RobotChallenge - APM Starmap Project

Revised on January 04, 2026

Introduction: Control intelligent robots with programming and engineering skills to complete the collection and deployment tasks of "Emotional Nutrients (Star Chart Fragments)" and "Self-Awareness Cores (Heart Core Fragments)", stimulating the enhancement of cognitive structure and psychological resilience. Contestants must accurately judge deployment zones, placing fragments into the "Energy Hub" symbolizing psychological energy integration or the "Growth Fission Field" triggering score multiplication, finally proceeding to the "Recovery Orbit", symbolizing self-reconstruction and emotional repositioning.

1 Group

A. Junior (Under 12 years old)
B. Senior (Under 18 years old)
C. For specific division criteria, please refer to the division descriptions in the competition registration system for the current year.
D. Each team consists of 2 team members and 2 robots.

2 Robot Requirements

A. The robot's dimensions in the starting area shall not exceed Length 30cm × Width 30cm × Height 30cm; size may expand after activation with no restriction.
B. The robot must use an STM32 or RP2040 core controller, with no less than 6 three-wire motor ports and no less than 6 three-wire digital and analog sensor ports. The number of three-wire motors used shall not exceed 10.
C. The robot must be constructed using structural components designed based on a 10.8mm standard. Screws, nuts, rivets, glue, zip ties, and other auxiliary connection materials may be used. Partial use of PC boards, acrylic boards, and 3D printed parts is allowed.
D. Each robot may use one battery, and its saturated voltage must not exceed 8.4V.
E. Before the match begins, each team may carry up to 2 task objects as pre-loads (Star Chart Fragments). During the match, there is no limit to the number of task objects a robot can simultaneously transport or hold.
F. Each robot may use up to 1 gas storage device. The inflation pressure of pneumatic devices must not exceed 140 psi.

3 Match Description

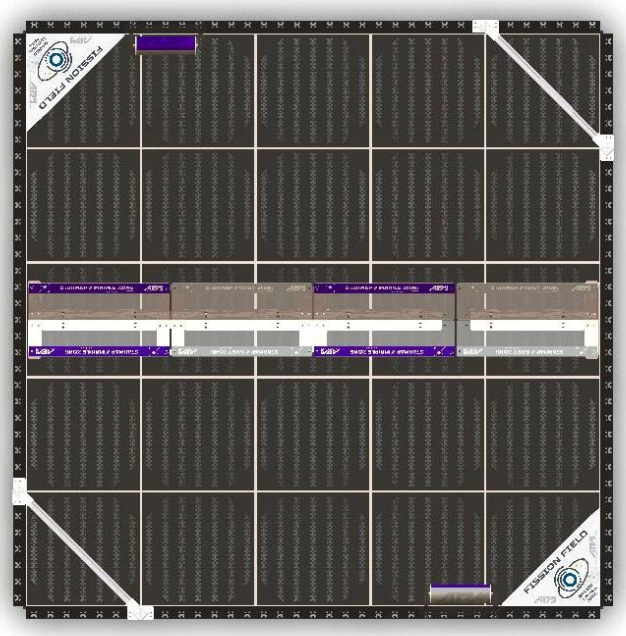
A. Matches are conducted in a head-to-head format. Each team consists of 2 members and 2 robots.
B. A match consists of a program-controlled phase and a manual remote-control phase. After the match concludes, the final score for each team will be calculated based on the results of all completed tasks.

C. The total match duration is 120 seconds, comprising a 30-second autonomous phase and a 90-second manual control phase. During the autonomous phase, robots must operate autonomously to complete tasks; no person may control or interfere with the robots in any form. During the manual phase, team members are allowed to remotely control robots but are not allowed to touch robots or field objects with hands or items.
D. Robots may not be replaced during match task execution, and no software or hardware changes may be made to the robots.
E. Points in all scoring zones during both the autonomous and manual phases can be eliminated by one's own team or the opponent.
F. At the end of the autonomous phase, the team with the higher total score from all scoring elements for that phase is the winner of the autonomous phase and receives a 6-point bonus added to their single-match total score.

