3rd ALARM CHALLENGE

Version 2018-10-01

SITUATION

A fire has broken out in a building on Isaac Asimov Boulevard and 3 people are inside. Your robotic intervention team is called in to help them.

Do not forget the three laws of robotics when designing your robots:

1. A robot cannot harm a human being, nor, while remaining passive, allow a human being to be exposed to danger
2. A robot must obey the orders given to it by a human being, unless such orders conflict with the first law
3. A robot must protect its existence as long as this protection does not conflict with the first or second law

Can you do what is necessary to establish a security perimeter and rescue the victims?

OVERALL FUNCTION OF THE ROBOT

This challenge has two levels, White and Black. The White level is a mission that must be solved using a single robot while the Black level is a mission that must be performed by a collaboration of two robots of the same team.

White Level:

The robot must be able to move on the playing surface and install a street barrier by lifting it to secure the incident area. It must also help people leave the site and go to a safe place by exiting through the windows.

Black Level:

Two robots must work together to accomplish the mission. Team members must also participate in the challenge but can not touch the robot or accessories.

The robots must install a street barrier by lifting it **together** to secure the incident area. While one of the robots helps the victims to leave the area through the windows, the other takes them to the appropriate safe place according to their condition, represented by a colour.

DESCRIPTION OF THE ROBOTS

- Maximum dimensions at the start: 30 cm X 30 cm
- No restriction on the number of engines

a. Characteristics for the White level

In the White level, the robot is versatile and must do all the work itself. It can use all its sensor ports.

b. Characteristics for the Black level

In the Black level, robots are specialized and do not all have the same characteristics:

Robot #1:

- It has **no colour/brightness sensor**
- He navigates using only ultrasonic sensors and his program. Team members are not allowed to touch the robot, but can guide it using panels. These panels have maximum dimensions of 15 X 15 cm. Up to 2 team members can guide the robot.
- It **cannot**take the victims into coloured circles

Robot #2:

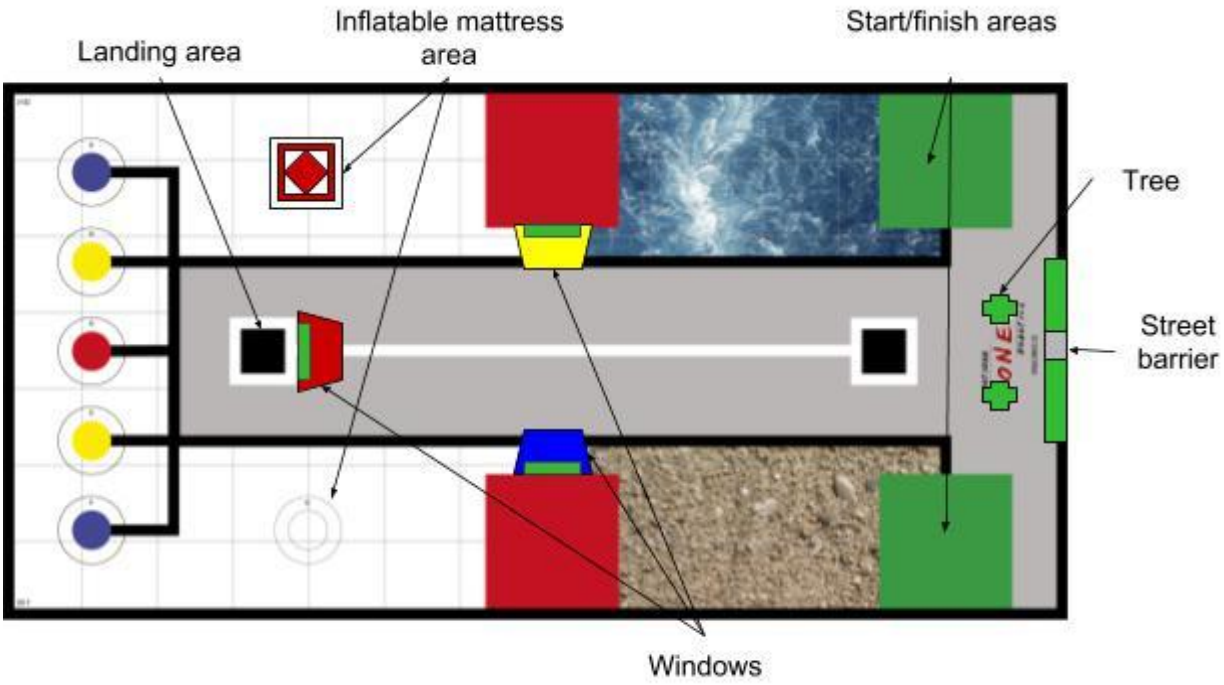
- It navigates 100% autonomously on the playing surface
- It can use any sensor.
- It **cannot**push the victims out of the windows

