Rescue Line Field

The field will consist of 30 cm x 30 cm tiles, with different patterns.

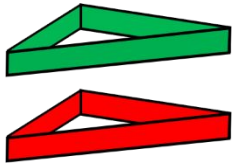
The Evacuation Zone is approximately 120 cm x 90 cm with walls in the 4 sides that are at least 10 cm high.

Victim

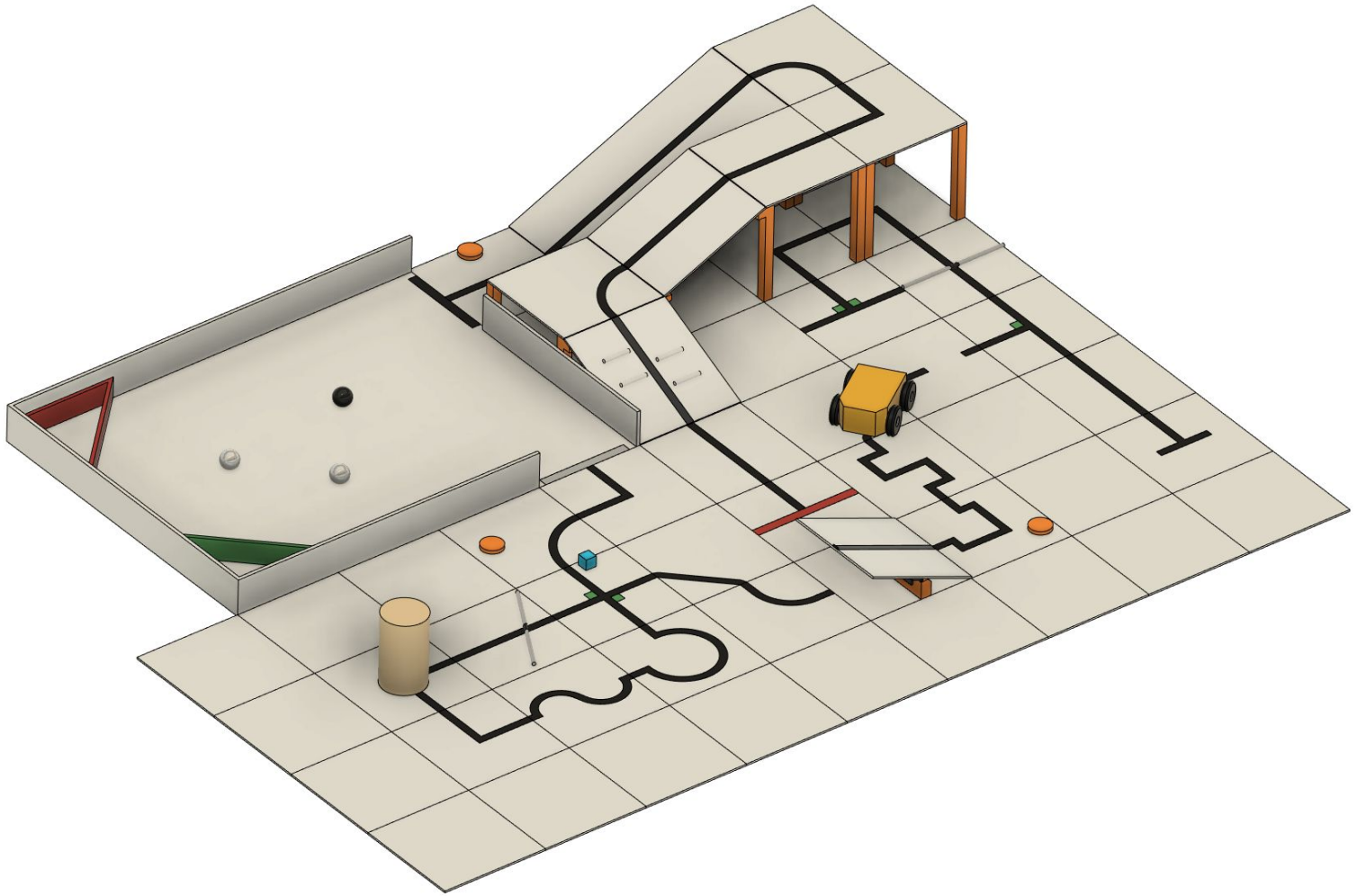
Speed bump

Checkpoint marker

Obstacles

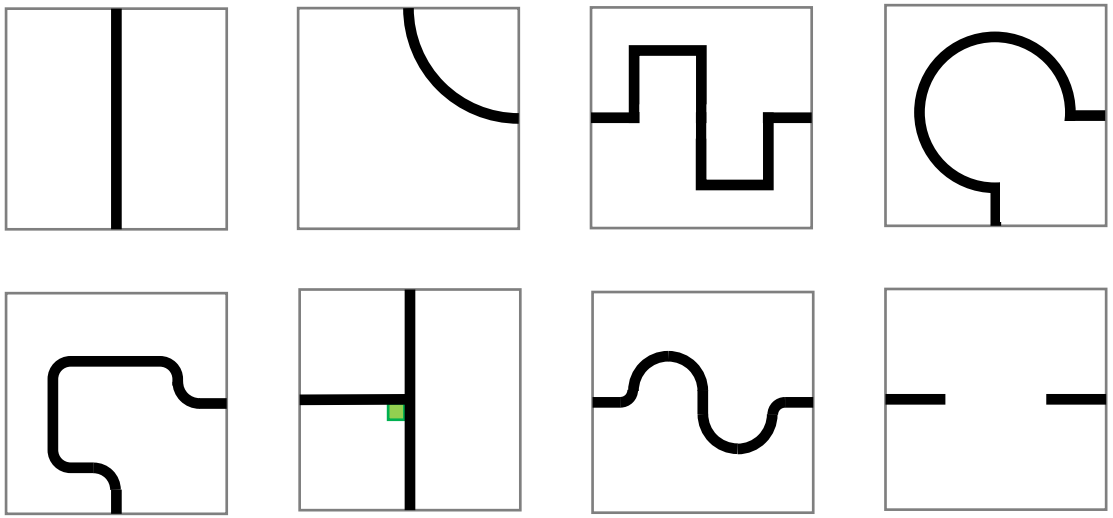


Evacuation Points

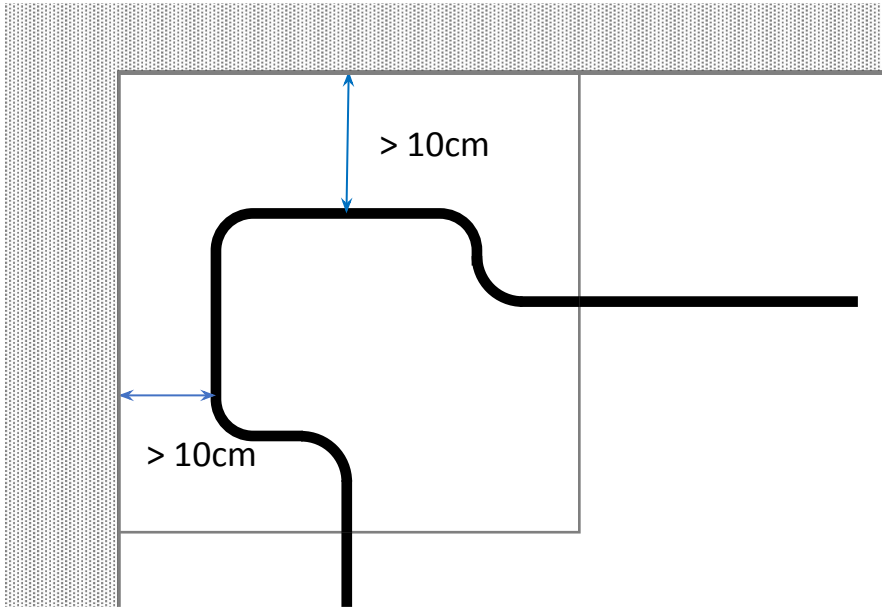


Tiles

The field will consist of 30 cm x 30 cm tiles, with different patterns.(2.1.2)



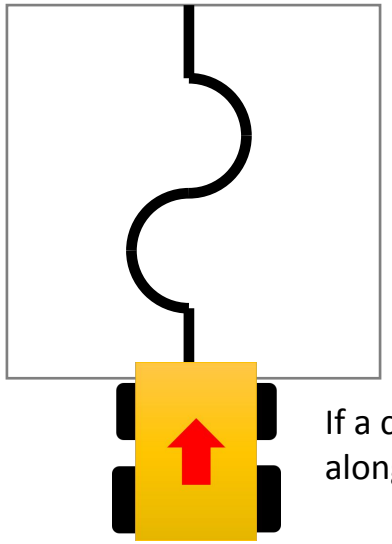
The black line is 1-2 cm wide. (2.3.1)

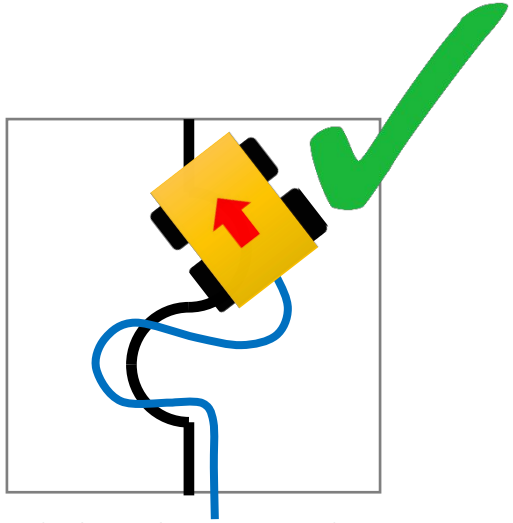


The line will be 10 cm away from any edge of the field. (2.3.4)

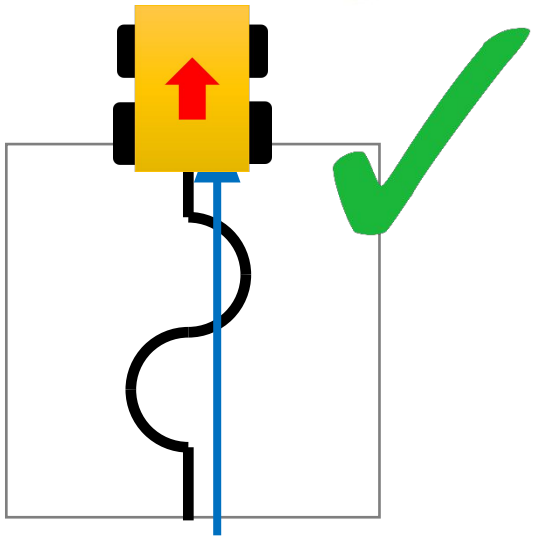
Follow the line

The robot must follow the line completely to enter the evacuation zone.

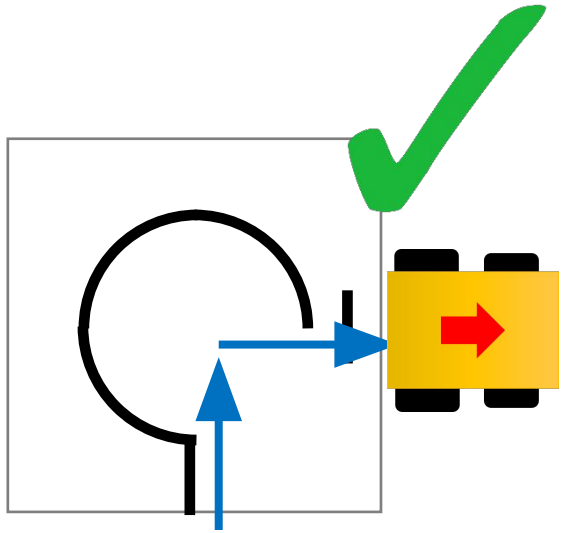




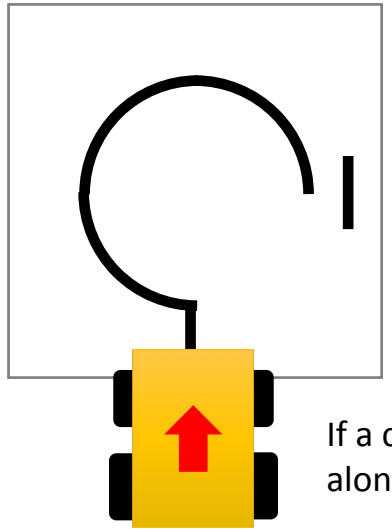
If a course is curved, the robot must advance along a curve, too

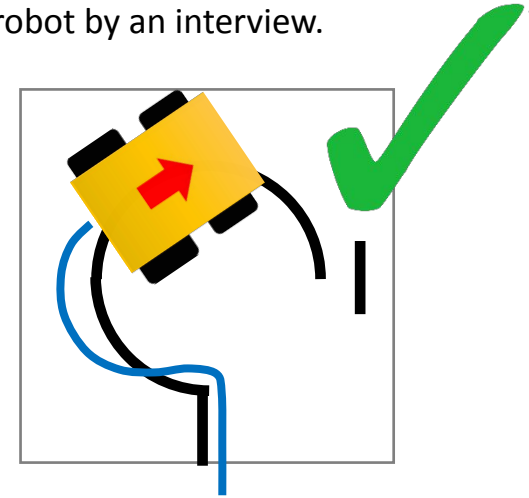


When a robot goes straight on, a referee confirms the movement of the robot by an interview.



When a robot goes that course, a referee confirms the movement of the robot by an interview.





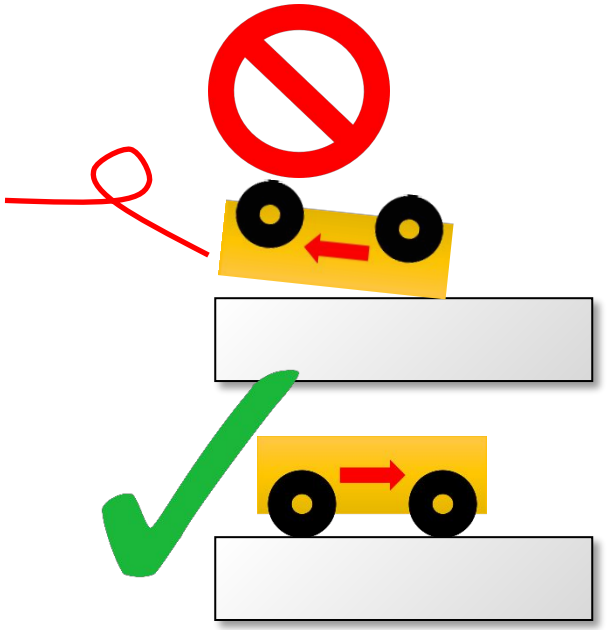
If a course is curved, the robot must advance along a curve, too

Visit a Tile

4.4.6. The robot has visited a tile when more than half the robot is within that tile when viewed from above.

More than a half of the robot is in a tile.

The robot is not moving along the black line in the tile.

