RoboCup Iran Open Self-driving Car League

Rulebook

Version: 1.2

2026

Contents

1. Introduction

1.1. RoboCup

RoboCup is an international joint project to promote AI, robotics, and related fields. It is an attempt to foster AI and intelligent robotics research by providing standard problems where a wide range of technologies can be integrated and examined. More information can be found at http://www.robocup.org/.

1.2. RoboCup Self-Driving Car league

Statistics show that 90% of road accidents are caused by human error, resulting in approximately 1.35 million deaths annually due to traffic crashes. Self-driving cars can significantly enhance safety, making their development increasingly vital. In this competition, safety is the top priority. Scoring prioritizes rule adherence and safe driving over completing tasks quickly. The competition aims to develop a 1/10 scale self-driving electric car capable of tasks such as lane-keeping, obeying traffic signs, yielding, parking, and emergency braking, etc.

1.3. Participation in the Competition

Participation in Self-Driving cars league requires successfully passing a qualification procedure. This procedure is to ensure the quality of the competition event and the safety of participants.

1.4. Steps to Participate

All teams intending to participate in the competition must complete the following steps:

1. **Preregistration:** Submit an email to the Technical Committee (TC).
2. **Qualification Material Submission:** Provide the required materials, including a Team Description Paper (TDP) according to provided template available in the website and, if necessary, additional items such as videos or drawings.
3. **Interview:** All members will be interviewed online. Date and time of interview will be further noticed.
4. **Final Registration:** Complete registration upon qualification approval.

All dates and detailed procedures will be communicated in advance in a timely manner.

1.5. Registration

• The maximum number of team members is 10.

• Only the team leader can lead two teams, provided the two teams have completely different hardware and software specifications, as verified by the technical committee. No other team member is allowed to be a part of more than one team. The technical committee will verify this distinction.

1.6. Team Description Paper

The Team Description Paper (TDP) is a central element of the qualification process and must be submitted by each team. The TDP must at least contain the following information in the author/title section of the paper:

- Name of the team (title)
- Team members (authors), including the team leader
- Link to the team web site (if any)
- Contact information

The body of the TDP should contain information as the following:

- Focus of research/research interest
- Description of the hardware, including images of the robot
- Description of the software, esp. the functional and software architectures
- Innovative technology (if any)
- Applicability and relevance to real-world tasks

The team description paper should cover the technical and scientific approach in detail.

2. General rules

2.1. Design of Car

Cars in the competition must be powered by electric motors. Both 4WD and 2WD configurations are permitted, with a minimum of four wheels. At least one axle must be steerable, and differential steering is prohibited.

All cars must adhere to the following specifications:

1. The wheelbase must measure a minimum of 200 mm, as shown in Fig. 1.
2. The track width must measure a minimum of 160 mm, as shown in Fig. 1.

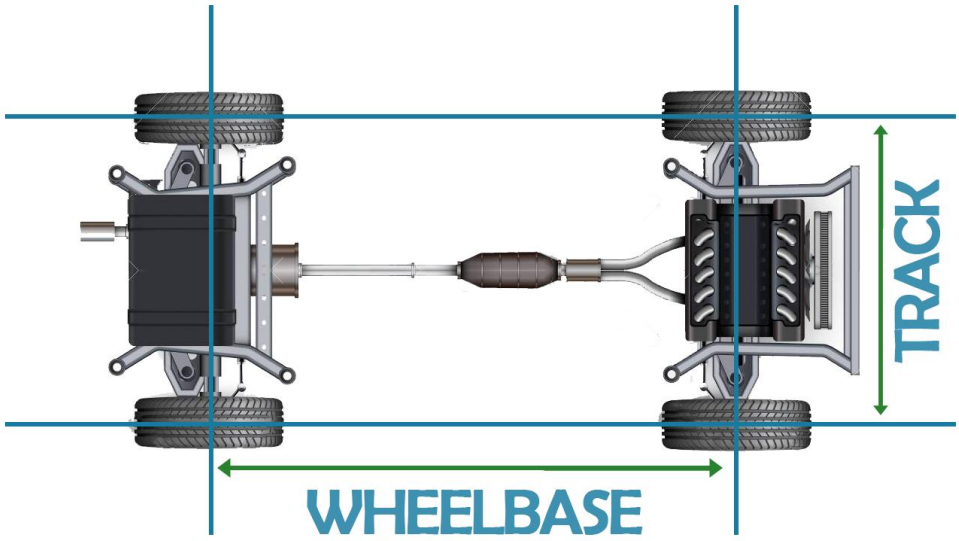


Figure 1

3. The car must not exceed a width or height of 300 mm.
4. The car must be capable of passing through a gate with inner dimensions of 300 mm in height and 300 mm in width.
5. All processing must be performed onboard. Any external data or signal transmission during the race is strictly prohibited. Violation of this rule will result in instant disqualification.
6. The use of ready-made solutions such as Donkey Car or JetRacer is prohibited.
7. In terms of using a remote control, a flashing light must be installed on the top of the car to indicate RC-mode.
8. The car is strictly prohibited from saving the race track.

9. Any wireless mobile communication, including 2G/3G/4G/5G, is prohibited.
10. A signal jammer will be active from setup time until the end of each run to prevent any external communication or data transmission. Teams are suggested to use wired methods (such as Ethernet) to connect and configure their robot.
11. All parts of the robot should be observable by the technical committee.
12. The angle between camera and track surface must be greater than 45 degrees.
13. The robot must begin its maneuver by executing only one bash file named 'home' located in the directory 'iranopen'. No other startup method is permitted.

2.2. Competition track

2.2.1. Course

The competition track will adhere to the following specifications:

- The course surface is dark black with white lines, simulating a typical street.
- The width of the lines varies: 20 mm for roadway boundaries (outer lines), 15 mm for lane boundaries (dashed centerline), and 30 mm for stop lines (refer to Fig. 2).
- Dashed lines on the course have a length ranging from 200 to 300 mm, with a distance of 100 to 200 mm between them (see Fig. 2).
- The inner roadway width falls within the range of 300 mm to 400 mm (refer to Fig. 2).
- All bends are constructed from circular segments with a minimum radius of 1000 mm (see Fig. 3).
- The roadway may feature both dashed and continuous lines.
- The suburban race track includes 90-degree corners in addition to circular bends with a minimum radius of 1000 mm.