DESCRIPTION OF THE PLAYING FIELD AND

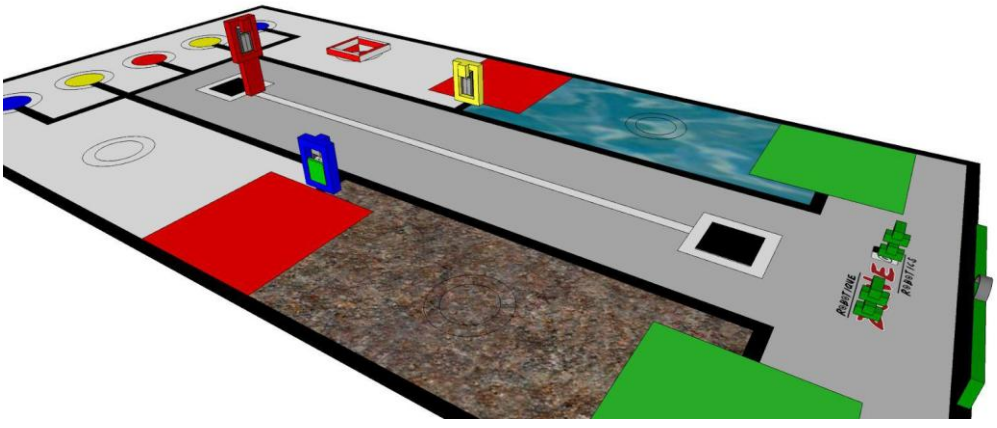
ACCESSORIES a. Playing surface

The playing surface is a Z01-F vinyl mat measuring 1219 mm X 1438 mm (4 feet X 8 feet).