4 Field and Task Objects Description

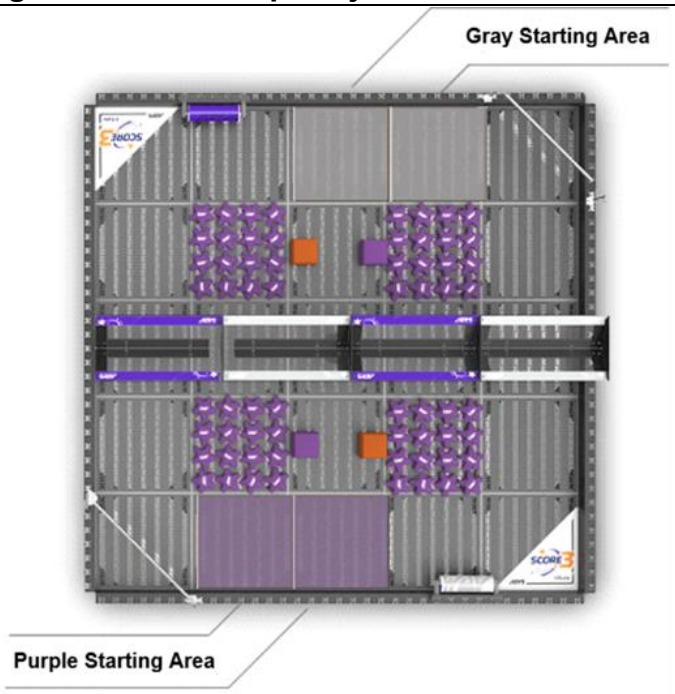
4.1 Field Dimensions

The competition field dimensions are Length 158cm × Width 158cm. The surrounding walls have dimensions of Length 150cm × Width 150cm × Height 9cm, with a thickness of 4mm.

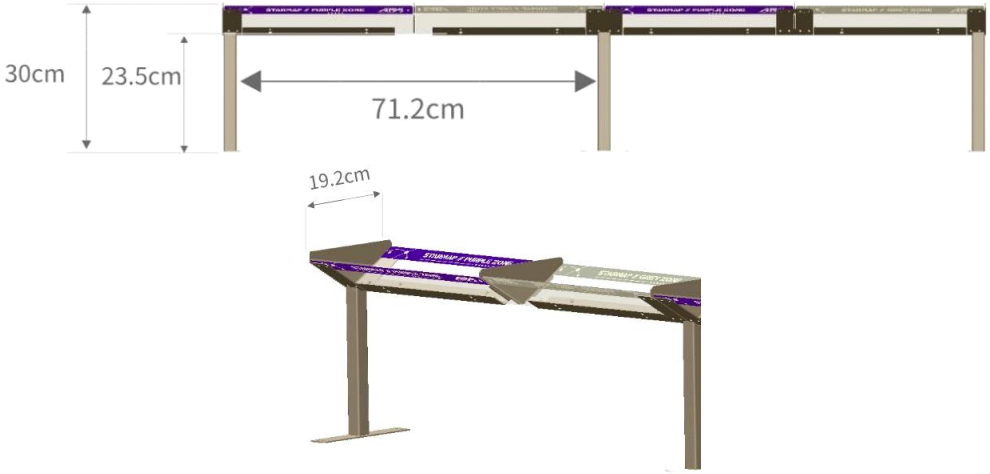


4.2 Field Layout

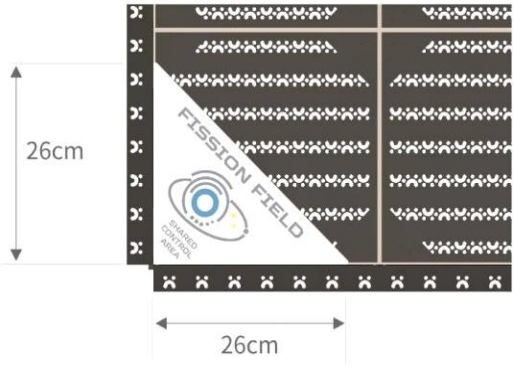
A. Robot Starting Zones: There are four in total, located on both sides of the field. This zone's dimensions are Length 30.2cm × Width 30.2cm.



