

ROBOTICS DOJO 2026

RULEBOOK

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1. Introduction

Welcome to the Robotics Dojo 2026 Challenge!
This year's arena tackles one of the most pressing urban challenges of our time; waste management. Teams will build robots capable of autonomous waste detection, waste collection, and waste disposal. This challenge aims to simulate real-world municipal and industrial waste-handling systems. Robots will be tested on autonomous navigation, object detection, terrain handling, and task execution.

Competition unfolds in two phases: a 3-minute mapping phase to scout the field, followed by a 5-minute autonomous task phase where your robot puts that map to work ; identifying, locating, and handling waste across the course.

2. Game Field Overview

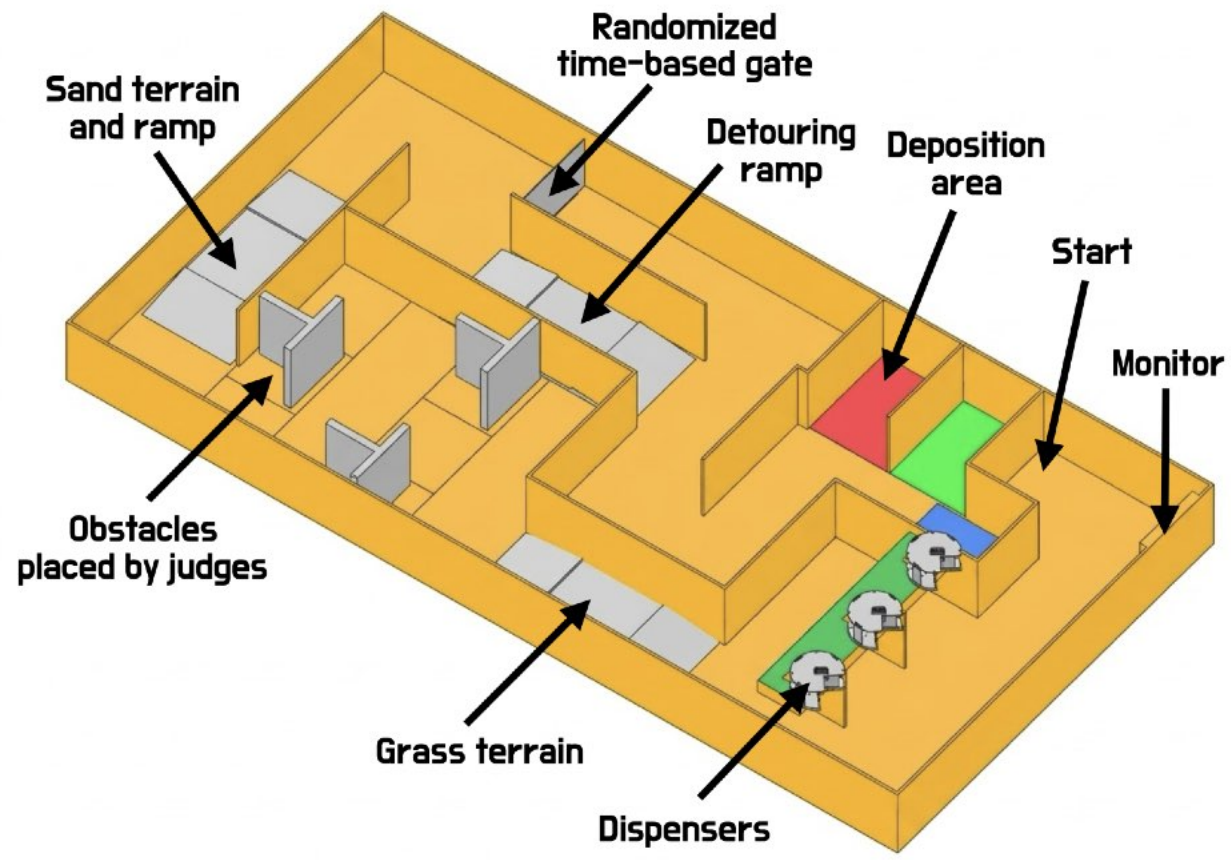


Figure: Game Field Overview (Isometric View)

