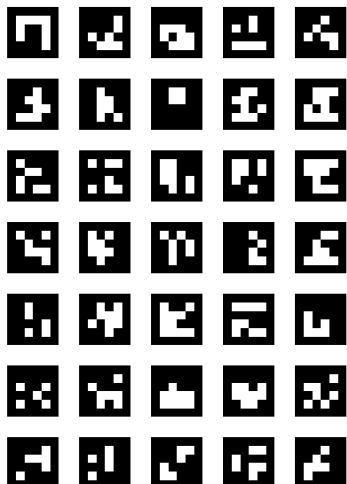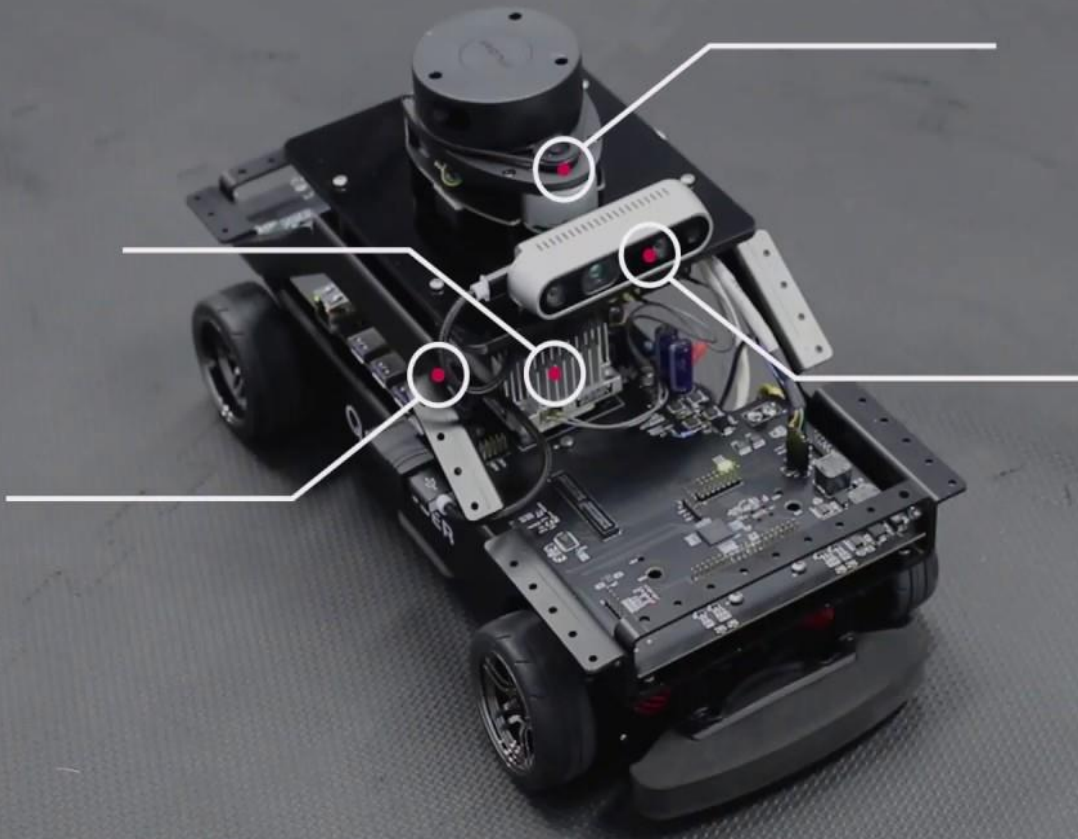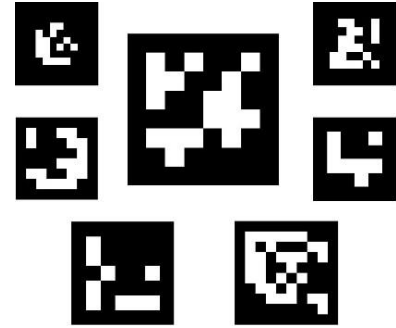# OUSL IMPACTO 24