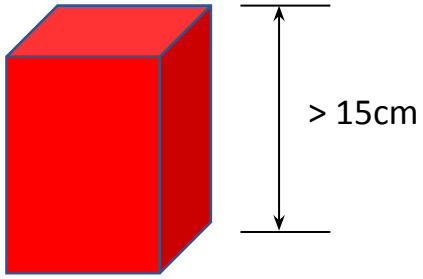


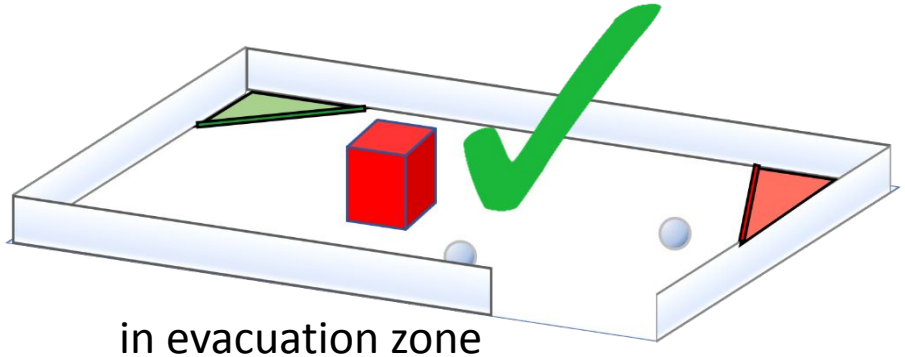
The robot must continue moving forward.

Obstacles placement

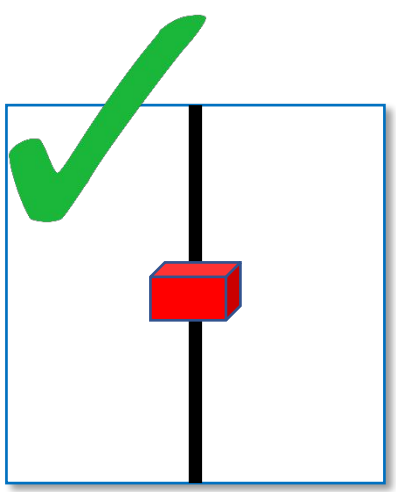
2.5.3. Obstacles may consist of bricks, blocks, weights and other large, heavy items. Obstacles will be at least 15 cm high, and can be fixed to the floor.

2.5.4. An obstacle will not occupy more than one line and/or tile.

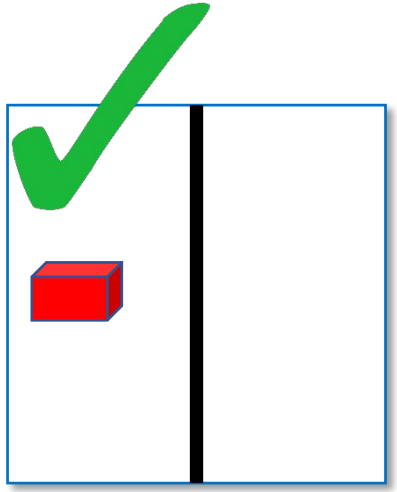




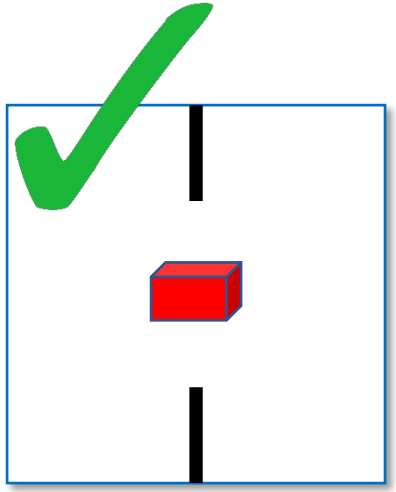
in evacuation zone



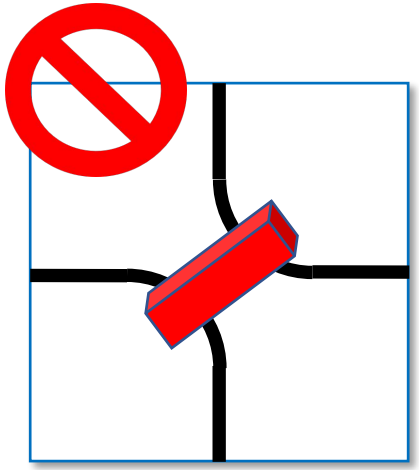
On a line



Not on a line



In a Gap

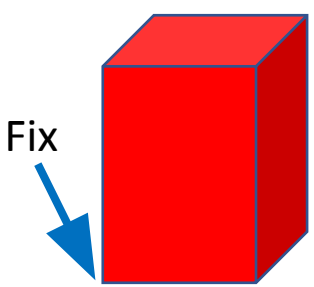


On multiple lines

2.5.6. Obstacles will not be placed closer than 25 cm from the edge of the field (including edges of tiles that are elevated by ramps) and inclined tiles.

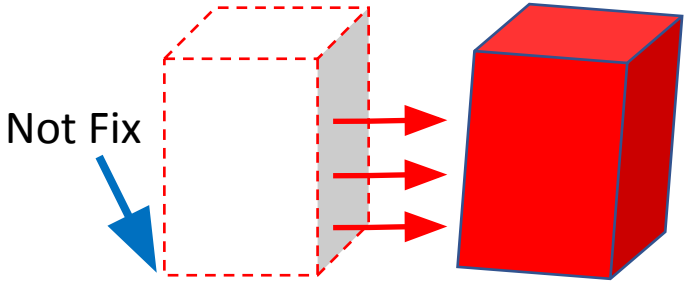
Obstacles placement

2.5.5 The robot may move an obstacle but it should be noted that obstacle may be very heavy or fixed to the floor.



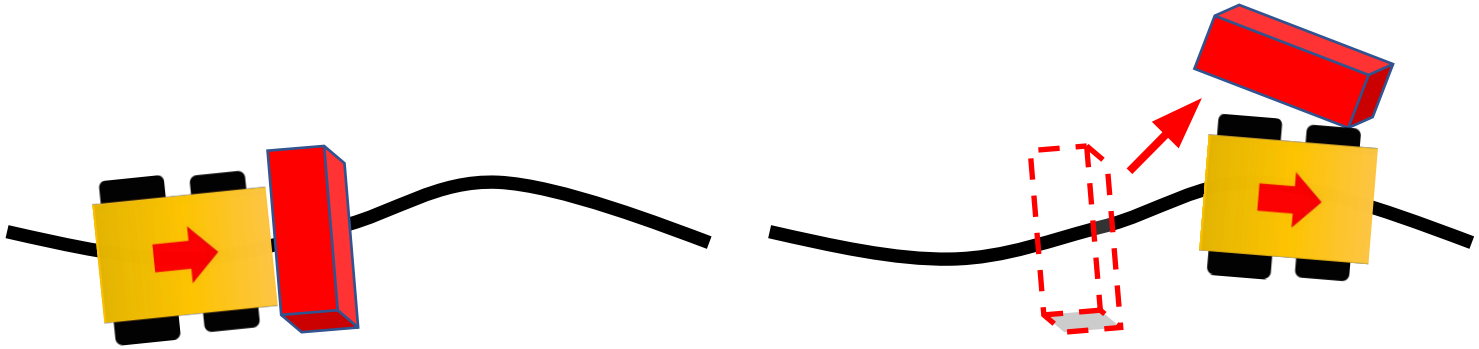
The obstacle may not move when the robot pushes it.

or



The obstacle may move when the robot pushes it.

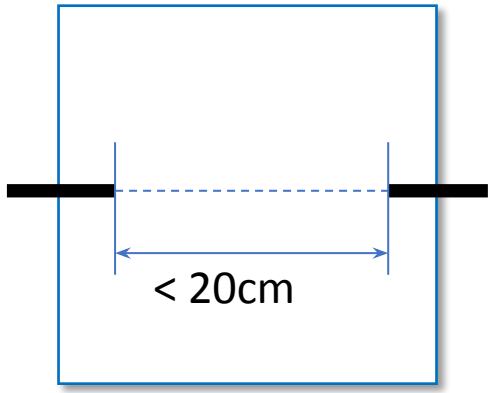
2.5.5 Obstacles that are moved will remain where they were moved to, even if that prevents the robot from proceeding.

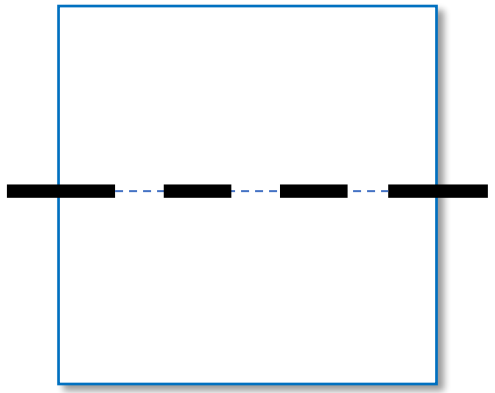


if the robot pushed the obstacle, it cannot be returned to the original position until the end of run.

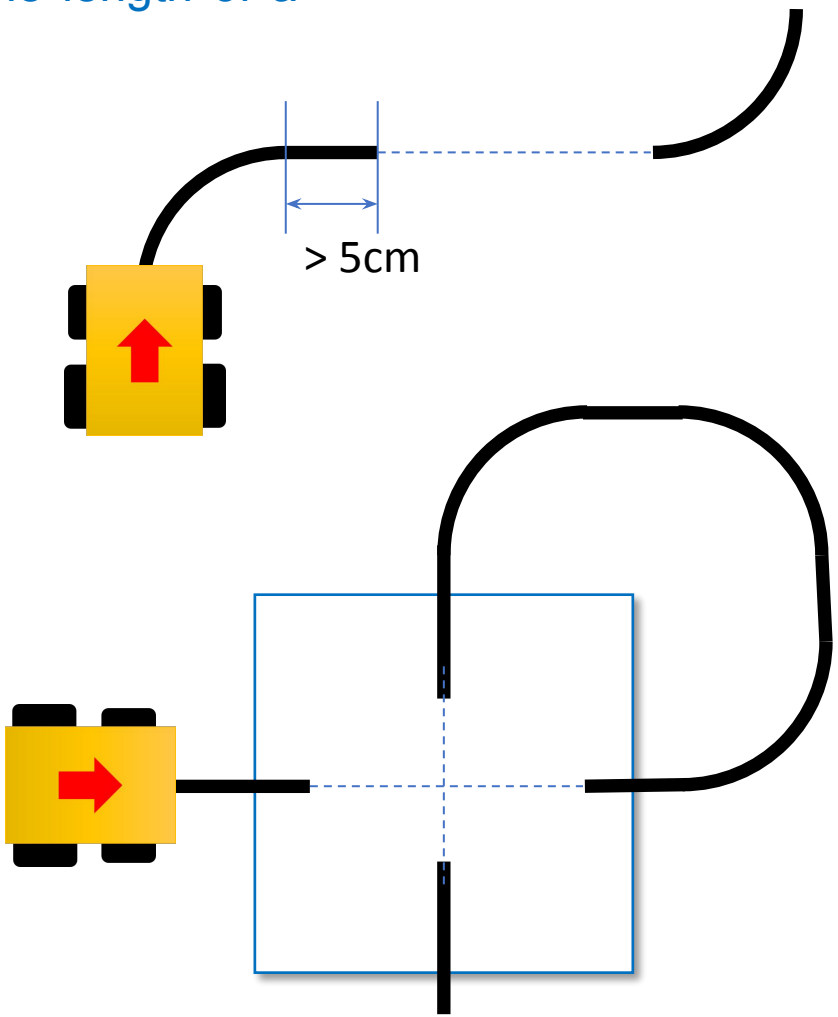
Gap placement

2.3.2. Straight sections of the black line may have gaps with at least 5 cm of straight line before each gap as measured from the shortest portion of the straight portion of the line. The length of a gap will be no more than 20 cm.





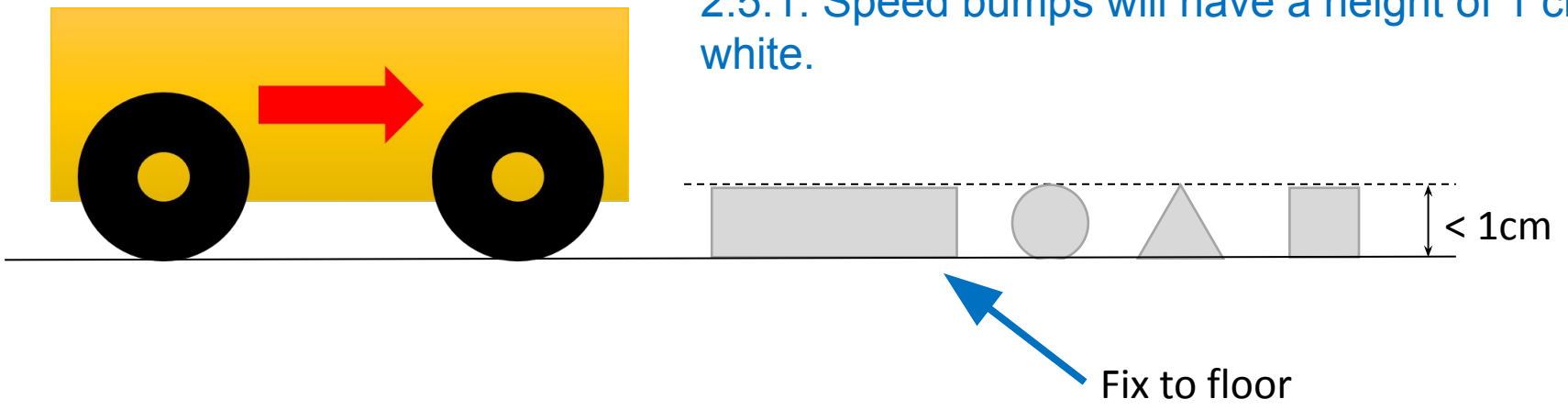
There may be multi gaps in one tile



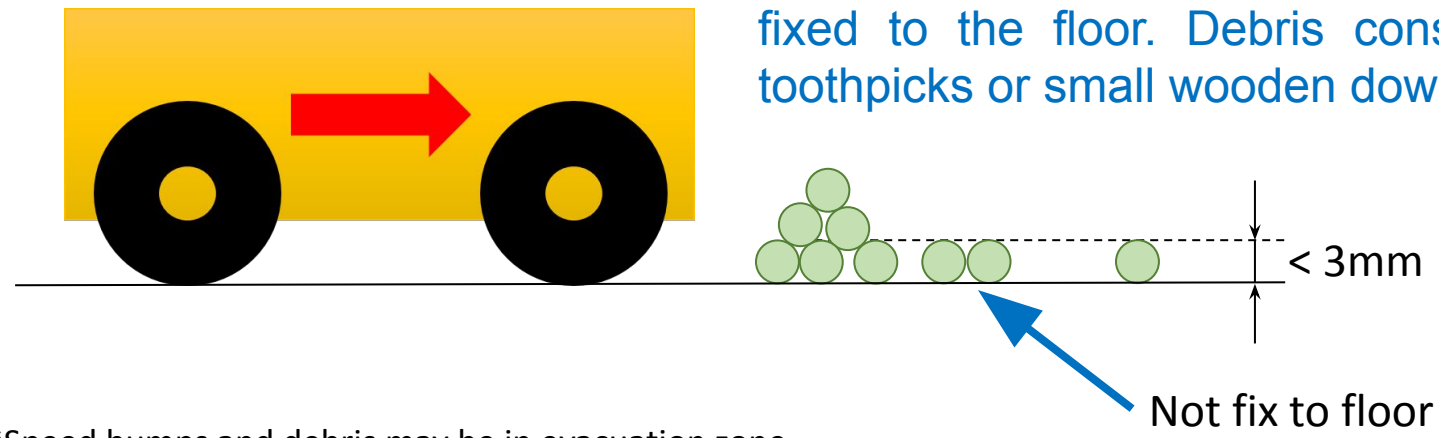
There may be cross gaps in one tile

Speed bump and Debris

2.5.1. Speed bumps will have a height of 1 cm or less and will be white.



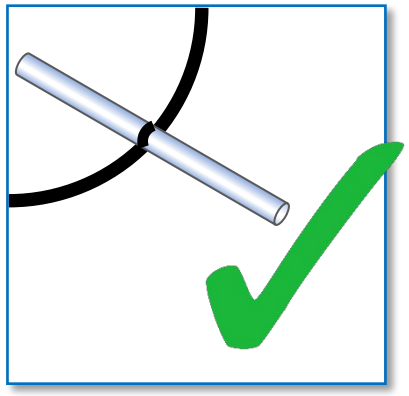
2.5.2. Debris will have a maximum height of 3 mm. It will not be fixed to the floor. Debris consists of small materials such as toothpicks or small wooden dowels, etc.



