Robotics Contest

Contact:
Stacy Buchholz stacy@uwyo.edu or Erin Persche epersche@uwyo.edu

Ag Robotics Mission Challenge (Junior, Senior) This is a challenge based contest. Some known challenges will be released prior to the contest, and the remaining on contest day. Teams build and program their robot for known challenges prior to the contest. On contest day, the remaining unknown challenges will be revealed and teams will be given time to build and program the robot to account for the newly revealed challenges.

Mini-Sumo Robot: (Junior, Senior) Teams will design and build a self-propelled or sensing robot designed to force another robot outside a circle four (4) feet in diameter. This contest will be divided by age divisions (junior and senior) with a double elimination bracket configuration.

Please note: *Teams must bring their own robot kit* (preferably the Lego Mindstorms NXT, EV3 or SPIKE) and any additional Lego pieces necessary for their contests. **It is also required that teams bring their own laptops/software. Please see game rules for specific equipment requirements**

Requirements: The contests are open to any 4-H member currently enrolled in the Robotics project. Teams may enter one or all of the contests. Teams may consist of 2-4 members. Team names and designations are due to contest officials ONE WEEK prior to the contest.

Age Groups: Junior (8-13)
Senior (14 & up)

Judging
All of the contests are ranked based on the criteria in the rules and score sheets. Members are judged on their application of technological principles and concepts and their ability to solve difficult problems. During the judging for each contest, only the contest facilitator and judges/officials are permitted in the designated contest area. Leaders, other members, parents and additional competition attendees are prohibited from entering the designated area of the contest while judging is occurring. For all contests and special awards, the decisions of the judge(s) are final and binding.

Awards:
Awards will be given to each of the 2 age groups for each of the contests (Mini-Sumo and Agrobotics Mission Challenge).

Mini-SUMO Robot Contest

The Mini-SUMO Robot Contest requires the member to build an autonomous self-propelled or sensing robot, designed to force another SUMO Robot outside a four (4) foot diameter circle. The competition circle will be a flat black, 4 foot in diameter, surrounded by a two-inch (2”) wide (painted or taped) flat, white ring. When one Sumo causes the wheels of the other to fall off the competition surface, that sumo is declared the winner.

Rules

1. The SUMO can use sensing devices to govern the motion of the SUMO and can use sensors to detect the other SUMO and/or the edge of the white circle.
2. Sumos cannot exceed 3 Kilograms in weight.
3. Sumos ***cannot*** exceed a **maximum size** of 20cm x 20cm x 20cm at the start of the contest. They may have attachments however that upon the start of the contest extend beyond the 20x20x20 footprint.
4. All Lego® Mindstorm pieces must be in their original factory condition. No additional pieces may be included, such as weights, washers, coins, etc.
5. No 3D printed pieces are allowed.
6. The SUMO drive wheels **must** be non-destructive to the playing surface.
7. The SUMO may not have a remote off/on switch.
8. The contest will be run in a double elimination tournament format for each age group.
9. At the beginning of each competition, with the power switch in the “off” position, the SUMO handler(s) will position their SUMO with a wheel or track on the starting line as instructed by the judges. At the command of the judge/facilitator, the handler(s) will turn the power switch to the "on" position.
10. When one SUMO causes **the wheels** of the other SUMO to fall off the competition board surface, that SUMO bot is declared winner of that engagement.
11. If one SUMO is disabled by another, it is automatically eliminated from that round
12. If the SUMO match continues for 3 minutes without a winner, there will be an automatic re-match. If after 3 consecutive re-matches, no winner is determined, both SUMOs will be given 5 minutes to re-program/build for a final match up. If no winner is determined from that re-match, both SUMOs will go into the loser’s bracket or be eliminated from the contest.
13. If both SUMOs leave the circle at the same time, a "non-contest" is declared and the two SUMOs are repositioned and the contest begins anew.
14. Decisions of the judges are final and binding.

AgRobotics

CONTEST OVERVIEW

The AgRobotics contest is a robotics competition where teams design, build, and program a Lego robot to complete challenges autonomously and score points in a 5-minute match. The theme and challenges change each year, but all are focused on some aspect of agriculture.

Each team will decide on their challenge strategy and will launch their robot from a designated home base. The robot will be programmed to move outside of that base and attempt to complete challenges within the given timeframe.

CONTEST FORMAT AND SCORING

The contest will consist of a set of known and unknown challenges that the robot must be programmed to complete autonomously. This adds an element of unpredictability that mimics real-world conditions, where farmers and agricultural technologists must often adapt to unexpected circumstances.

There will be approximately 5-8 known challenges and 1-4 unknown challenges. Known challenges will be released in January, and the unknowns will be released on the day of the contest.

Teams must build and program their robot for known challenges prior to the contest. On contest day, the unknown challenges will be revealed, and teams will be given 60 minutes to build, program, and test the robot for known and unknown challenges.

On the day of the contest, teams will practice and compete on the same game table. A table schedule will be posted so teams know when they will be completing challenges.