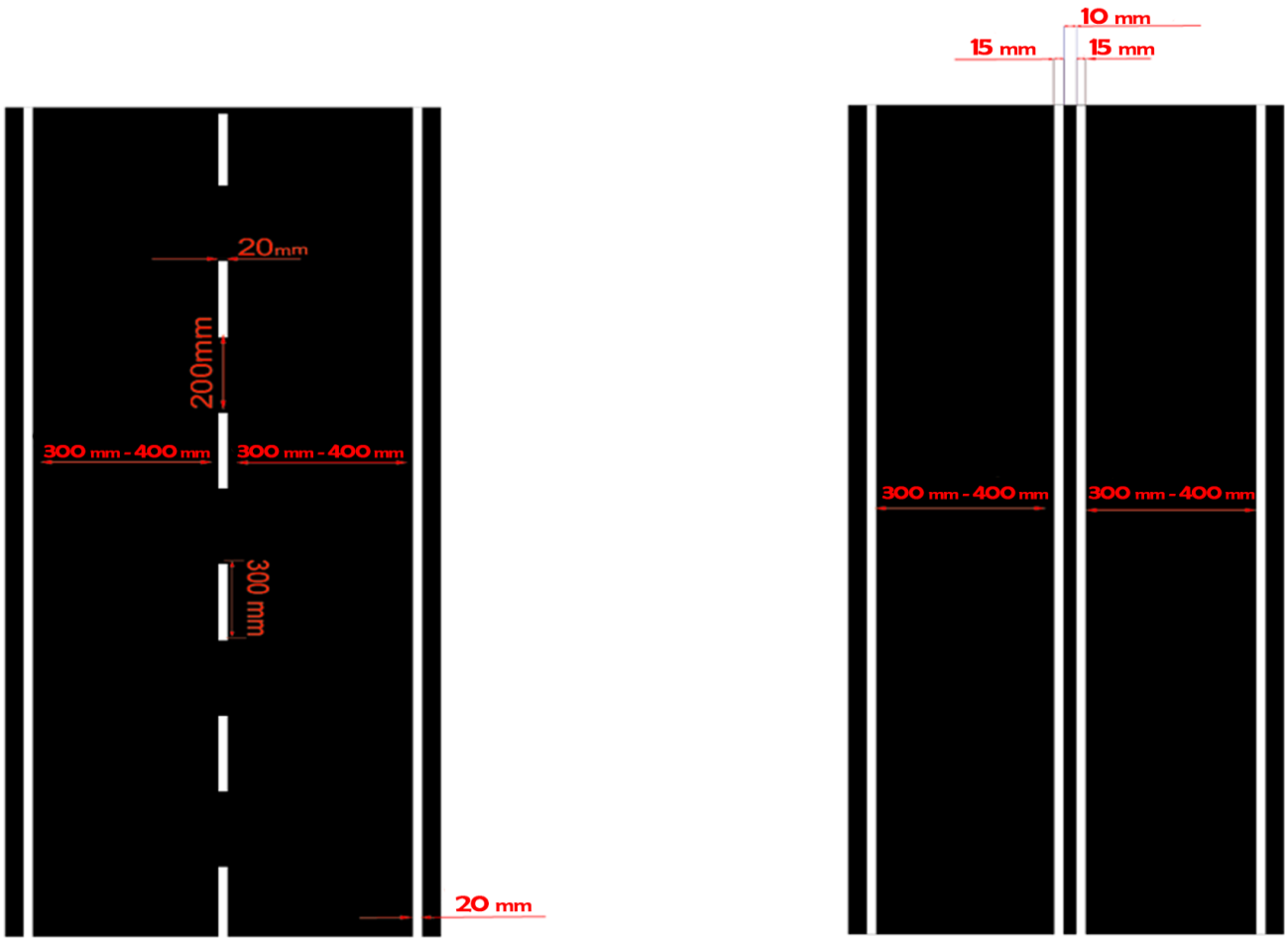


Figure 2

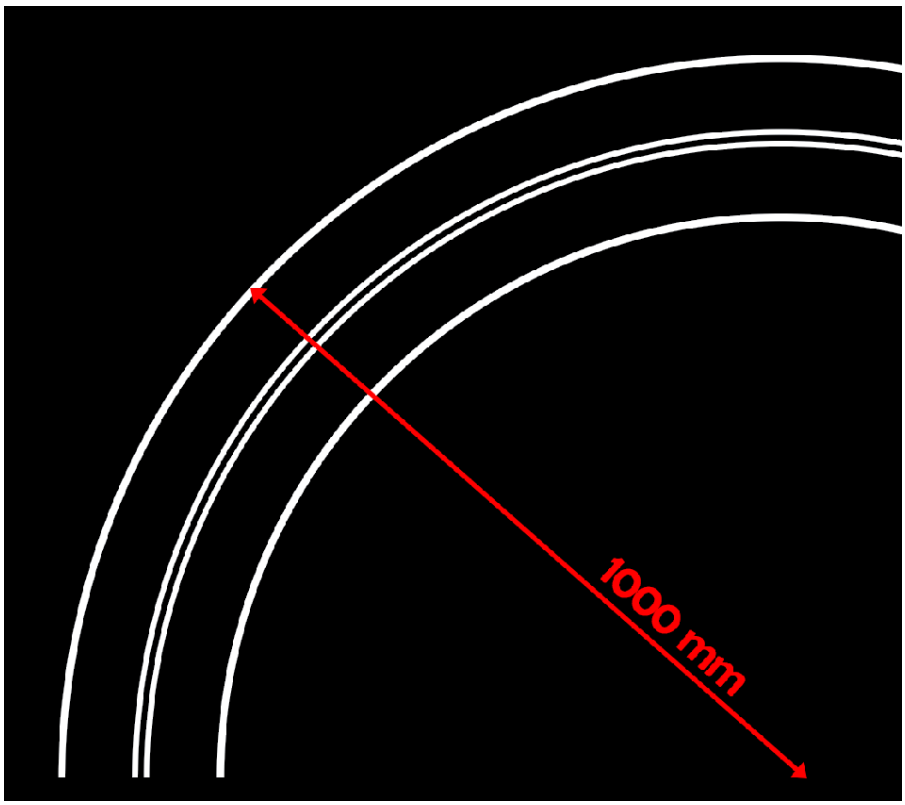


Figure 3

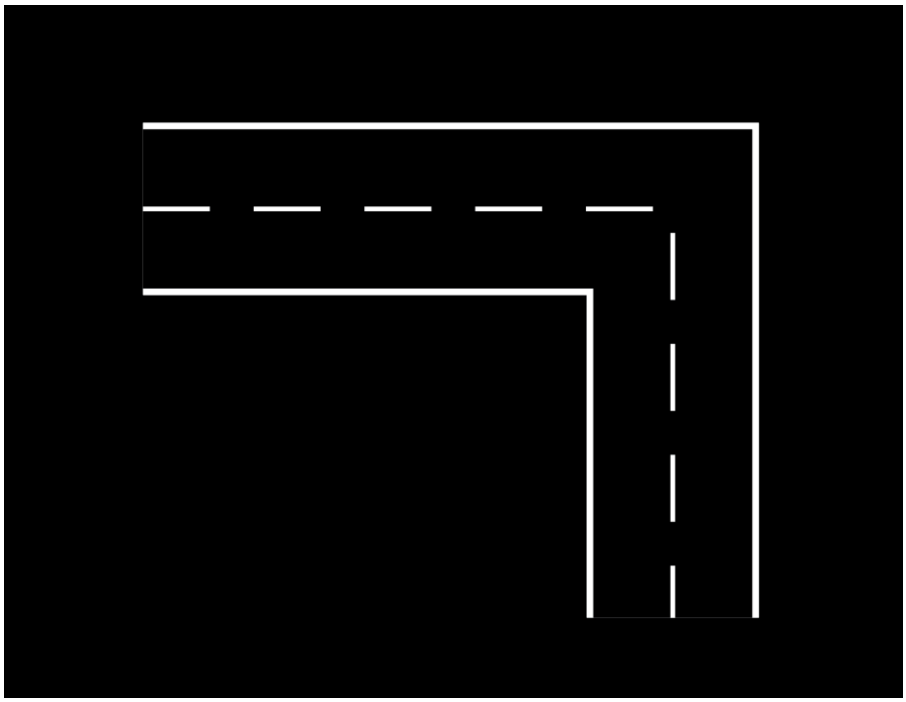


Figure 4

- The course may feature dirt-road sections. In these sections, the surface is dirt brown with grass for roadway boundaries, lane markings, and stop lines. All line width specifications remain unchanged.

