Cahier des charges

Version **Alpha**

WISY RACE
SMART MISSION

📍 ULT. B6, 23 Av. Louis Braille, Tunis 1002

Contents

Good reading !

A. INSTRUCTIONS

The images in this document are provided for information only to illustrate the different paragraphs. Under no circumstances can they be used as a reference. Only the dimensions and colors indicated in the appendix are to be taken into consideration.

B. GENERAL INTRODUCTION

B.1. ULT ROBOTS:

ULT-Robots 6.0: RACEBOT is an incredible event bringing together fun, high technology, friendship, creativity, education and passion! Organized by the Club Megabot ULT in collaboration with WISYLAB, this sixth edition will take place on February 27, 2022 at the ULT, it is an opportunity to take up challenges, share knowledge, live the experience and celebrate passion. This event will materialize the know-how, the work and the enthusiasm of the different teams.

B.2. MEGABOT:

MEGABOT is one of the oldest clubs in the ULT, specializing in the field of robotics.

Founded in 2012, MEGABOT celebrates its first decade this year, a history full of national and international success.

The club today represents a continuity of the training of the technological pole of the ULT, since it offers an opportunity to the students to implement their achievements and skills.

B.3. WISYLAB:

WISYLAB is your new High Tech Universe allowing anyone, whatever their age, academic or educational level to integrate easily and smoothly into the era of New Technologies and Artificial Intelligence.

As a result, we have implemented all the skills and logistics necessary to welcome you in a comfortable and pleasantly equipped space with the supplies and educational resources necessary to ensure and guarantee the best conditions that promote training courses. and the Learning Workshops necessary for special children's workshops via digital and advanced solutions adapted to all levels of knowledge.

<u>B.4. REGISTRATION :</u>

• A team must be made up of 4 people including a team leader and three members. • The team leader must present himself on the day of the competition for the approval of the robot. • A member can only be part of one team, even if the teams belong to the same structure (club, university, etc.)

C. PRESENTATION OF THE TOPIC
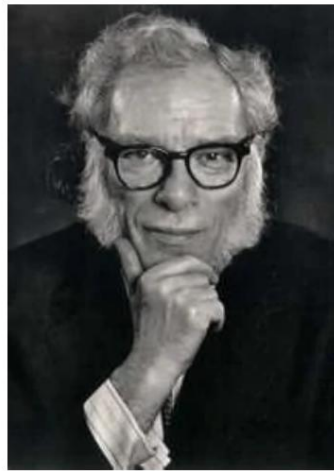
<u>C.1. THEME:</u>

The acceleration of breakthroughs in the fields of artificial intelligence, sensors, telecommunications, and connected objects have led to a new generation of autonomous robots that can aim with inhuman precision and which are equipped with powerful sensors, these robots are considerably safer and more reliable than previous models and now dominate all areas. Autonomous robots are meant to serve humanity. The concept is protected by the Three Laws of Robotics (according to Isaac Asimov)

First law:
• A robot cannot injure a human being or, through inaction, allow a human being to be hurt.

Second Law:
• A robot must obey the orders given to it by human beings, unless such orders conflict with the First Law.

2

Third Law:

• A robot must protect its own existence until such protection comes into effect.
  conflict with the first or second law.

WISY-BOT: "Smart mission" offers you a challenge beyond the usual, autonomous robots with their perceptions and intelligences must solve a problem to help humans while communicating with the external environment. To achieve this mission more quickly, in a race between robots, the time factor is essential for each robot to protect its own existence.

D. PLAYING AREA AND ACTIONS

IMPORTANT NOTE:

The organizers undertake to build the playing area with the greatest possible accuracy. Nevertheless, minor tolerances may be observed depending on manufacturing constraints.