Point values for each game challenge may vary, depending on the level of difficulty. Penalties will also depend upon challenge design, but examples may include: knocking over pieces, restricted human interaction with robot or game pieces, excessive retrievals, etc.

Teams will have two preliminary matches, and points from both will be added together. Additionally, teamwork score(s) will be assessed by judges and the team interview score will be added to the match total to form the total score.

After each match, the team captain will initial the score sheet, indicating agreement to the points awarded. Once signed, the match score is final and cannot be challenged. Scoresheets will be delivered to the contest tabulator who will review the score sheet, correct any mathematical inaccuracies, and record the match score.

The contest results, as announced, will be final.

GAME TABLE

The game table consists of two parts:

- Base – made of 4'x8' sheet of plywood or comparable material.
- Rectangular Frame – made of 2"x4" (actual dimensions are 1.5" x 3.5") lumber attached on top of the base. The inner dimensions of the frame are 45" x 93".

A resource tray will be located outside and next to the game table. This is one or more plastic trays that will hold additional game pieces used during the match. Contestants can pick up or place game items into the resource tray once the match begins. Teams may place those game pieces onto their robot or in the Player Zone (see definition below) as allowed. Neither the tray(s) nor the game pieces it holds are part of the playing field.

GAME MAT

1. A vinyl game mat will be placed flat inside the frame of the game table. The game mat will be approximately 45" x 93". It will generally consist of the following areas:
   i. Player Zone – the area where the robot must launch from. There is typically only one player zone, but there may be more depending on the game theme. This is an area where game pieces may be collected from and/or placed upon the robot for retrieval/delivery.
   ii. Robot Zone – the area outside of the player zone where the robot performs its tasks autonomously.

THE ROBOT EQUIPMENT

1. Each team must supply their own equipment. Each team may only bring the items and respective maximum quantity listed in the table below. Any extra equipment or item that does not meet specifications will be returned to the team coach. No infrared beacons (remote) or sensors allowed.

ITEM	MAXIMUM QUANTITY
Lego® Mindstorm® EV3, Spike Prime, or Inventor brick/hub	1
Lego® Mindstorm® EV3, Spike Prime, or Inventor: • Building pieces (excludes brick/hub) • Battery • Motors • Ultrasonic sensor • Touch sensor • Light/color sensor • Gyro sensor	Unlimited
Laptop computer or tablet with programming software (Lego® or non-Lego® is acceptable)	2
Backup laptop battery	Unlimited
Portable, battery powered AC power station (must fit under table work station)	1
3-pronged extension cord (up to 25') (power is not provided at SALE)	1
USB cables	Unlimited
Build plans (paper or digital)	Unlimited
Plastic container or cardboard box for transporting robot to and from game area	1
Ruler or tape measure	Unlimited
Pencil/pen and notepad for design and note-taking purposes	Unlimited
Protractor (for measuring angles)	1

2. All Lego® Mindstorm pieces must be in their original factory condition.
3. No 3D printed pieces are allowed.
4. Teams may use any software that facilitates autonomous movement of the robot, so long as the robot is solely controlled by the programs stored on the HUB or microSD card.
5. No remote controllers of any type are allowed.
6. No computers or tablets may be brought up to the game tables during any matches. It can be during build time.
7. Note paper may only be used for note-taking purposes only. Teams may bring notes to the game table during matches. The paper is not allowed to be used for any other purpose (used on the robot for example).
8. Teams are not allowed to bring their own game mat and/or pieces.

BLUETOOTH AND INTERNET CONNECTIVITY

1. Bluetooth connections can be made and utilized during Build Time. It is not allowed during the Match Play or Finals while the robot is on the playing field.
2. Internet connectivity may be provided, but please be prepared if it is not available.
3. Teams are HIGHLY encouraged to ensure their computers' operating system, software/app, and robot firmware are up to date prior to the contest.
4. When teams check-in and are assigned to their "pit", members and their coach should test and resolve any connectivity/pairing issues.
5. Contestants should be well-trained on how to resolve Bluetooth or USB connection issues.
6. Teams are encouraged to create a unique name for their hub so that pairing is less confusing and will minimize any mistaken pairings with other robots/computers.

MATCH SETUP AND INSPECTION

1. Before the match begins, the robot and all its attachments must be placed and fit into the boundary of the Player Zone for inspection by a contest official.
2. The Player Zone is 11"x17"x12" (length/width/height).
3. To pass inspection, the robot and ALL attachments may not break the plane of the Player Zone boundary nor be taller than 12 inches from the surface of the game mat.
4. Once the official inspects and approves the size of the robot, team members may set up their robot to prepare for the match.
5. **At all times during the match**, the robot (including attachments) must not exceed the 11"x17"x12" (length/width/height).
6. No game pieces found in the Resource Tray may be touched until the match begins. The tray may not be used by the robot nor placed on the game table for any reason.
7. Contest officials reserve the right to remeasure the robot after a match. Any robot deemed to exceed the dimensions will forfeit the match.