AUTONOMOUS NAVIGATION

University Category

Organized by
OUSL Mechatronics Society
Department of Mechanical Engineering
Faculty of Engineering
The Open University of Sri Lanka

AUTONOMOUS NAVIGATION CHALLENGE

The OUSL AUTONOMOUS NAVIGATION Challenge is more than just a contest; it's a chance to apply your classroom knowledge in a real-world scenario. You'll be challenged to design, build, and program a robot capable of autonomous navigation. This hands-on experience will not only hone your technical skills but also foster critical problem-solving abilities and teamwork – qualities that are highly sought after in the professional world.

As you embark on this journey, you'll have the opportunity to collaborate with like-minded peers, exchanging ideas and strategies that push the boundaries of what's possible. Your robot's ascent up the vertical frontier will be a testament to your dedication and innovation, showcasing your ability to overcome challenges and engineer practical solutions.

The skills you develop and the insights you gain from the University AUTONOMOUS NAVIGATION Challenge are not confined to the competition itself. They'll stay with you as you navigate your academic and professional endeavors, adding a unique feather to your cap and opening doors to exciting opportunities in robotics, programming and beyond.

So, if you're ready to take your passion for robotics to new heights, if you're eager to apply your classroom theories to real-world innovation, and if you're excited to be a part of a community of young, creative minds, then gear up for the University AUTONOMOUS NAVIGATION Challenge.

In order to participate, every team is required to conceive and construct a completely self-directed robot adhering to the technical specifications detailed within this manual. The document also elucidates essential aspects of the landscape and the task that need to be executed. An unbiased panel of evaluators will oversee the competition, evaluating it based on the robots' design and their subsequent execution.

Furthermore, kindly take into account that any modifications to the regulations will be reflected on the website, www.ou.ac.lk/impacto. Should you require any inquiries or elucidations, feel free to reach out to the game coordinators via email at *ouslimpactomech@gmail.com*, or get in touch with Mr. K.B. Wickramasinghe at 0712373000.

Important Dates

Deadline for applications: 30th December 2023

Competition Date: 28th March 2024

THE COMPETITION TASK

Welcome to the AUTONOMOUS NAVIGATION Challenge, your task is to design an autonomous navigation robot capable of navigating through a predefined grid as quickly as possible following the navigation rules. The robot should move the shortest travel time from start to finish.

Task Explanation

1. First robot should place on the robot starting position by participant and power up the robot.

2. Then the robot should complete the path with the help of autonomous navigation in the shortest time by identifying ArUco markers.

3. The path navigation needs to be done by detecting ArUco markers, the ArUco markers provide which direction the robot needs to navigate on the game arena.

GAME ARENA

Specifications of game arena:

1. The length of the working area is 2.4 m and width of the working area is 2.4 m.

2. The ArUco markers place on 6 × 6 matrix game arena as shown in figure 2.

3. The game arena consists of 36 ArUco markers.
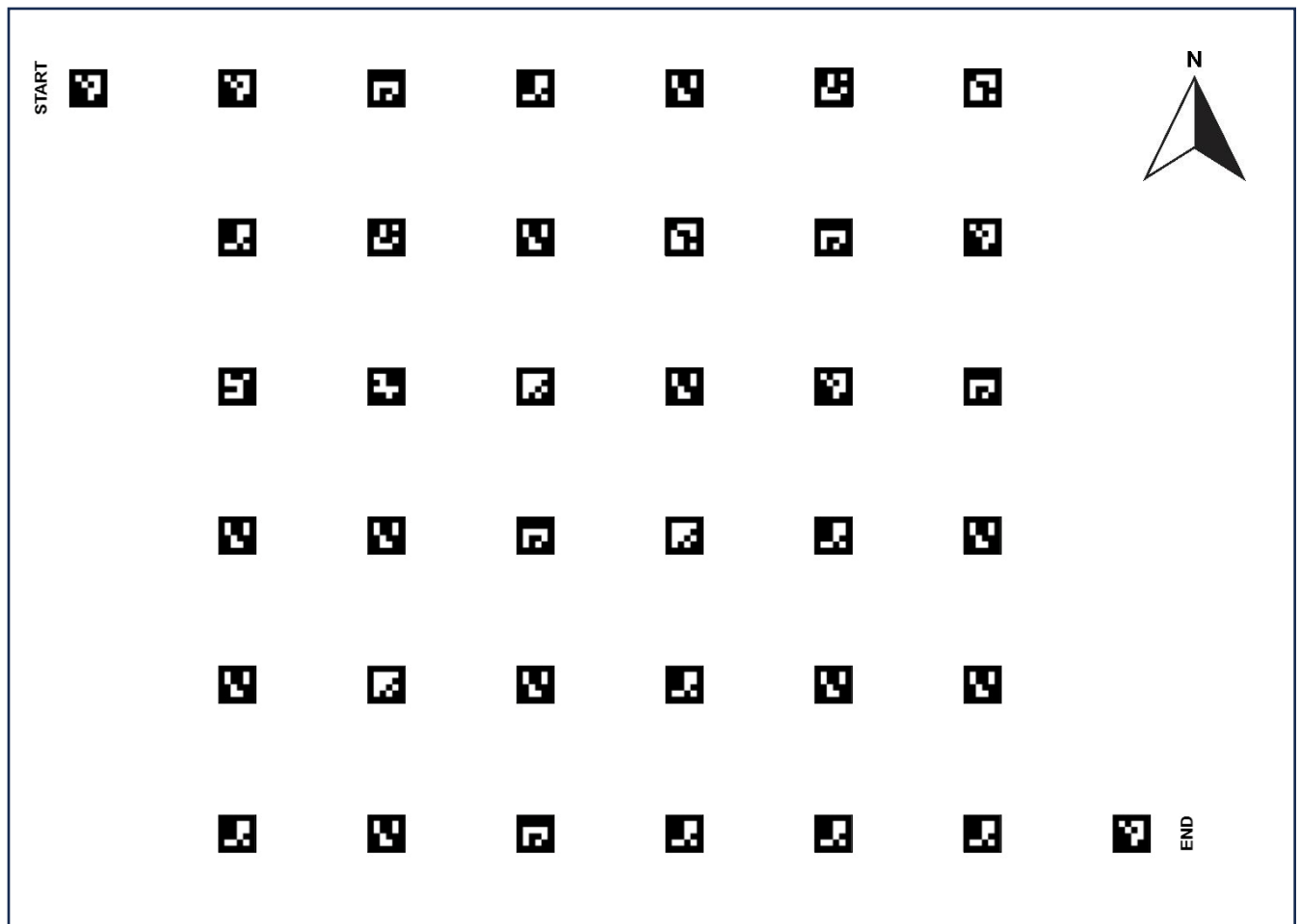
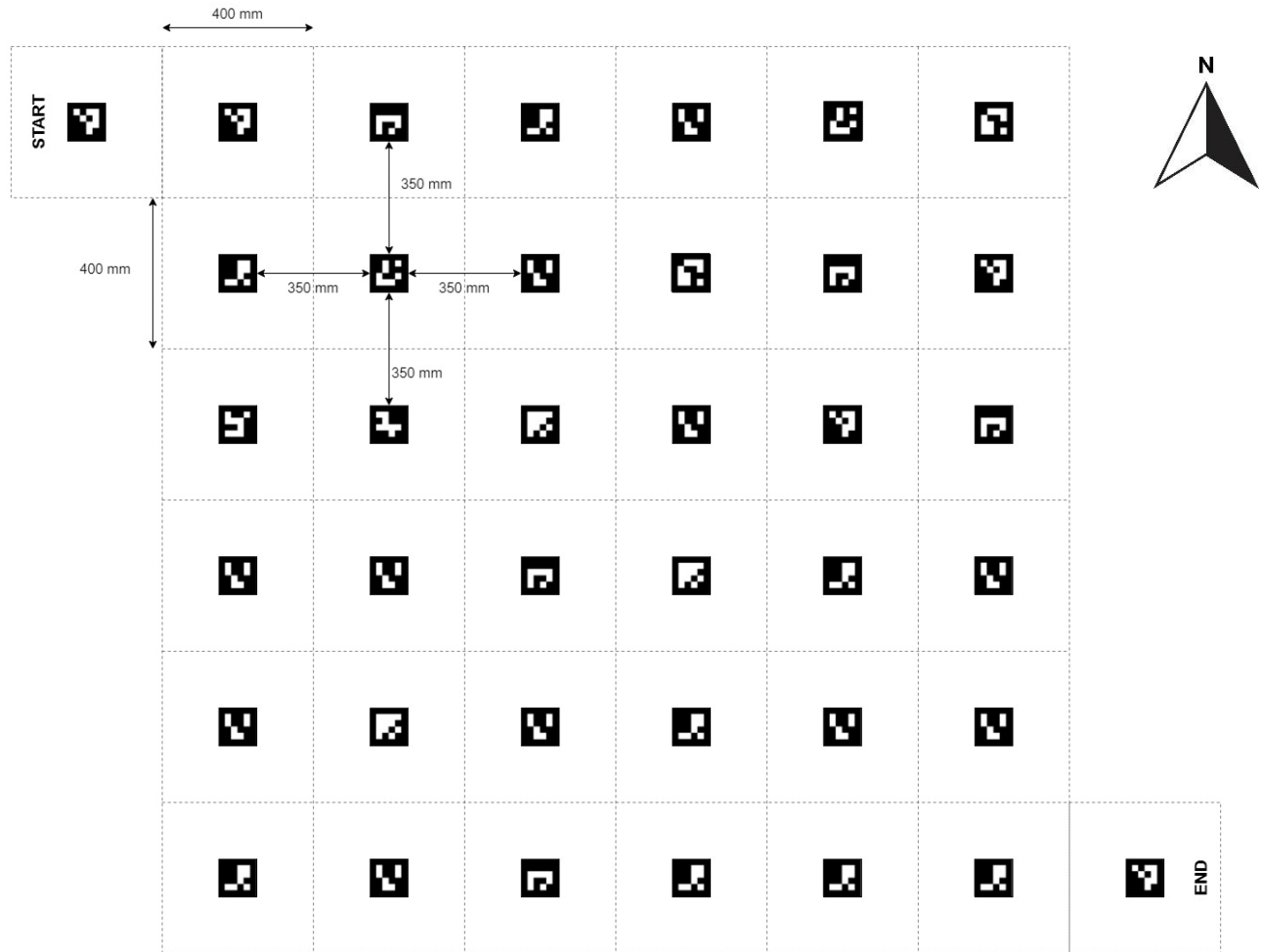4. The color of the game arena floor is White.