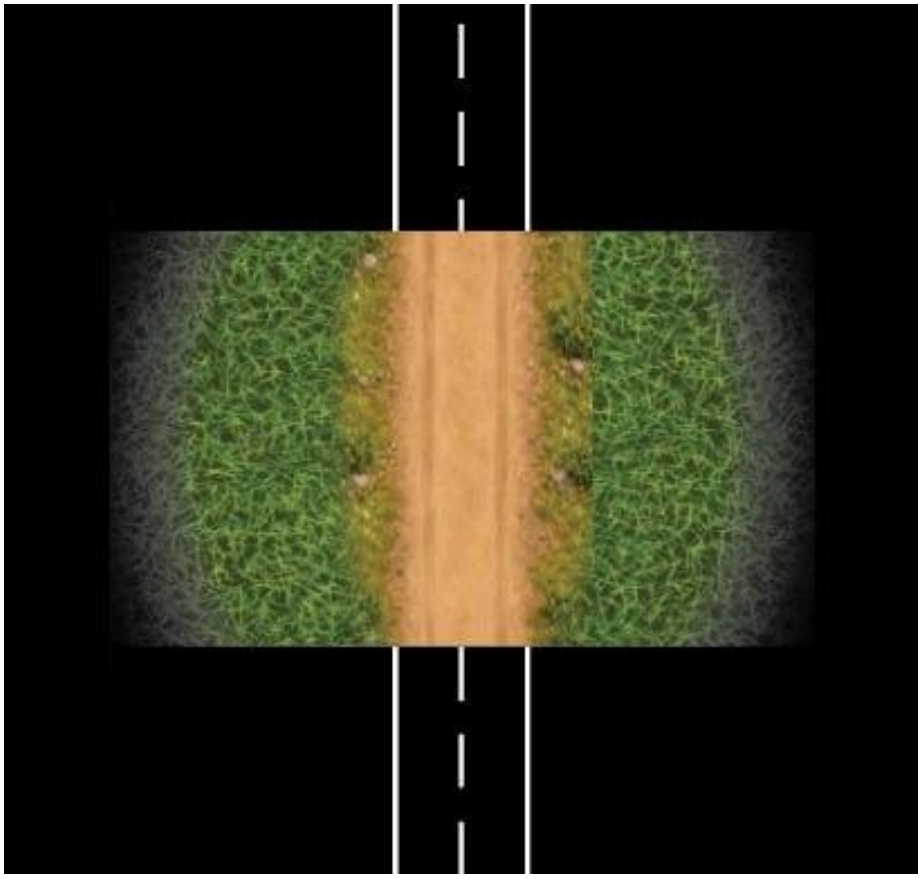


Figure 5

2.2.2. Traffic signs

The type and position of traffic signs on the competition track are described as below.

Traffic signs can be replaced with an AprilTag upon the competitor's request. Each AprilTag includes a white outer boundary measuring 10-20 mm around it as shown in fig. 6,7,8 and table 1.

