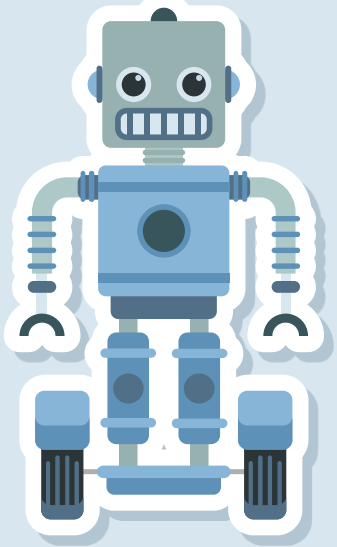
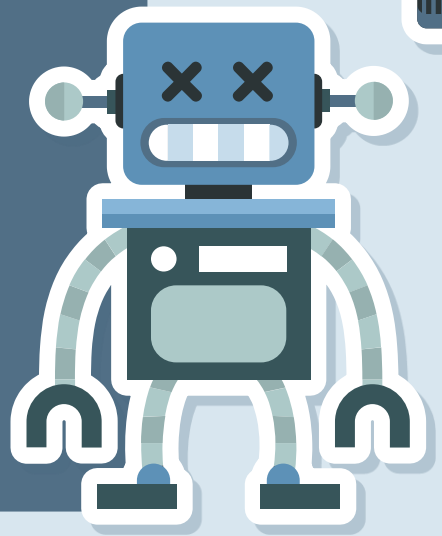
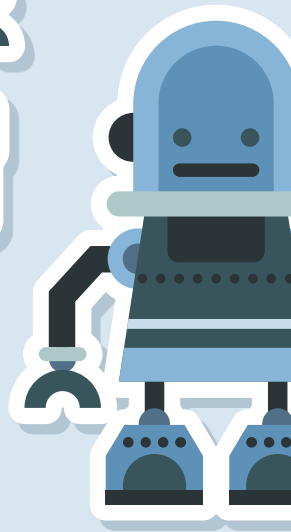
Bright Future Cup 2023

Ben Y B CHAN
Director, Center for Engineering Education Innovation, HKUST







香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

ATE

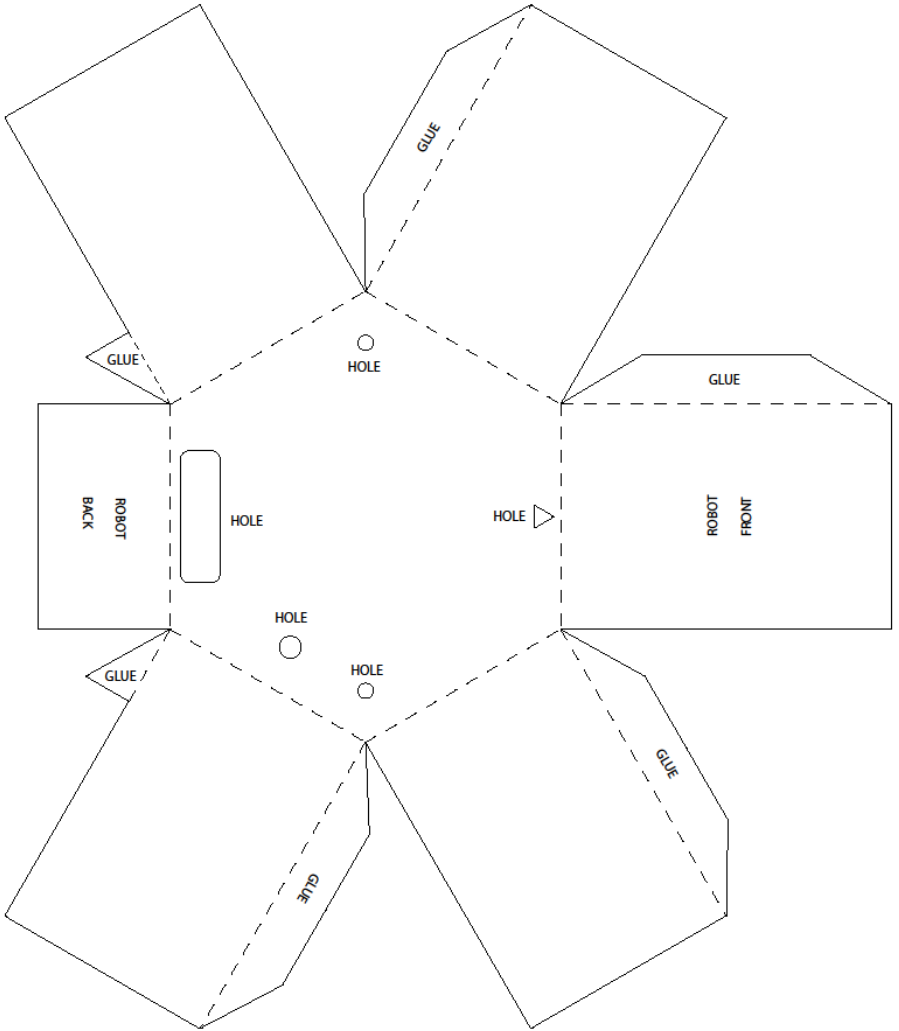
EDB STEM教育中心

ACADEMY FOR BRIGHT FUTURE YOUNG ENGINEERS
鵬程青年工程師學苑

The Competition

Uniform Design

Design the skin of 3 Soccer Robots



The Team

The Competition Team

A match is played by two teams, each consisting of not more 2 players.
At most one player may be designated as goalkeeper, the others are all field players.