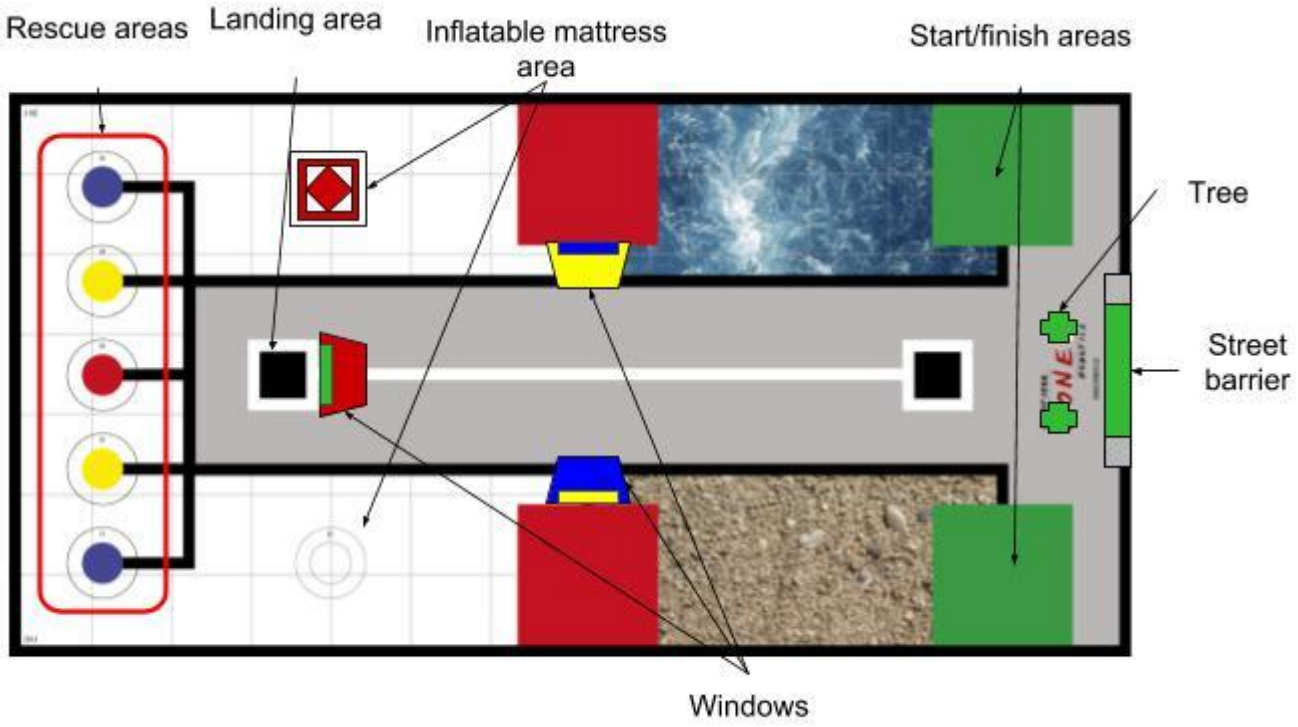
2D view, White level



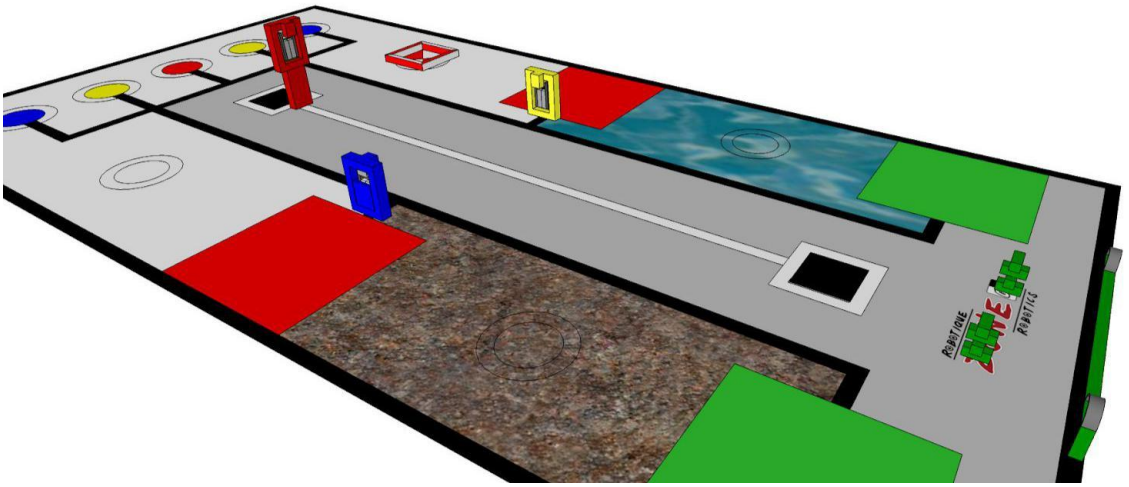
3D view, White level



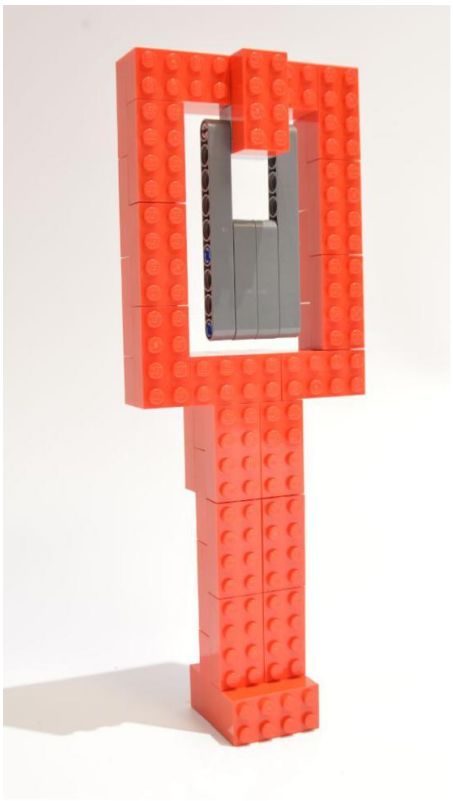
2D view, Black level

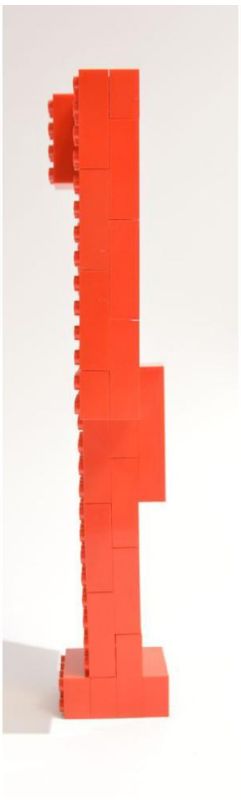


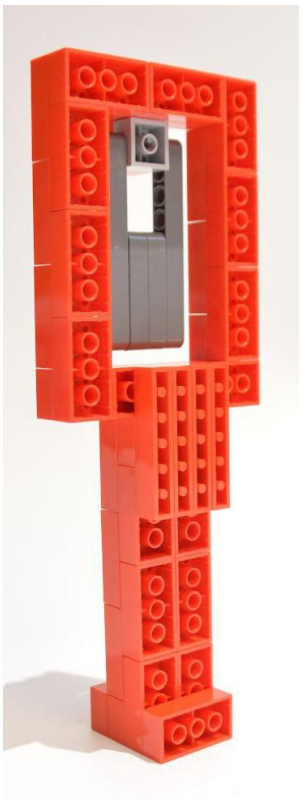
3D view, Black level



C. Windows

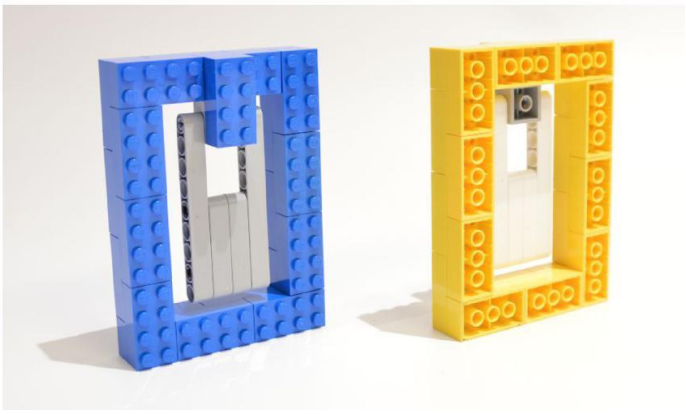






The large red window is mainly composed of 2 X 4 red bricks and 1 x 6 red bricks. The other windows consist of 2 X 4 blue or yellow bricks. The colour of the lever does not matter.

The windows are not attached to the ground. Points will be lost if you drop or damage the windows.