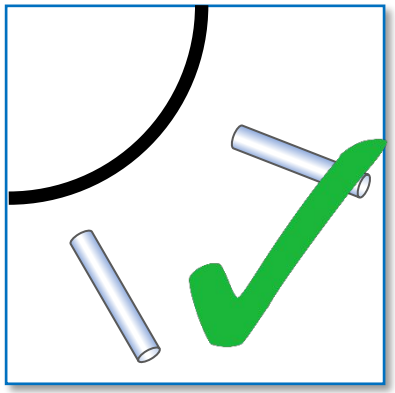
*Speed bumps and debris may be in evacuation zone.

Speed bumps placement

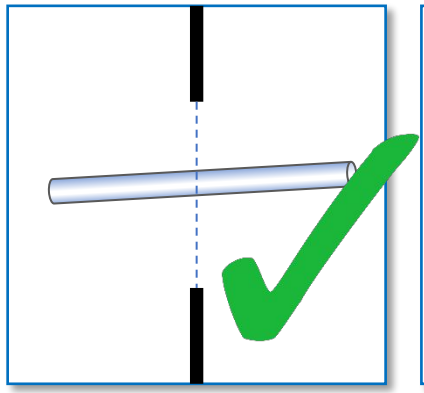
2.5.1. Speed bumps will have a height of 1 cm or less and will be white. When the speed bump is placed over any black line, the overlap between the speed bump and the black line will be colored black. Speed bumps will be fixed on the floor.



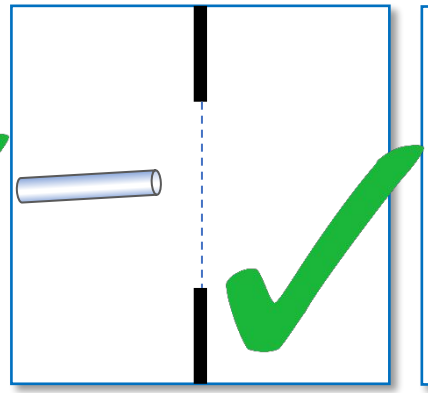
On black line



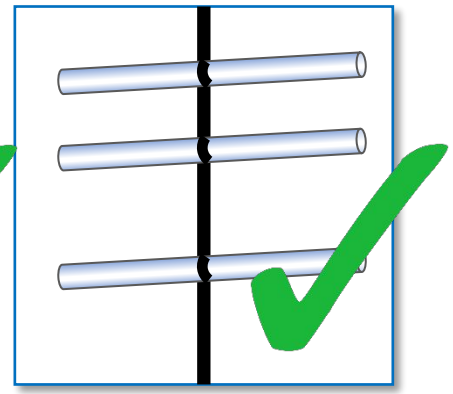
Not on Black line



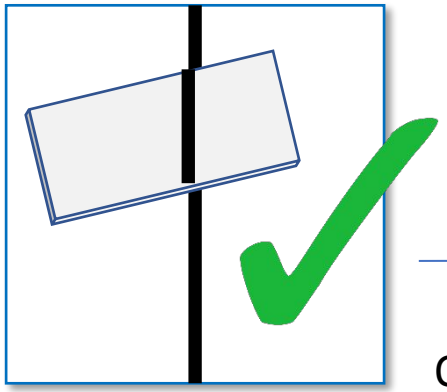
In a Gap



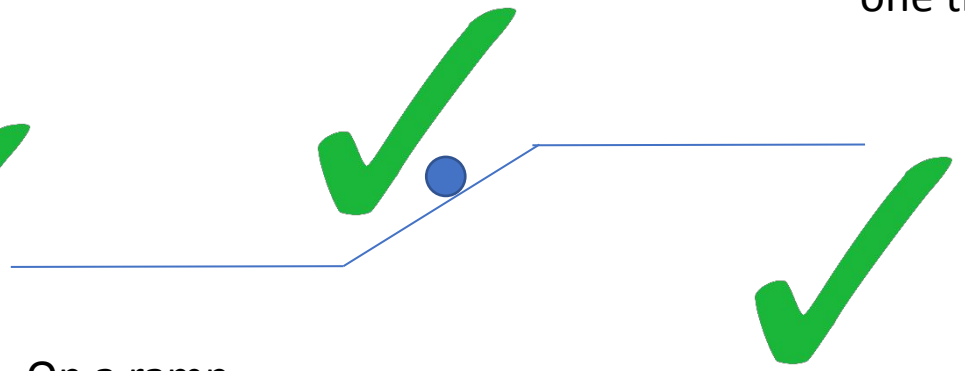
Not in a gap



Many bumps in one tile



Big bump



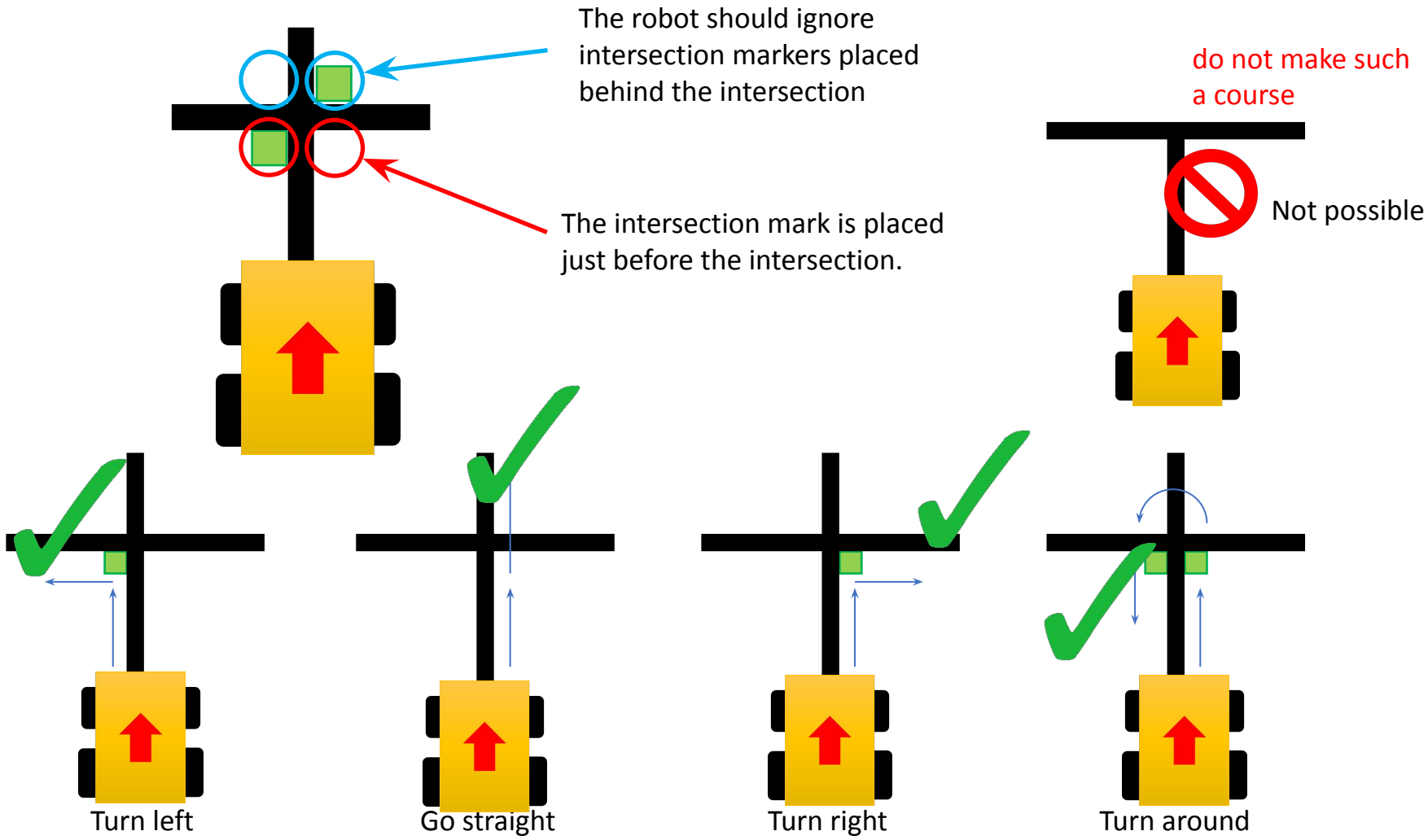
On a ramp

*In the evacuation zone

No points are given

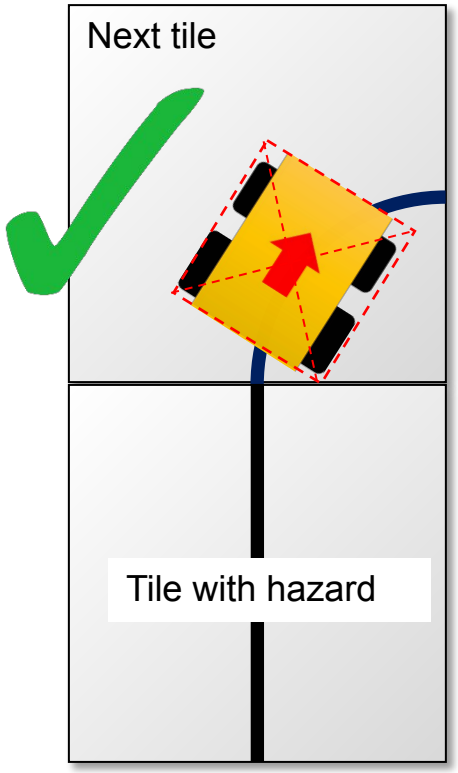
Intersections

2.6.2. Intersection markers are green and 25 mm x 25 mm in dimension. They indicate the direction of the path the robot should follow.
2.6.3. The robot should continue straight ahead if there is no green marker at an intersection.
2.6.4. A dead end is when there are two green marks before an intersection (one on each side of the line), in this case the robot should turn around.
2.6.5. The intersections are always perpendicular but may have 3 or 4 branches.
2.6.6. Intersection markers will be placed just before the intersection. See the images below for possible scenarios.

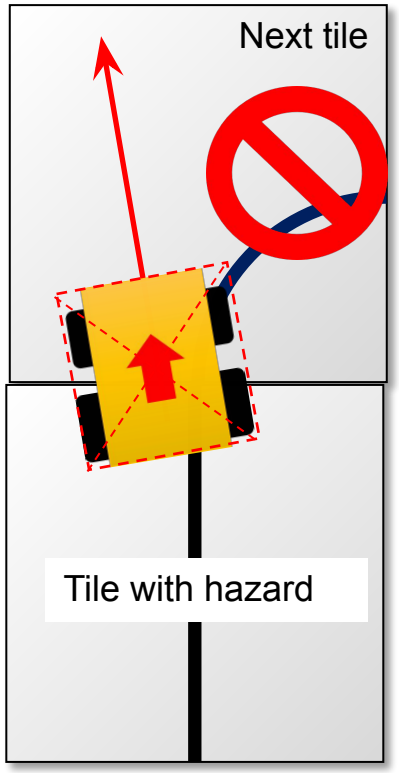


Reached the subsequent tile in sequence

4.6.1. Points are awarded per hazard when the robot has reached the subsequent tile in sequence



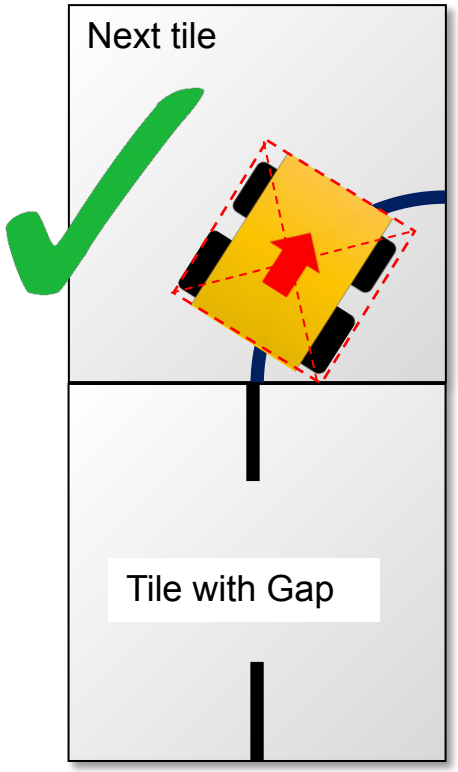
The robot is moving along the black line in this tile.



The robot is not moving along the black line in this tile.

Successful Gap

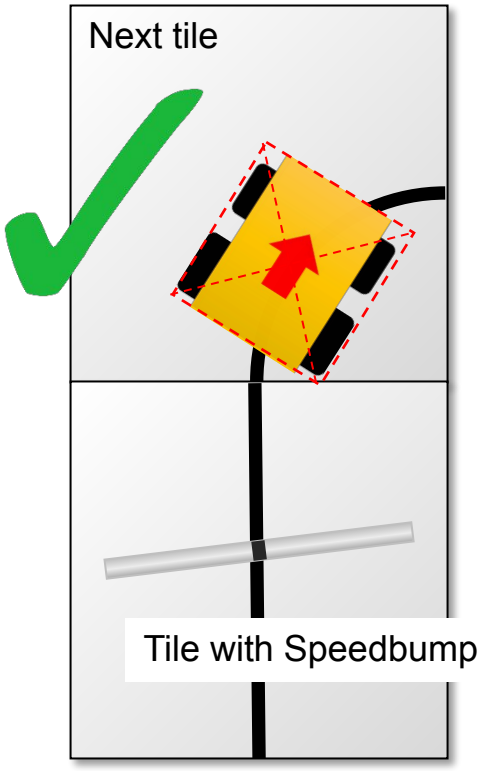
4.6.1. A robot is awarded points for successfully navigating each hazard (gaps in the line). Points are awarded per hazard when the robot has reached the subsequent tile in sequence. Point allocations are, 10 points per tile with gap



The robot is moving along the black line in this tile.

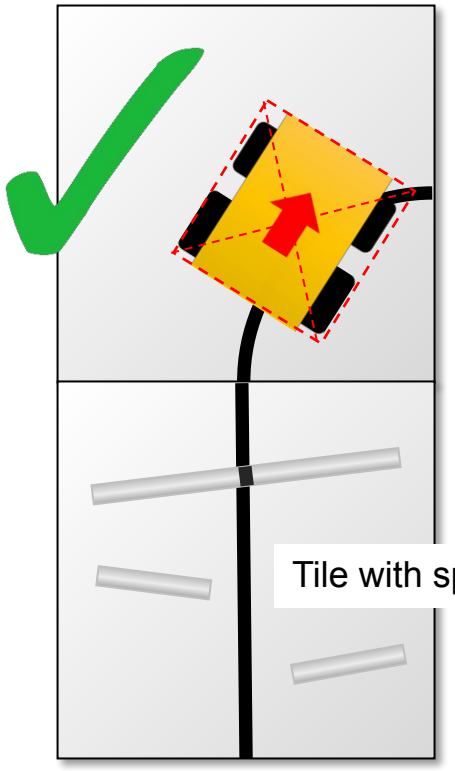
Successful Speed bump

4.6.1. A robot is awarded points for successfully navigating each hazard (speed bumps). Points are awarded per hazard when the robot has reached the subsequent tile in sequence. Point allocations are, 5 points per tile with speed bumps.



