BOTTLESumo

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

V 1.0 – International Kickoff Version for 2020 season. Each country may clarify/adapt/change rules for each country's qualifying competitions. World Championship rules will be finalized in Jan 2020.

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

www.robofest.net   **robofest@ltu.edu**   248-204-3568

Room J233 Taubman Complex, LTU
21000 West 10 Mile Road, Southfield, MI 48075, USA

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 find and intentionally push a two-liter bottle (filled with 1 liter of water) off the table
    OR
  - be the last robot remaining on the table

2. BottleSumo Age Divisions and Team Size

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

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 (1/3)

- Robot must be fully-constructed upon arrival to the competition
- Robot must be fully autonomous. No human control, signal, or remote computer control (tele-operation) is allowed
- One robot per team (same robot must be use for time trial and head to head)
- Robots must have label clearly indicating their team ID number
- Robot must have a label indicating the FRONT of the robot. The FRONT of the robot includes edge sensor(s) and opponent sensor(s). Robots without front mounted sensors to detect the table edge and the opponent on the declared FRONT will not pass inspection
- 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

3. Robot Requirements (2/3)

|	Junior Division	Senior Classic	Senior Unlimited
Maximum robot weight	0.9 Kg	1.5 Kg	3 Kg
Robot Brain	LEGO NXT, LEGO EV3, 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.		
On-board vision sensor system	**NOT** allowed	Examples of allowed vision sensors: • NXTcam: http://www.mindsensors.com/ev3-and-nxt/14-vision-subsystem-camera-for-nxt-or-ev3-nxtcam-v4 • Pixicam: http://charmedlabs.com/default/pixy-for-lego-mindstorms/ • Others such as smart phone vision: https://youtu.be/_Kqyf0h16gI	

3. Robot Requirements (3/3)

	Junior Division	Senior Classic	Senior Unlimited
Number of sensors	At least one sensor that can detect dark/light contrast on the same plane AND at least one sensor that can detect objects. Sensor Multiplexers are **NOT** allowed.		
Number of motors	Maximum 3		
Motor types	LEGO NXT(9842), LEGO EV3 (455202), or Vex IQ (228-2560) only. 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. Playing Field Table(s)

- 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-2924g-6-foot-folding-table
- 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

4.1 Junior Division Field

- Made up of one table
- Placed on a dark colored floor with the legs folded under. The table can be raised up with rolls of packing tape for example, (we recommend a stack of three)

The Bottle will be placed on this line
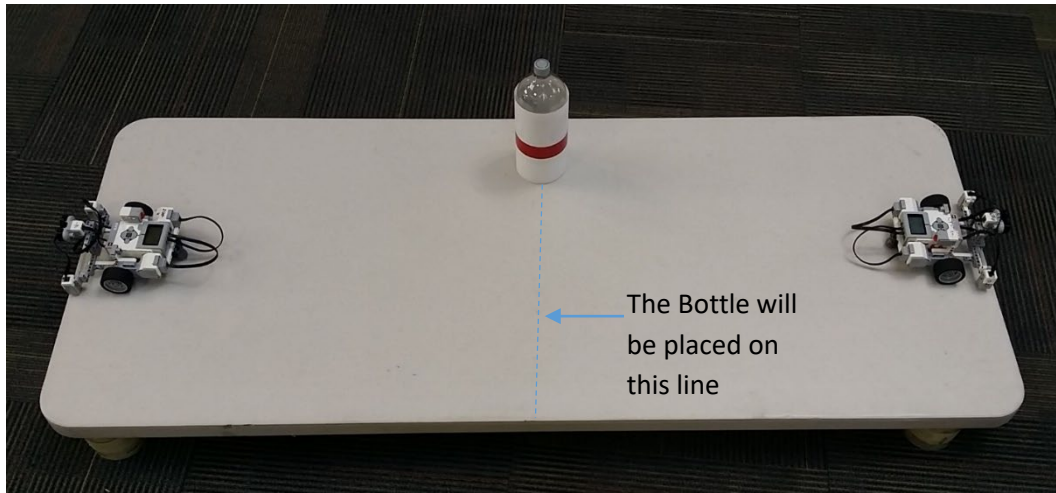
An example of BottleSumo Game Initial Configuration, Junior Division

12.75 cm
3 stacked packaging tapes

Raised Table Setup for all Divisions

4.2 Senior Division Field

- Made up of two tables, placed on a dark floor, raised (see previous slide "4.1")
- An example of a possible setup is shown
- Tables are connected together using masking tape similar to the color of the table. The exact color of the tape is unknown until the competition day