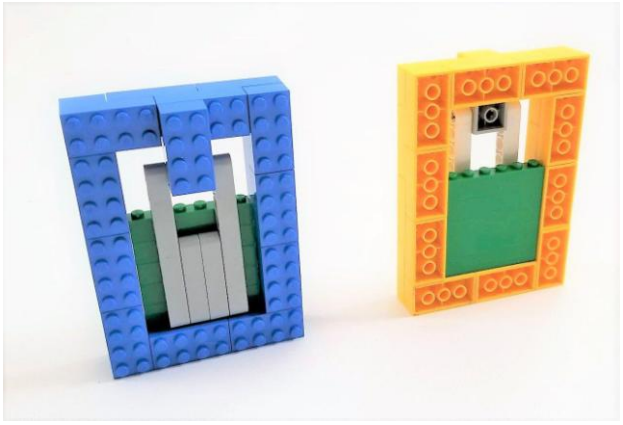


d. Victims

White level

Black level

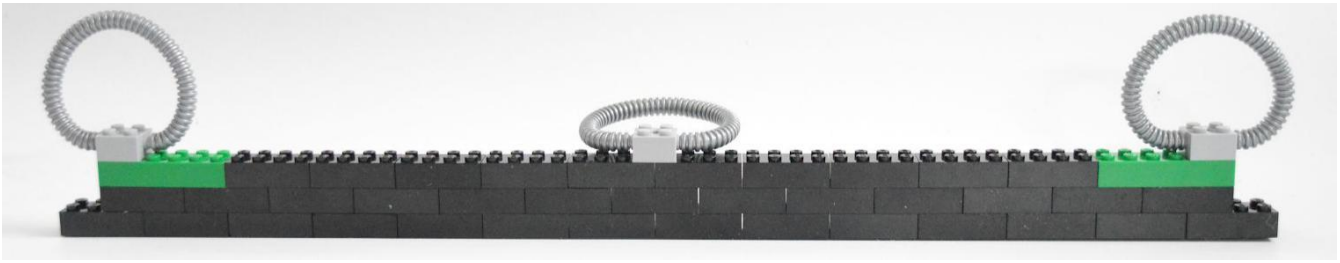
The victims consist of 5 1 X 6 bricks of different colours. In the white level, the victims are all green. In the black level, a single victim will be green and will be installed at the elevated window. The other two will be yellow-yellow, yellow-blue or blue-blue. At the beginning of the mission, the victims will be placed in the windows so that they can fall toward the exterior of the central zone.



e. Street barrier

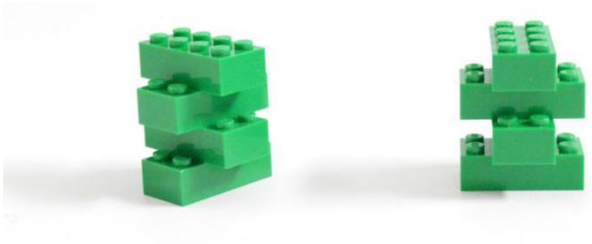
White level

Black level



The street barrier is composed of 2 x 4 bricks and 3 rings. In the white level, only the central ring is raised. In the black level, only the rings at the ends are raised.

f. Trees



The trees are installed directly on the Zone01 logo, on the letter "Z" and on the square of the "01". They serve as obstacles between the street barrier and the street. The robot (s) must therefore raise the barrier over the trees to place it in the central area. Points will be lost if one or more trees are damaged or if they no longer touch their original position.

g. Inflatable mattress

The inflatable mattress is a construction that must be imagined and built by the team. Each team is responsible for bringing its own mattress to the competition. The maximum dimensions of the mattress are 15.4 cm x 15.4 cm (which corresponds to the dimensions of the white square of the landing zone). The maximum height is 5 cm.

Example of inflatable mattress. It's up to you to create yours!

CHALLENGE STEP BY STEP, WHITE LEVEL (1 ROBOT)

1. A member of the team places his mattress in one of the two white circles (B1 or B5). He then positions his robot in one of the two green starting zones.
2. At the judge's signal, the team starts its robot.
3. The robot must secure the central area by installing a street barrier. It will have to lift it and place it so that the ends of the barrier touch the two black lines of the central area.
4. The robot must help the victims get out of the house by pushing them through the windows.
5. Two victims will land in a risk area (red). The robot must recover them and bring them back to one of the starting areas.