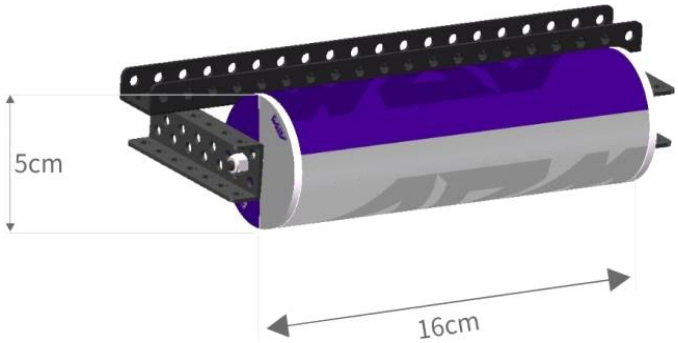
B. Fragment Hub Station: Located at the center of the field, it is an inverted triangular trough-shaped container. Four such containers are closely connected and on the same level. The two colors of the container correspond to the affiliated colors of the two teams.



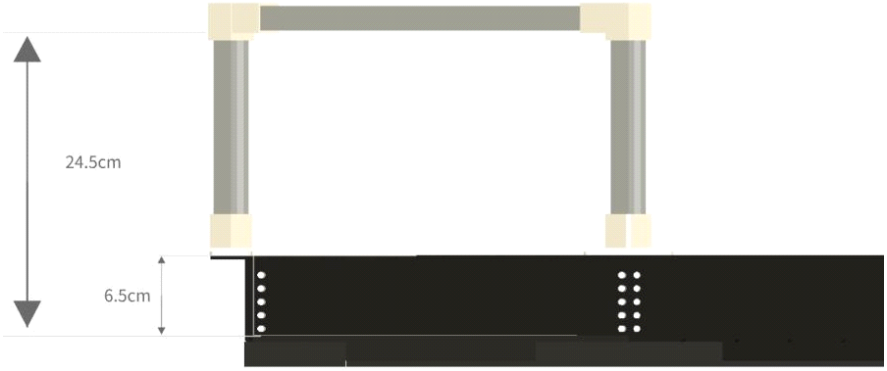
C. Fragment Fission Field: There are two in total, located at both ends of the field's diagonal. It is a triangular area with Width 26cm × Height 26cm.



D. Core Control Device: There are two in total, located on the side borders of the field adjacent to the "Fragment Fission Fields". The "Core Control Device" is a cylindrical object with Length 16cm and Diameter 5cm, covered with stickers in gray and purple colors, corresponding to the affiliated colors of the two teams.



