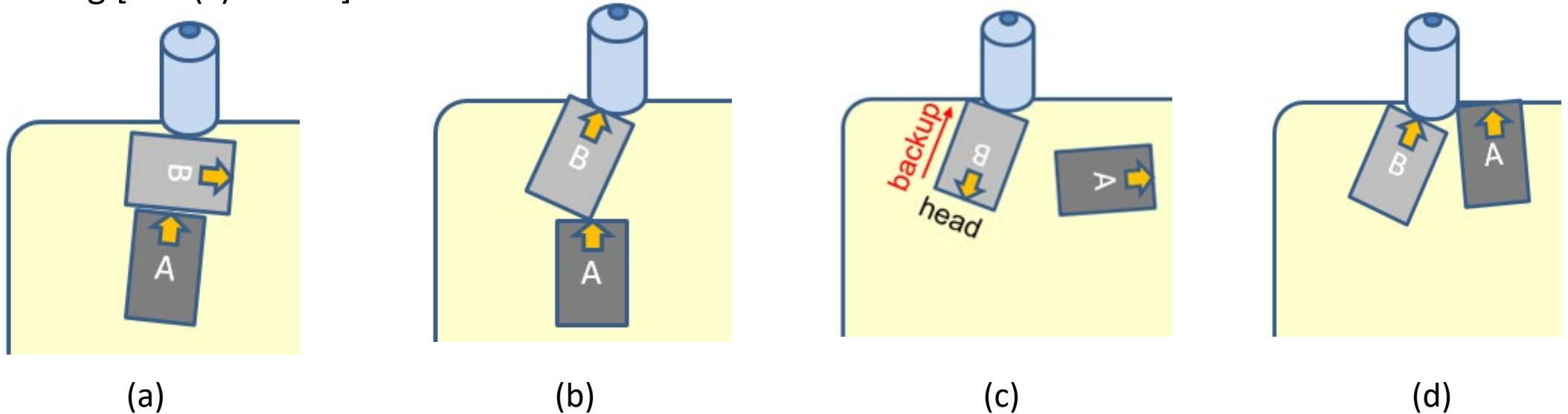
12. Game-Intentional Push Definition

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". In figure above, Robot A is not in contact with B or bottle

13. Game–Unintentional Push Definition

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]

| (a) | (b) | (c) | (d) |

In figure (d) above, suppose B pushed the bottle off the table. It is an unintentional (not a clean) push, since robot A was also touching the bottle

14. Game Rules-Ties

- 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 (except in the case of a piece of the robot falling on the floor, See section 10 rule J)
  - The robots both fall off the table within three seconds of each other
  - NO progress is being made for 20 seconds at Judge's discretion
  - BOTH robots fail to start (do not move)
  - BOTH robots fail the unknown starting requirement
  - One robot fails to start (does not move) and the other robot fails the unknown starting requirement
  - There is no winner after two minutes
  - The result is unclear or too close to call

- If the match is a tie, the teams will keep playing additional games until one team wins two games

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

BottleSumo 2020 Rules

15. FAQ (Frequently Asked Questions)

- 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.

- If robot A intentionally pushes the bottle off the table, but it fell off the table before the 3 seconds, then the opponent B survives at least 3 seconds after the A's fall. Who is the winner? B is the winner.

- If robot A pushes robot B off the table, but A fell off the table too before the 3 seconds. Who is the winner? Tie Game.

- If robot A intentionally pushes the bottle off the table, but it fell off the table before the 3 seconds, then the opponent B committed "Sumocide" without surviving 3 seconds after the A's fall. Who is the winner? Tie Game.

- Robot A failed the unknown start. Robot B was successful and survived on the table at least 3 seconds. B is the winner.

- Both robots failed the unknown start. Tie Game.

- My start button was not pressed correctly. Can I touch the robot after the game started? No in general, but up to the Judge's discretion.