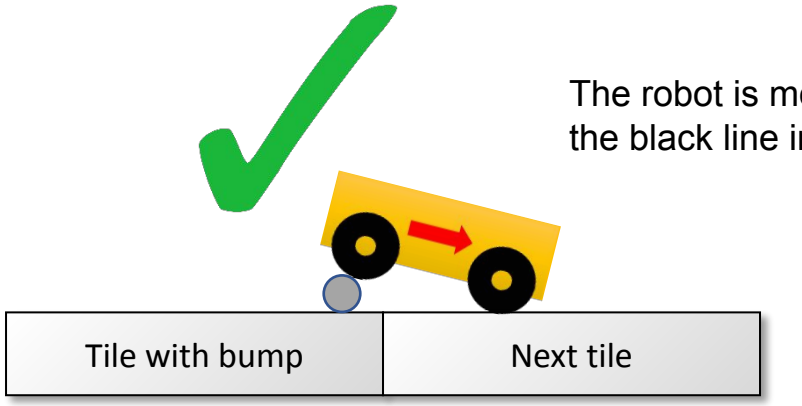
The robot is moving along the black line in this tile

Successful Speed bump



Tile with speedbumps

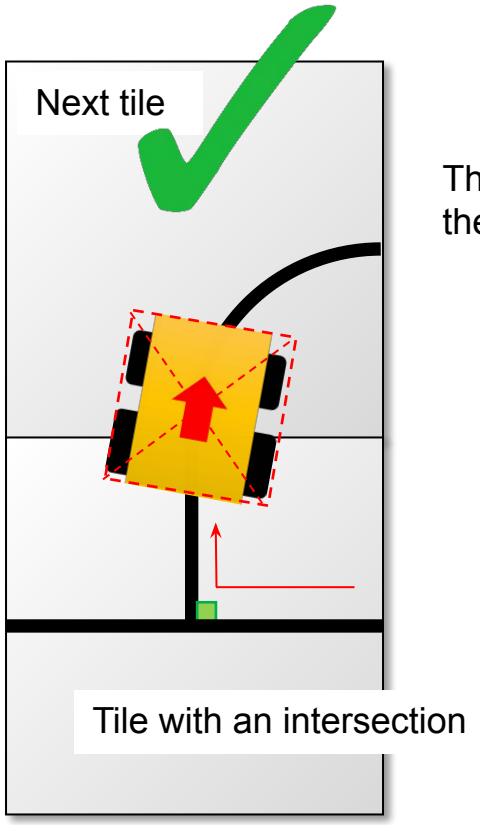
The robot crossed over the tile with 3 bumps
 = 5 points



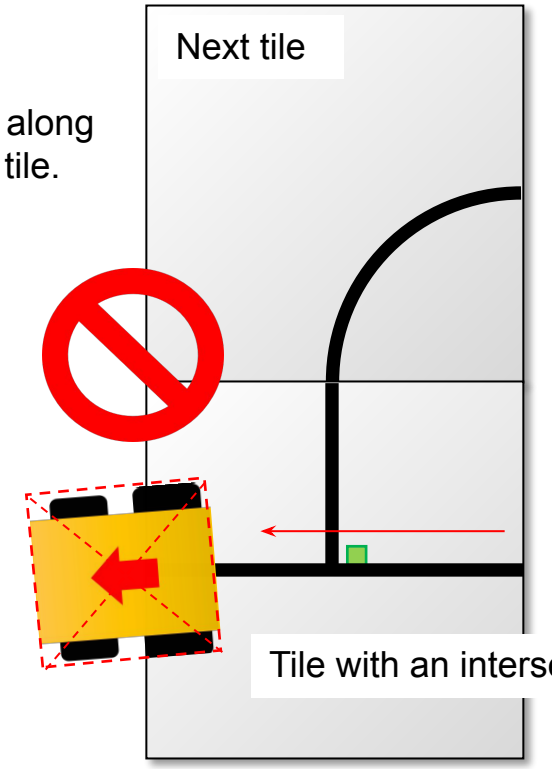
The robot is moving along the black line in this tile.

Successful Intersection/dead end

4.6.1. A robot is awarded points for successfully navigating each hazard (intersections, dead ends). Points are awarded per hazard when the robot has reached the subsequent tile in sequence. Point allocations are, 10 points per intersection/dead end.



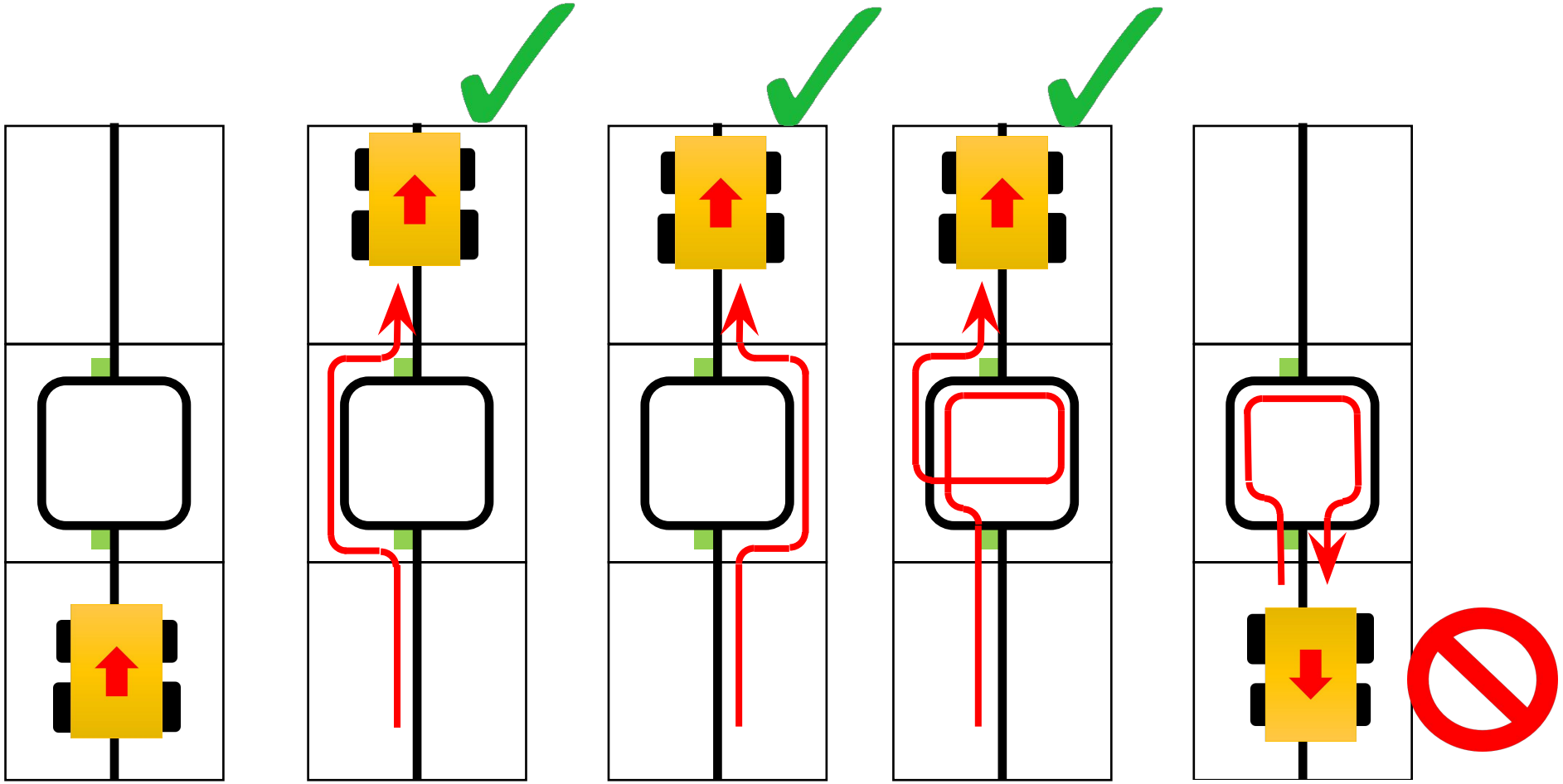
The robot is moving along the black line in this tile.



The robot goes to an incorrect tile.

Successfully negotiating an intersection tile

When there are multiple intersections in one tile, 10 points for each intersection.



Successful 2 intersection 20 point

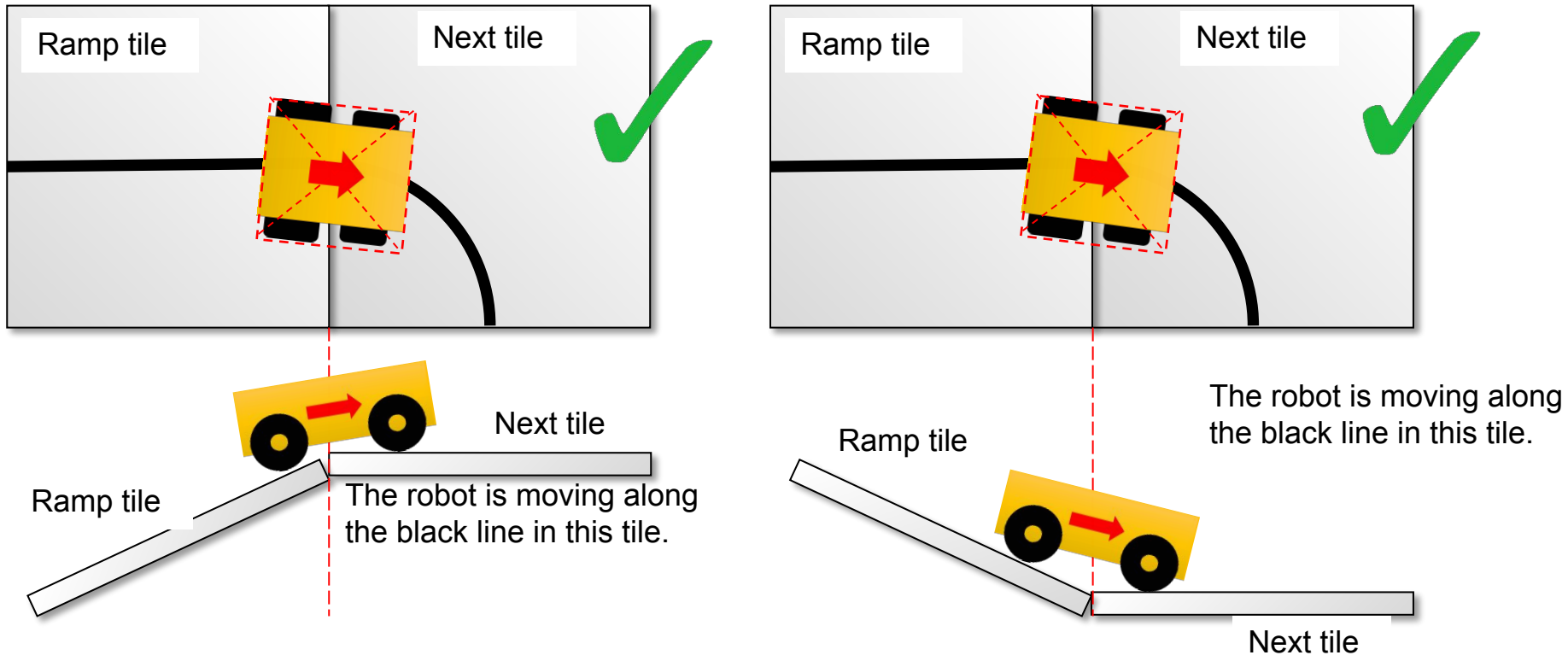
Not successful intersection

0 point and a lack of Progress

Successful Ramp

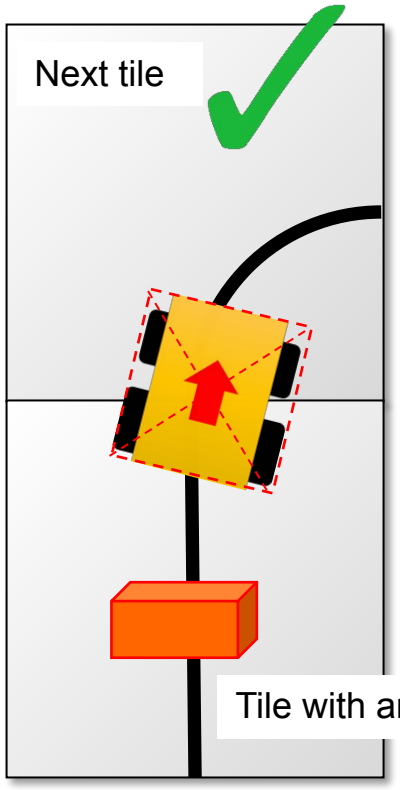
4.6.1. A robot is awarded points for successfully navigating each hazard (ramps). Points are awarded per hazard when the robot has reached the subsequent tile in sequence. A ramp as a hazard accounts for all of the inclined tiles that make up one ramp. Point allocations are, 10 points per ramp.

2.7.5. The line along the ramps can contain gaps, speed bumps, intersections, obstacles and debris.



Successful Obstacle

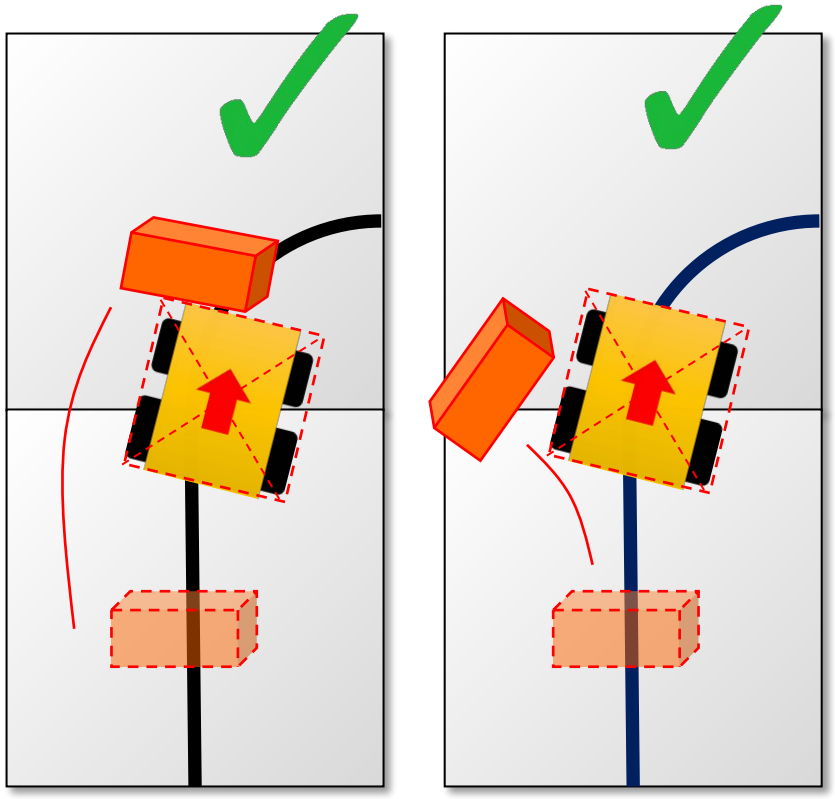
4.6.1. A robot is awarded points for successfully navigating each hazard (obstacles). Points are awarded per hazard when the robot has reached the subsequent tile in sequence. Point allocations are, 20 points per obstacle.