TIP: Build designs that use fewer parts can not only save you space for maneuvering but may also save you time and present fewer mechanical/programming problems.

RULES OF PLAY

1. The robot must be programmed to perform all challenges autonomously.
2. All parts of the robot, attachments, and game pieces must **completely fit** within the Player Zone each time the robot is launched from the Player Zone.
3. Teams must pre-build and program a robot prior to the competition.
4. Teams will report to the designated location and time for check-in and submit their robot and additional pieces/equipment for initial inspection.
5. After check-in, each team will be directed to a team pit (table and chairs) where they can work on their robot and programming. In some cases, teams may have to share a table with another team.
6. Electricity will be provided, please plan to bring extension cords and power strips in order to ensure you have access to power.
7. An orientation will be provided for all participants where superintendents will review the challenges, rules and scoring.
8. After orientation, each team will have 60 minutes of Build Time for additional designing, building, programming and testing of their robot. Junior teams will be able to consult with their coach during build time. Senior teams will have 10 minutes of consultation time with their coach prior to build time to strategize. Once build time has started, Senior teams will not be able to consult their coach.
9. Teams will practice and compete on the same game table.

a. In the case where a team has to move tables (example: for finals), teams will be given a designated amount of time to practice on the new table.

10. If time permits, teams are allowed to make alterations to their robot design and/or program between matches.
11. When match play begins, teams must report immediately to the game table when called. The robot must be powered up and ready for inspection when they arrive at the game table. Failure to report to the game table in a timely manner may result in the team forfeiting the match. Schedules will be posted at each table.
12. Contestants may retrieve their robot at any time during the match without penalty. When retrieved, the robot must be returned to the PLAYER ZONE.
13. Contest officials will not assist with any retrievals.
14. When the contestant is retrieving the robot, he/she may do so any time during the match in order to start/re-attempt challenges, but must not manipulate, interfere, or intercept game pieces on the board during retrieval *unless game piece is in robot's possession - see Rules of Play #15-18. If contestants physically alter where game pieces sit or land on the game board during retrieval, they may be subject to penalties or disqualification from the match.
15. Possession is defined as a game piece that is not touching the playing surface and is under the control of the robot. Items in possession of a robot may be retrieved once any part/piece of the robot has broken the plane of the PLAYER ZONE boundary.
16. If the robot is in possession of a game piece in the GAME ZONE, and the robot is retrieved by the player, the game official will return the game piece(s) to its original location/state.
17. A robot that has possession of a game piece may be retrieved during the match. A robot that loses possession of a game piece during the match (ie - robot drops piece outside of the player zone) the piece can no longer be retrieved by contestants.
18. A player is not allowed to touch any game piece except when the piece is completely inside the PLAYER ZONE boundary, OR if the robot is deemed in the PLAYER ZONE AND in full possession of a game piece(s). Once the piece is deemed inside the PLAYER ZONE, contestants may remove the game piece from the game table/robot and store it in the RESOURCE TRAY.
19. If a contestant intentionally touches a game piece in the GAME ZONE, the team will be given a 100-point penalty per occurrence. In such cases, the piece will be returned to its original starting position by contest officials as quickly as possible.
20. All competing team members are allowed around the game table during competition, and any member may touch the robot when necessary.
21. Teams not competing must remain at their tables or staging area.
22. Good sportsmanship is always expected. This is crucial during practice times. Practice time on the game table may be limited as build time progresses.
23. Only registered contestants and designated contest officials will be allowed in the robot Challenge pit areas.
    . Due to space limitations, parents and other spectators must remain outside the designated contest area.
24. Teams that experience equipment malfunction(s) may not replace the equipment with supplies outside the contest area (from coaches, volunteers, parents, or contest officials). Instead, team members must work together and be creative in completing preparations without the malfunctioning/missing equipment or visit with other teams to borrow the needed part.
25. Depending on the challenges, contest officials may allow or require teams to use non-lego items in the design of the robot. In such cases, details will be outlined in the game release and/or orientation.

26. No cell phones or other types of communication devices are allowed in the pit or contest areas. Exceptions include medical devices.
27. During Build Time and Match Play, contestants are not allowed to communicate with anyone outside of the contest (coaches, parents, siblings, etc.). Exceptions include medical emergencies. Contestants are welcome to ask questions to contest officials or other contestants.
28. A match will be 5 minutes in length. The official timekeeper and announcer will have a countdown to start and stop. Any activities performed by the robot after time has been called will not count for points.
29. Any structures built by the team or game pieces cannot be placed onto the ROBOT ZONE by human players but may be permitted to be placed by the robot so long as it is done autonomously and is permitted by challenge rules.
30. Tie-breaker procedures/order will be as follows:
    a. Highest total teamwork and interview total score combined
    b. Highest total teamwork score.
    c. Highest total interview score.
31. Any contestant, coach, or spectator that becomes disruptive or does not exhibit sportsmanship, may be removed from the contest area at the sole discretion of contest officials and/or show (host) management.
32. Teams will be responsible for cleaning up their build space.