Unibots Rulebook

Season 2025 - 2026

Last Modified: 01/10/2025

1. Game Rules

Abbreviations:

UO - Unibots Organiser's

1.1. The objective of this competitive game is to collect as many magnetic ball-bearings and place a maximum of ping-pong balls into the nets that are attached on the outside of each wall.

1.2. The organiser will announce the number of matches and the match schedule at the start of the competition.

1.3. A match consists of four teams (or in some cases two teams) and lasts for 180 seconds. Each of the four teams playing will have an associated judge, who will score points for their individual team as the game is played.

1.4. Matchmaking will occur at the beginning of the competition day, and aim to evenly spread teams out both in terms of their match times, and who they are competing against.

1.5. The game will be played in the arena defined in Section 4.

1.6. Before a match begins:

1.6.1. Participating teams will be informed of their positions in the arena at least five minutes before the match (North, South, East or West Zone and their corresponding colours: Yellow, Orange, Purple or Green). This is to allow teams to update their code with the appropriate AprilTags ID at their own zones. The team will be rotating across these different positions throughout different matches.

1.6.2. Participating teams must place their robot touching a wall of their associated scoring zone. The robot must be placed such that it is in-front of its scoring net, with no parts extending outwidth the boundaries of the net.

1.7. Only teams participating in the current match are allowed around the arena itself. Only a maximum of **two** members of each participating team are allowed to be next to their team's scoring zone. In the event that a competition day is using multiple arenas at once, teams in the preparing arena are allowed to have more than **two** members around the arena, until the match begins.

1.8. All participants and UO volunteers who are arena-side must wear safety goggles or their own glasses.

1.9. Robots must be started by teams leaning into the arena to press a **physical** start button on their robot when instructed to do so. At any other time during the match, team members cannot be in contact with their robot, the arena, or any object in the arena unless explicitly instructed by the judges. Team members **cannot start, reset, nor control** their robot in any way (SSH, controller, etc.).

1.10. There are no voluntary resets allowed. Once a robot is in the arena, it stays until the end of the match unless excessive damage occurs.

1.11. In the event of a robot collision, a **UO volunteer** will remove the robots from the arena and hand it over to the two arena-allowed team members. Participating teams may then place their robots back within their starting zones. A collision is defined as two or more robots making physical contact for a period of longer than three seconds, counted automatically by the associated team judge.

1.11.1. If a free position within the starting zone is available without any balls or other robots, it must be used. If there is no free position within the starting zone with no balls present, the balls will be removed by a UO

volunteer, and randomly replaced within the arena. As the size of the starting zone is larger than competing robots, opposing teams' robots will not be moved nor penalised.

1.11.2. Balls contained or physically attached to the robot will be carried back with the robot to its reset position. Contained or physically attached is defined as when lifted from the sides, do the balls stay with the robot. If human input is required to keep the ball in place, this does not count, and the ball will be left where it was.

1.11.3. Participants may press the **physical start switch** on the robot to restart its running code during a collision reset. Participants are not allowed to make any modifications to the robot, to remotely connect to the robot, or make changes to their robot in any other way during collision resets.

1.12. During a match, if any ball leaves the arena by any means, the ball will be returned to the arena as soon as possible and will be placed randomly by a UO volunteer. The match will not be paused when this happens. In the event of a ball launched into the air (aimed at a scoring net) but missed, it will be brought back to the arena randomly by a UO volunteer.

1.13. After 180 seconds (and an additional five second grace period) into the match, the robots must come to a complete stop at any location of the arena. If a robot fails to stop automatically, UO volunteers will switch off the robot manually at once.

1.14. A match may be terminated prematurely or may be restarted if all teams participating in a match agree unanimously. The clock will not be paused while this decision is made.

1.15. The decisions of the judges and their interpretations of the rules are final.

2. Scoring

2.1. Definition:

2.1.1. A Match is a single round of contest in which robots collect and move balls for at most 180 seconds.

2.1.2. Game point is the raw score calculated at the end of a match to determine the match ranking of the participating teams in a single match.