The robot is moving along the black line in this tile.

Successful Obstacle

2.5.5. A robot is expected to navigate around obstacles. The robot may move obstacles but it should be noted that obstacles may be very heavy or fixed to the floor. Obstacles that are moved will remain where they were moved to, even if that prevents the robot from proceeding.

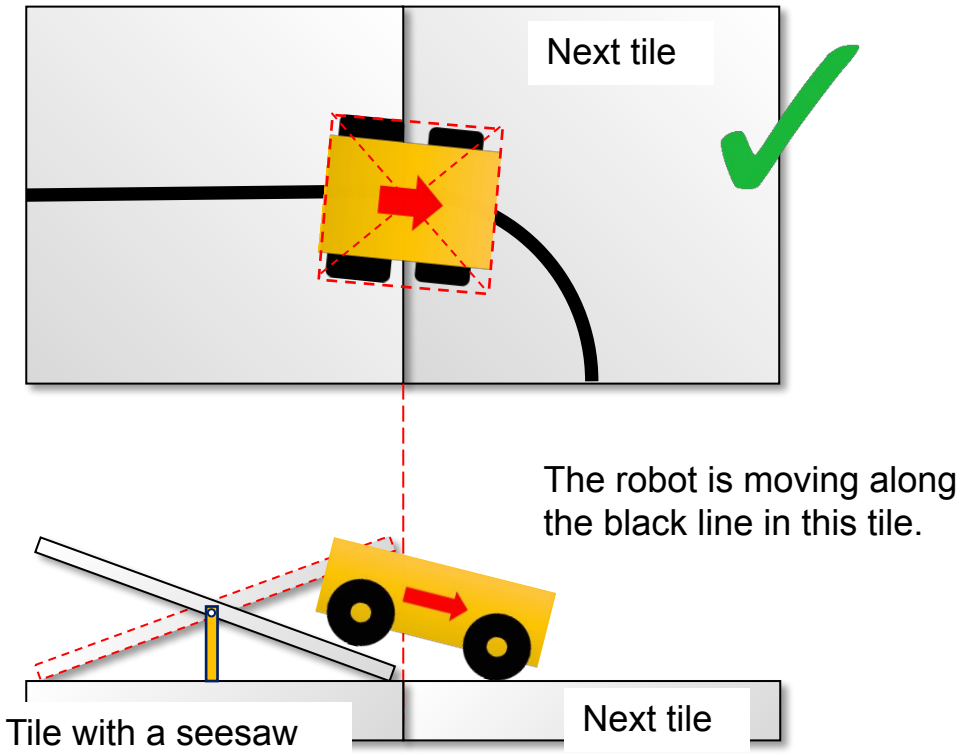


The robot pushes an obstacle and enters in the next tile □ the obstacle will be scored

Obstacles moved by the robot will not be returned to their original positions even during LoP.

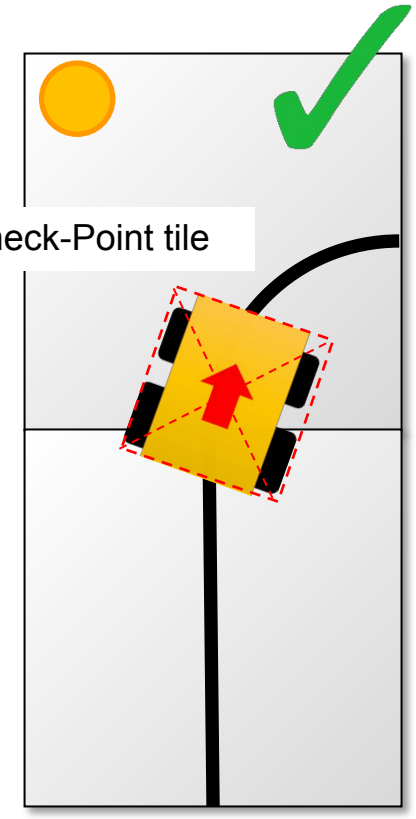
Successful Seesaw

4.6.1. A robot is awarded points for successfully navigating each hazard (seesaws). Points are awarded per hazard when the robot has reached the subsequent tile in sequence. Point allocations are, 20 points per seesaw.

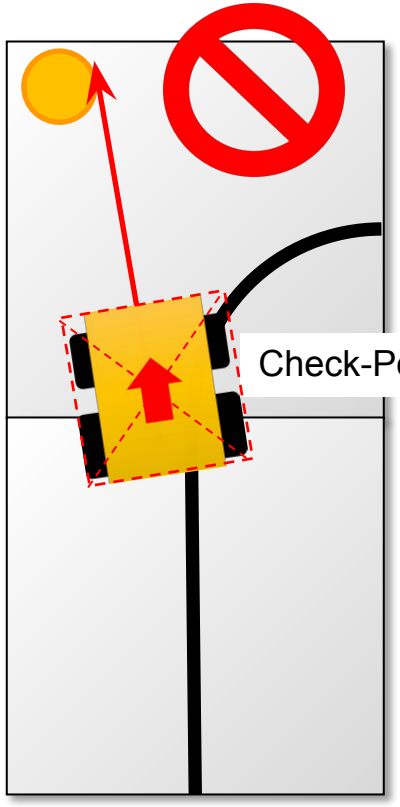


Successful reach Checkpoint

4.6.3. When a robot reaches a checkpoint tile or stops on the goal tile, it will earn points for each tile it has passed since the previous checkpoint.



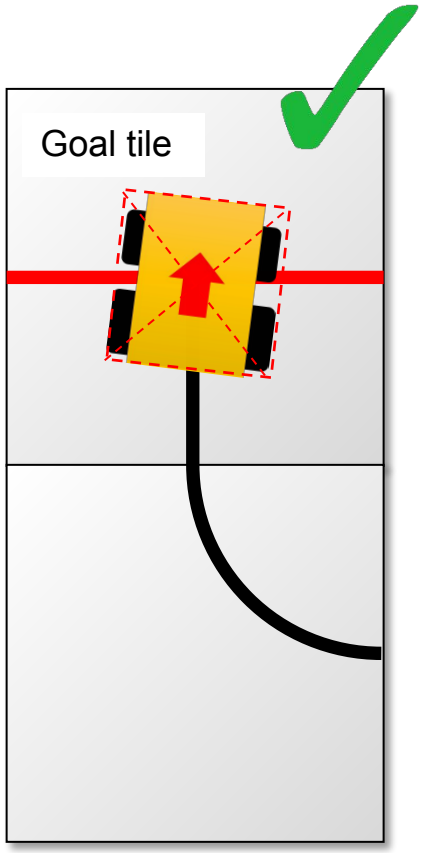
The robot is moving along the black line in this tile



The robot is not moving along the black line in this tile

Successful Exit bonus

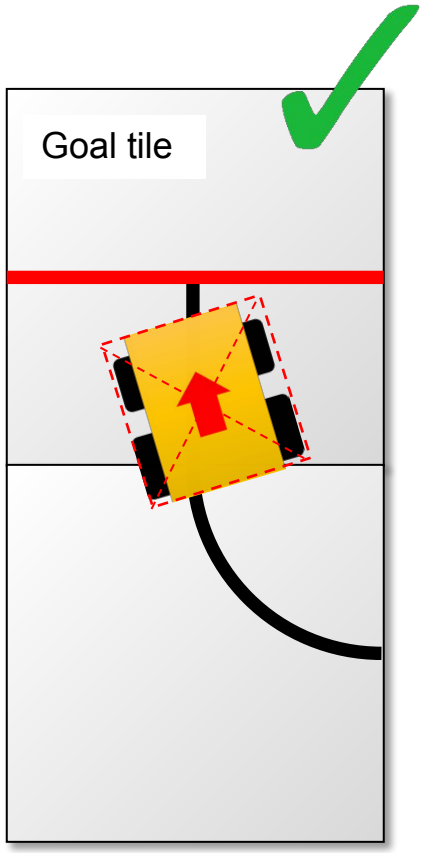
4.6.12. An exit bonus is awarded when the robot has reached the goal tile and has completely stopped for more than 5 seconds (this time is included in the total 8 minutes)



The robot advances along the black line in this tile

and

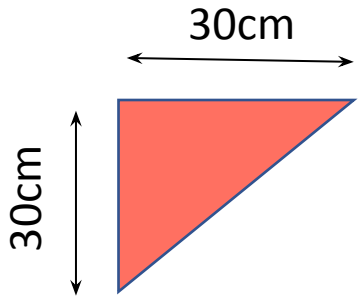
stops for 5 seconds after reaching the goal tile

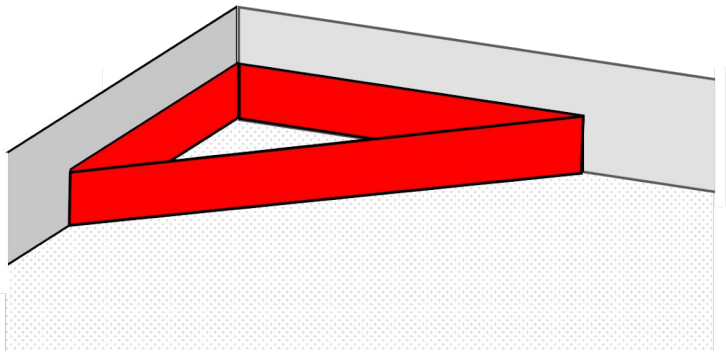


Even if the robot is not on the red line, if the robot stopped for 5 seconds after going along the line in the goal tile, it will be awarded the exit bonus.

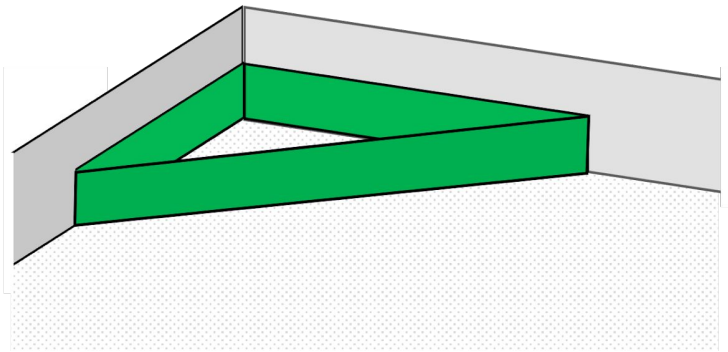
Evacuation Point

2.9.7. Safe evacuation points are defined by red and green right-angled triangles with sides of 30 cm × 30 cm with 6 cm walls and a hollow center.





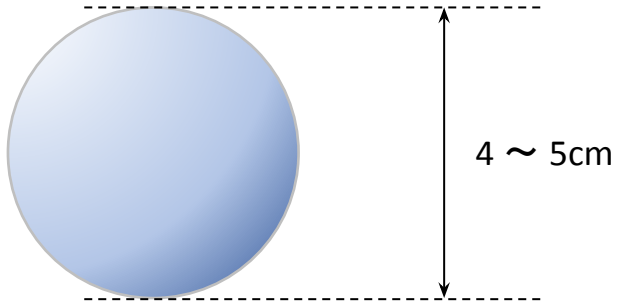
There will be one red evacuation point where the dead victim must be placed by the robot.



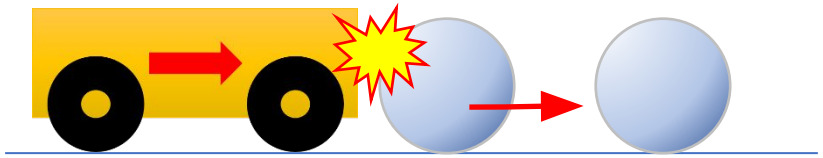
There will be one green evacuation point where the living victims and rescue kit must be placed by the robot.

Victims

2.10.2. A victim represents a person and is in the form of a 4-5 cm diameter sphere with an off-center of mass and a maximum weight of 80 g.

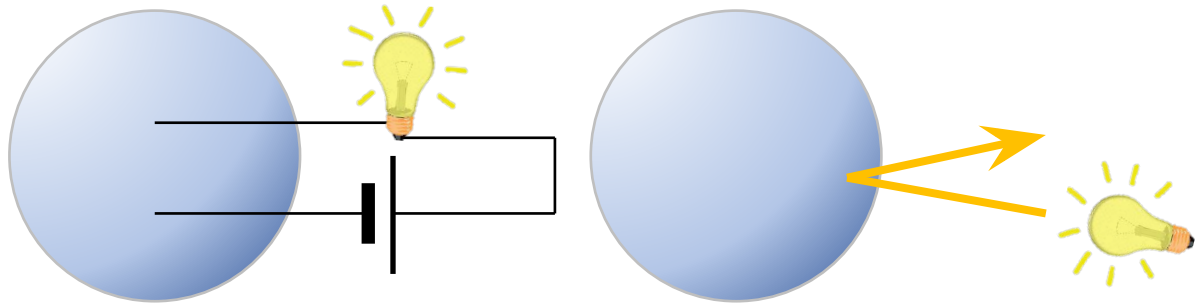


When a robot touches it, it rolls

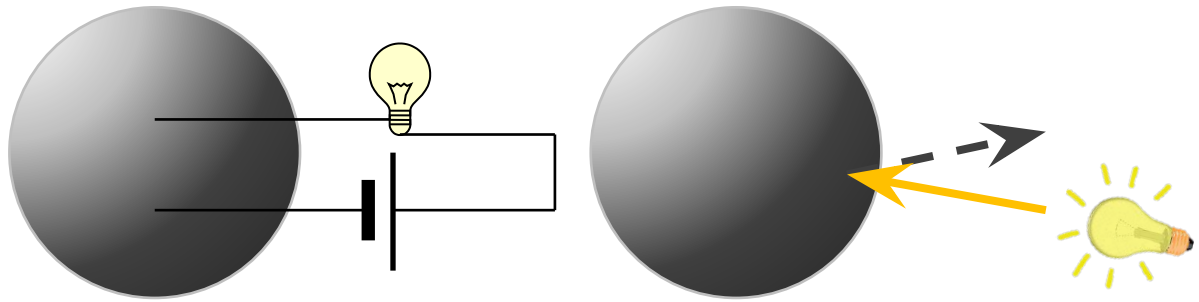


There are two types of victims

Living victims
- silver
- reflect light
- electrically conductive

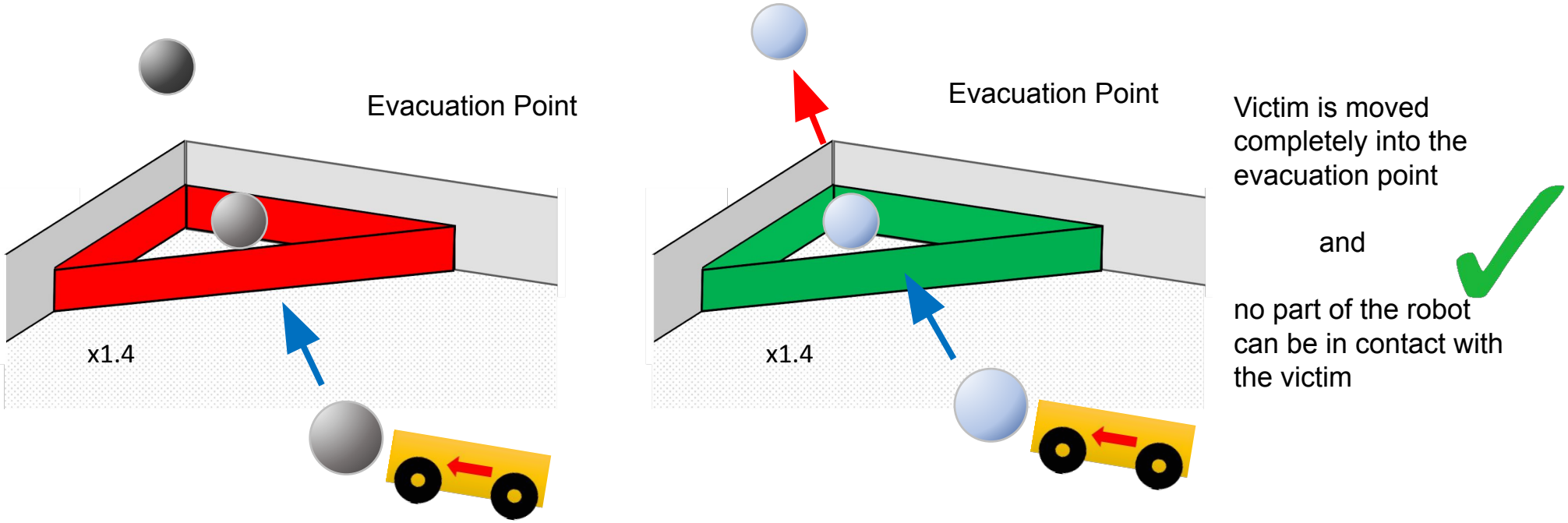


Dead victims
- black
- not reflect light
- not electrically conductive.