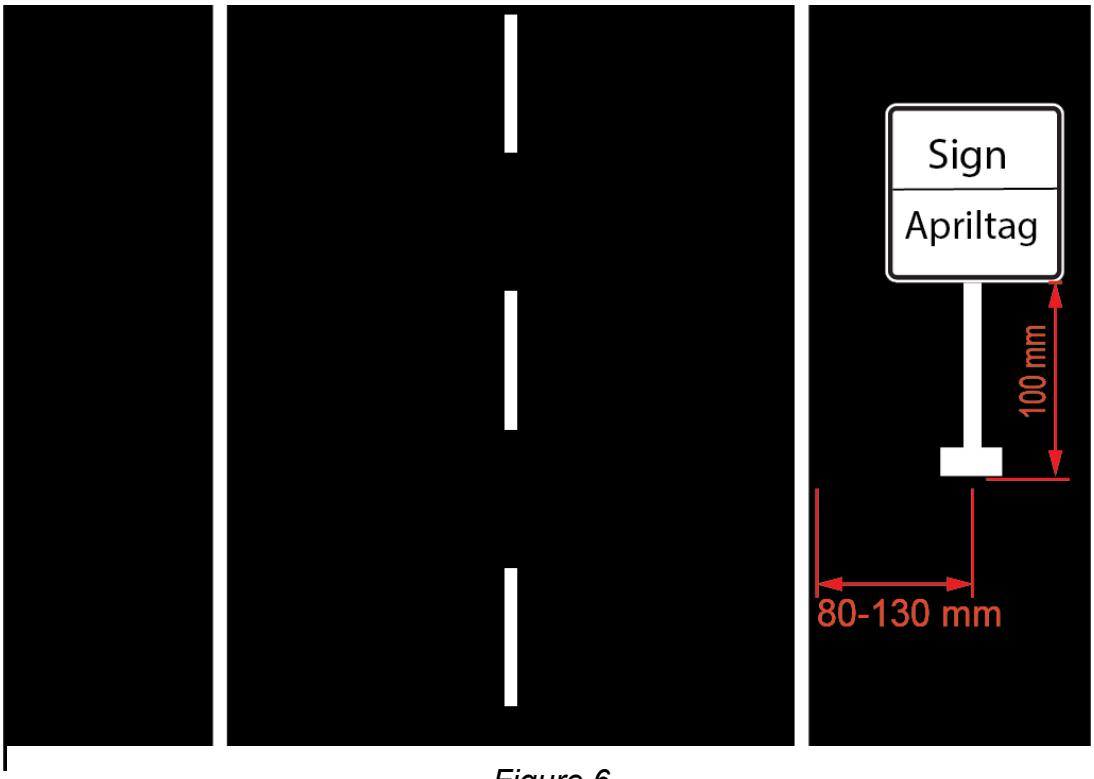


Figure 6

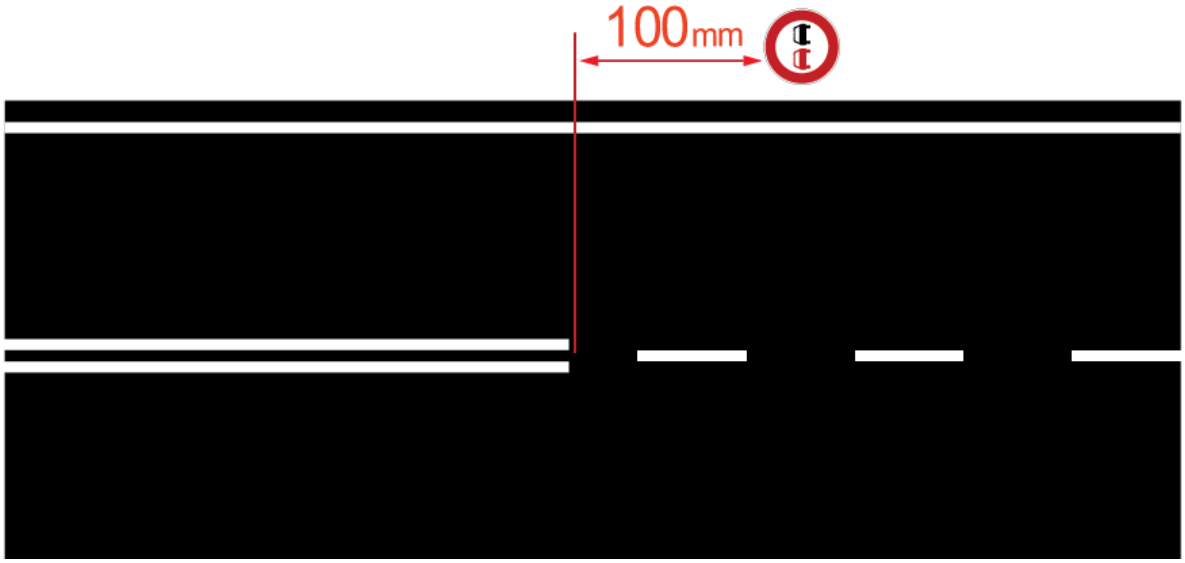


Figure 7

Fake traffic signs may be placed on the track. The car must distinguish between legitimate and fake signs, responding only to valid traffic signs.

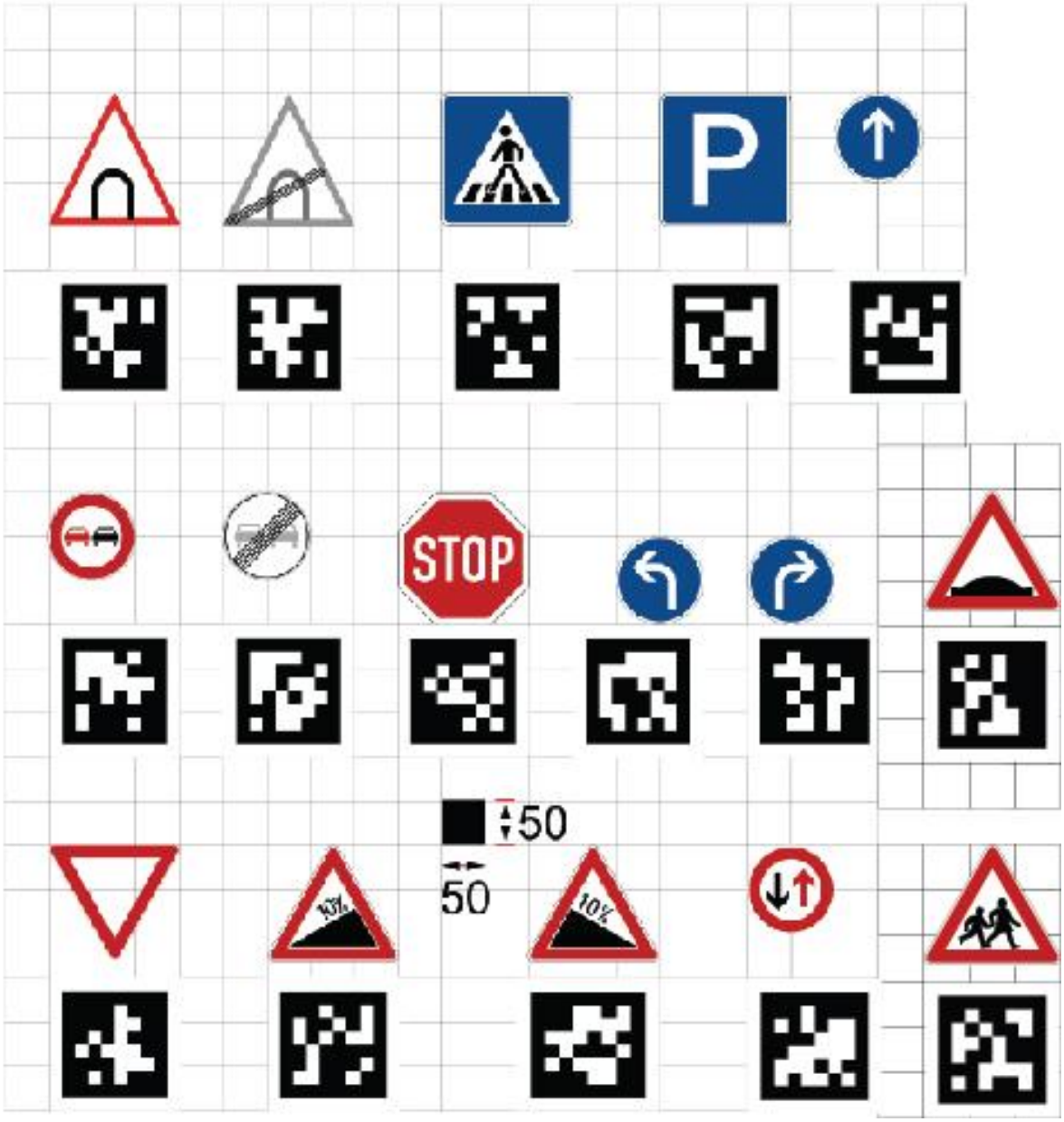
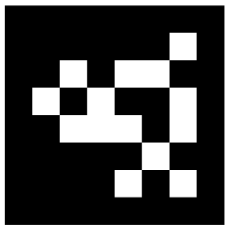
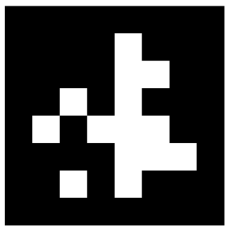
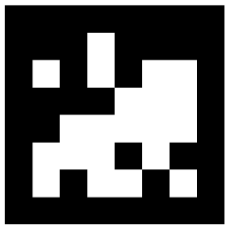
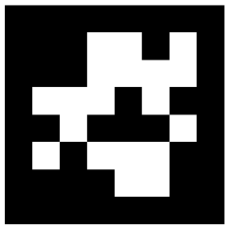
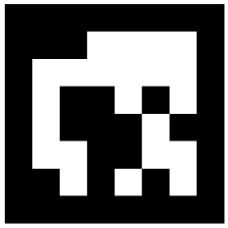