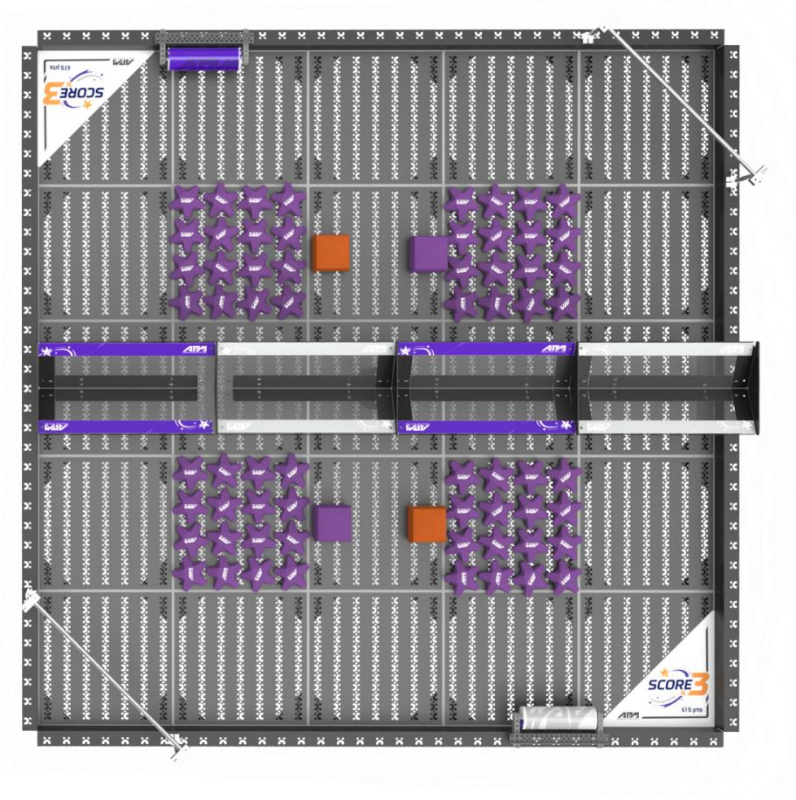
E. Return Orbit: There are two in total, located at both ends of the field diagonal, at a height of 24.5cm above the field floor.



4.3 Task Objects

A. There are a total of 72 task props. Each team may pre-load 2 star-shaped scoring objects (Star Chart Fragments). There are 64 regularly placed star-shaped scoring objects (Star Chart Fragments) on the field, and 4 sandbag-shaped scoring objects (Heart Core Fragments). **All scoring objects are shared by both teams.**

B. The initial placement positions of scoring objects are as shown in the figure:



5 Match Description

5.1 Match Task Description

A. **Enter Virtual Space Station**

The robot is considered successful when the vertical projection of its body completely leaves the starting area.

B. **Star Chart Fragment Collection**

The robot places "Star Chart Fragments" from the field into the "Fragment Hub Station" of its team's affiliated color located at the field center. There is no limit to the number of Star Chart Fragments a robot can transport simultaneously.

C. **Heart Core Fragment Collection**

The robot places "Heart Core Fragments" from the field into the "Fragment Hub Station" of its team's affiliated color located at the field center. There is no limit to the number of Heart Core Fragments a robot can transport simultaneously.

D. **Fragment Energy Fission**

The robot places Star Chart Fragments and Heart Core Fragments from the field into the "Fragment Fission Field" located at the diagonal position of the field. There is no limit to the number of fragments within a Fragment Fission Field.

5.2 Scoring Rules

Prohibition: After the autonomous phase begins, a team's robot must not cross the autonomous phase boundary line, must not interfere with the opponent's actions, and must not contact the field panels, scoring objects, or field elements in the opponent's alliance zone on the other side of the autonomous phase boundary line. If a team's robot crosses the autonomous

phase boundary line during the autonomous phase, they are directly judged as losing the match.

A. **Star Chart Fragment Collection**

a) Autonomous Phase: The robot operates autonomously and places Star Chart Fragments into the Fragment Hub Station of its team's color. Each Star Chart Fragment in the Fragment Hub Station of the team's color scores "1 point".

b) Autonomous Phase: The robot operates autonomously and places Star Chart Fragments into a Fragment Fission Field. After the autonomous phase ends, if the Core Control Device's scoring color matches the team's color, each Star Chart Fragment whose vertical projection is within that Fragment Fission Field scores "3 points". The maximum point limit for one Fragment Fission Field is "15 points". If the Core Control Device's scoring color is the opponent's color, the points are awarded to the opponent.

c) Manual Control Phase: The contestant operates the robot to place Star Chart Fragments into the Fragment Hub Station of their team's color. At the end of the match, each Star Chart Fragment in the Fragment Hub Station of the team's color scores "1 point".

d) Manual Control Phase: The contestant operates the robot to place Star Chart Fragments into a Fragment Fission Field. At the end of the match, if the Core Control Device's scoring color matches the team's color, each Star Chart Fragment whose vertical projection is within that Fragment Fission Field scores "3 points". The maximum point limit for one Fragment Fission Field is "15 points". If the Core Control Device's scoring color is the opponent's color, the points are awarded to the opponent.