The game field consists of several areas:

1. Terrain zones: grass, sand and ramps
2. A time-based barrier
3. Obstacles placed randomly by Judges
4. A Waste Loading zone
5. A colour-coded Waste Offloading section
6. A designated start position (Assigned which load to pick)

3. Competition Objectives

The challenge evaluates your robot's ability to:

1. Map the field: Scan and map the gamefield, walls, and relevant markers during the mapping phase.
2. Navigate terrain: Cross grass and sand terrain without human control.
3. Time-based barrier: Detect the time-based dynamic barrier and choose the best path.
4. Detect and avoid obstacles: Locate obstacles placed by judges and avoid them.
5. Pick and deliver: Collect items from the loading zone and deposit them in the correct colour-coded offloading zone.
6. Finish on time: Complete all tasks autonomously within the 5-minute task phase.

4. Competition Flow Diagram

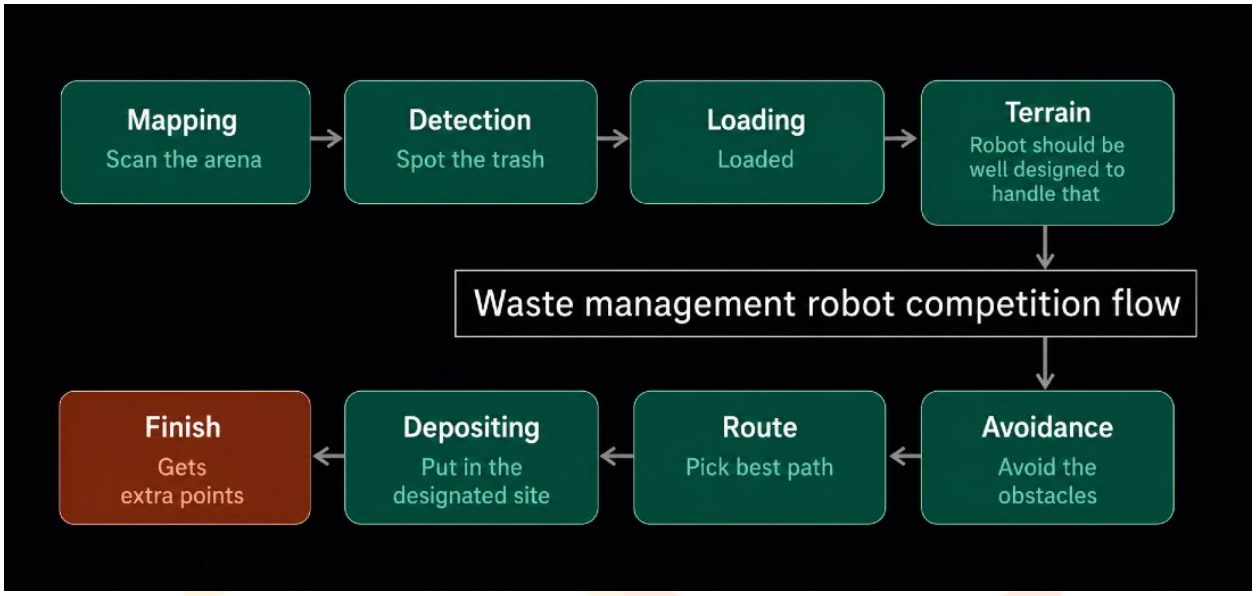


Figure: Waste Management Flow Diagram

5. Competition Structure

Mapping Phase (3 minutes)

- Teams teleoperate the robot to scan the environment
- The robot must generate a digital map using onboard sensors (LiDAR, cameras, etc.)
- Map quality is judged on:
    - Completeness of area coverage
    - Accuracy of features
    - Usability for autonomous navigation
- This is the only phase where human control is permitted