3 vs 3

Each team can have a maximum of 3 robots on the field:-

- One goal keeper robot *
- Two field player robots

4 Registered Robots

Each team can register up to 4 robots during the pre-game registration stage

4 Pilots

Each robot must be controlled manually by 1 student pilot
Each team can register up to 4 pilots **

1 Coach

Each team can register 1 coach
The coach can be either a teacher or a student

* Only goal keeper robot can enter the team's penalty area
* The goal keeper robot will be indicated by a sticker assigned by the committee
* The sticker can pass the another robot during time out period but there can only be 1 goal keeper robot (per team) on the field
** Pilot must be a full-time high school student

The Robot

Size

The robot (in steady state with moving wheels touching the ground) MUST be able to fit into * a cone with a 200mm inner diameter

Mechanical Design

No invasive component (such as isolated sharp corner, punch device, etc.)
No lose part(s)

Mechanical Design

No sticking mechanism
No trapping mechanism
No shooting mechanism

Kicking Mechanism

A movable kicking mechanism (KM) is allowed with the following restrictions:-

- KM can only be activated when there is an attempt to hit the ball
- KM cannot extend out of the robot body for more than 100mm at any particular instant during a game
- The KM mush be retracted (back to its steady state) within 3 seconds after it is activated

* Fit in refers to the situation where, in the absent of external force/support, the free standing robot is not touching the inner perimeter of the cone

The Robot

Hardware

All robots must strictly follow the specification for the following components* :-

- Power Pack
- Motor
- Wheel

Electronics

One of the following Arduino boards:-

- UNO
- Nano
- Mega

Control Interface

All robots must be controlled by a digital user interface designed by the participating team** :-

- No mechanical controller is allowed
- The digital user interface must be operated on a portable device (phone or tablet) using Android or IOS system

Connection

Wired connection is not allowed. The robot must be connected to the controlling portable device directly, external signal stabilizers or signal amplifiers are not allowed.

* There components can be obtained from the organizing committee or designated providers
* Any deviation from the specification will lead to disqualification
** Direct application of commercial UI apps are not allowed

Restrictions on the hardware

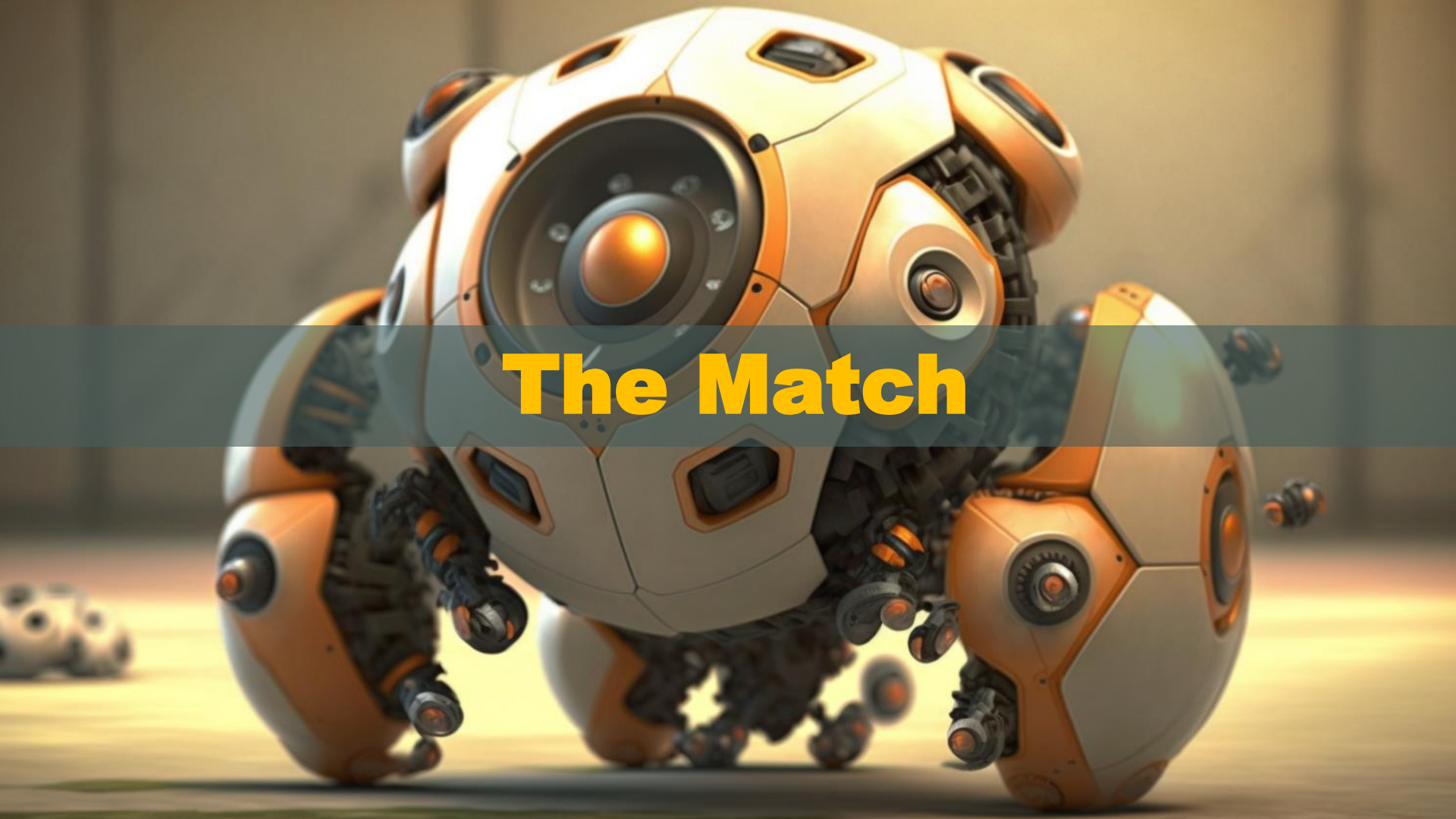
Each robot **must** use the following hardware provided by the organizing body