B. **Heart Core Fragment Collection**

Heart Core Fragments (sandbags) come in orange and purple colors. The placement order of the two colors of Heart Core Fragments (sandbags) is randomly determined by the on-site referee.

a) Autonomous Phase: If one team successfully places an orange Heart Core Fragment into the Fragment Hub Station of their corresponding color, while the other team does not complete the corresponding operation, the team that successfully places the orange Heart Core Fragment directly wins the autonomous phase.

b) If both teams have completed placing the orange Heart Core Fragment into their own hub station, or if neither team has completed placing the orange Heart Core Fragment into their own hub station, then the scores from other scoring elements on the field are calculated. The team with the higher score wins the autonomous phase.

c) Autonomous Phase: The robot operates autonomously and places a Heart Core Fragment into a Fragment Fission Field. After the autonomous phase ends, if the Core Control Device's scoring color matches the team's color, each Heart Core Fragment whose vertical projection is

within that Fragment Fission Field scores "9 points". The maximum point limit for one Fragment Fission Field is "15 points". If the Core Control Device's scoring color is the opponent's color, the points are awarded to the opponent.

d) Manual Control Phase: The contestant operates the robot to place Heart Core Fragments into the Fragment Hub Station of their team's color. At the end of the match, each Heart Core Fragment in the Fragment Hub Station of the team's color scores "3 points".

e) Manual Control Phase: The contestant operates the robot to place Heart Core Fragments into a Fragment Fission Field. At the end of the match, each Heart Core Fragment in the Fragment Fission Field of the team's color scores "9 points". The maximum point limit for one Fragment Fission Field is "15 points". If the Core Control Device's scoring color is the opponent's color, the points are awarded to the opponent.

C. **Docking with Return Orbit**

At the end of the manual match, the robot may use its own device to attach itself to the Return Orbit. The robot is considered successful if its body completely leaves the field floor, awarding "10 points". If the lowest part of the robot's body is higher than the field border height, it awards "15 points".

5.3 Scoring Details

A. At the end of both the autonomous and manual phases, scoring objects contacted by a team's own robots within their own scoring zones do not score points.

B. At the end of both the autonomous and manual phases, as long as the vertical projection of a scoring object contacts a Fragment Fission Field, that scoring object can score points. The total point limit for each Fragment Fission Field area is 15 points. Points from scoring objects exceeding this total are invalid.

C. When a robot is attaching to the Return Orbit, if the robot has already left the field floor and fails to attach due to interference such as contact or collision from an opponent robot, it is considered a successful attachment and awards the 15 points.

D. At the end of the match, the referee will determine the scoring (attribution) of the Fragment Fission Field adjacent to a Core Control Device based on the color pointed upwards by the white line on the side of the Core Control Device. If the white line points upwards at the (junction point) between gray and purple, neither team scores.

5.4 Handling of Scoring Objects Falling Outside the Field

If a scoring object falls outside the field during the match, the match continues. The referee or staff will place the fallen scoring object back onto the field at a position close to where it fell and that has minimal impact on robot actions. The specific time and location for replacement are at the discretion of the referee or staff.

5.5 Prohibition on Blocking Opponent Robots

A. Restraining, Trapping, Locking, Lifting - States of a robot. If a robot meets any of the following criteria, penalties will be applied according to the rules.

B. During the manual control phase, each instance of restraining an opponent robot must not exceed 5 seconds, counted down verbally by the head referee.