The Bottle will be placed on this line

An example of BottleSumo Game Initial Configuration, Senior Divisions

How to connect two tables with masking tape

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 as shown

- 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
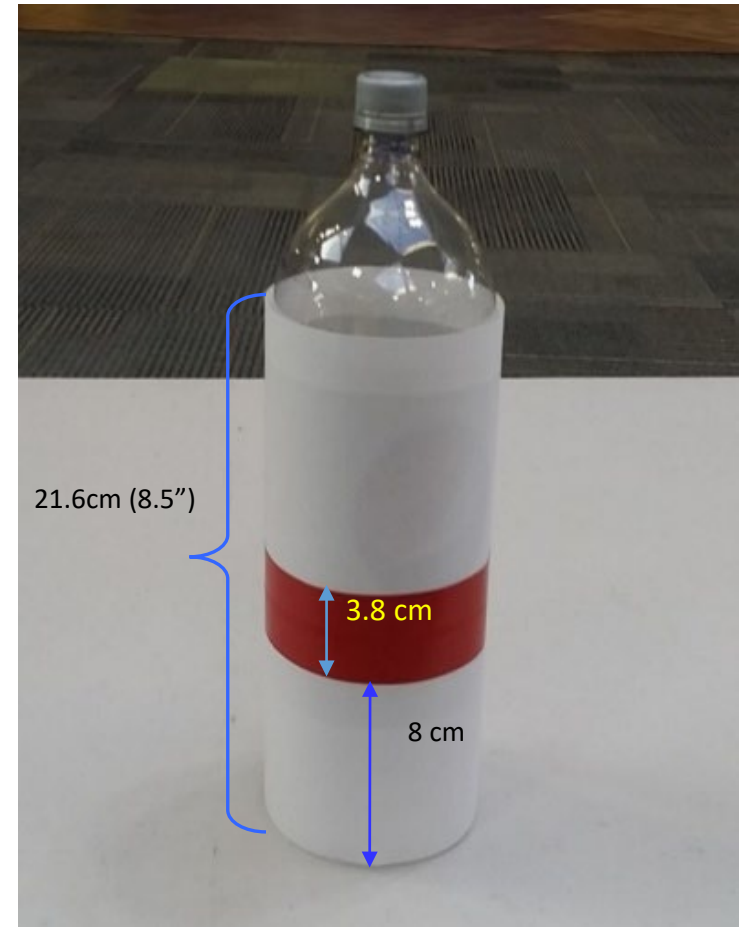
Bottle Dimensions

6. Unknown Start Task – Example 1

- 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 1:*
    - *Robot will flash an LED for 1 second after the game is started (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.*

6. Unknown Start Task – Example 2

1. *A black sheet of paper or cardstock is placed under one of the robot's light sensors*

2. *The robot must not start until the sheet is removed (after the Judge states "GO")*

3. *Robot must then back up approximately 1 inch (25cm) and wait 3 seconds before continuing. A judge will place a bottle on the table approximately equidistant from each robot during the 3 second period.*
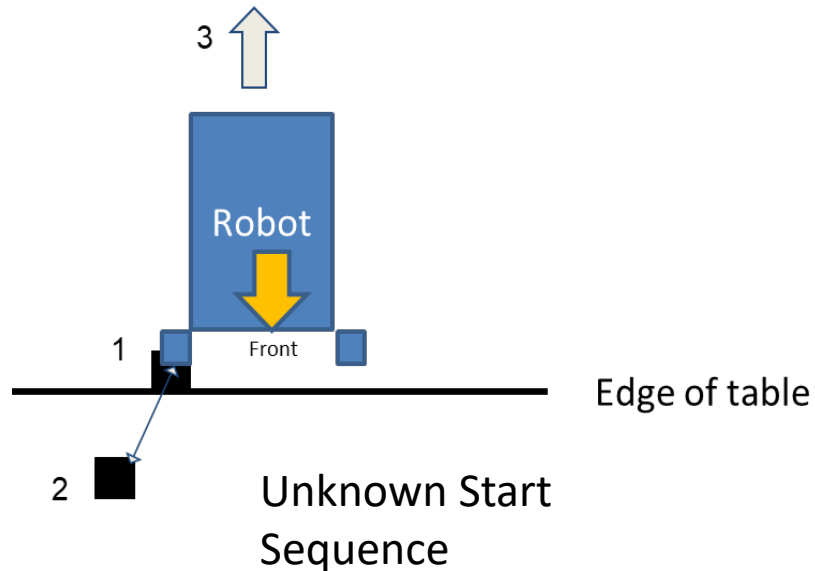
Additional examples of Unknown Start Tasks can be found on the robofest.net website

3

Robot

1

Front

Edge of table

2

Unknown Start Sequence

BottleSumo 2020 Rules

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 and weight will be checked, as well as labels. 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) Jr Sr	Team ID _____ 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 Match (Head to Head) Rules

A. The first team to win two games wins the match

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

C. 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 example, see Game Field images)

D. Students will start their robots following the judge's instructions

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

F. 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

G. 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

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

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

J. If the bottle is pushed off the table unintentionally (by chance), the game continues with head-to-head sumo wrestling

K. 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

L. 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* pushes the **bottle** off the table and then remains intact and on the table for at least 3 seconds. **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
  - It intentionally or unintentionally pushes the opponent off the table and then remains intact and on the table for at least 3 seconds. See (note) above
  - It remains intact and on the table for at least 3 seconds after the opponent has committed "Sumocide" by falling off the table. See (note) above
  - 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. **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
- If the result is unclear, the game will be declared a tie and replayed. (For example, a robot pushed off the bottle, but the opponent robot pushed off the robot nearly at the end of 3 second survival time.)