Figure 8

Table 1

Stop		
Priority over		
Barred area		
Steep hill	 uphill grade	
Steep hill	 downhill grade	
Turn left		

Tunnel Beginnig	 beginning	
Tunnel End	 end	
Cross walk	Crosswalk 	
Parking zone	Parking Zone 	
No - passing zone	 beginning	
No - passing zone	 end	

Turn right		
go straight		
School zone	School zone 	
Speed bump	 Speed bump	

2.2.3. Traffic lights

Traffic lights are placed at intersections, as shown below (fig. 7).

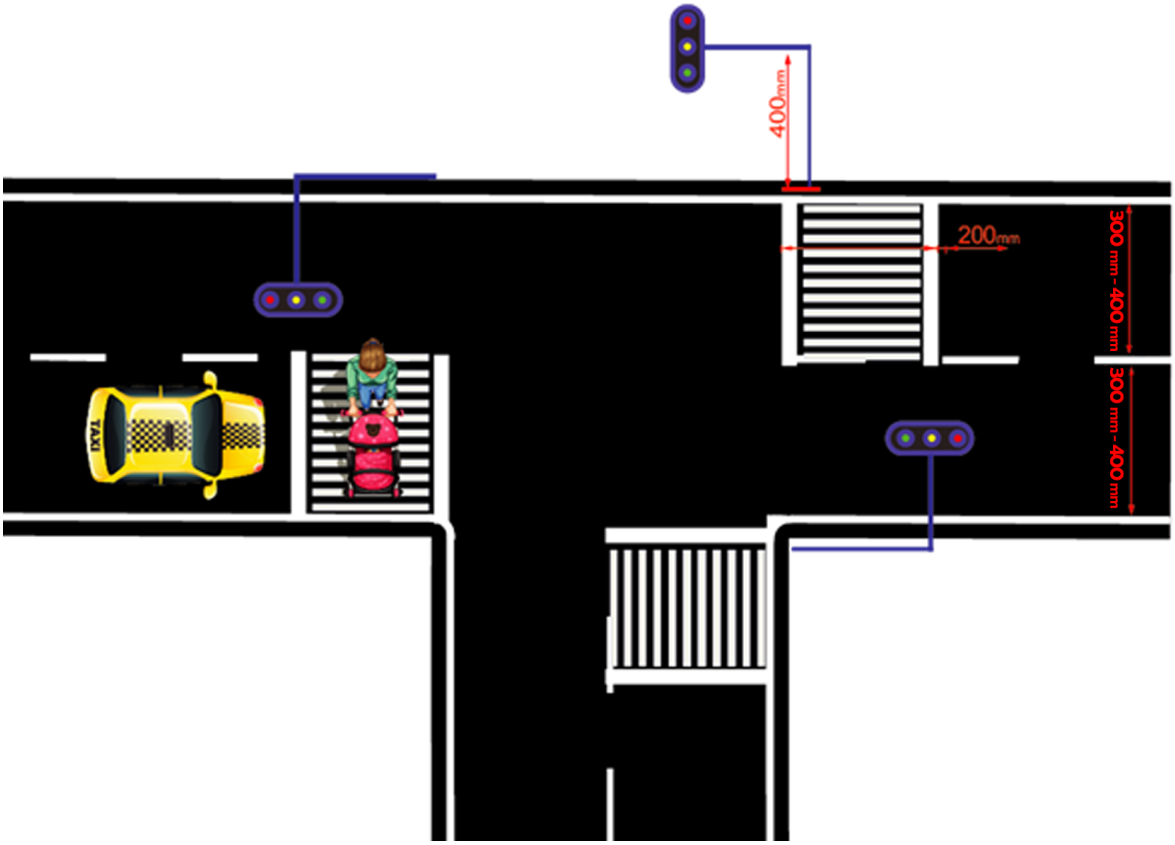


Figure 7

2.2.4. Tunnels

There will be a tunnel along the race track that may or may not have lighting. The tunnel will be on a straight section of the track and will be indicated by tunnel sing 10cm before the entrance.

2.2.5. Buildings

Buildings or building-like structures may be set up adjacent to the road.

2.2.6. Plants

Trees or other plants may be set up adjacent to the road.

2.2.7. Static Obstacles

Static obstacles will be placed anywhere on the racecourse. These obstacles can be cars, dolls, or rocks.

2.2.8. Bridge

There will be a bridge with a 20 degree slope on the race track. Passing over the bridge is mandatory. The bridge will be clearly marked or indicated on the course.

2.2.9 Speed bump

Speed bumps may be placed on the race track. Each speed bump has a radius 20 mm and is indicated by a dedicated traffic sign positioned before the bump. Cars must reduce speed appropriately when approaching speed bumps.

2.2.10. Dynamic Obstacles

Dynamic obstacles will be present on the track, resembling the shape of static obstacles. These obstacles will move and behave in a manner similar to human driving.