Successful Victim rescue

4.6.6. Successful victim rescue: Robots are awarded multipliers for successfully rescuing victims. A successful victim rescue occurs when the victim is moved completely into the designated evacuation point, and no part of the robot can be in contact with the victim.

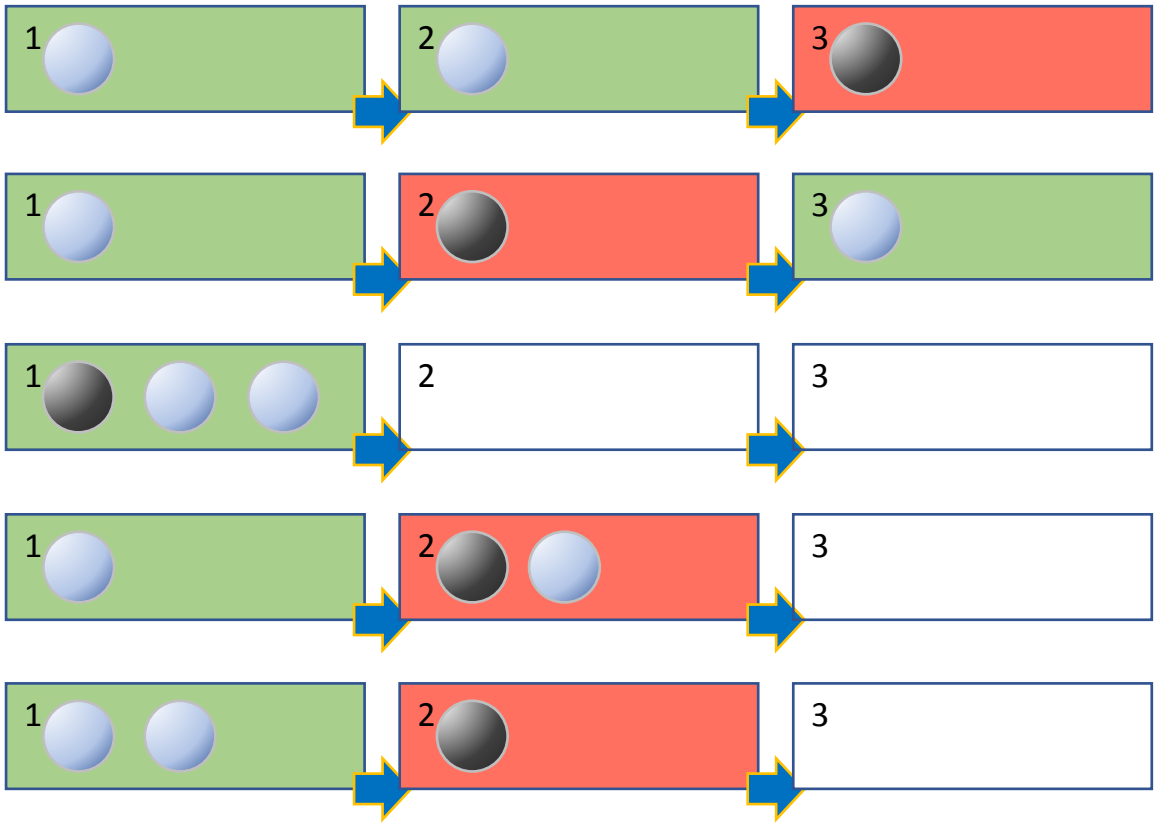


4.6.6 When the referee determines there has been a successful victim rescue, the victim will be removed from the evacuation point to allow more victims to be evacuated.

Successful Victim rescue

The multipliers are allocated as such:

- ×1.4 per successful rescue of a living victim
- ×1.4 per successful rescue of the dead victim, if both the living victims have been successfully evacuated



1.4 x 1.4 x 1.4 --> 2.744

1.4 x 1.0 x 1.4 --> 1.96

1.0 x 1.4 x 1.4 --> 1.96

1.4 x 1.0 x 1.0 --> 1.4

1.4 x 1.4 x 1.4 --> 2.744

Evacuation Zone Multiplier

4.6.8. When a lack of progress occurs between checkpoints (or checkpoint and exit) containing an evacuation zone, 0.05 will be deducted from each of the obtained multiplier (however multipliers will not be less than 1.25).

Lack of progress : **Zero**
1.4 x 1.4 x 1.4 --> 2.744

Lack of progress : **1**
(1.4 **- 0.05**) x (1.4 **- 0.05**) x (1.4 **- 0.05**) --> 2.460375

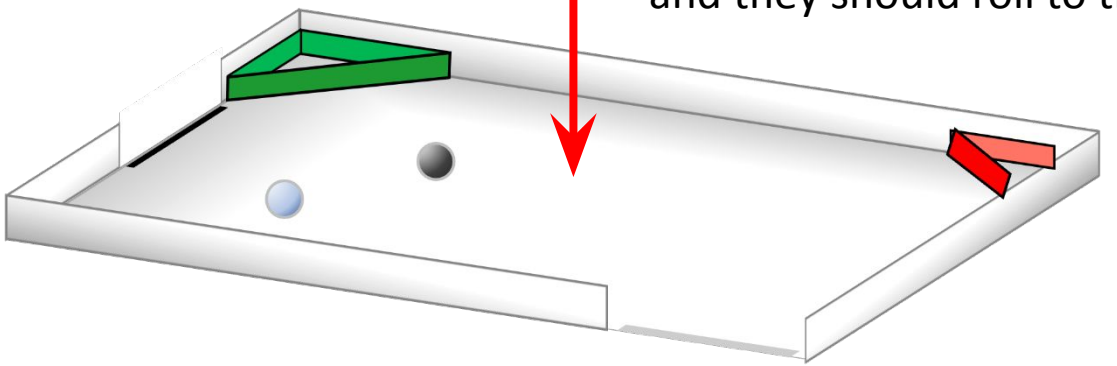
※ Lack of progress occurs between **checkpoints** (or checkpoint and exit) **containing an evacuation zone**

Victim Placement

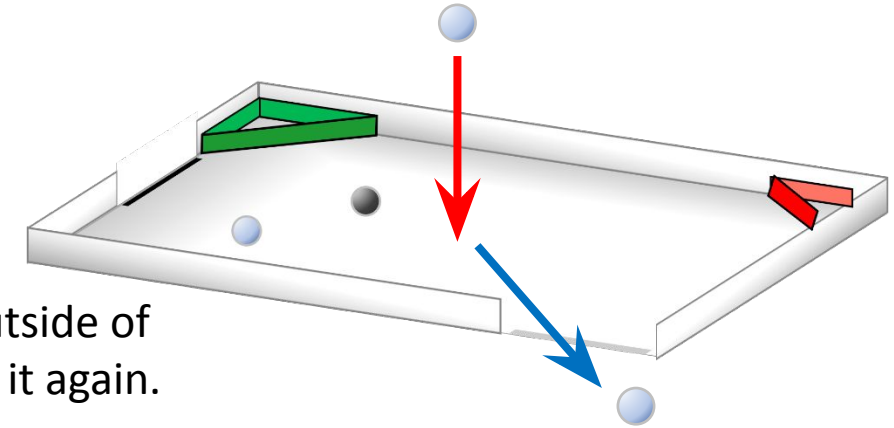
2.10.4. The victims will be located randomly in the evacuation zone. There will be exactly two live victims and one dead victim placed in the evacuation zone.

The victims should be dropped into the evacuation zone

and they should roll to their positions by themselves.



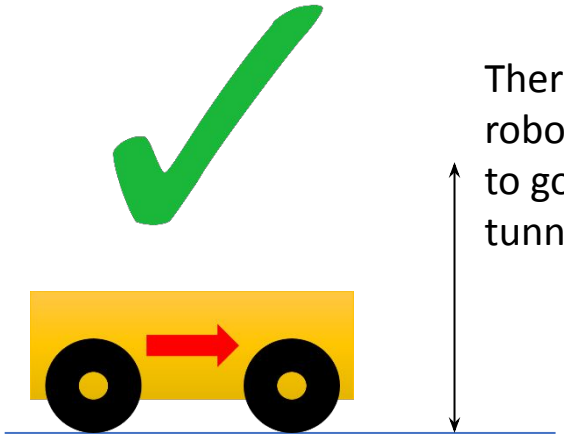
The victims should never be touched or pushed by humans to new locations after they are dropped in the evacuation zone.



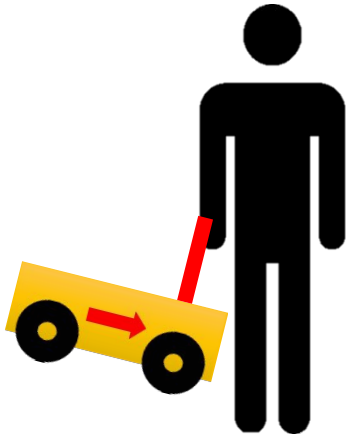
If the dropped ball rolls outside of the evacuation zone, drop it again.

Robot

3.2.2. Teams are not permitted to use any commercially produced robot kits or sensors components that are specifically designed or marketed to complete any single major task of RoboCupJunior Rescue.

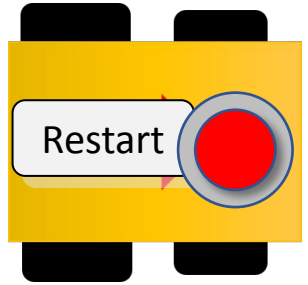


There is no size limit for the robot. However, the robot need to go through a 25 cm x 25 cm tunnel.(2.2.3).

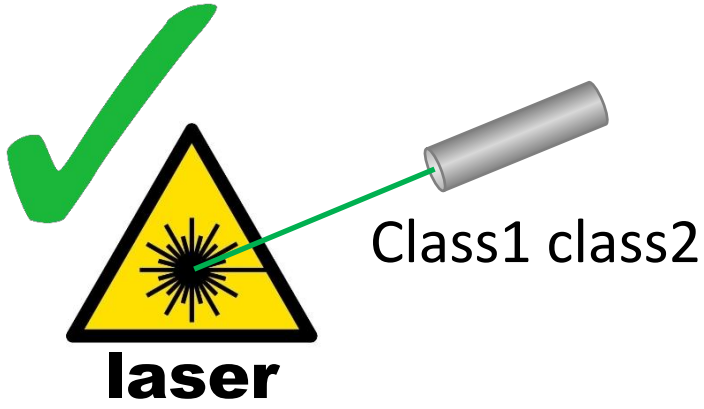


3.2.7. Robots must be equipped with a handle which is to be used to pick them up during the scoring run.

3.2.8. Robots must be equipped with a single binary switch or button of any kind, clearly visible to the referee, for restarting the robot when a lack of progress occurs.



3.2.3. For the safety of participants and spectators, only lasers of class 1 and 2 are allowed.



3.2.4. Wireless communication must be used correctly as described on the RoboCupJunior General Rules.

Bluetooth Class 2, 3 and ZigBee communications are the only wireless communication types allowed in RoboCupJunior.

The robots are not allowed to communicate with devices outside of the field.

allowed to only between two robots

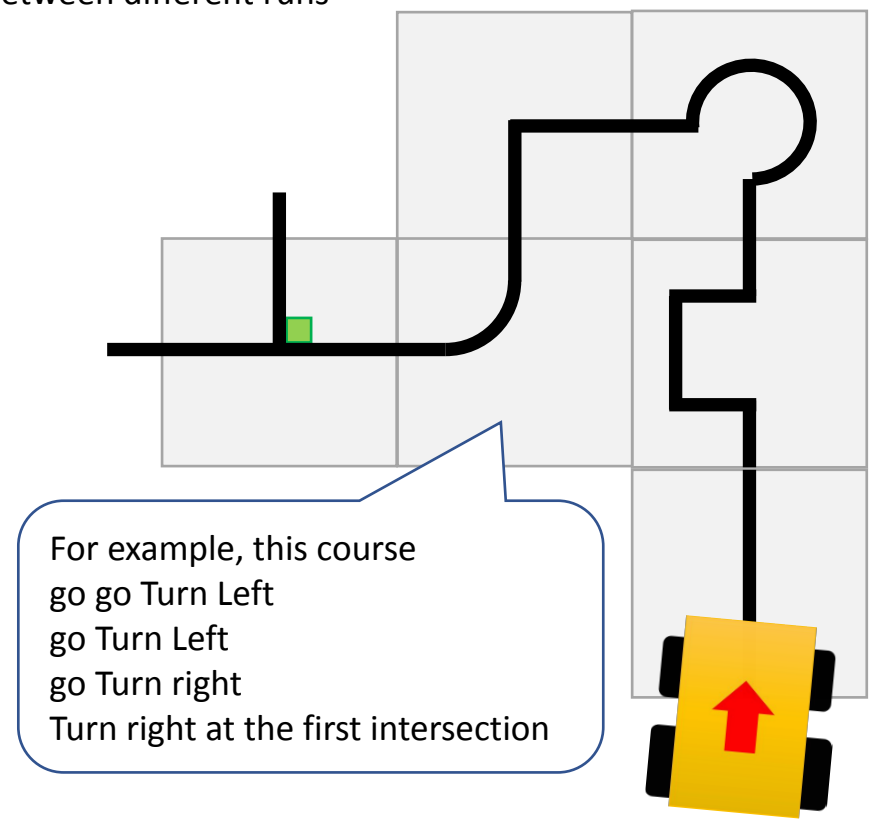
Pre-mapped type of dead reckoning

Pre-mapped type of dead reckoning (movements predefined based on known locations before game play) is prohibited.