Autonomous Phase (5 minutes)

After mapping, the robot must complete the following tasks autonomously, in sequence:

Waste Detection

- Navigate to the display screen
- Detect the waste type shown: plastic, metal, or organic
- Judged on classification accuracy and navigation to the screen

Loading Operation

- Navigate autonomously to the loading station corresponding to the detected waste type
- Load the item

Terrain Navigation

- Navigate toward the offloading zone via the ramp
- Traverse the ramp incline and mixed terrain, both ascending and descending

Dynamic Obstacle Avoidance

- Detect and avoid dynamic obstacles placed at random locations along the route, representing workers or obstructions in the area

- Obstacles may block the path at any time; the robot must either wait or reroute
- Every collision reduces the Dynamic Obstacles score (see Section 7)

Route Decision (Time-based barrier)

- At the path junction, choose between two routes:
    - Path 1: Ramp (always available but the ramp increases difficulty)
    - Path 2: Flat and obstacle-free but gated
- If Path 2's gate is closed, the robot must either wait for 2 seconds for it to open or divert to Path 1
- Judged on whether the robot makes an efficient routing decision rather than defaulting to the harder path

Depositing Task

- Identify the correct offloading station by color:
    - Blue = plastic
    - Green = organic
    - Red = metal
- Precisely deposit the item in the correct station
- Judged on sorting accuracy and total time taken

6. Robot Requirements

1. Dimensions: Maximum 30 cm × 30 cm × 30 cm (L × W × H).
2. Autonomy: The robot must operate without human intervention during the autonomous phase.
3. Sensors: The robot must include mapping and object-detection capabilities.
4. Communication: The robot must implement wireless communication.
5. Safety: The robot must not damage the game field or pose a risk to spectators, judges, or other participants.
6. Power: The robot must use a self-contained power source with a maximum system voltage of 24 V.
7. Timing and Performance Logging: The robot must record timestamps for key autonomous events and transmit the required data to the judges' monitoring system.

7. Competition Scoring, Documentation & Evaluation Rules

Robotics Dojo 2026 presents two separate awards. The Game Award (100 points) is decided by the field run: the mapping phase and the autonomous arena tasks. The Technical Award (50 points) is decided by the technical report, the technical presentation and the extra bonus. Each award is ranked and presented on its own, and the two scores are not added together.

a. Game Award: Score Sheet (100 Points)

Task	Points	Scoring Criteria
Mapping Phase (pre-scoring)	10	Completeness of arena coverage (0 to 5), feature accuracy and usability for autonomous navigation (0 to 5)
1. Waste Detection	15	Classification accuracy: plastic, metal or organic (0 or 10), navigation to the screen (0 or 5)
2. Loading Operation	10	Selection of the station matching the waste type (0 or 4), positioning and docking (0 or 3), securing the payload (0 or 3)
3. Terrain Navigation 1	5	Stability across the grass zone (0 or 5)
4. Dynamic Obstacles	15	Tick one: avoided obstacles with no collisions (15), with 1 collision (10), with 2 collisions (5), 3 or more collisions (0)
5. Terrain Navigation 2	15	Stability across the sand zone (0 or 10), ascending and descending ramps without tipping over (0 or 5)

6. Route Decision	10	Tick one: passed through the gated path (10), took the detour via the ramp (5), crashed into the gate (0). Explained in detail below
7. Depositing Task	15	Chose the correct station (0 or 10), placement inside the station (0 or 5)
8. Finish Performance	5	Speed (0 to 3, see the table below), stopped inside the station (0 or 2)
Arena Tasks Total	90	
Game Award Total (Mapping + Arena Tasks)	100	

Finish Speed (Task 8)	**Points**
Less than 3 minutes	3
Less than 4 minutes	2
Less than 5 minutes	1
5 minutes or more	0

b. Scoring Method

Scoring type	**Applies to**
All or nothing (0 or full points)	Waste Detection, Loading Operation, Terrain Navigation 1 and 2, Depositing Task, stopping inside the station
Graded by the judges (0 to 5 per item)	Mapping Phase

Tick one outcome	Dynamic Obstacles, Route Decision
Time-based	Finish speed

c. Route Decision: 10 Points

- Path 1: Contains a Ramp; always available.
- Path 2: Flat route with a gate; gate opens after a 2-second delay.