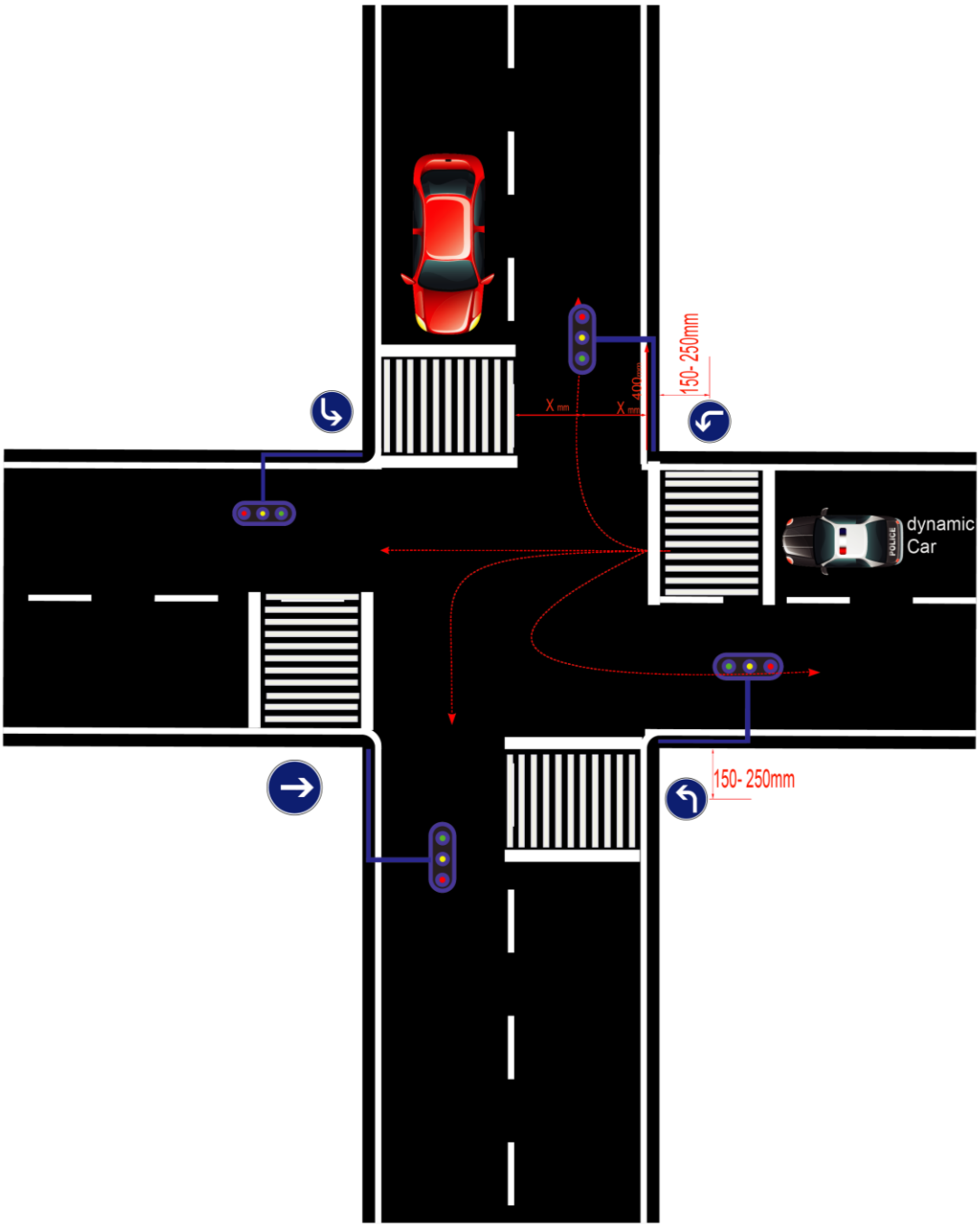


Figure 9

2.2.11. Crosswalks

Crosswalks are located at every junction, as shown in the illustrations, and may also appear elsewhere on the track. Crosswalks outside intersections are marked by a corresponding traffic sign. At crosswalks, a pedestrian may wait at the roadside to cross. Vehicles must stop on both sides whenever a pedestrian steps onto the crosswalk. If no pedestrian is present, vehicles must stop for three seconds before proceeding.