Information that is **OK** to tell the robot beforehand:
the inclination of the ramp, the width of the line, the color values of intersection markers, etc.

Information that is **NOT OK** to tell the robot:
the location or size of the obstacles, the placement of the evacuation point, if it is better to go right or left around obstacles, the number of checkpoint markers, etc.

・everything that can vary between different runs

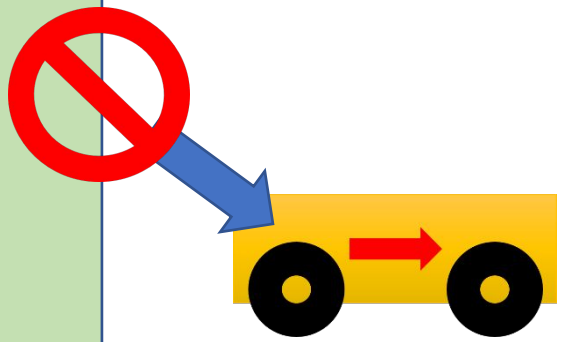


For example, this course
go go Turn Left
go Turn Left
go Turn right
Turn right at the first intersection

(in the Program)

Start Position is
X=1,Y=1

Go Straight
Go Straight
Turn Left
Go Straight
Turn Left
Go Straight
Turn right
.
.
.



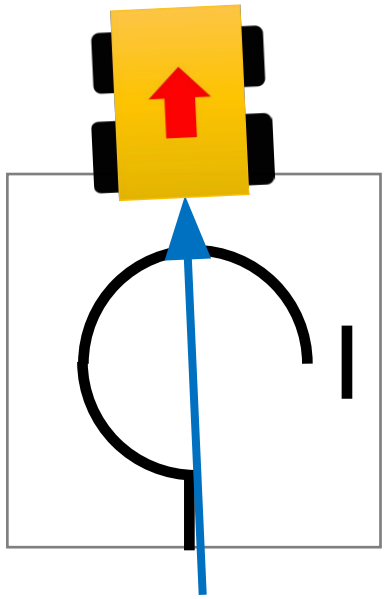
Lack of progress

4.5.1. A lack of progress occurs when:

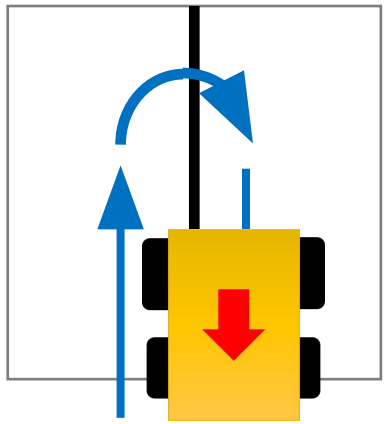
a. a team captain declares a lack of progress.

b. a robot loses the black line without regaining it by the next tile in the sequence (see figures at end of the section).

c. a robot reaches a line that is not in the intended sequence.

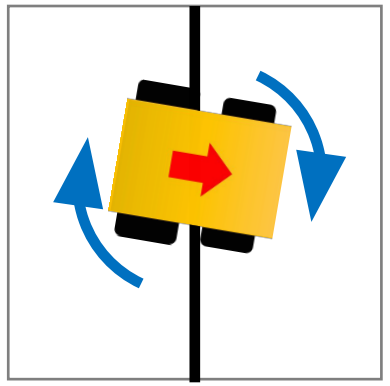


Don’t follow the line

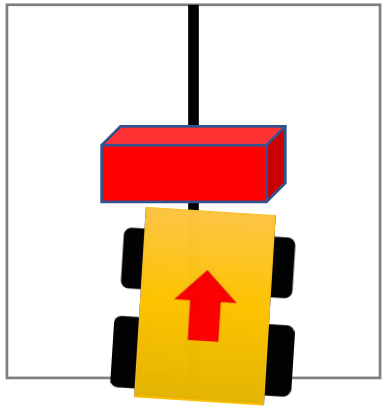


Reverse run

These are not “Lack of progress”.



Turn on the spot



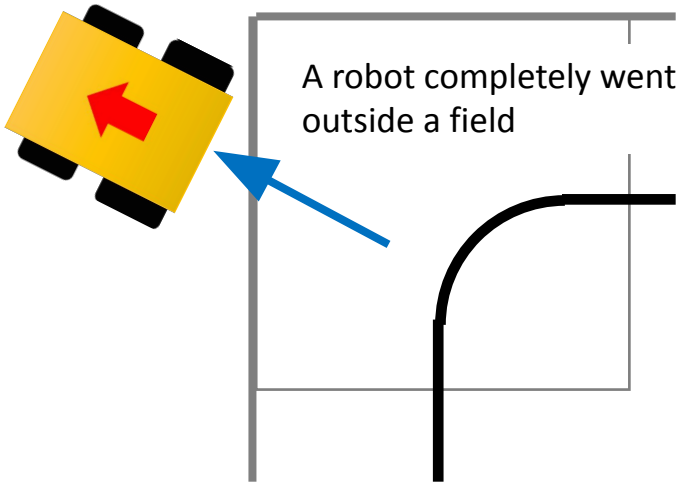
Not move

Other

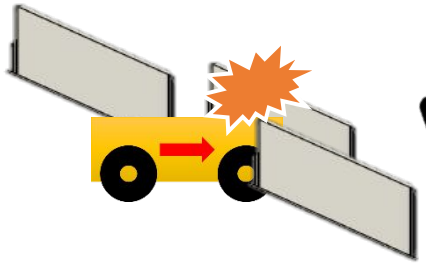
It deviated from the black line, and the robot returned to the black line that the robot already passed.

It deviated from the black line, and the robot cannot return to the original line by the next tile etc.

Lack of progress

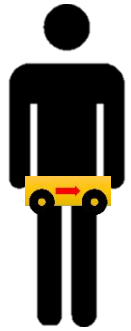


The team captain declares



A robot damages the field.

A team member damages or touches the field.



A team member touches the field or their robot without permission from a referee.

In these cases, the referee declares a Lack of progress or any penalty.

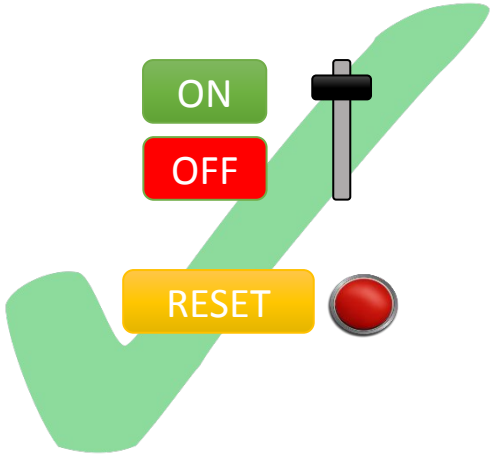
After Lack of Progress was declared

- 4.5.3. After a lack of progress, the team must reset the robot by using a switch of button located in a clearly visible location by the referee.

Team captain can:

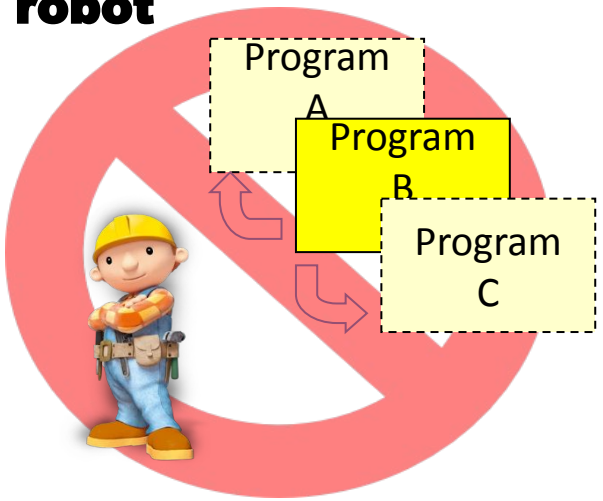
- **Power Off & On**
- **Reset the program**

Same operation at every LOP



Team captain cannot

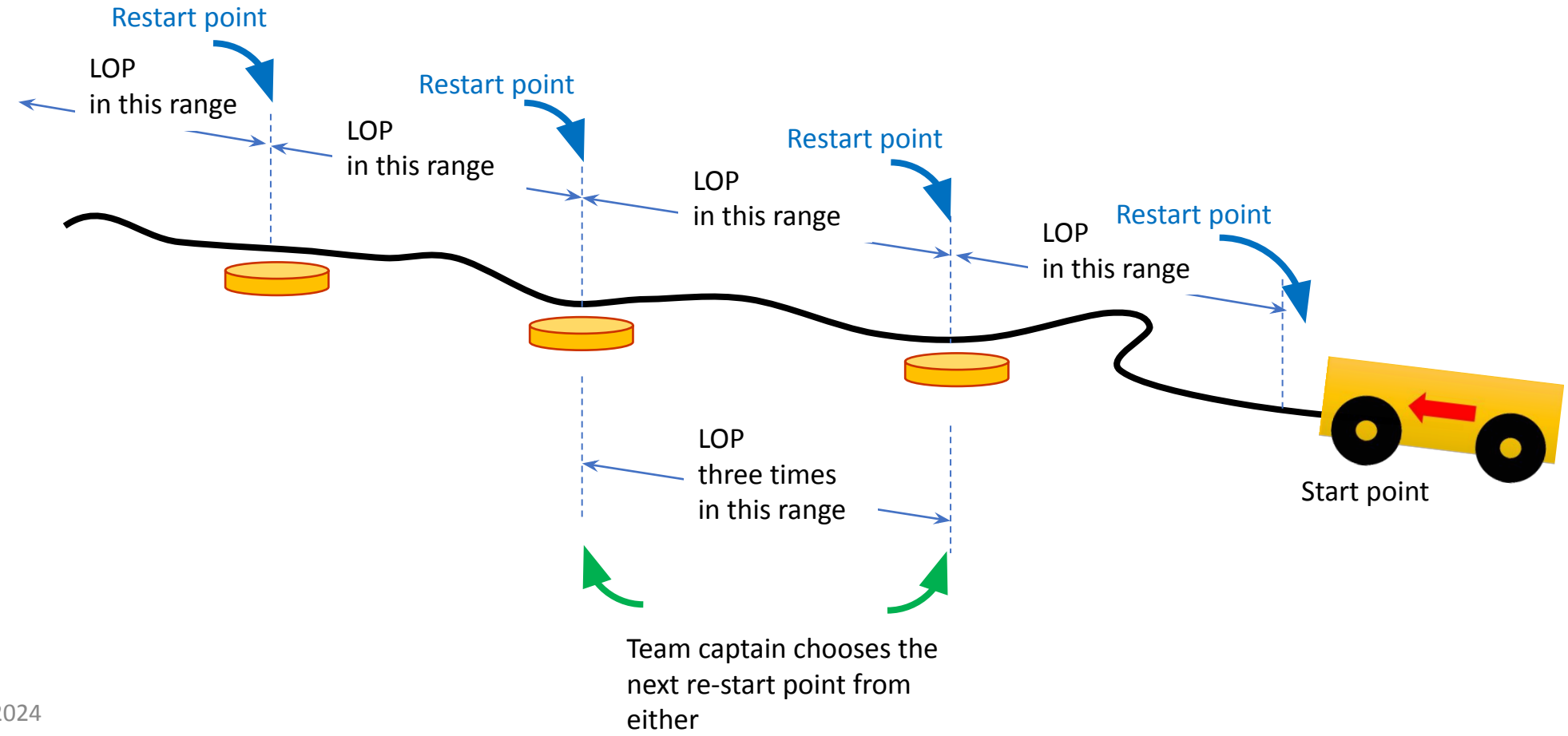
- **Change program**
- **Modify the program**
- **Repair the robot**
- **Input a restart position**
- **Manually modify the robot**



When a robot loses parts in the field, nobody is allowed to remove them.

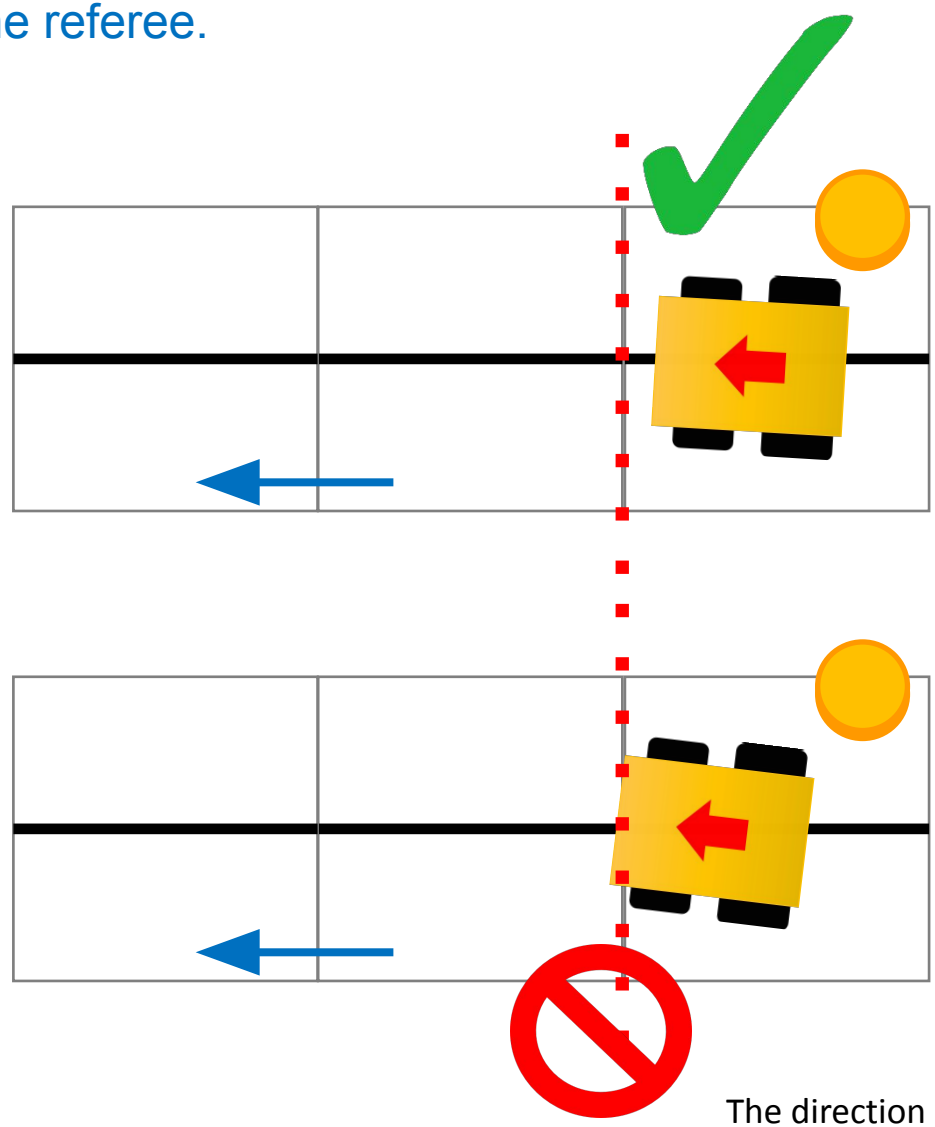
When a Lack of Progress

If a Lack of Progress happens, the robot must be positioned at the previous checkpoint facing the evacuation zone, and checked by the referee.
A robot is allowed to proceed to the following checkpoint, if the robot fails to reach it after the third attempt.



