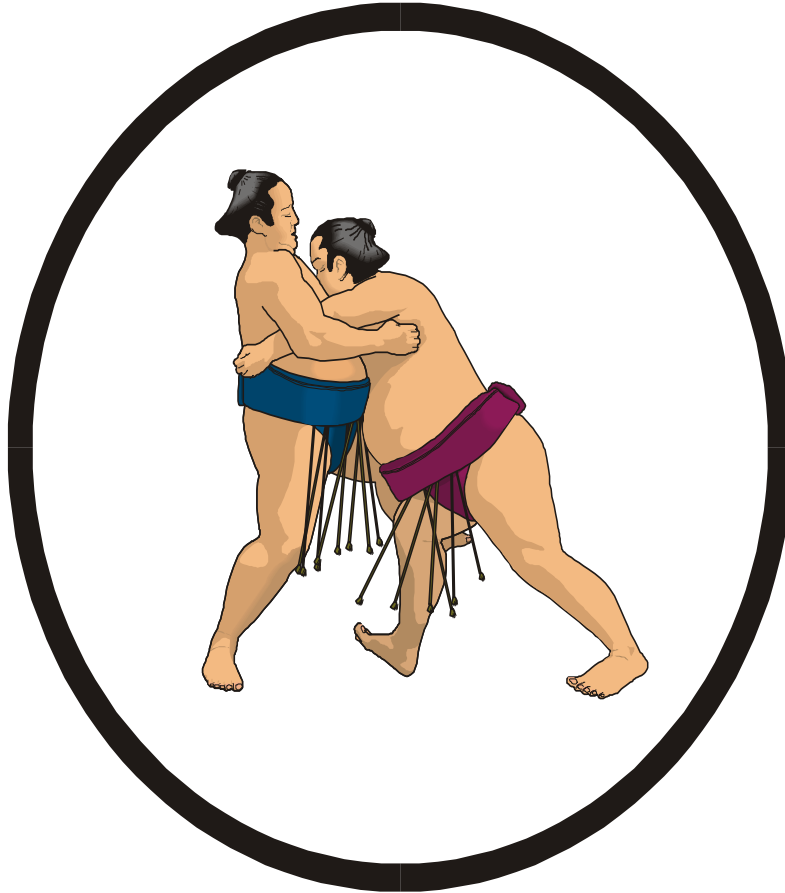


# BC Skills Canada 2014

## Mini-Sumo Robot Challenge Scope



**April 9, 2014**  
(For Grades 8 to 10)  
**Tradex Abbotsford BC**

**Technical Chair/Committee:**

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# Skills Canada 2014 Tethered Mini-Sumo Robot Challenge Scope

Level: Junior (grades 8 to 10)

Duration: (4 Hours)

Purpose of the Challenge: To create a wheeled device that can remove an opponent out of a given area (sumo ring).

Tested Skills and Knowledge: Drafting and Design, mechanics, electronics, metalwork, programming, woodwork & Communications.

Supplied by the Competitors: Robots, robot accessories, batteries, extension cord, power bar, various tools required to modify and repair robots on site and safety equipment including mandatory eye protection.

Supplied by the Committee: A weigh scale, playing field (sumo ring), and a Power Supply for the Sumobot to connect to during competition. Also, a power outlet and worktable will be available for repairs during the competitions.

Judging Criteria: The winner of the double knockout tournament.

Team Size: This is an individual event.

Number of Individuals entered: Limited to the first 32 registered on a first come, first serve basis. The maximum number of competitors at the Provincials from a school is 2 with an additional 2 on a waiting list. If space is available for additional students from your school, you will be contacted. Individuals will be placed in pools and the winners will advance. (In past years the 32 limit has NOT been met and some schools have brought more than 4 students).

## Mission Statement

*The intent of the Mini-Sumo Robot Challenge is to introduce junior students to the varied field of Technology through the design, building and competing in an event that is fun and exciting. While at the Provincial Skills Canada event students will get a chance to view other more specific trades that they may wish to participate in when they get into the senior grades.*

*In the spirit of the competition and the intent of the challenge, the individual must compete with a completely student built robot. A student **cannot purchase, re-use or adapt** any commercially made robot/system **except for the gearbox, Microcontroller, HC-SR04 distance sensor and I293/I298 H-Bridge.***

The judges will check for adherence to the above-mentioned statement, before a robot is allowed to compete in the challenge.

## Origin of the Mini-sumo Challenge

The Mini-sumo is an internationally standardized class of robotic competition, which has traditionally seen most competitions use a computer-programmed chip to control the robot. The original rules (<http://www.robotroom.com/SumoRules.html>) of the International challenge have been used as a guide in helping to develop this package, but have not been adhered to explicitly. The biggest change from the original rules is the size restriction of 13cm cubed at the start of the challenge.