Power Pack
Output voltage: 12.6 V
Contains 3 18650 batteries

Each battery has a capacity of 2200 mAH.
Brand: Gongtian

JGB37-520 Motor
Operating voltage: 12 V
Rotational speed: 960 rpm

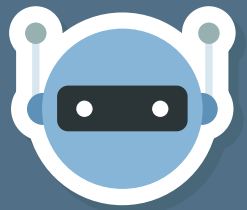
Omniwheel
Wheel diameter: 58 mm
Weight: 60 g
Number of rollers: 5


The Match

The Competition Field

Dimension

3.12m x 1.90m (±0.1m)
Round corners (r=0.5m)
Line Thickness: 15mm

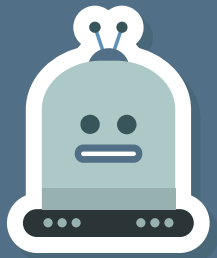


Field Surface

Green polypropylene carpet (short fiber)

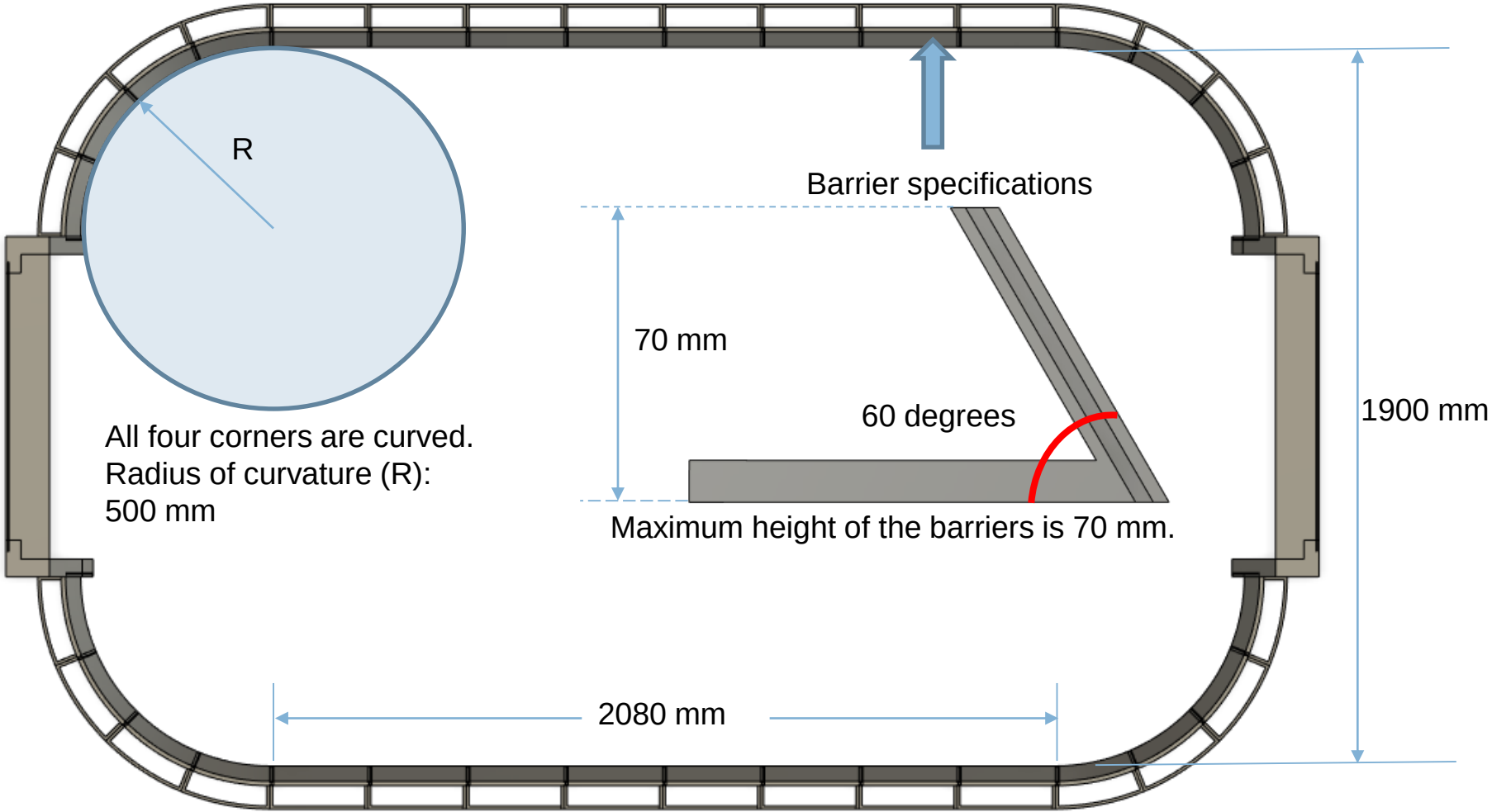
Goals

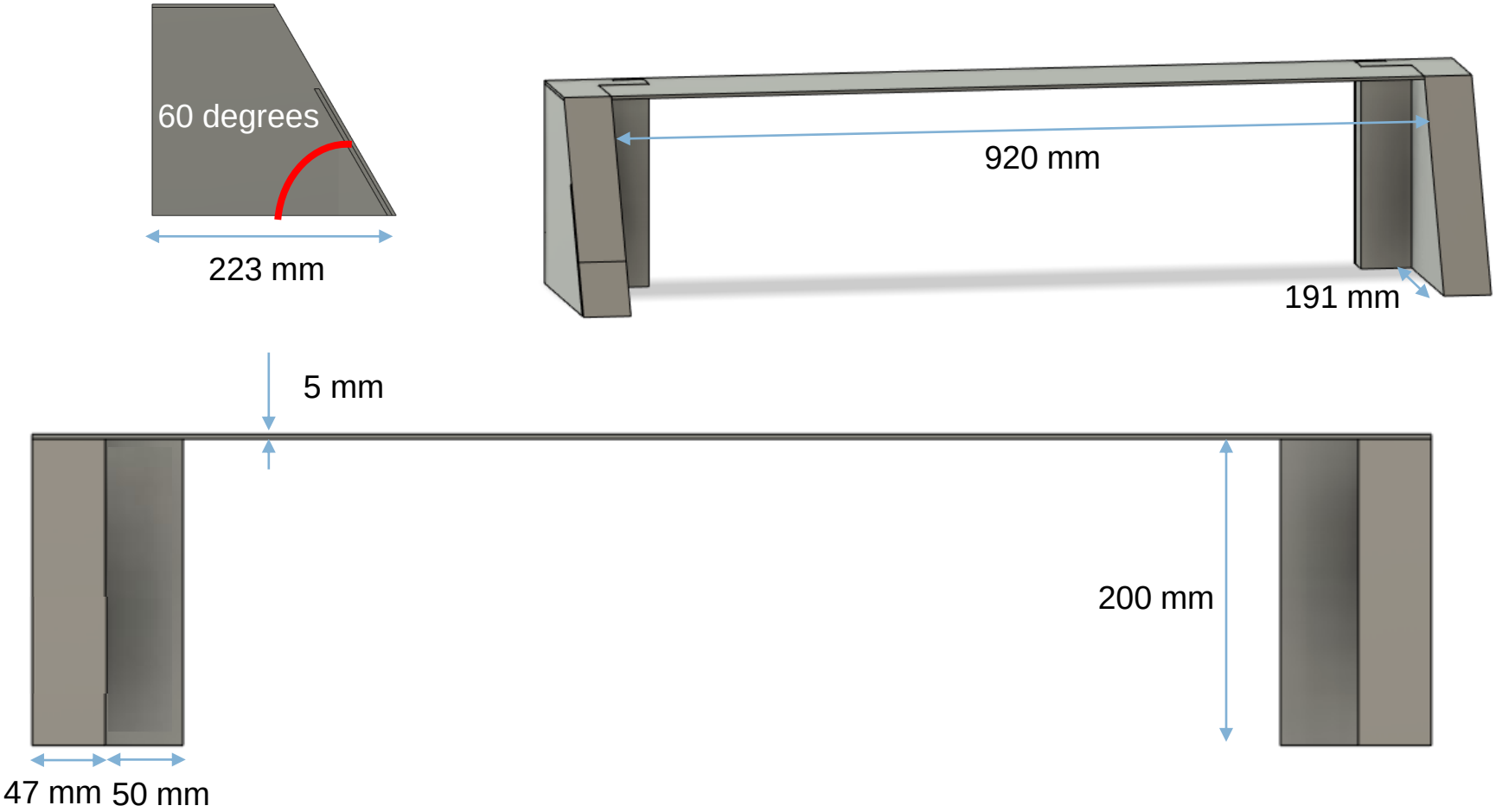
0.90m (w) x 0.20m (h)
Placed at the center behind the goal line