2.1.3. League point is the final score awarded to the participating teams at the end of a match based on the match ranking.

2.1.4. League competition is a series of matches with four teams each. We will aim to make each team play the same number of matches. However, in cases of an odd number of competing teams, some teams will be chosen randomly to play extra matches which will not add to their total league points if such arrangement is necessary to form a match of four teams.

2.1.5. Knockout competition is a series of one-versus-one matches for the top four highest ranking teams after all teams have taken part in the league competition. The result of the knockout competition determines the top 3 winners.

2.1.6. Ranking is based on the total cumulative league points obtained in league competition. Ranking is used to identify the four teams that are qualified for knockout competition. In the case of tied league points, cumulative game points will be used to determine the ranking.

2.2. At the end of each match, **game points** will be calculated after the robots

and balls are stationary. It will be awarded to each participating team as follows:

2.2.1. 3 points for a robot successfully “parking” by touching their scoring wall at the end of the match (Note: The robot must have moved from its starting position).

2.2.2. 4 points for each ping-pong ball within a team’s own net at the end of the match.

2.2.3. 1 point is awarded for each magnetic ball bearing held by the robot. The bearing ball must be in direct contact with the surface of the robot.

2.2.4. A further two 2 points are awarded for each ball bearing within a team’s own net at the end of the match.

2.3. **League point** will be awarded as follows at the end of each match:

2.3.1. The four teams, ranking from the highest to the lowest in their game points, will be awarded 8,6,4,2 league points respectively.

2.3.2. In the event of a draw, the point for each team averages the points for the rankings they should have taken up (e.g. two teams both ranking 2nd are both awarded (6+4)/2=5 points).

2.4. **Knockout competition**

2.4.1. Only the top four teams in the league competition will advance to the knockout competition. In the event of tied league positions, the teams will be ranked by their cumulative game points in the league competition.

2.4.2. Each match in the knockout competition involves two teams.

2.4.2.1. Semifinal 1: 1st in the league vs 3rd in the league

2.4.2.2. Semifinal 2: 2nd in the league vs 4th in the league

2.4.2.3. Bronze medal match: loser of Semifinal 1 vs loser of Semifinal 2

2.4.2.4. Final: winner of Semifinal 1 vs winner of Semifinal 2

2.5. **Final competition prizes** will be awarded to the following teams:

2.5.1. First place: Winner of Final

2.5.2. Second place: Loser of Final

2.5.3. Third place: Winner of bronze medal match

2.5.4. Creativity and Technical Award: [SPONSORED PRIZE] Awarded to the robot that showcases the best creativity and complexity in the technology used or the design of the robot. Our Sponsors will be awarding this prize at the end of the Competition Day.

2.5.5. Blogging Award: Awarded to a team that has shared their journey, their progress on social media or personal blog. We want to see you share about your experience participating in Unibots UK Competition and want to reward you for doing so! UO will award this prize at the end of the Competition Day.

2.6. If there is a time constraint, the committee may amend the number of league matches or cancel knockout matches.

3. Robot Specifications

3.1. The robot should be completely autonomous without any real-time remote control capability. Team members must not remotely control their robot in any way (SSH, controller, etc.) during match play.