Figure 1 Game Arena

Figure 2 Dimensions of game arena

5. The ArUco markers provide eight individual IDs for eight directions as shown in figure 3 that robot needs to move.

6. Figure 4 shows ArUco markers with relevant IDs and relevant directions.

7. Colour of ArUco markers are black and white.

8. Size of the ArUco markers 50 mm × 50 mm.

9. ArUco marker directory (Standard directory = 4×4(50×100×250×1000)).

   ArUco mark generator (https://chev.me/arucogen/)
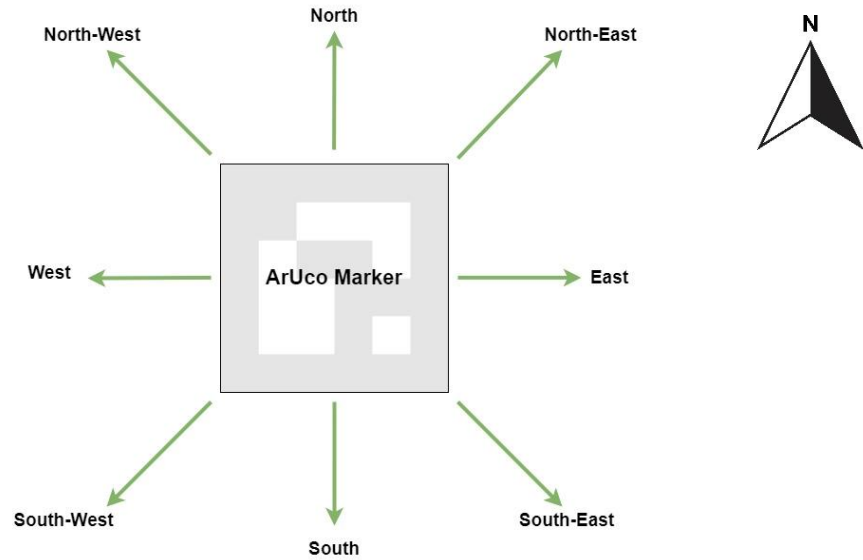
Figure 3 Directions indicate by ArUco Markers

Figure 4 Directions indicate by individual ArUco Markers
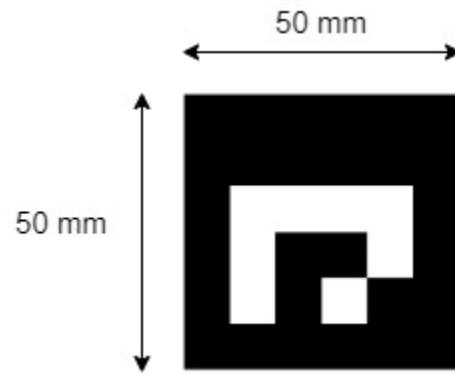
Figure 5 Dimentions of ArUco Marker