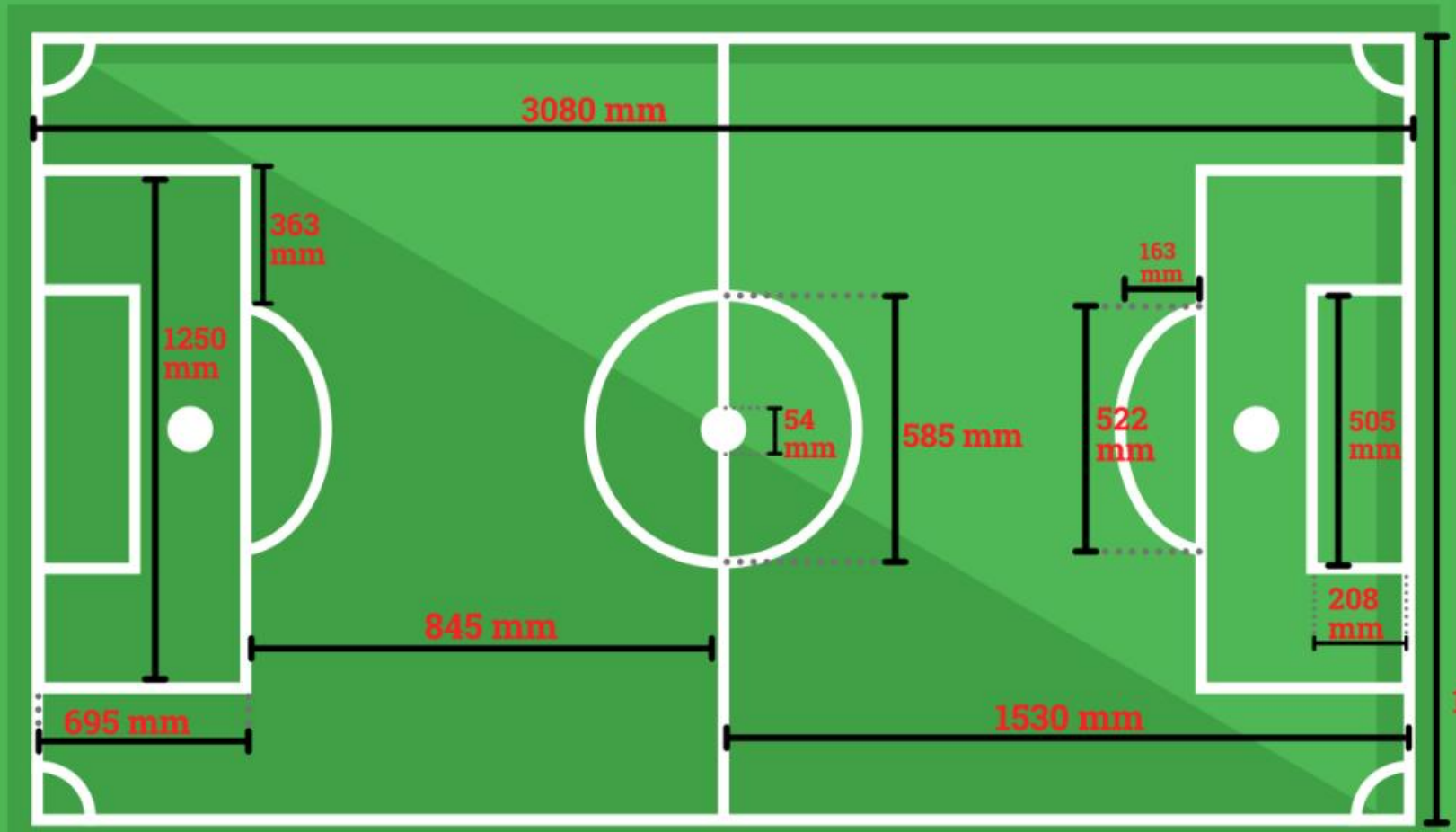


Ball

Plastic football with a diameter of 100mm

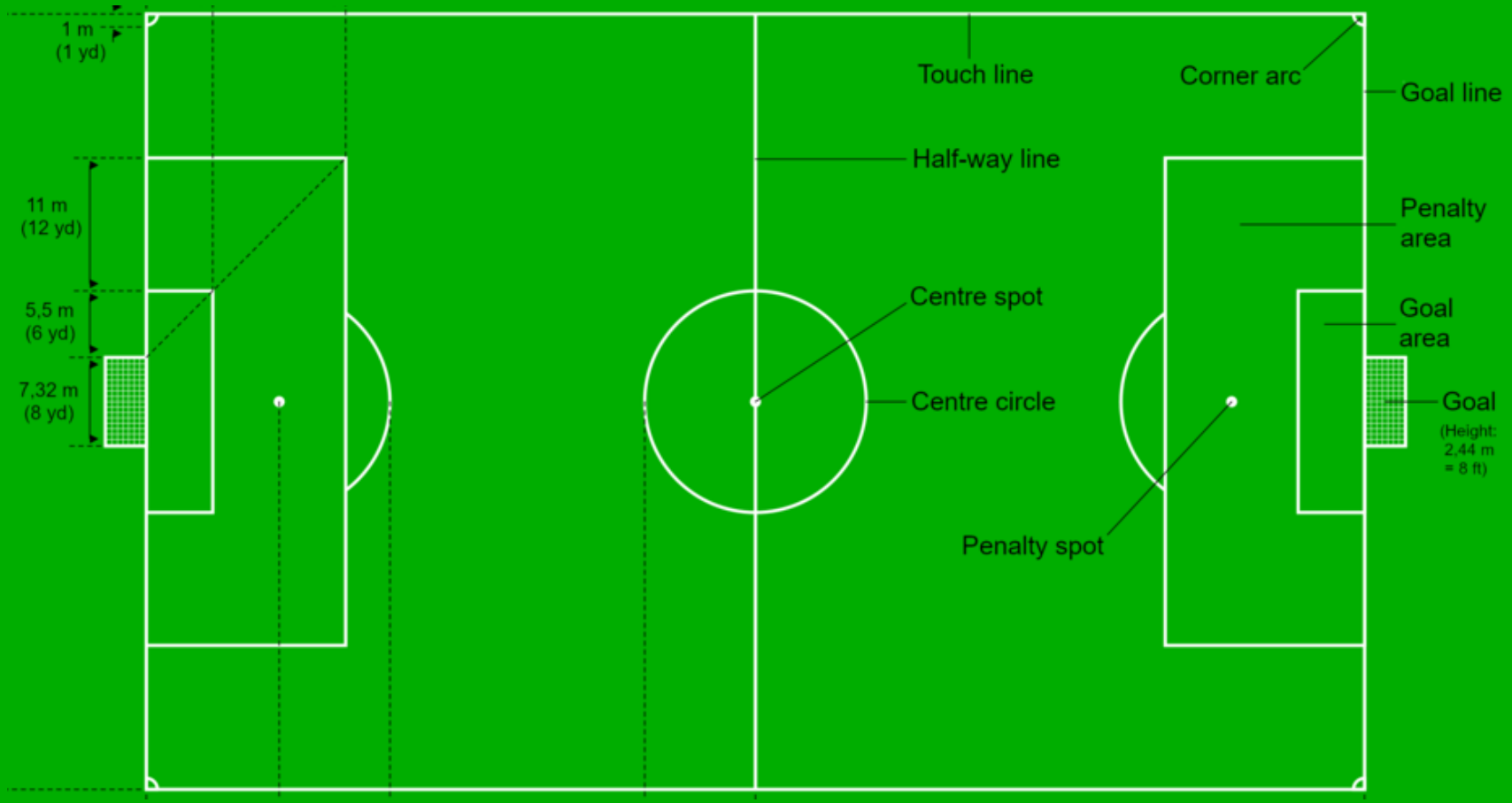

R
All four corners are curved.
Radius of curvature (R):
500 mm
Barrier specifications
70 mm
60 degrees
Maximum height of the barriers is 70 mm.
1900 mm
2080 mm