12. Game-Intentional Push Definition
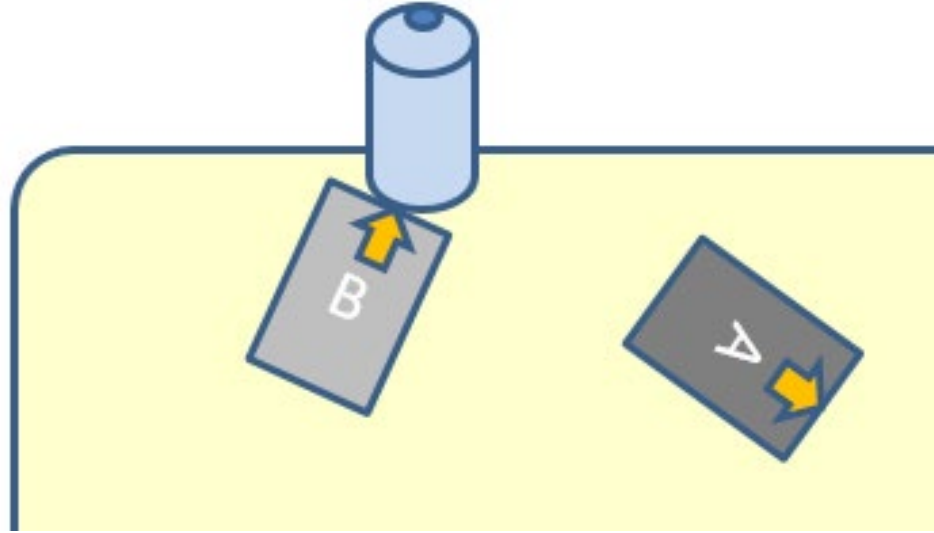
(*) **Intentionally** pushing the bottle off the table is defined as "the robot pushes the bottle off the table with any side of the robot that has a sensor, while neither the robot nor the bottle is in contact with the second robot". In figure above, Robot A is not in contact with B or bottle.

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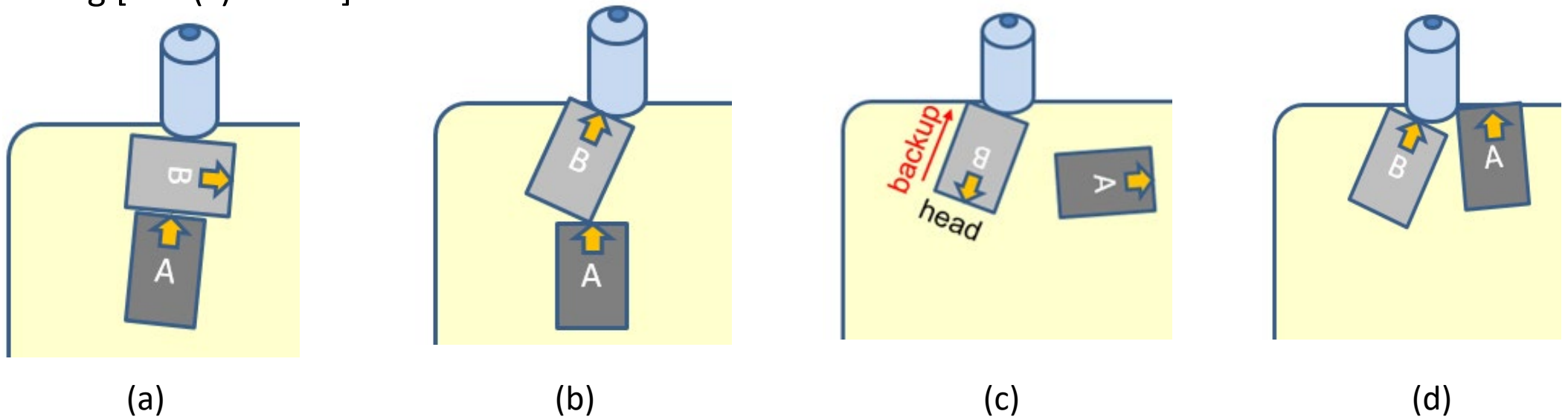
Finally, as shown in figure (d) above, suppose B pushed the bottle off the table. It is an unintentional (not a clean) push, since robot A was also touching the bottle.

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 K)
  - 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. The judge will announce a "Ten-second countdown" and begin a 10-9-8-7-6-5-4-3-2-1 countdown out loud before ending the game. (Audience participation encouraged!)
  - 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 staring 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

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.