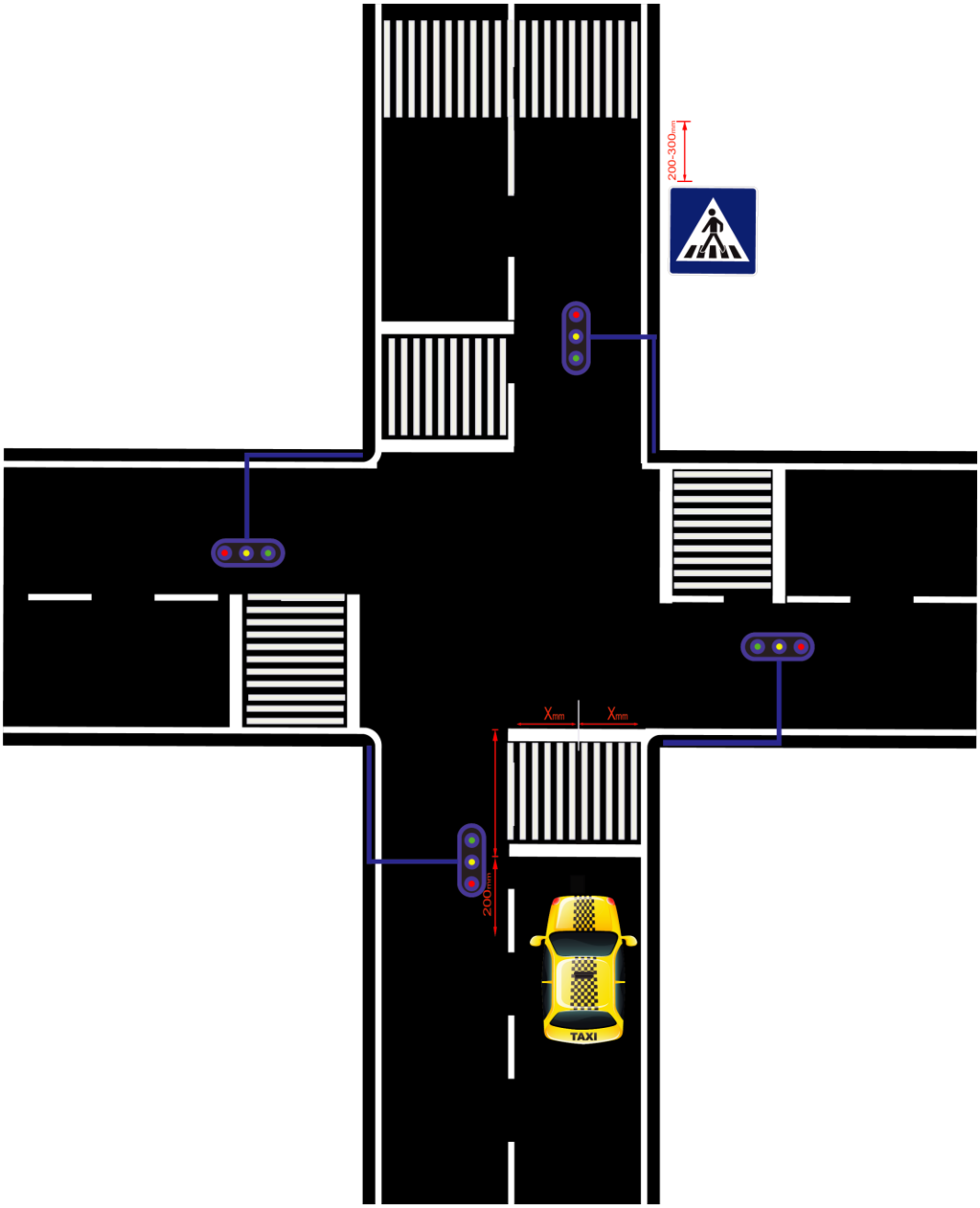


Figure 10

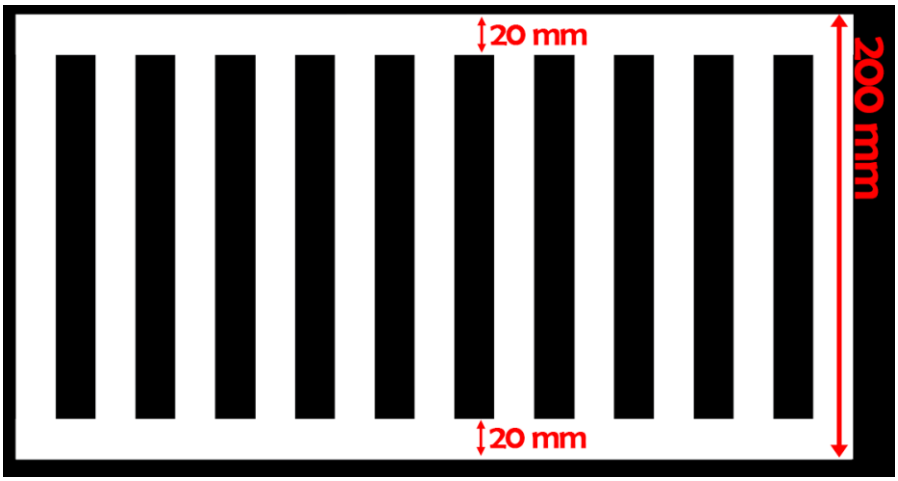


Figure 11

2.2.12. Parking

There will be two parking spots on the track: one at the start and one at the finish line. The starting position is a parallel parking spot. The finishing position may be either a parallel or cross parking spot. After passing the parking sign near the finish line, the car shall find the parking spot within the parking area and maneuver into it, without touching the surrounding obstacles.

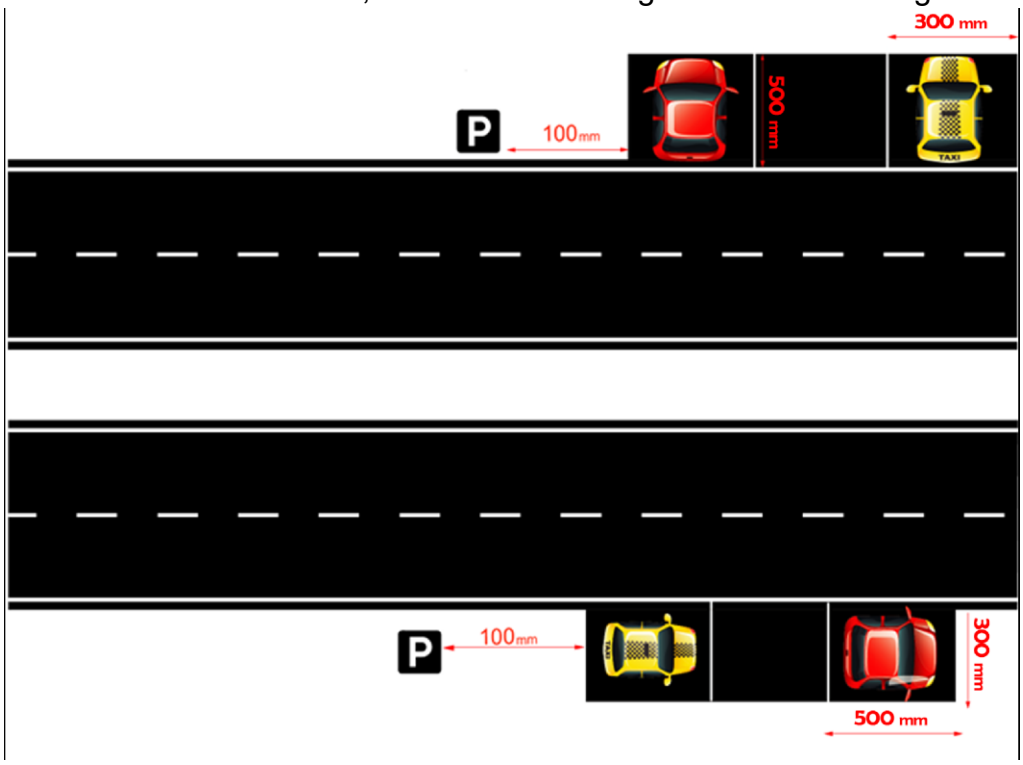


Figure 12

2.3. Software Execution Requirements

The robot must initiate its autonomous operation by executing a single bash file named 'iranopen' located in the directory path 'home'. No alternative startup methods or multiple startup files are permitted. The technical committee will verify this requirement during the quarantine period before each run.

3. Competition procedure

This competition consists of two components: a suburban race and an urban performance competition, each featuring distinct tasks. Each stage is scored individually, and the final team score is the sum of both stage scores. All urban rounds must begin and end with parking maneuvers. The starting position is a cross park and the ending position is a parallel park spot. The round begins with the car positioned in a parallel parking spot at the start line, marked by a stop sign (or the corresponding April tag). The timer sets off when the car exits the parking spot after the stop sign is removed. At the end of the track, the robot must locate the finish parking spot (indicated by a parking sign), maneuver into it without touching surrounding obstacles, and remain stationary for 10 seconds.