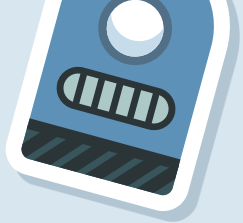

60 degrees
223 mm
920 mm
191 mm
5 mm
200 mm
47 mm
50 mm

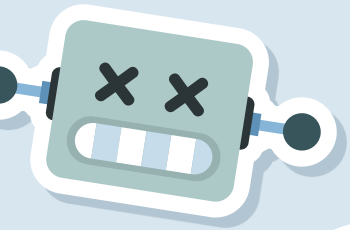


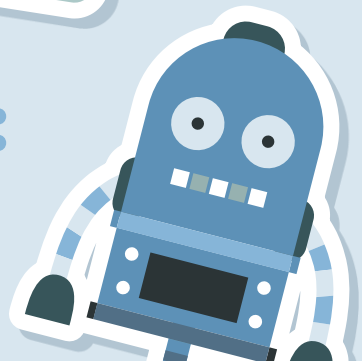
SOCCER FIELD DIMENSIONS

- Diagram not drawn to scale
- Line Thickness: 15 mm


1 m
(1 yd)
11 m
(12 yd)
5,5 m
(6 yd)
7,32 m
(8 yd)
Touch line
Corner arc
Goal line
Half-way line
Penalty
area
Centre spot
Goal
area
Centre circle
Goal
(Height:
2,44 m
= 8 ft)
Penalty spot





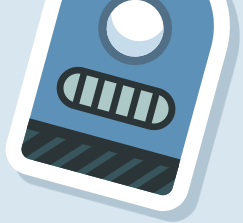


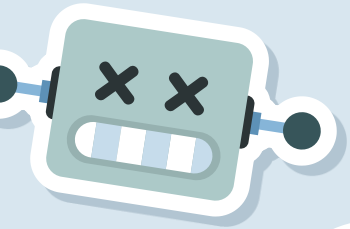
The Goal

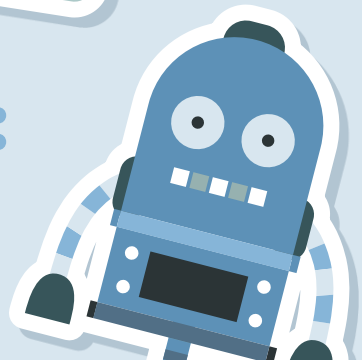
A goal, including own goal, is achieved when the entire ball (not only the center of the ball) goes over the goal-side edge of the goal line, i.e. the ball is completely inside the goal.

The head referee signals a goal by a single whistle blow, followed by the call “Goal ”. The head referee should point with one arm towards the center of the field.

The goal can be ruled out by the referee if a violation of game rule by the attacking team can affect the outcome of the goal.







Winner

The team collects more goals after the second half (4+4 minutes) wins the game !!!

The Match

Pre-game Inspection (15min)

- All robots participating in the match should report to the inspection deck 15 minutes before the game
- Robot will stay in the inspection desk until the match begins

First Half (4min)

- Players cannot touch any robot in the field until the game in temminated by the referee (eg time-out/ goal scored)
- Players cannot repair a robot in the field

Half-time Break (5min)

- Only minor change wihtout violating the game rules is allowed:-

- Replacement of battery
- Replacement of damaged parts
- Remove component(s) on the robot

Second Half (4min)

- The two participating team will switch side
- Same as first half
- In case of a tie game after the second half, the 1vs1 death match will start immediately (no break time)

Inspection Check List

Mechanical:

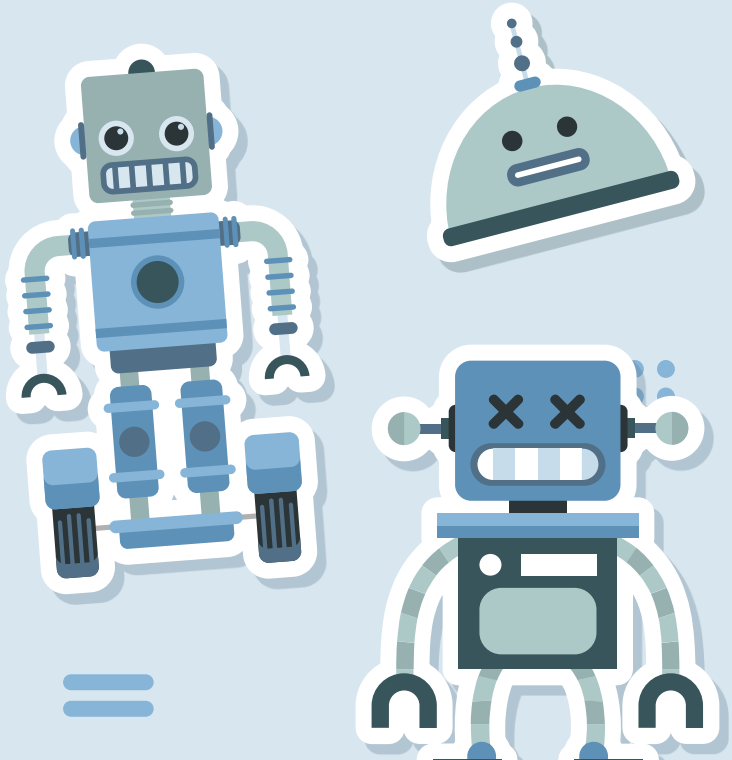
- Size and dimension (using a cone with 200mm inner diameter)
- Shape edge
- Sticky material on the robot body
- Lose part
- Kicking Mechanism