Point Allocation

A robot receives 10 points when:

- The robot waits for the gate to open and passes through the gated path (Path 2).

A robot receives 5 points when it completes the route safely by taking the detour via the ramp (Path 1).

A robot receives 0 points when it crashes into the gate.

d. Extra Points and Penalties

Extra points and penalties apply to the Game Award only and are recorded on the arena score sheet.
Extra points:

- Used a self-made machine learning model: +2 points

Penalties:

- Extra time beyond the 5-minute autonomous phase: -5 points per 30 seconds
- Human intervention: -5 points per intervention
- Restart: -5 points per restart (maximum 2 restarts per run)

Final Game Award score = Game Award total + extra points - penalties.
For every run the judges record official timestamps: mapping time, autonomous navigation time, start time delay, navigation start delay, official start time, gate decision, gate wait duration, deposit completed and official finish time.

e. Team Documentation Video

Every team must submit one 3 to 5 minute development video. The video must demonstrate the team's engineering process and contribution. The video is assessed as part of the Innovation Bonus in the Technical Award.

Format:

- Landscape orientation
- 16:9 aspect ratio
- Clear audio and video
- Original team content

f. Social Media Engagement

The official Robotics Dojo social media page may publish or repost team videos.

Engagement is assessed as part of the Innovation Bonus in the Technical Award.

Engagement will be measured at a fixed date announced by the organizers.

g. Technical Readiness Interview

Before the competition, each team will participate in a Technical Readiness Interview.

Teams must demonstrate knowledge of:

- Robot design
- Sensors
- Mapping and SLAM
- Navigation
- Autonomous decision-making
- Expected performance

Teams may also be required to demonstrate their mapping system using a virtual SLAM simulation after the training session.

Failure to demonstrate sufficient technical understanding or provide a satisfactory mapping result may result in disqualification.

h. Technical Award: Score Sheet (50 Points)

Category	Points	Scoring Criteria
Technical Report: Documentation	10	Depth of technical content, system diagrams and schematics; methodology, testing results and conclusions; clear structure, completeness and references
Technical Report: Originality	10	Novel approach or design beyond reference solutions; own implementation and custom improvements; justification of design choices
Technical Presentation: Poster Presentation	10	Technical clarity; visual organization and architecture; problem framing and system trade-off articulation
Technical Presentation: Robot Demonstration	10	Working demonstration of key functions; virtual robot simulation; explanation of system design and engineering decisions; answers to judges' questions
Extra Bonus: Innovation Bonus	10	Exceptional autonomy, novel edge AI or hardware mechanism; innovative recovery behavior during unexpected faults; documentation video; social media engagement
Technical Award Total	50	

CAD Design Submission

Each team must submit its robot's CAD file for evaluation.

Teams must provide:

- STEP files of the robot design.

- CAD screenshots showing the complete assembly and important components.
- Reasons for selecting important components, shapes, dimensions, and mechanisms.
- How the design supports the competition requirements.

Judges will evaluate both the quality of the design and the team's ability to explain and justify its engineering decisions.

Virtual SLAM (Robot Demonstration)

Teams will demonstrate their mapping and navigation system using a virtual SLAM environment.

Evaluation will include:

- Map completeness.
- Map accuracy.
- Localization and navigation.
- Ability to use the generated map for autonomous navigation.