When a Lack of Progress

4.5.2. If a lack of progress occurs, the robot must be positioned on the previous checkpoint tile facing the path towards the goal tile and checked by the referee.



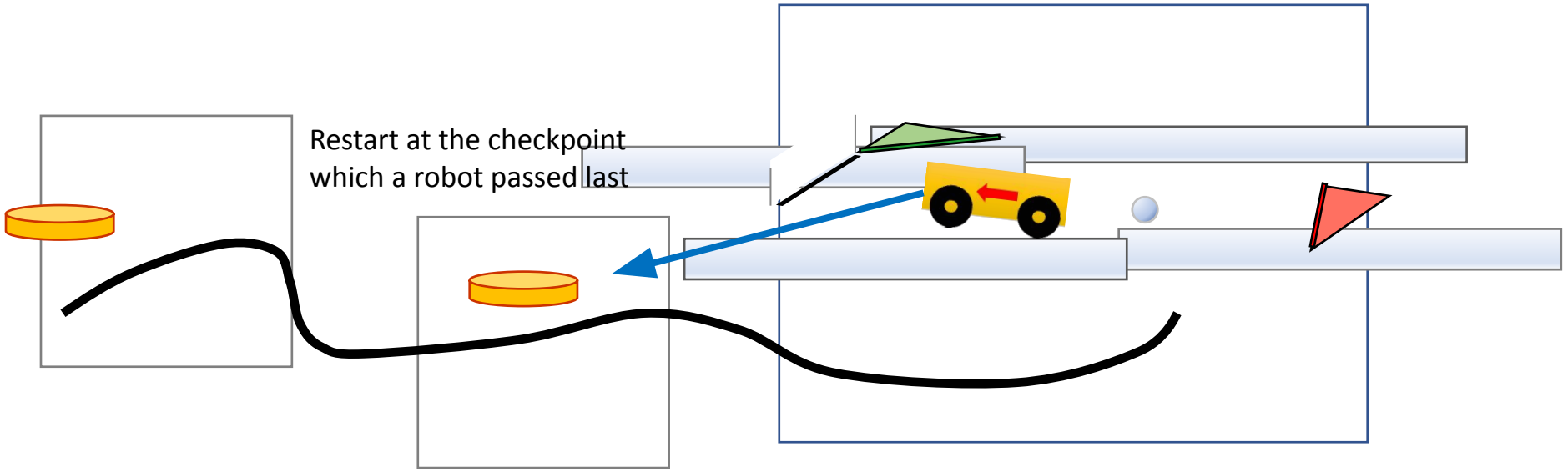
When the robot restart

The referee checks the position of the robot.

The direction of the robot should be in the direction of the path toward the goal tile

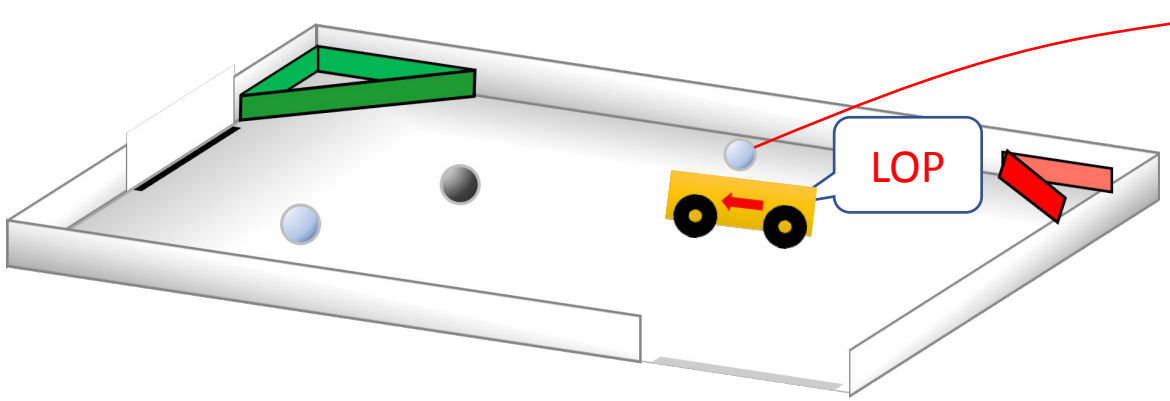
When a Lack of Progress

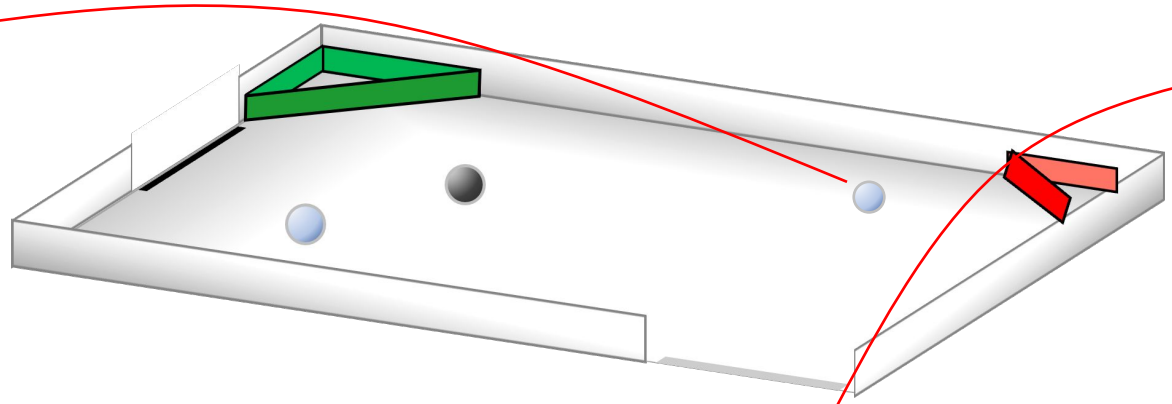
4.5.6. If a lack of progress occurs in the evacuation zone, all victims (including ones that have rolled) will remain in their current position.



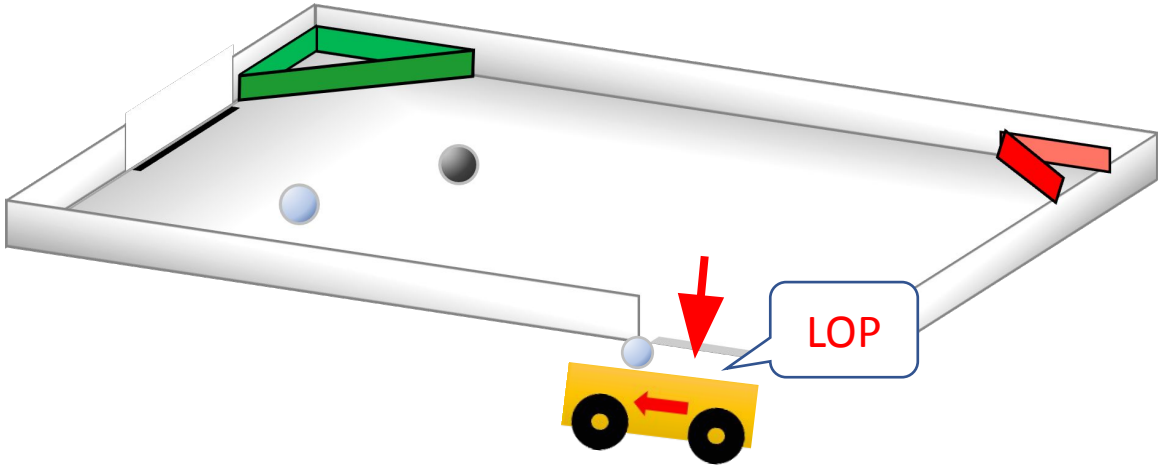
When a Lack of Progress

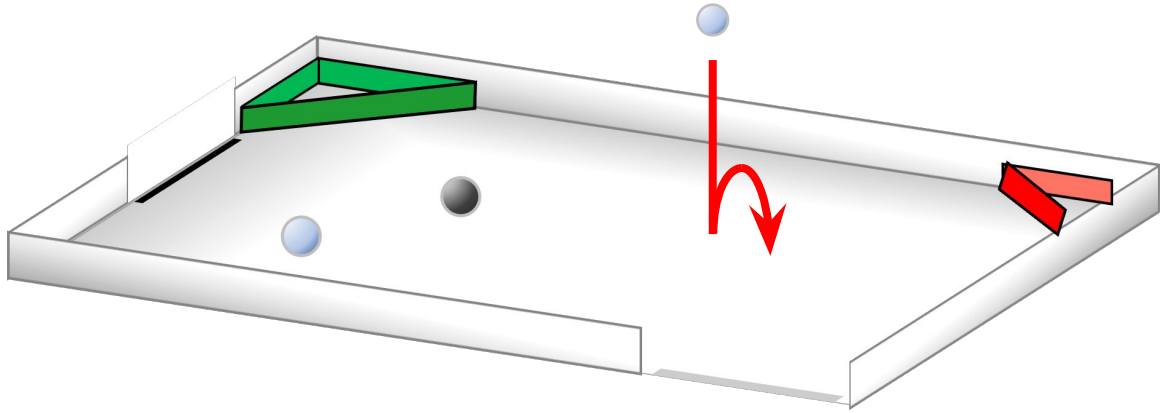
4.5.6 Victims that are held by the robot will be placed roughly on the location of the robot when the lack of progress occurred in the evacuation zone.



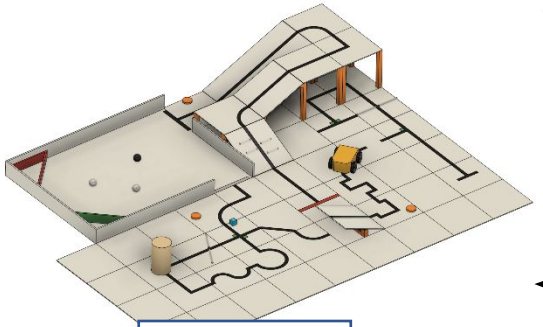


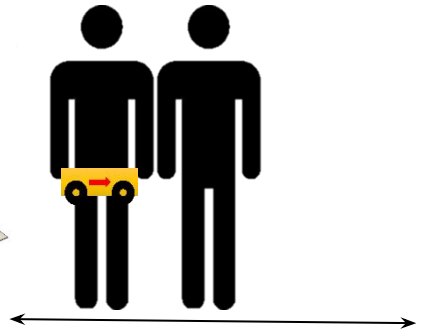
4.5.6 If a lack of progress occurs as the robot exits the evacuation zone whilst carrying victims, the victims will be randomly placed in the evacuation zone.





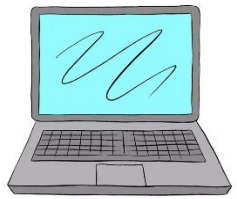
Start of Play



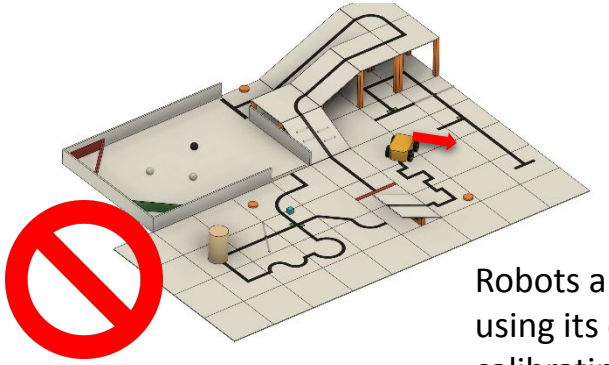


150 cm

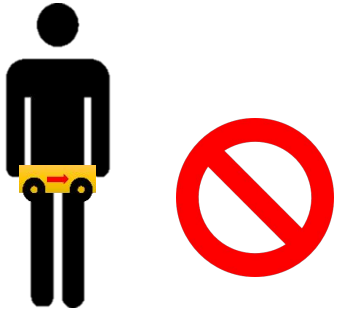
Teams should designate a team member as ‘captain’ and ‘co-captain’. Only these two team members will be allowed access to the competition fields.
Other team members within the vicinity of the rescue field have to stand at least 150 cm away from the field.



Calibration is defined as the taking of sensor readings and modifying a robot’s program to accommodate such sensor readings. **Pre-mapping activities will result in immediate robot disqualification for the round.**



Robots are not permitted to move using its own power while calibrating.



Once the game has begun, the robot playing is not permitted to leave the competition area for any reason.

Calibration

Set up

Scoring run

max 8 min

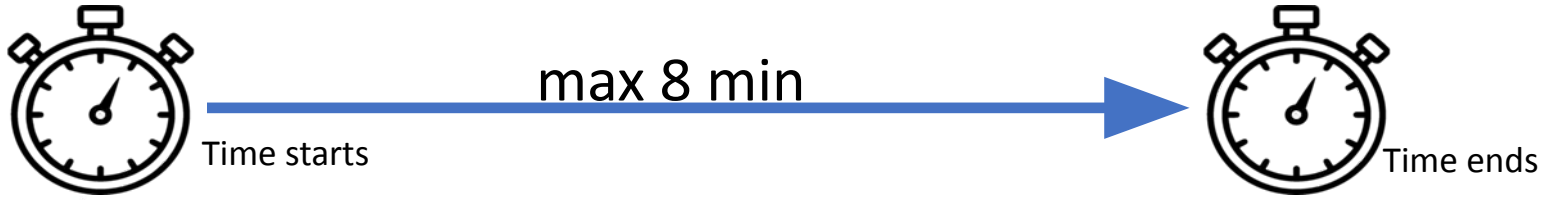
End of Play

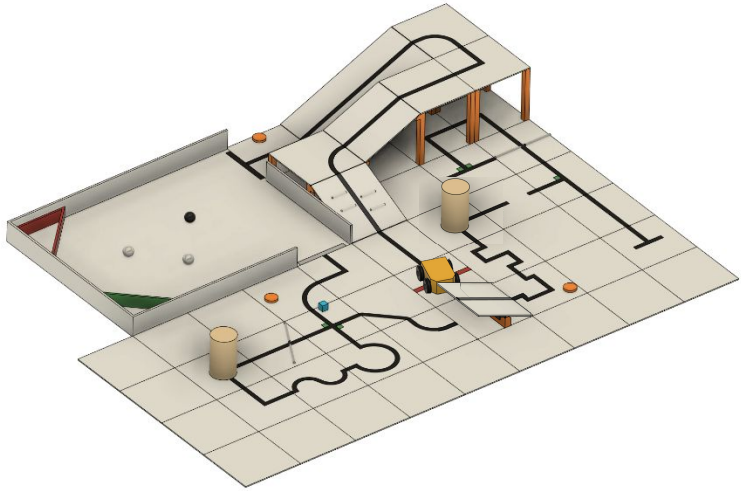
4.7.2. The game ends when:

a. the 8 minutes of allowed game time expires

b. the team captain calls end of game

c. the robot reaches the goal tile and completely stops for 5 seconds





The robot reaches the goal tile and completely stops for 5 seconds

The time expires

8 min

The team captain calls end of round.

Scoresheet

- Judges record points a team scores on a **scoresheet**.
- The **judge's decision** on the scoring of a runs is **final**.
- If a team **disagrees** with the score, the team captain has to **write a comment in the designated part of the scoresheet** and **sign** it.
- The scoresheet will be reviewed **later**, and the team will be approached to present **video evidence** to their claim.

  The teams **are allowed** to film their runs, but video evidence will **only be accepted during the review**. **No videos are to be discussed at the field.**
  Videos will **only** be inspected if a **comment was written** in the **signed scoresheet**.