D.1. PLAYGROUND:

The playing area is a horizontal rectangular plane of 3000mm by 1500mm with 50mm borders on each side.
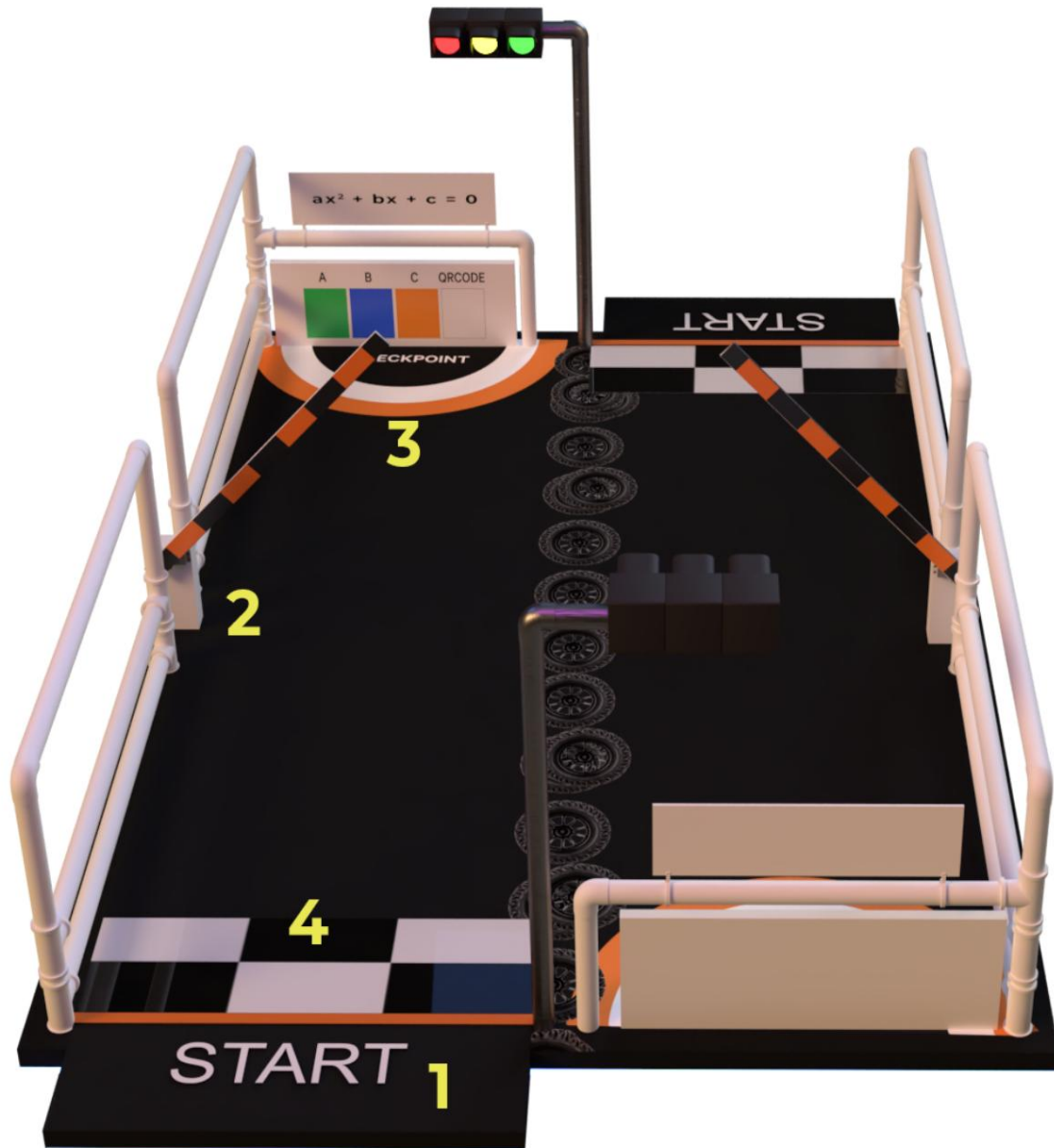
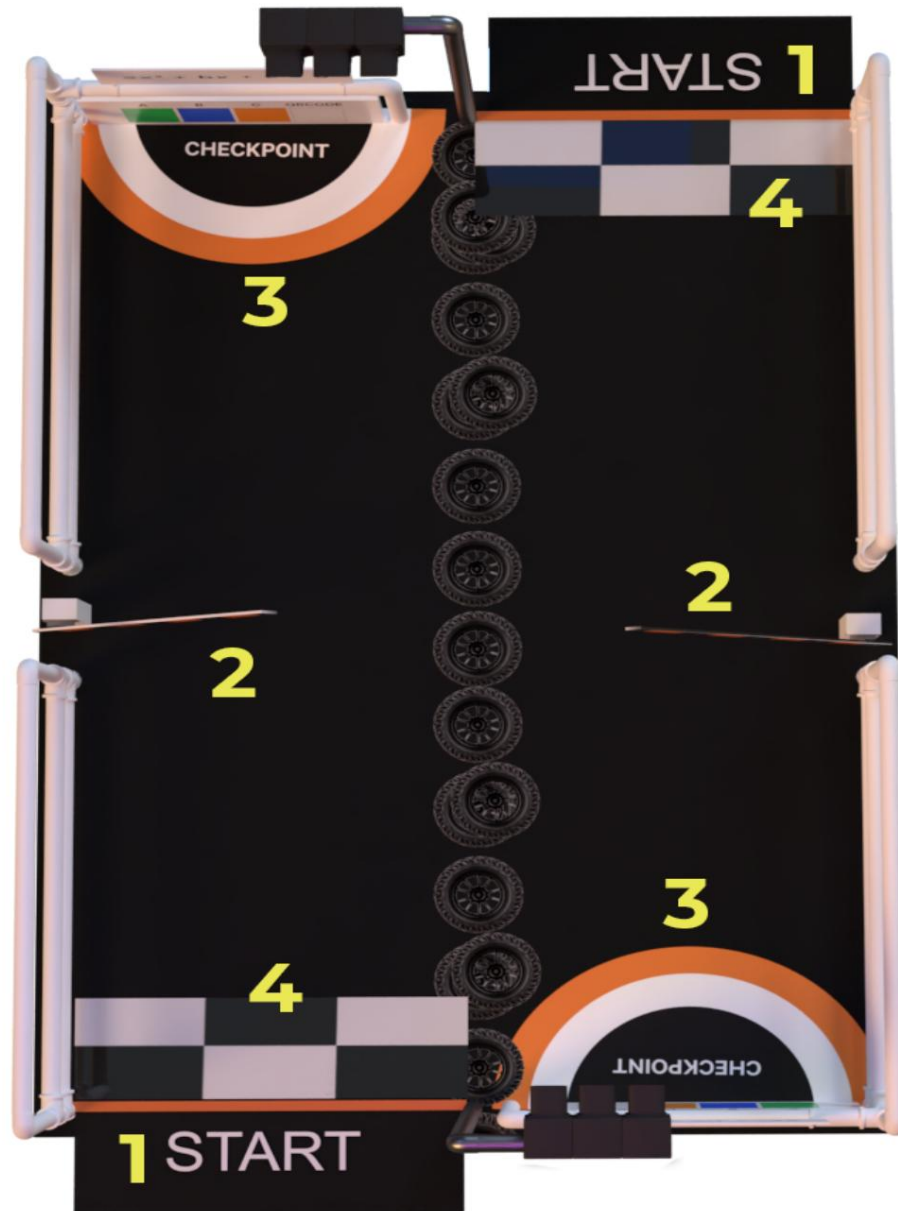**Figure 1: Detailed view of the playing area**