## The Challenge

The objective of the challenge is simple, get your opponent out of the ring using tradition Sumo rules. To compete in the challenge you will require a self-built mini-sumo that is no more than 13cm X 13cm X 13 cm at the beginning of the match. The robot will be manually controlled by the student through an attached tethered wire or autonomous controlled with a microcontroller and sensors.

## Robot Limitations and Rules

1. While in its starting position, the robot must fit within a box measuring 13cm X 13cm X 13cm. An additional tether antenna with a maximum height off the playing surface of 20cm is recommended and allowed to reduce tangles during competition.
2. The robot cannot exceed a maximum of 500g.
3. The operating voltage is restricted to 6 volts for motors and 9 volts for microprocessors only (power supplies will be supplied at the event for tethered robots)
4. The robot must stay as one unit.
5. **A Tamiya Twin-Motor Gearbox Kit (part # 799-70097 or 799-70168) MUST be used to drive the robot (see appendix for details on ordering bulk kits).**
6. Additional gearboxes/motors may be used to move other parts.
7. No store bought wheels or treads.
8. You cannot use parts or devices that are intended to damage another robot (No drills, saws, flames, hammers, object throwers, etc.).
9. You cannot use any liquids, powders or compressed air to be used against another robot.
10. You cannot use parts that could damage the playing surface.
11. You cannot use sticky tapes, glue or suction devices to hold your robot to the playing surface. A paper pick-up test may be used at the judge's discretion or at other competitor's request. A robot will be disqualified if the paper is picked up off the playing surface by a wheel.
12. Your robot must have a clearly labeled name on both sides so the judges and spectators can identify it.

## Controller Limitations and Rules

1. The case of the controller **MUST** be student made, **NO** commercially fabricated cases are allowed (plastic boxes, game boy controller, etc)
2. The control switches **MUST** be student made. You cannot use any form of bought or salvaged switches or potentiometers. (See "Controller Construction Ideas" for suggestions and diagrams on making switches).
3. The controller must house the battery pack (if being used). A 6V power supply will be used for consistent power so batteries are not necessarily required.

## Autonomous Limitations and Rules.

1. The robot must use a H-bridge circuit board and handmade sensors with the exception of a HC-SR04 or Ping distance sensor. No store bought secondary boards. The microcontroller board may be store bought or hand made. Arduino Uno, Arduino Leonardo, Raspberry Pie, or other sub \$40 microcontrollers acceptable. (See Controller Construction Ideas)

## The Playing Surface

The playing surface will be an elevated 77cm diameter circle constructed out of  $\frac{3}{4}$ " MDF. It will be painted flat black with a 1" white ring around the outside. There will be a  $\frac{3}{4}$ " white tubing structure above the playing field for the tethers to be attached to, to help prevent tangles during competition.

## Game Play

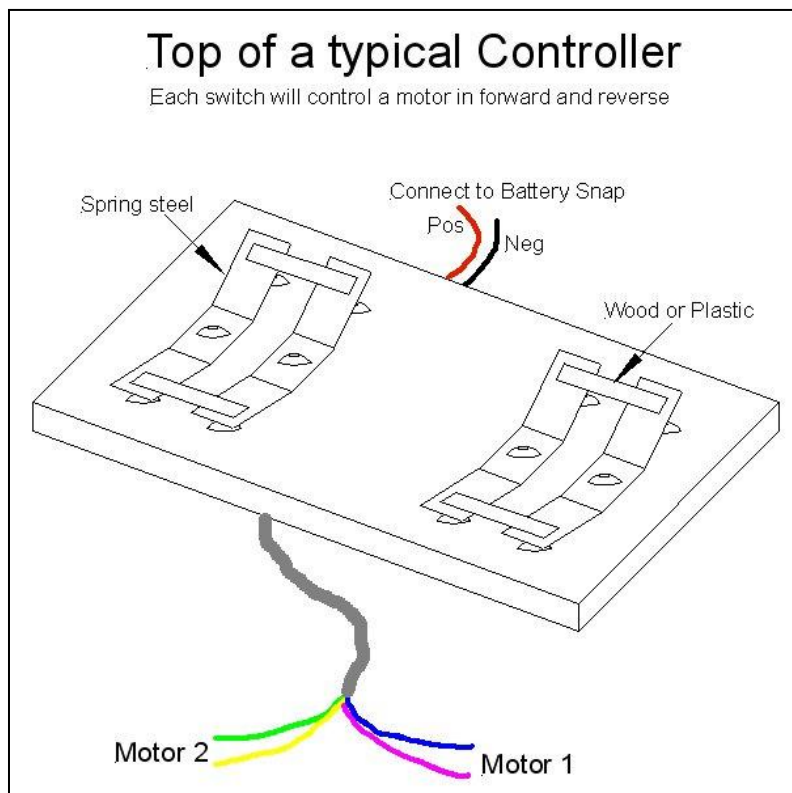
1. Robots will be placed randomly into round robin game play of 8-12 teams. Depending on the number of contestants there will be anywhere from 2 - 4 pools (Pool A, B, C, D) of round robin play. The top 4 - 8 robots from each pool will advance to the playoff round.
2. The top 16 robots will compete in a true double knockout tournament style competition where you are OUT only after you have lost 2 matches.
3. Each match will consist of 3 games. The winner of the match is the one who wins two games.
4. The first robot that has been removed from the playing surface is considered the loser of the game. In the event that both robots fall off the playing surface, the first to touch the ground is the loser.
5. If the robots wiring become tangled, the judge has the decision to continue play or untangle and restart.
6. If two robots are facing each other and NO movement is made for 5 seconds, then both robots must stop power and the judge will restart the game and continue for the time remaining (this helps prevent the burning out of motors).
7. If a robot loses power and cannot move, it forfeits the game. A 2 minute timeout will be granted between games to correct any repairs! After the 2 minutes, the robot will forfeit the match if the repair is unsuccessful.
8. IT IS THE COMPETITORS RESPONSIBILITY TO ENSURE PROPER POWER CONNECTIONS FOR THE ENTIRE MATCH. A match will not be stopped or paused for a competitor to reconnect power.