The virtual SLAM assessment may be conducted after the training session as part of the team's technical readiness evaluation.

i. Awards

Award	Maximum Points
Game Award: Mapping Phase (10) + Arena Tasks (90)	100
Technical Award: Technical Report (20) + Technical Presentation (20) + Extra Bonus (10)	50

The Game Award and the Technical Award are separate awards, and their scores are not added together. Extra points and penalties apply to the Game Award only.

The official competition time keeper remains the final authority in case of any timing discrepancy.

8. Competition Rules

1. Team Composition:
    - 3-5 members per team
    - All members must be currently enrolled students
    - One designated team captain for official communications
2. Game Field:
    - No modifications permitted
    - Obstacles may change between rounds
    - Teams may inspect field before competition
    - Only 1 team and its robot allowed on the gamefield during a match
    - No stepping on the gamefield with shoes
3. Robot Operation:
    - Manual control only permitted during mapping phase
    - No external control or communication during autonomous phase
    - Up to two restarts allowed per run (-5 points each)
4. Judging:
    - Decisions by panel of judges are final
    - Scoring based on objective metrics and subjective evaluation
    - Video review may be used for tie-breaking
5. Team Documentation & Reflection:
    - Every team must submit one 3 to 5 minute video documenting their robot development process.
    - The video must be recorded in landscape (16:9) orientation.
    - The video should clearly cover:
        - Team member roles and how work was divided.
        - The inspiration for the name chosen by the team.
        - The robot's design and development process.
        - Key engineering decisions and challenges encountered.
        - Expected results versus actual results.
        - Whether the team's expectations were met.
        - Lessons learned and areas for improvement.
        - Suggestions for improving future Robotics Dojo competitions.
    - The video should have clear audio and good lighting.
    - Teams may use demonstrations, diagrams, CAD models, simulations, or test footage to explain their work.

- The video should be original work produced by the team.
- Each team must submit the video before the competition deadline.

Disqualification

The following may cause a team to be disqualified and banned from future Robotics Dojo Competitions:

- Unauthorized control during autonomous phase
- Deliberate cheating
- Deliberate damage to the gamefield or other teams' robots
- Gross misconduct
- Failure to participate without an approved reason
- Robot exceeds the specified dimensions
- Sabotage

9. Competition Schedule

Stage	Date	Activity
Team Registration Deadline	Sep 4, 2026	Teams sign-up via online form
Notification of qualified teams	Sep 7, 2026	Successful and unsuccessful applicants notified via email
Training sessions commence	Sep 8, 2026	Robotics Dojo Interns & Alumni train the competitors
Robot Design commences	Sep 9, 2026	Use CAD Software to design the robot
BOM Submission	Sep 15, 2026	Bill of Materials plus justification submitted via Email
Mini Competition	Oct 26, 2026	Will determine teams that proceed to the Grand Competition
Final Technical poster and paper submission	Nov 16, 2026	Teams will submit their technical posters and papers for the judges to evaluate
Technical poster presentation	Nov 23, 2026	Each team to present their poster and be evaluated by the judges

Grand Competition	Nov 24, 2026	Final Competition and live demo on the gamefield

10. Safety Regulations

1. All robots must pass the mandatory safety and dimensional inspection before competing. Each item is judged pass or fail: maximum dimension envelope (30 × 30 × 30 cm or less), self-contained power, autonomous compliance, and arena and spectator safety (no field damage).
2. No hazardous materials permitted
3. Judges may halt any run deemed unsafe
4. Teams are responsible for any damage caused by their robot or team members

11. Tips for Success

1. Prioritize reliable autonomous navigation.
2. Test the robot on different terrain types.
3. Practice obstacle detection and avoidance.
4. Test loading and depositing procedures thoroughly.
5. Calibrate sensors beforehand.
6. Plan safe and efficient routes.
7. Build robust recovery routines without human intervention.
8. Check the robot's battery, sensors, and mechanics before each run.
9. Design for consistency and reliability over speed.
10. Use field inspection time to plan your strategy.

Think smart, adapt fast, and finish strong! May the best team win at Robotics Dojo 2026!

Organizing Committee
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