Electronic:

- Power Pack (voltage output)
- Motors
- Wheels
- Adruino Board

User Interface:

- Control Device
- User Interface



Match Setup

- When the match time is up, the coach of both teams have to report to the scorer within 1 minute
- After confirming the identity of both teams, the referee will announce the beginning of a 2 minutes preparation time

By the end of the preparation time:-

- A match should always start/restart with with 3 robots on the field for each team
- A maximum of 1 substitute robot on the work station for each team
- All robots should be placed behind the half-way line towards the team's control area
- Only the goal keeper can be placed inside the penalty area
- All pilots should be ready in the control area
- The coach should be ready in the coach area

Match Setup

- While the match is in progress, player cannot leave the control area and coach cannot leave the coach area.
- The game is suspended under the following situations:-

1) The referee called for a “time out” or “restart”.
2) A goal scored by a team.
3) The end of the “first half”/ “second half”.

- While the match is suspended, the coach and one pilot in the control area might enter the field and perform one or more actions below:-

1) Pick up and relocate their team’s robot
2) Replace a robot with the substitute robot
3) Pass the goal keeper sticker to another robot

- The above action(s) should be completed within 10 seconds, all pilots, robots and the coach should return to their starting area and get ready for a restart

Goal Keeper

- The goal keeper robot (GPB) is the only robot that can enters it's own penalty area to defense
- All robots can enter the opponent's penalty area
- If a field player robot (FPR) enters the penalty area on their side and touches one of the followings, a yellow card will be issued:-

1) Any Robot
2) The Ball
3) The Goal Frame

- If the violation above directly denying a goal scored by the opponent, a red card will be issued instead

Half-time

- When the first half is over, there is a 5 minutes half-time break
- Pilots should carry their belongings to the opposite side.
- After switching side, pilots can repair and replace essential component of any robot within the control area

1) Replacement of battery
2) Replacement of damaged parts
3) Remove component(s) on the robot

- The coach cannot enter the control area and cannot participate in the repairing process
- Robots should be placed on the field, pilots and the coach should return to their respective areas by the end of the half-time break

1 vs 1 Death Match

- In case of a tie game after the second half, the 1vs1 death match will start immediately (no break time)
- Each team will leave 1 robot on the field, the death match will start with the robot placed completely within the penalty area
- The first team collect a goal wins the match
- The death match will last for a maximum of 3 minutes

First Kick

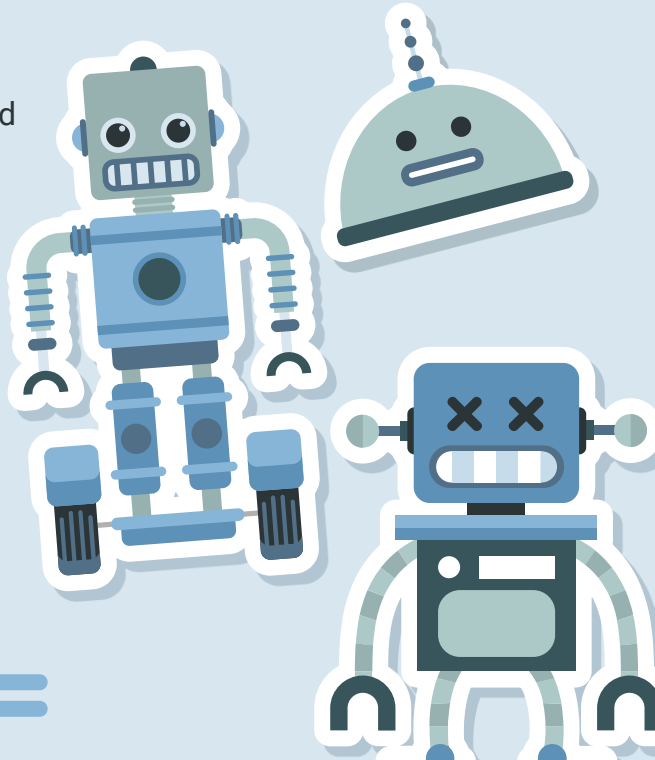
- In case of a tie game the 1vs1 death, the first kick game decider will start immediately (no break time)
- Each team will leave 1 robot on the field, the first kink will start with the robot placed completely within the penalty area
- After the referee counting down “3 2 1 start!” the first team touches the ball will win the match

Yellow and Red Cards

Disqualification

A disqualification refers to the situation a team is not allowed to participate/continue in the match

- Failed to report to the inspection desk 15 minutes before the match
- All robots cannot past the inspection test
- At any stage during a match, there is no robot can be placed on the field
- Damaging opponent’s robot intentionally



Warning, Yellow Card and Red Card

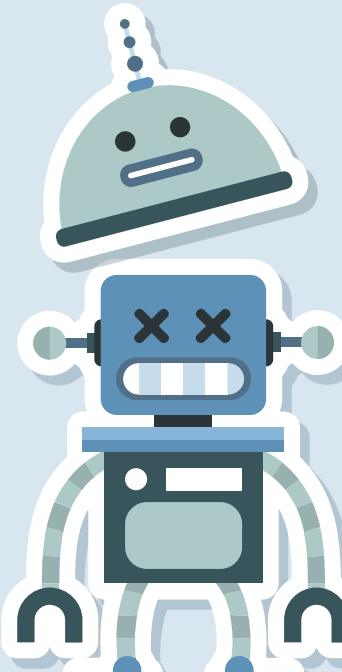
A oral warning will be given to any minor violation of game rule during a match, ignorance of a oral warning will lead to a yellow card.