Figure 2: Top view of the playing area

1: Starting lines

2: Automatic barriers

3: Checkpoints

4: Arrivals areas

All the dimensions of the playing area as well as the positioning of the elements: "equation" and "QR code" are indicated in the appendix of these regulations.
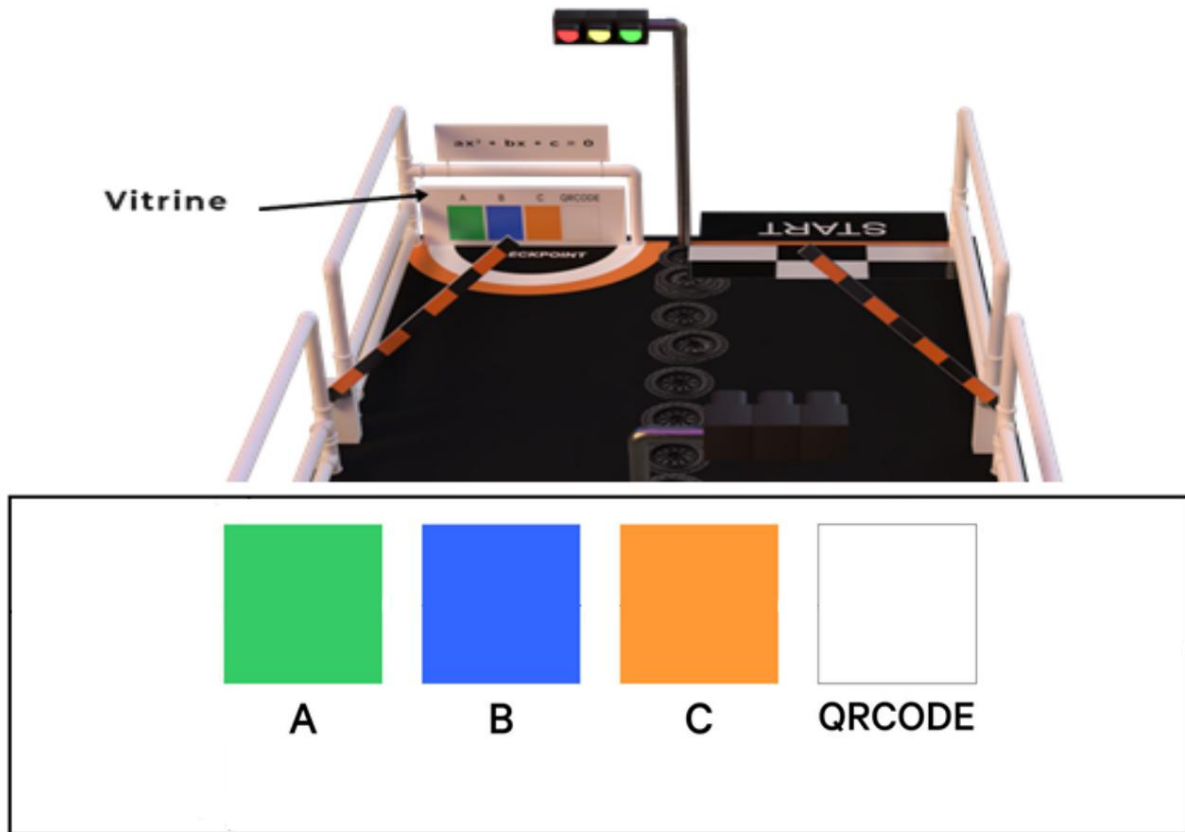
5

Figure 3: Showcase

D.2. DESCRIPTION:

This competition consists in designing autonomous and intelligent robots, which will set off mission in a racing setting. Each team has a starting area for their robot.

This is a "START" 1 line, robots compete in opposite directions to each other.

In the course of each robot an automatic barrier 2 separates the starting area from the execution area, **the latter ends with a checkpoint 3 which contains a showcase carries the following two elements:**

6

• A quadratic equation of the form **ax ^{2}+ bx + c = 0,** where **a, b** and **c** are real numbers with

a different from 0, the discriminant **ÿ** of this equation is : **ÿ ÿ** 0.
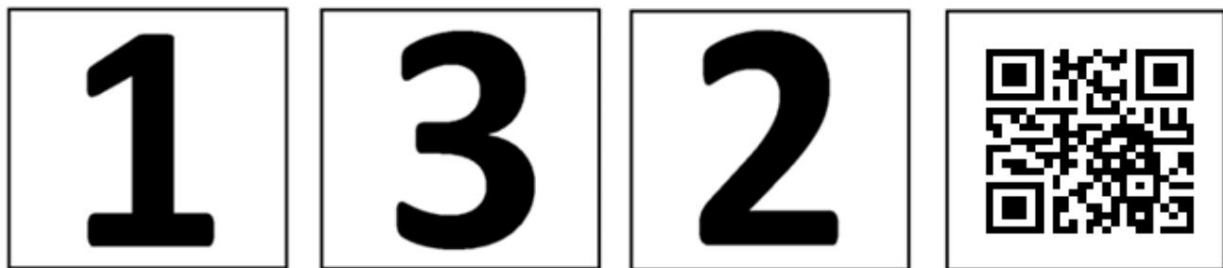
• A QR code / (email address).

The last part in the playing area is the "finish area" 4 black and white checkerboard. the

crossing this zone allows the robot to complete its mission.

D.2.1 CONSTRAINTS:

ÿ Variables a, b, c and QR code will be printed with HD quality, Mat lamination

In each race the juries change the variables randomly.
The color codes are:

Black: #000000
White: #FFFFFF

Figure 4: Example of storefront variables

ÿ The showcase is initially hidden by a curtain mechanism, visual access will be activated

only when the robot will be present in the checkpoint area.