Example Task
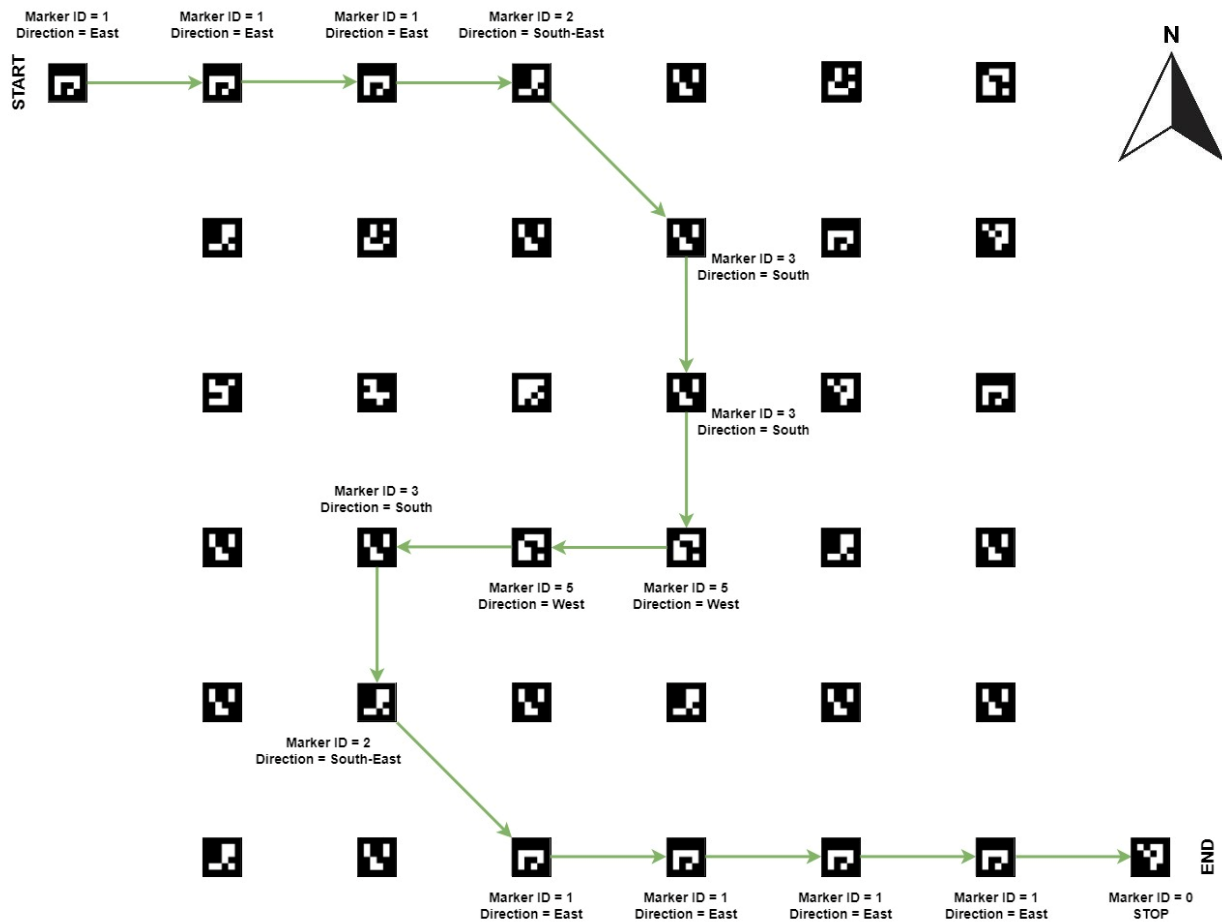
Figure 5 Example task

GENERAL RULES

1. Before starting, the robot must get accepted from the initial qualification process and kept in view of the contest officials.

2. The competitors must be prepared to start within 5 minutes after the call, if not the run is lost.

3. The time taken to travel from the start to the destination is called the 'run' time.

4. The time taken to complete the task shall be measured by the contest officials.

5. The robot must be fully autonomous. The contestant can only switch it on at the beginning and switch it off at the end.

6. If no successful run has been made, the judge will make a qualitative assessment of the design, performance (based on distance achieved) and quality of control.

7. **THE DECISION OF THE JUDGES WILL BE THE FINAL DECISION**.

ROBOT'S SPECIFICATIONS

1. The robot must be completely self-contained, fully autonomous and must receive no outside assistance.

2. The robot must not exceed the given dimensions – a width of 25 cm, length of 25 cm.

3. A robot must be integrated with internal power supply and supply voltage should be less than 24V.

4. Prioritize safety by securing loose wires, using proper insulation, and avoiding sharp edges that could harm participants or spectators.

5. No remote-control modules can be used to navigate the robot.

INITIAL QUALIFICATION

1. The robot must not exceed the given dimensions – a width of 25 cm, length of 25 cm.

2. No remote-control modules can be used to navigate the robot.

3. A robot must be integrated with internal power supply and supply voltage should be less than 24V.

4. The robot should not damage the arena and judges have the full authority to terminate the run in such cases.

5. No parts of the robot can remain in the arena during the drive and there should be no oil leakages.

TEAM FORMATION

1. Create a team with a maximum of five members. Solo entries are also accepted.

2. All the team members should be from the same university/ institute.

3. Make up your team's name.

4. Design your promotional material for the team.

UNIVERSITY CATEGORY COORDINATOR

Please do not hesitate to contact us if further information or assistance is needed.

Contact Number: Mr. K.B. Wickramasinghe at 0712373000

Email : ouslimpactomech@gmail.com

Deadline for applications: 30th December 2023

Registration link: https://forms.gle/UUbNv1i78mBzNdmQ8

Sacn for More Information

www.ou.ac.lk/impcato