C. After the restraint timer ends, that robot must not restrain the same opponent robot again for 5 seconds.

D. Trapping - Restricting an opponent robot's movement to a small area on the field (no larger than the size of one field panel) with no escape path. During the manual control phase, each instance of trapping an opponent robot must not exceed 5 seconds, counted down verbally by the head referee. After the trapping timer ends, that robot must not trap the same opponent robot again for 5 seconds.

E. Lifting - If an opponent robot is overturned in any way, the offending robot is penalized with a stop until the opponent robot is restored to normal.

5.6 Score Sheet

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Scoring Item				Points	Purple Side	Purple Score	Gray Side	Gray Score
Autonomous	Fragment Hub Station	/	Star Chart Frag	1				
			Orange Heart Core Fragment	Y N √ ×				
			Purple Heart Core Fragment	3				
	Fragment Fission Field 1	Purple/Gray	Star Chart Fragment	3				
			Heart Core Fragment	9				
	Fragment Fission Field 2	Purple/Gray	Star Chart Fragment	3				
			Heart Core Fragment	9				
Remote	Fragment Hub Station	/	Star Chart Fragment	1				
			Heart Core Fragment	3				
	Fragment Fission Field 1	Purple/Gray	Star Chart Fragment	3				
			Heart Core Fragment	9				
	Fragment Fission Field 2	Purple/Gray	Star Chart Fragment	3				
			Heart Core Fragment	9				
Autonomous Match Winner				6				
Return - Leaves Ground				10				
Return - Above Field Border				15				
Total Score					Purple:		Gray:	

6 Competition Format

6.1 Match Points Ranking

A. For the RobotChallenge head-to-head competition, based on the number of registered teams, they are divided into several groups equally. A round-robin format within groups is used, with the top 2 teams in group points advancing to the elimination round.
B. In each head-to-head match, the winning team receives 3 ranking points, a draw gives each team 1 ranking point, and the losing team receives 0 ranking points.
C. If tied points occur among teams affecting advancement from the group, the team that won the head-to-head match between the tied teams ranks higher. If three or more teams are tied and the head-to-head results cannot determine ranking, affecting elimination round qualification, these tied teams will have a rematch.

6.2 Elimination Round

A. In each elimination round match, the winning team advances to the next round. If a match ends in a draw, an extra match will be played until a winner is determined.

7 Violations

7.1General Violation Rules

A. Robots exceeding competition specifications and restrictions, and causing damage to the arena or damaging the opponent's robot in ways not permitted by the rules.
B. Insulting opponents will be considered a serious violation, as will posting insulting language on the robot's body, or deliberately damaging other teams' robots or programs.

7.2Minor Violations

Entering the competition arena without the referee's permission.
Actions or statements detrimental to the fairness of the competition.

8 Injuries and Accidents During Competition

8.1Request to Stop the Match

When a participant is injured, or their robot has an accident that prevents the Match from continuing, they may request to stop the Match.

8.2Unable to Continue the Match

When a Match cannot continue due to a participant's injury or a robot accident, the participant who caused the injury or accident loses the Match. When it is unclear which team caused it, the participant who is unable to continue, or who requested the stop, will be declared the loser.

8.3Time Required to Resolve Injury or Accident

The referee and the organizing committee will decide whether to continue a Match suspended due to injury or accident. This decision process should not exceed 5 minutes.

9 Raising Objections

9.1Raising Objections

There are no objections allowed against the referee's decisions.
If there is any lack of understanding in the application of these rules, the team captain may raise an objection to the referee.

10 Rule Flexibility

As long as the concept and foundation of the rules are respected, these rules should be flexible enough to adapt to changes in the number of participants and the content of the competition.

11 Liability

Participating teams are always responsible for the safety of their robots and any accidents caused by their team members or machines.
The RobotChallenge organizing committee and its personnel cannot be held liable for any accidents caused by participating teams or their equipment.