ÿ Robots must fully enter the starting area. The vertical projection

robots must not exceed the limits of the starting area.

7

D.3. ACTION:

Each **robot must be turned on to start the race** from the starting line with a

acoustic or visual signal, passing the barrier which will descend automatically after

120 seconds. The robot must arrive at an execution zone "checkpoints", to read the reals a, b

and c of the equation. He will also have to scan the QR code (email address), then he must find the

/the root(s) of this equation and display them in a dynamic display device of a

permanently (the solution must remain displayed until the end of the match) and send it via

QRcode (scanned email). After the execution of the mission, the robot must return to the line of

departure.

• The team must evaluate the number of points made in the match by its robot:

ÿ Evaluation before the match on a static display device, the team enters the score

what she plans to do during the game.

D.4. POINTS:

The assessment is based on all of the previous actions:

-5 points if the team's robot is in the starting line or area

-5 points if the robot crosses the area of the automatic barrier

-5 points if the robot arrives at the execution zone "checkpoints"

-15 points if the robot displays the solutions or the roots of the equation

-5 points if the robot clears the finish area

-20 points if the robot sends the solutions by QR code / email

D.4.1BONUS:

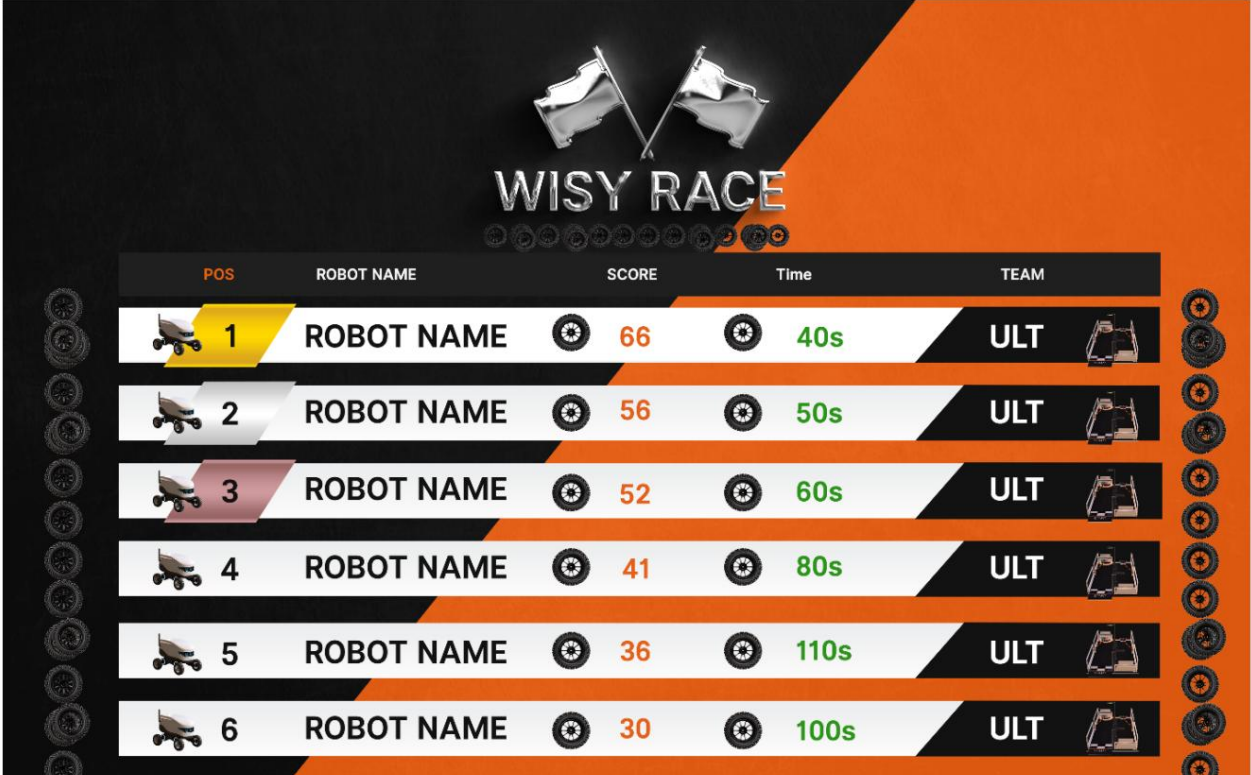The appraisal bonus is calculated as follows:

Bonus = (0.2 x Score) - Spread

• The score is the score made by the team during the match on standard actions.