6. The third victim is located at an elevated window. It is important that an inflatable mattress be installed at the base of the window before the victim is pushed out of the house!
7. The robot completes its mission in the starting area.
8. Time stops when one of these events occurs:
    a. The allowed time is up (2 minutes)
    b. A member of the team touches one of the robots or says "Stop"

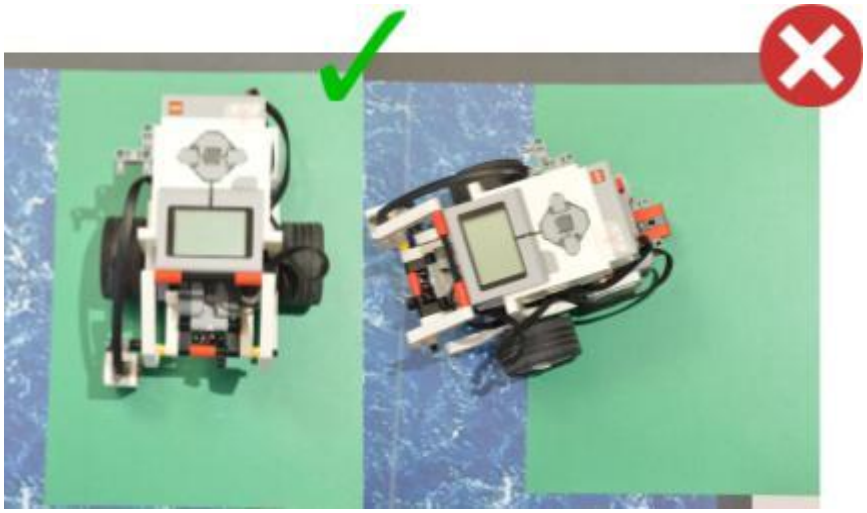
CHALLENGE STEP BY STEP, BLACK LEVEL (2 ROBOTS)

1. A member of the team places his mattress in one of the two white circles (B1 or B5). The team then positions the 2 robots in the 2 green starting zones.
2. At the judge's signal, the robots begin their mission.
3. The robots must secure the central area by installing a street barrier. They will have to lift it and place it so that the ends of the barrier touch the two black lines of the central area.
4. Robot #1 has to help the victims get out of the house by pushing them through the windows.
5. Two victims will land in red areas (risk areas). Robot #2 must retrieve them and bring them to a circle corresponding to their colour in the rescue zone. There can only be one victim per coloured circle.
6. The third victim is located at an elevated window. It is important that an inflatable mattress is installed by robot #2 at the base of the window before the victim is pushed out of the house by robot #1!
7. The robots finish their mission in the departure zones.
8. Time stops when one of these events occurs:
    a. The allowed time is up (2 minutes)
    b. A member of the team touches one of the robots or says "Stop"
    c. One of the robots performs a task that is forbidden