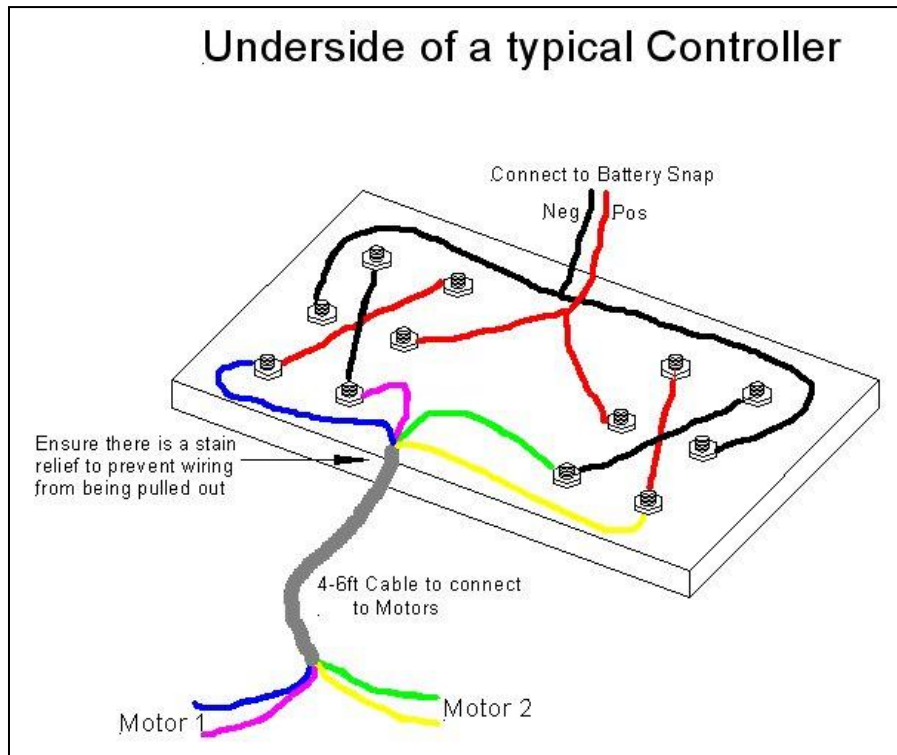
## Robot Construction Ideas

- The use of recycled materials is encouraged (VCR casing, plastic cutoffs, photocopier parts, scrap aluminum, etc).
- As the intent of the competition is to remove the other robot out of the ring, your robot should be constructed to withstand repeated contact of other robots. A case to cover the internal workings is recommended.
- As this competition is very much a spectator's sport, you should design your robot with some entertaining qualities (paint, body design, attitude, flare).

## Controller Construction Ideas

- The tether cable needs to be between 4ft - 6ft long. A mouse cable works well.
- The following 2 diagrams are helpful for making a typical controller and switches, however, there are other ways to do this.
- See [www.theprojectinventory.com](http://www.theprojectinventory.com) for detailed autonomous instructions using an Arduino microcontroller.





## Appendix

### Purchasing the Tamiya gearboxes

The **Tamiya Twin-Motor Gearbox Kit** (part # 799-70097 or 799-70168) can be purchased from Borgfeldt Canada (tel: 905-946-9677, [www.borgfeldt.ca](http://www.borgfeldt.ca)) at under \$10 each including tax and shipping - they take VISA or Purchase Orders.