Each team is granted one to three runs in both stages, depending on the number of participating teams. During each run, three resets are allowed. Checkpoints are positioned along the designated course, with each crossing contributing positive points. The last passed checkpoint serves as the reference for total run time and scoring calculation. Before the start of each run, all robots will undergo a quarantine. A signal jammer will be activated during quarantine and will remain active throughout the entire run to ensure compliance with the prohibition of external communication.

The robot's autonomous operation must be initiated by executing a single bash file named 'iranopen' located in the directory path 'home'. The technical committee will verify compliance with this requirement during quarantine.

Key rules regarding resets:

- Resets can only be used when the car goes entirely off the race track.
- Only the captain has the authority to call for a reset.
- In the event of a reset call, only the captain can place the car inside the raceway. The car must be positioned before the last checkpoint. The captain may also utilize a reset button if available.

3.1. Suburban race

In this stage, the objective is for the robots to navigate the race course as swiftly as possible and reach the finish line. The suburban race track features 90-degree corners in addition to the circular bends described in the general course specifications. The course is free from pedestrian lanes, traffic signs, traffic lights, etc.; but it may or may not include obstacles. The car must remain stationary until the obstacle is removed. Scoring is based on the time it takes for a robot to cross the finish line or the time recorded at the last checkpoint.

In this challenge, the arrangement of robots may vary depending on the number of participating teams. In instances with multiple teams, two robots can be positioned on the road, each in a designated lane. One robot is placed in the left lane, and another is placed in the right lane. These robots will then compete against each other.

3.2. Urban performance competition

In this stage the main challenge is the performance of the robot in urban environment. The race course may have obstacles, traffic signs, traffic lights, tunnel, cross walks and parking zone.

4. Scoring

In general, the criterion for scoring is race completion time and the number of errors. In the following, the method of scoring in the two sections of speed competition and performance competition is discussed.

*Teams should pass technical interviews. The interview has 2000 points.

** To ensure order and a clear chain of communication, objections must be made solely by the team captain. Any objections raised by other team members will result in a 100-point deduction.

Total score = Total urban performance competition score + Total suburban race score + Technical interviews – Number of team members objections

4.1. Urban performance competition

4.1.1. Crossing task

Car arriving at a crossing must act according to signs, and must give way at all of the following:

- At give way signs (for 3 seconds)

- At stop signs (for 3 seconds)
- Turning across the path of an oncoming car at an intersection
- Turning from a terminating road onto the ongoing road at a T-intersection
- If you're turning at an intersection, you must also give way to pedestrians crossing the road you are entering.
- Give way to pedestrian crossing in crosswalks in middle of the road.

4.1.2. Parking task

Starting parking spot: The car must successfully exit the parallel parking spot at the start line. Failure to exit properly or collision with obstacles results in negative points.

Finishing parking spot: The car must locate and maneuver into the parking spot at the finish line. The end of the parking procedure must be signaled by a stop of at least 5 seconds. Failure to park correctly or collision with obstacles results in negative points.

4.1.3. Tunnel

Crossing the tunnel is optional, and the correct crossing has positive points.

4.1.4. Crosswalks

Skipping the crosswalk procedure has negative points.

4.1.5. Obstacles

Each touching of an obstacle has negative points.

4.1.6. Track

If the car completely gets off the track, it has negative points, and it can continue the race only if the captain calls for reset.

4.1.7. Traffic signs

Failure to maneuver correctly according to a traffic sign or AprilTag has negative points. Correct maneuvering based on a traffic sign earns additional points, while April Tags do not provide extra points.

4.1.8. Traffic lights

Detection and enforcement of traffic lights are optional and have positive points.

4.1.9. Timing

Each run has a specific time to complete and it will be determined before the race. Each checkpoint reference time is the total time divided by the number of checkpoints. Each additional second taken to complete the last checkpoint results in a negative point.

4.1.10. Scoring table

description	points
Time	((number of passed checkpoints ÷ total checkpoints) × reference time) – Run Time
Each Collision with pedestrian	-300
Each Collision with obstacles	-200
Get completely off the track or wrong turn in junctions	-300
Each **correct** traffic sign detection (except the signs that indicate the route)	+50
Each **false** traffic sign or April tag detection	-50
Exit starting parking spot correctly	+100
Park the car correctly at finish line	+100
Pass the bridge correctly	+100
Pass the tunnel correctly	+100
Each **correct** traffic light detection	+100
First checkpoint pass	200
Second checkpoint pass	300
Third checkpoint pass	400
Fourth checkpoint pass	500
Fifth checkpoint pass	600
Cross the continuous lines	-100
Failure to pass the bridge	-100
Collision with obstacles during parking maneuvers	-50 (per collision)

Total urban performance competition score = Time + Collision with pedestrian * N + Collision with obstacles * N + completely off the track (or wrong turn in junctions) * N + correct traffic sign detection * N + false traffic sign or April tag detection * N + Park the car correctly * N + Pass the tunnel correctly * N + correct traffic light detection * N + checkpoints pass points + Cross the continuous lines * N

****N: Each time**

4.2. Suburban race

4.2.1. Track

In suburban races, crossing either dashed and continuous lines is prohibited. If the car completely Get off the track, it has negative points and it can continue the race only if the captain calls for reset. Missing the stop sign at the end of the lap is considered both a lane-crossing violation and a misidentification of a traffic sign, resulting in penalties for each infraction.

4.2.2. Timing

Each run has a specific time to complete, and it will determine before the race. Each checkpoint reference time is the total time divided by the number of checkpoints. Any extra second it takes to complete the last checkpoint has a negative point.

4.2.3. Collision

In case two robots collide, the faulty robot will face 500 points penalty and the race will start again from the beginning.

description	points
Time	((number of passed checkpoints ÷ total checkpoints) × reference time) – Run Time
Collision with rival robot	-500
Get completely off the track	-300
First checkpoint pass	200
Second checkpoint pass	300
Third checkpoint pass	400
Fourth checkpoint pass	500
Fifth checkpoint pass	600
Cross the continuous lines	-100

Total suburban race score = time * 10 + Collision with rival robot + Get completely off the track * N + checkpoints pass points + Cross the continuous lines * N

****N: Each time**

5. Ranking

- Trophies will be awarded for 1st, 2nd, and 3rd place. If there are eight or fewer teams, only 1st and 2nd place trophies will be awarded.
- In order to value very specific capabilities required in self-driving cars, technical challenges are part of self-driving cars league. Technical challenge is separately awarded.
- There will be a best car body design award.

*All numbers may have 10% tolerance.

*Technical committee has the right to change the rules at any time until competition day.