3.2. This is a non-contact sport and robots should implement collision avoidance capability. Robots intentionally designed to disrupt other robots' play, via direct contact or indirect contact, may be disqualified at a judge's discretion.
3.3. Before a match starts, the initial dimension of the robot must fit within a cube with 200mm internal sides. The robot may be able to extend to 300mm on all sides.
3.4. Robots must be able to display a board with their team number. This board must be of a rigid material, or a 3D-printed plaque, and must be at least 50 x 50 mm. If teams arrive at the competition without this display board, it will be provided to them, and must be included on the robot otherwise it will not be allowed within the arena.
3.5. Robots must not intentionally damage anything – including the arena.
3.6. The robot must pass a safety check by a UO volunteer prior to the start of the competition, otherwise it will not be allowed to enter the arena. Robot Safety requirements are detailed in Appendix C.
3.7. If the judges deem the robot unsafe, they have the power to withdraw the robot from the game until amendments to fix the issue are made.
3.8. Robots may be modified or repaired while not actively playing in a league match. Robots may not be modified during the knockout competition, but may be repaired if and only if components implemented during the league matches break. Matches will not be postponed for modifications or repairs.
3.9. UO volunteers reserve the right to examine your robot software and hardware at any time.
3.10. Any assistance from a UO volunteer may be provided without guarantees.

4. Arena Specifications

4.1. Arena

4.1.1. The arena floor will be a 2000mm × 2000mm square, as shown in Appendix A, Figure 1. The tolerance of these two dimensions is ±50mm.
4.1.2. The perimeter of the arena floor will be delimited by four raised walls, approximately 150mm tall. The four walls will be painted black, except for the scoring zone area. Each scoring zone wall is painted a different colour (Yellow, Orange, Purple or Green) and are labelled as North, East, South and West respectively. See Appendix A, Figures 2 and 3.
4.1.3. The floor of the arena is painted white.

4.2. Scoring Zones

4.2.1. Each of the four walls have a scoring zone attached in the form of a scoring net. The net's length is 800mm, placed from 600mm distance from the corner as shown in Appendix A, Figure 1.
4.2.2. The nets are hanging from the walls on the outside and have a depth of 200mm, and will have a height of -100mm, shown in Appendix A.
4.2.3. The nets will be positioned to an accuracy of ±50mm.

4.3. Balls

4.3.1. There will be 40 balls in the arena: 16 ping-pong balls, 24 magnetic ball bearings. These will be randomly but approximately rotationally symmetric, placed in the play area.
4.3.2. Ping-pong balls will be white with a diameter of 40mm, and may have

markings on them.

4.3.3. Magnetic ball bearings are 20mm in diameter, and are made from a steel alloy (e.g. carbon steel). The ball bearing is ferromagnetic: it can be pulled by magnets, but it does not act as a magnet on its own. For example: https://www.amazon.co.uk/sourcing-map-Bearing-Precision-Polished/dp/B0B5PM69P6

4.4. Line following track

4.4.1. A black tape of width 19mm will be used to form four (4) rounded-square line following tracks on the floor of the arena as shown in Appendix A, Figure 1.

4.4.2. The black lines are aligned along the directions facing the centres of AprilTags as shown in Appendix A, Figure 1.

4.5. Fiducials

4.5.1. AprilTags will be used as fiducial markers which are pasted onto the four walls of the arena as shown in Appendix B, Figure 1.

4.5.2. These tags have a dimension of 100x100mm.

4.5.3. The distance between the tags are measured from the centre of each tag.

4.5.4. Each tag has a unique ID. The IDs of the tag are numbered from 0 to 23 as shown in Figure 1.

4.5.4.1. North wall: 0 to 5

4.5.4.2. East wall: 6 to 11

4.5.4.3. South wall: 12 to 17

4.5.4.4. West wall: 18 to 23

5. Clarifications

5.1. We welcome any feedback or suggestions to improve the rules!

5.2. Requests for rule clarifications may be made on Unibots Discord, and this document will be updated if deemed necessary.