• The difference is the difference between the score made by the team during the match and the score estimated by

the team. This is always positive (absolute value).

• The bonus is an integer value (rounded up).

8

• The bonus is added to the team's points.

• A negative bonus is reduced to 0.

• A score of zero cannot give rise to any bonus.

D.5. RULES:

The race lasts 120 seconds, and it ends with the descent of the automatic barriers.

An action outside the race will not be counted in score. The winner will be the one who has the more points and whoever was the fastest. **(Score takes precedence)**

Figure 5: Example of a ranking table

Any disrespect to the rules, or any of the actions below, will be classified as violence and

will result in the immediate disqualification of the robot.

- Deliberately causing damage to opposing robots, or to the playing area and its elements.

- Jet of liquid, powder, or the use of flammable, toxic or explosive.

- Leave the starting line before the referee's signal.

- If the robot leaves the model.

- Intervening in the field of play during the match.

- Any changes in the robot after the certification test.

- Participants must not under any circumstances discuss the decisions of the jury.

- **Penetration** of the robot in the zone or corridor of the adversary robot.

E. ROBOTS AND CERTIFICATION

E.1-ROBOT:

- The robot must be autonomous.

- The maximum dimensions of the robot: 30cm x 30cm x 30cm (length, width, height).

- Maximum weight: 6 kg.

- NXT robot is not allowed.

- The robot can deploy within the limits Indicated

- The energy source must be internal.

- The autonomous robot must be equipped with an emergency stop button placed on the top of the robot in a position that is visible and immediately accessible by the juries at all moment.

E.2.STATIC APPROVAL:

The robots are subject to the control of a referee who verifies their compliance with the rules. The

robots must be able to easily show all of their mechanisms. Each

team must present a technical file in the form of printable papers.

E.2-1-HOMOLOGATION SCORE:

 • Mechanical design: 20 points.

 • Electronic design: 20 points.

ÿ The homologation score will be taken into account only in the case of a tie

E.3.DYNAMIC APPROVAL:

The robots must, in 120 seconds, validate at least one action. Robots are put into

game situation in this homologation the juries will check the ability of the robots to avoid

the automatic barriers, the sides of the playing area, and the penetration into the area of

opponent etc.

Be imaginative! For example, as an innovation but also to offer the

public and the media an attractive spectacle.