SCORING IN IMAGES

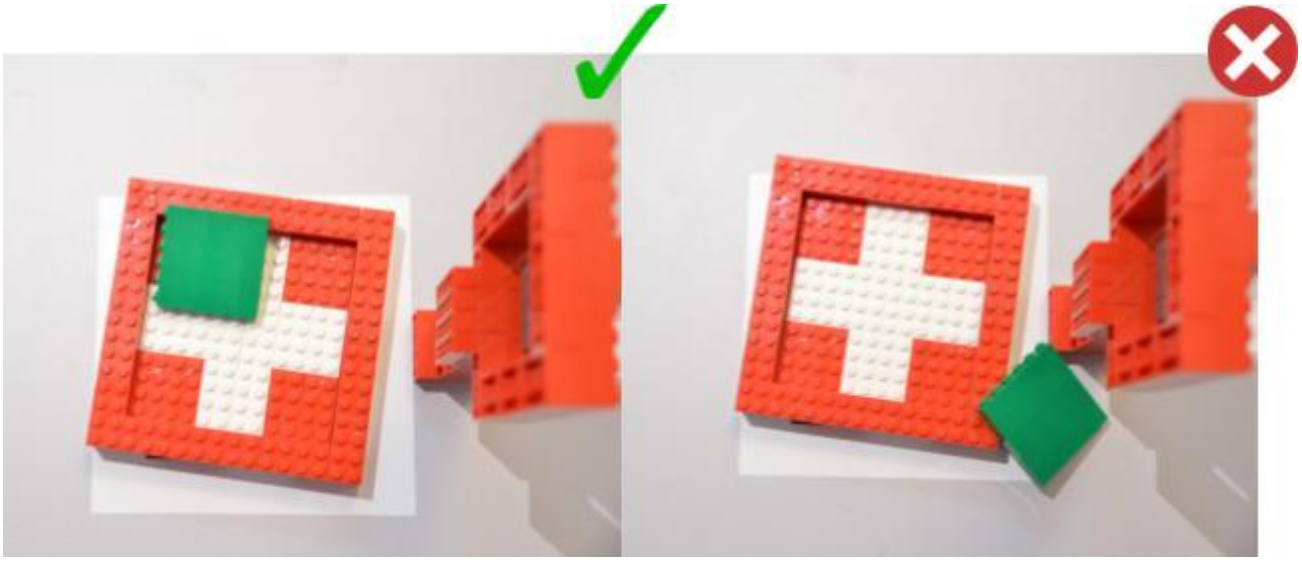
Finish area

All points of support must be in the finish area for points to be awarded.



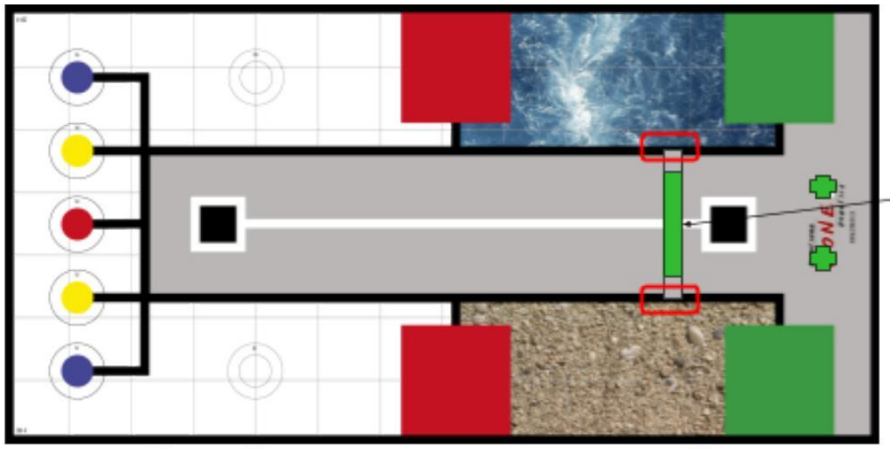
Landing area

The victim must be on the mattress and not touching the ground for the points to be awarded.