5.3. Requests received within one week of the competition are unlikely to be processed.

Appendix A

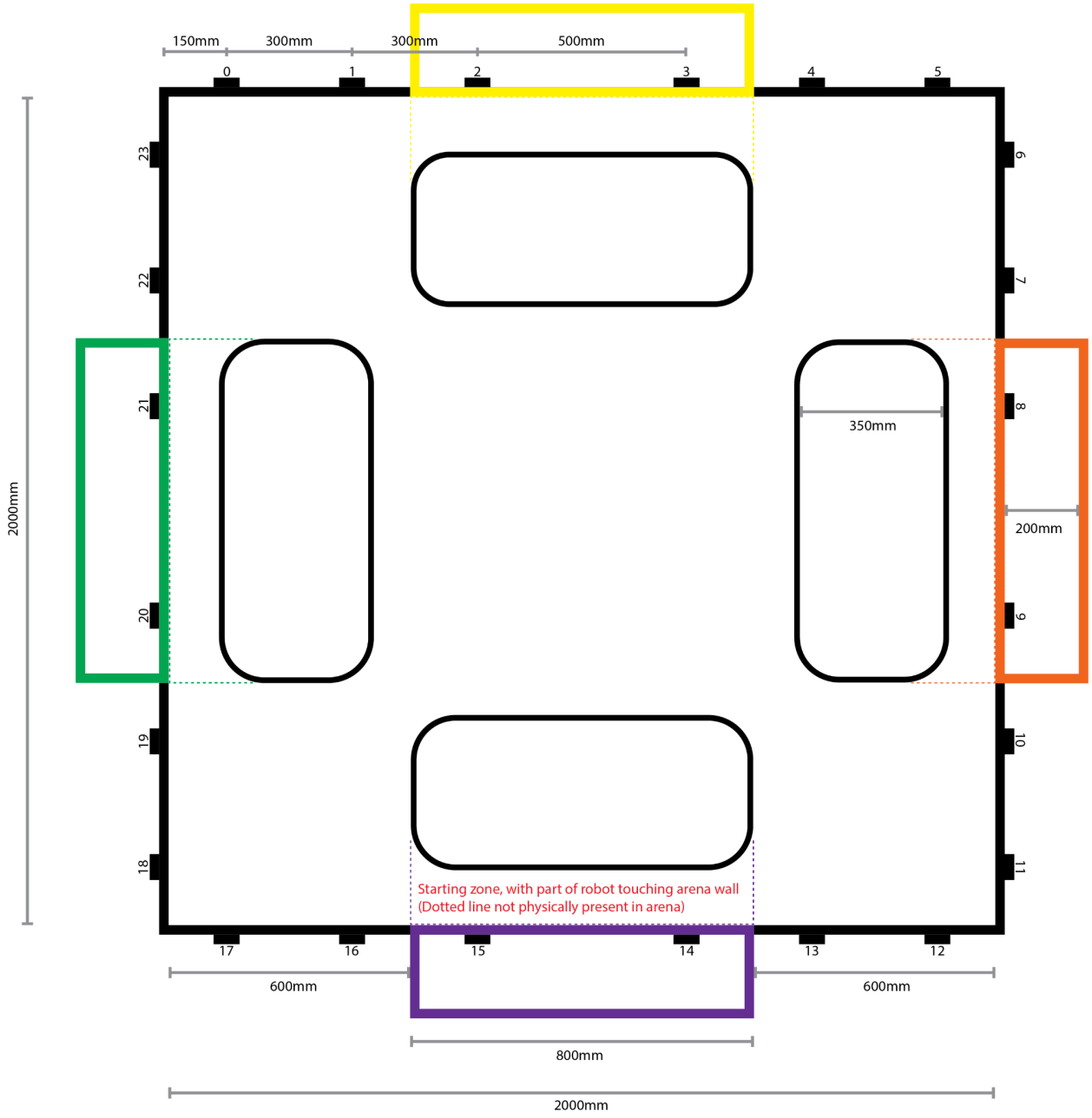

Figure 1 The full arena with scoring nets and line following tracks

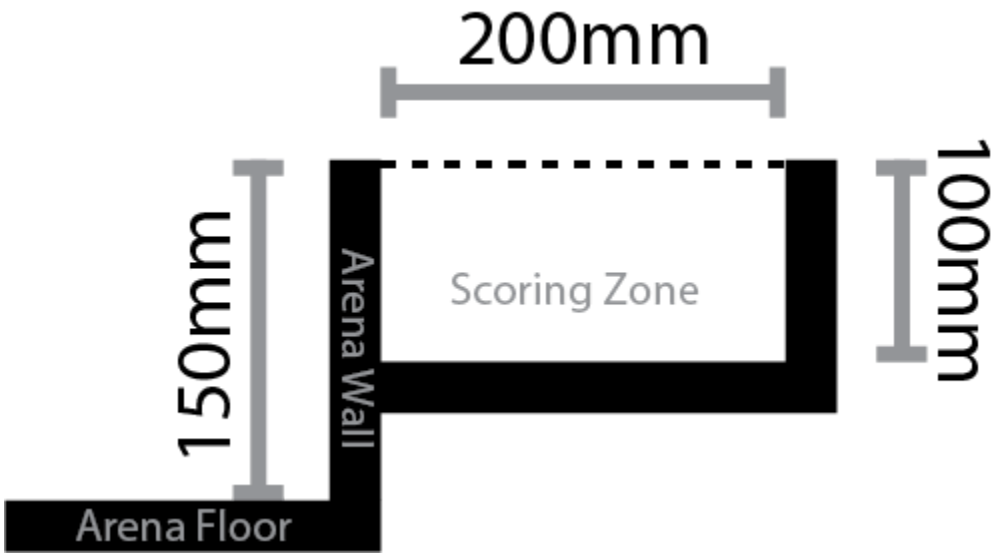

Figure 2 Wall construction and scoring net depths. Arena wall depth will be defined shortly, once arena materials are agreed upon. Expect between 4mm - 20mm.