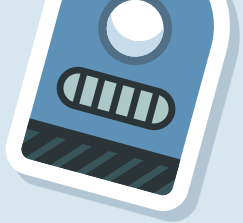
A yellow card will be issued when a violation of game rule leading to disadvantage(s) of the opponent. two yellow cards will lead to a red card.

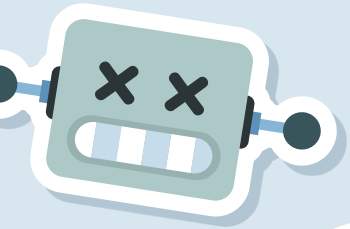
A red card will be issued when a violation of game rule leading to a goal/ a decent goal opportunity, or the violation is leading to significant damage of the opponent's robot.

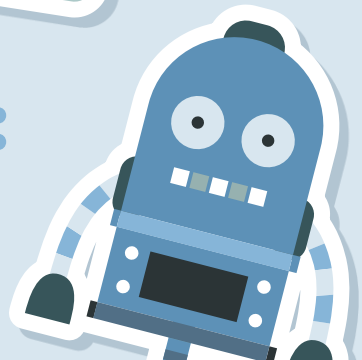
In the situation of a red card being issued, the team will have to play with 1 less robot in the remaining time of the match.

In the situation where a red card is issued due to dangerous/invasive design/action of a particular robot, the referee can decide which robot should be removed from the match.



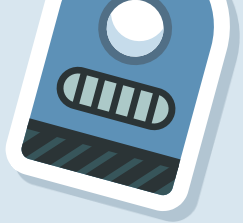


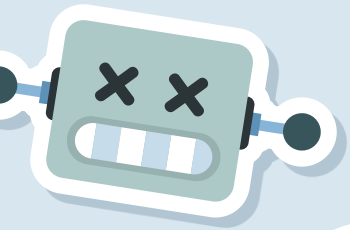
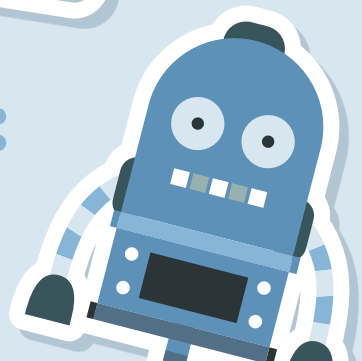




Workshop

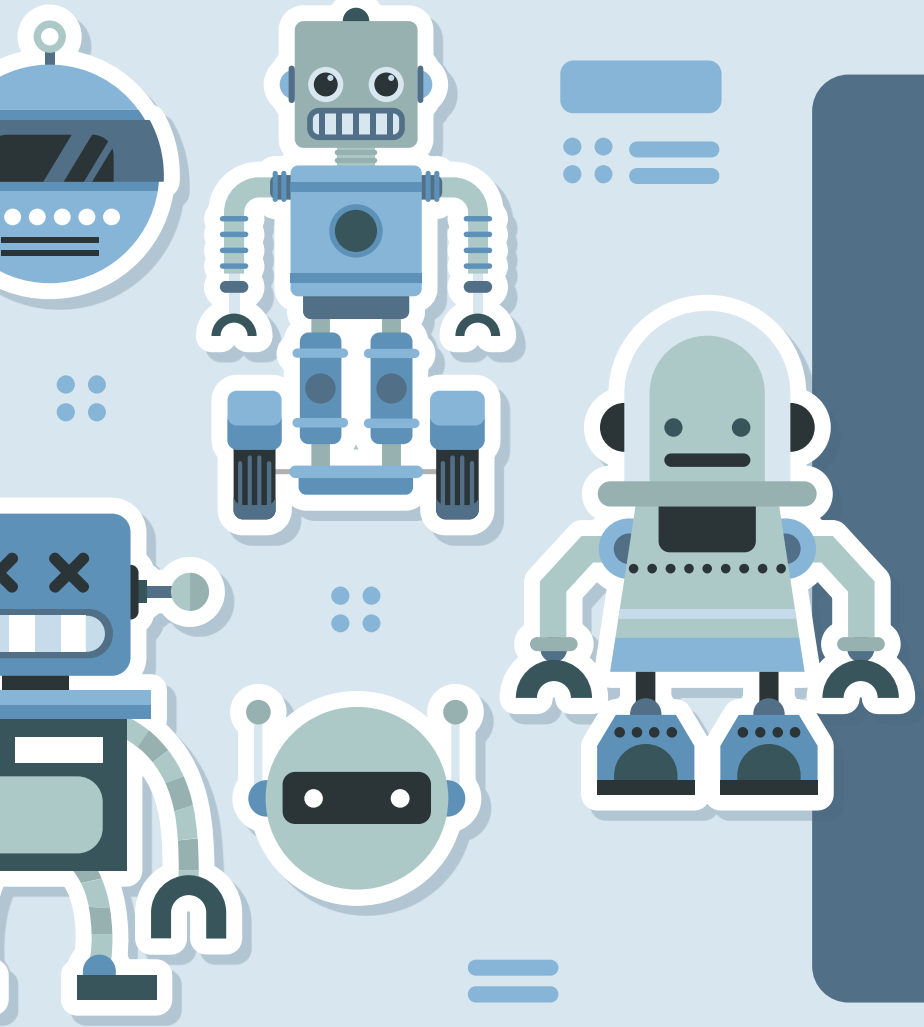
Session 1: 22nd April AM
Session 2: 22nd April PM
Session 3: 29th April AM
Session 4: 29th April PM



Workshop

- Basic Robot Assembling
- Creating Buttons in an user interface
- Uploading program into Arduino
- Connect devices using Bluetooth



Thank you! and Enjoy!

Does anyone have any questions?

egfaiyeung@ust.hk

QUESTIONS?