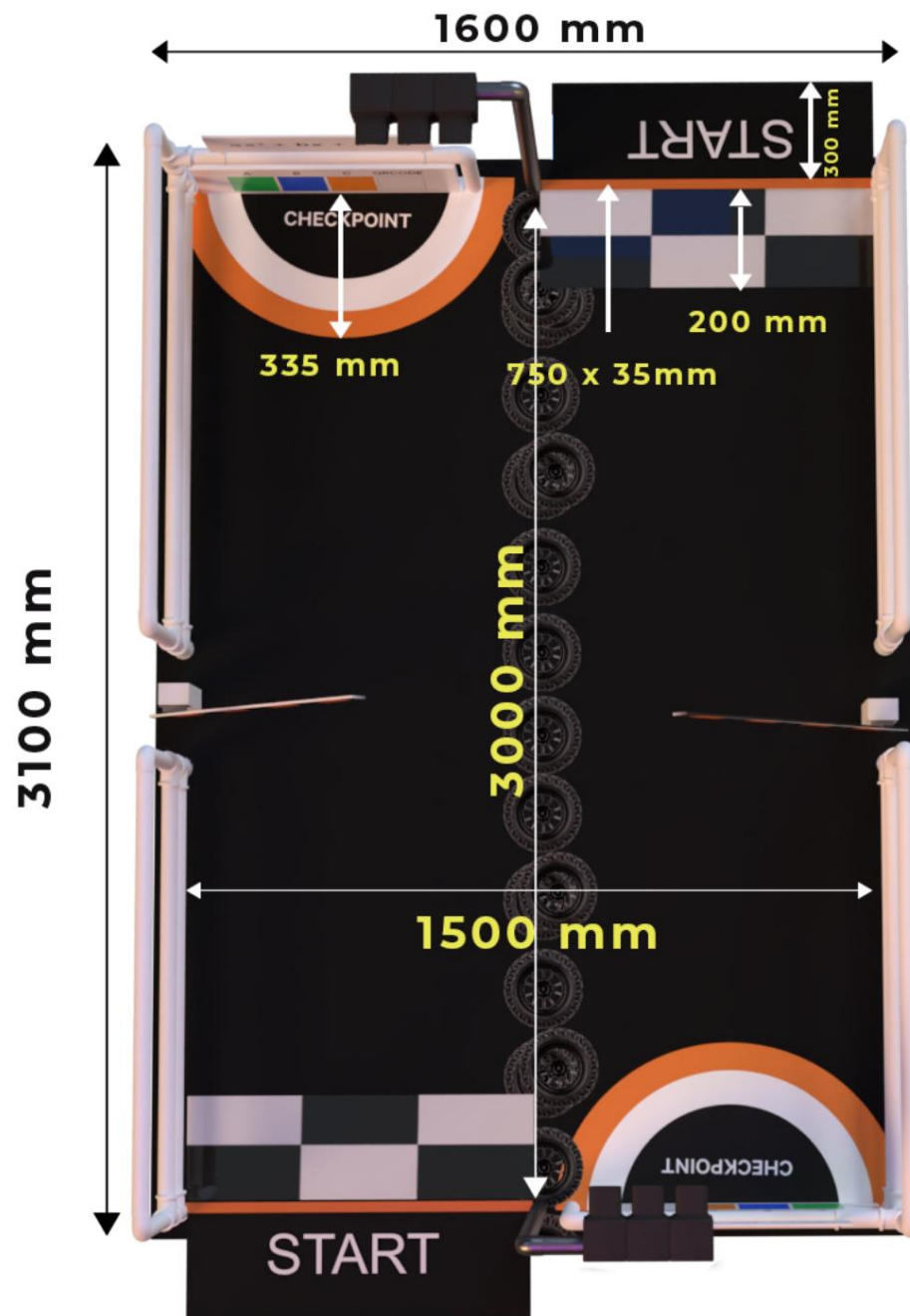Create aesthetic robots and if possible in phase with the theme.

1600 mm

START

300 mm

CHECKPOINT

335 mm

200 mm

750 x 35mm

3000 mm

3100 mm

1500 mm

START

CHECKPOINT

13

Figure 6: dimensions of the playing area
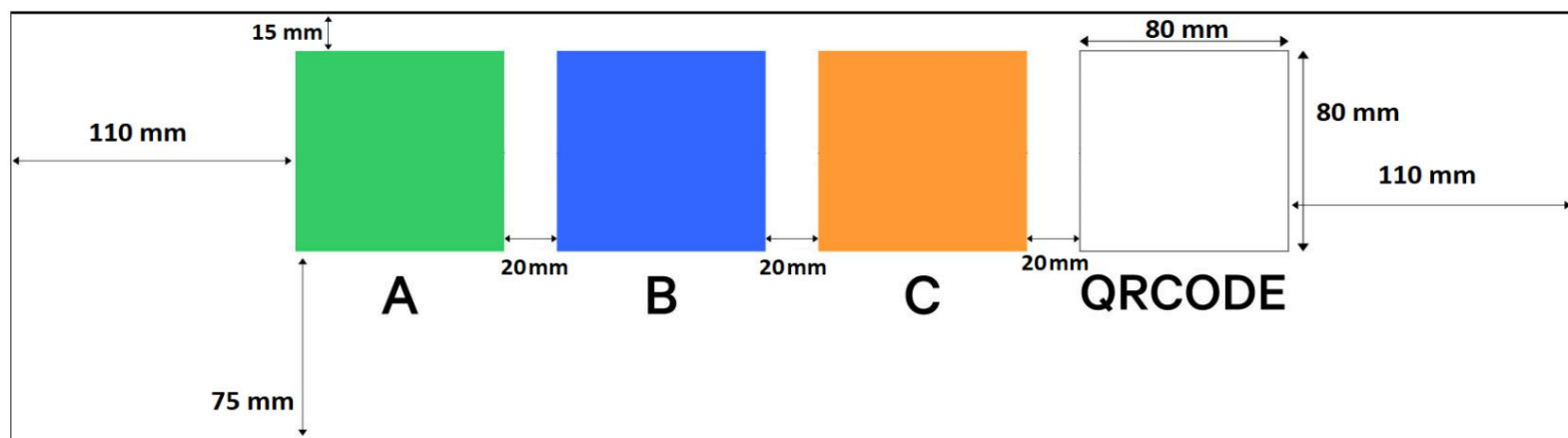
Figure 7: Showcase dimensions