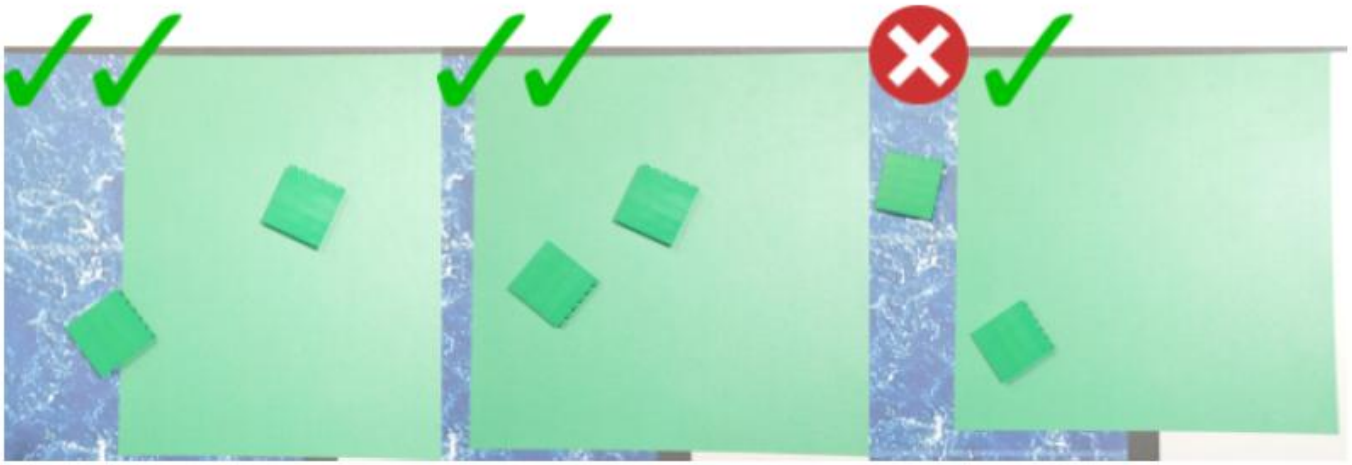


Street barrier

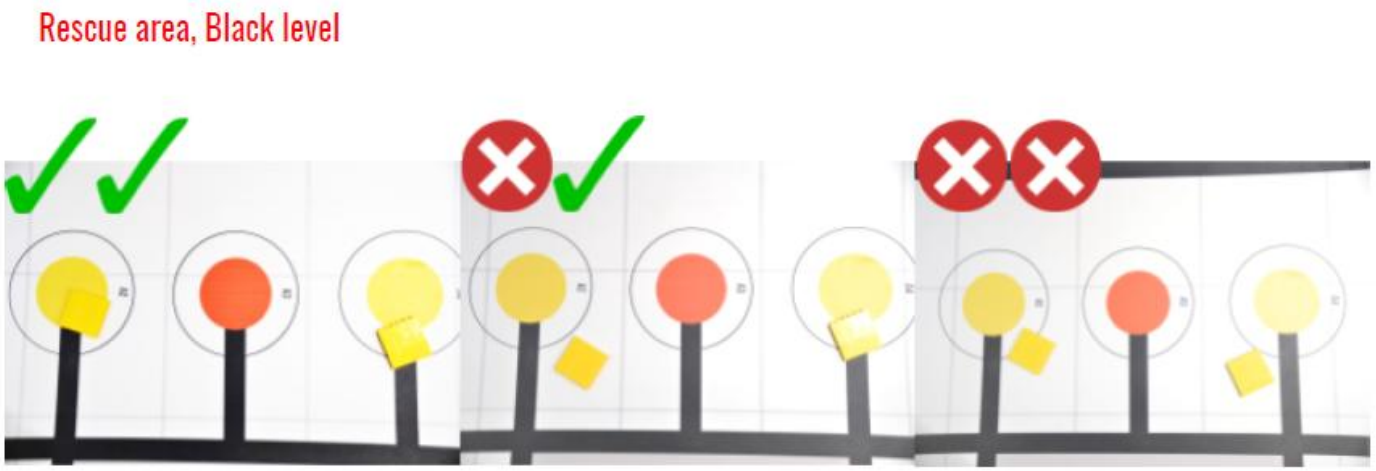
The barrier must touch the two black lines to get the maximum points.



Rescue area, White level



Rescue area, Black level



SCORING TABLE

	MAX PTS
7 points per victim pushed out of the window (3)	21
10 points per victim on an area of the same colour (2)	20
points per victim on a circle of the wrong colour (2)	*10*
10 points for placing the inflatable mattress in the landing area so that it touches the black square	10
7 points per victim on the inflatable mattress (1)	7
12 points for placing the street barrier so that it touches the two black lines	12
points if the barrier touches only 1 black line	*6*
10 points for finishing fully in the starting area	10
points if one robot out of two is entirely in the starting area	*5*
20 points for taking advantage of the surprise rule!!!	20
Total	**100**

PENALTIES

	MAX PTS
-6 per window dropped or moved (3)	-18
-5 if a victim falling from the 2nd floor touches the ground	-5
-2 if a tree is damaged or moved (2)	-4
-5 if the barrier fell or was damaged at the end of the event	-5