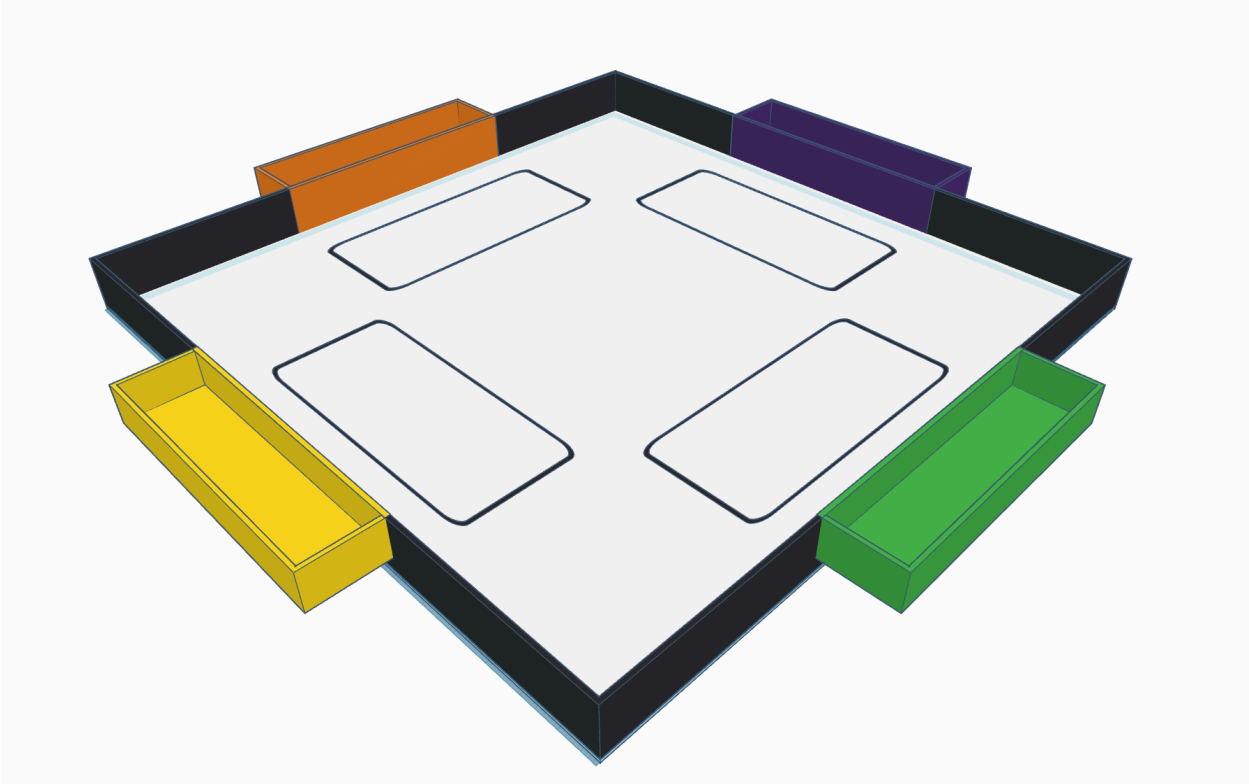

Figure 3 3D model of arena showing scoring nets and colours

Appendix B

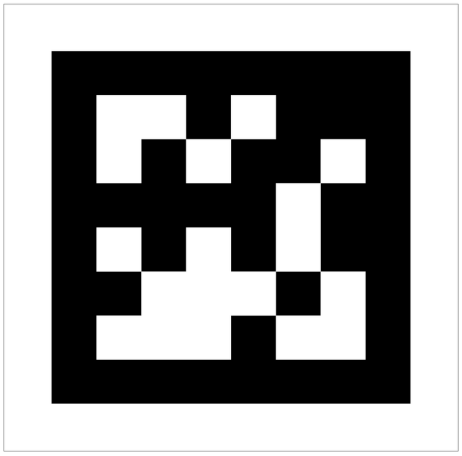

Figure 1 An example AprilTag 42 from the 36h11 family

Appendix C

Robot Safety Requirements
These requirements exist as a minimum set of requirements that all robots must adhere to. All robots will be checked individually, and will be given a pass sticker once assessed.

- The robot's power switch must be easily accessible at all times – including throughout the game for UO volunteers to access. Without a visible physical power switch, the robot will not be allowed to compete.
- If a robot makes use of Li-Po, Li-Ion, or other batteries with additional safety requirements, these must be followed. When not in use, they must be stored within fire-safe, or "Li-Po" storage bags. Additionally while charging, batteries **must not** be left unattended, and must be charged on a suitable surface, inside a fire-safe bag.
- If the event is a multi-day event, robots may be allowed to be stored on the competition premises overnight, **if and only if** the battery is removed and safety taken from the premises. The Unibots Competition Organisers take no liability for robots stored within competition premises.
- Batteries of any chemistry must be securely fixed to the robot using a removable mounting method (e.g. velcro, removable zip ties), such that they do not come loose during a match.
- Batteries of any chemistry must be protected from accidental puncture from any robot, the arena, during transportation, and at all other times. This may be a simple rigid material shield around the battery, for example plastic.
- Robots must be free of loose or dangling wiring, so that no other robot can become entangled.
- Robots must be free of sharp edges, such that if a volunteer or team member picks the robot up they can be assured they will not be injured.
- Robots must not include dangerous elements or "weapons" of any description, designed to disrupt the play of other robots. This is not limited to: air cannons, high speed spinning devices, any object intended to be released (e.g. darts, nets, shrouds, other than the game scoring pieces collected during play), or any flammable objects.
- Robots implementing a launch system for balls must do so with precaution. During the safety check, UO volunteers will ask to see a demonstration of the system and its maximum capable power. If it is deemed excessive, teams must ensure that it is limited to a safe manner. Excessive may involve launching balls for a distance of over 2 meters, or at speeds which will cause injury when colliding with any arena-side participants or volunteers.
- All participants and UO volunteers who are arena-side must wear safety goggles or their own glasses.