Vitrine
600x170 mm
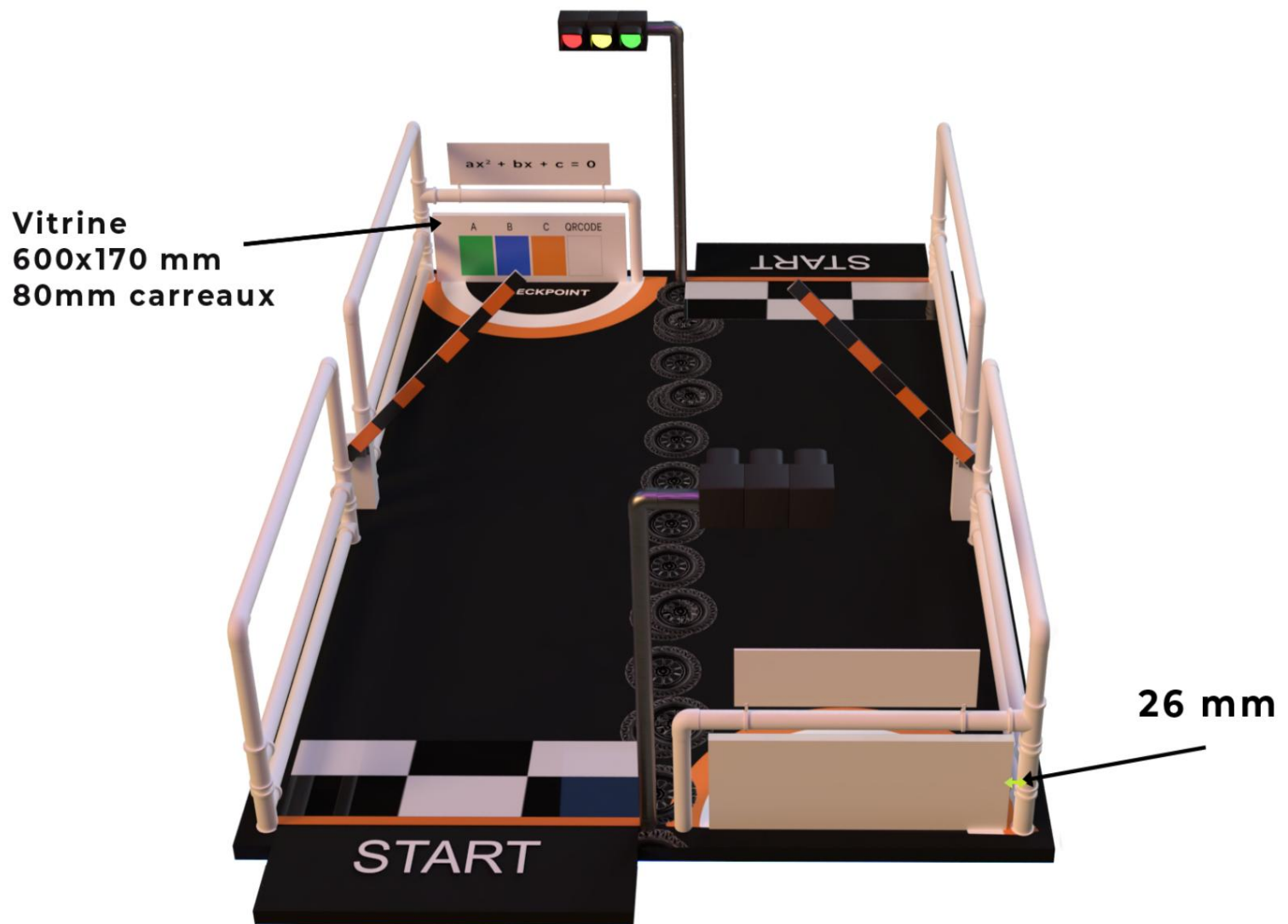80mm carreaux

ax² + bx + c = 0

A   B   C   QRCODE

ECKPOINT

START

26 mm

START

Figure 8: General dimensions of the showcase