



S1 CHALLENGE DUPONT CONSTRUCTION

Version 1.1
(February 19th, 2017)

SETTING THE SCENE

The SLJ900/32 (see photo above) is a machine capable of building bridges. Invented by a Chinese engineering firm, this machine transports and installs the deck of a bridge in record time and without using a crane. To see this impressive machine in action:

<https://www.youtube.com/watch?v=vKGYs71N72c>

GENERAL FUNCTION OF THE ROBOT

You will need to design a robot that will be able to transport and install a bridge over a valley and then cross it. The bridge is not made of LEGO.

The distance separating the two sides of the valley, just like the number of bridge supports, depends upon the level White, Black or Senior+. The robot or the bridge must never touch the floor of the valley (the mat).

You must build the bridge that will be installed by the robot. Your bridge will be made from materials of your choice. However, metal materials and LEGO pieces are prohibited. Your bridge can be made in several separate sections or be interconnected as you wish.

DESCRIPTION OF THE ROBOT:

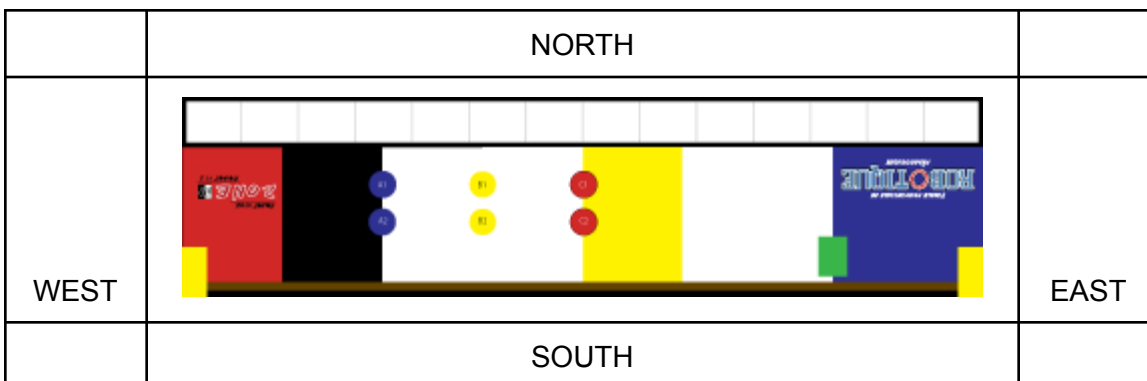
The dimensions of robots participating in this challenge must not exceed the following limits:

- A. Initial length: 40 cm
- B. Initial width: 30 cm
- C. Initial height: 30 cm
- D. Mass: no limit

The length and width can be interchanged. The robot and all sections of the bridge must be included in the start area.

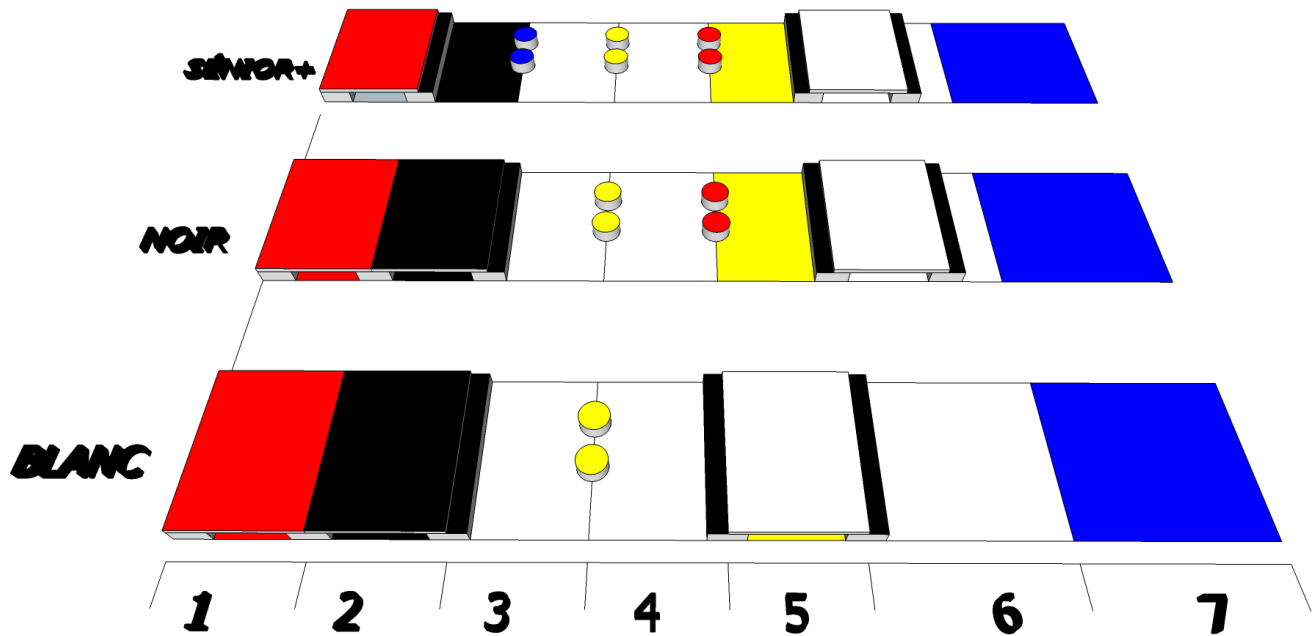
DESCRIPTION OF THE SURFACE AREA:

Surface used: Z01-A mat

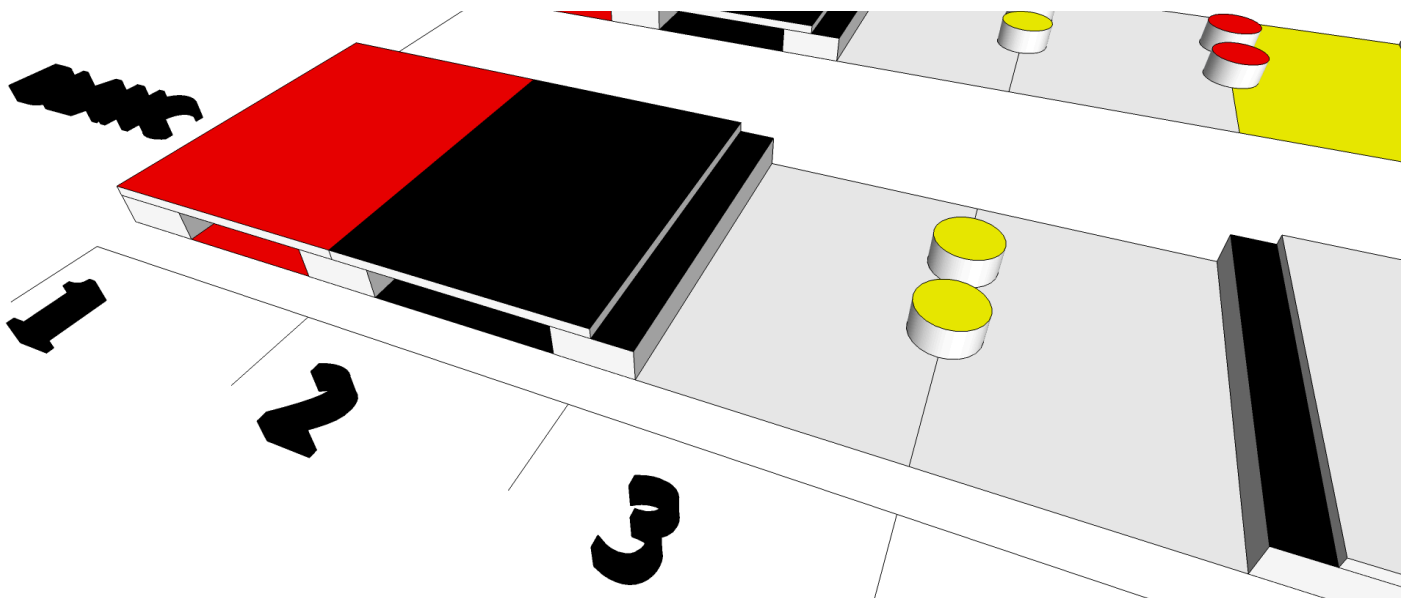


The used surface is half a Z01-A mat. Raised start and arrival areas are placed on the mat. The distance between these two zones is the valley that the robot must cross by installing a bridge.

Pillars have been erected to support the bridge. These pillars are positioned on the circles located between the start and arrival areas. One of the pillars is missing at the start and must be installed manually by the team during the game.



View of the playing surface in three dimensions for each level



Description of accessories:

Start area:

The start area is a raised area made using a 30.48 cm X 40.64 cm X 1.27 cm (12" X 16" X ½") wooden board placed on supports made from a 2X4 wooden beam. This area covers the red mat surface.

For the White and Black levels only, an extension of the start area of the same size will also cover the black surface of the mat, giving more space for the robot and the bridge at the start.

Arrival area:

The arrival area is a raised area made using a 30.48 cm X 40.64 cm X 1.27 cm (12" X 16" X ½") wooden board placed on supports made from a 2X4 wooden beam, as for the start area. The position of the second side of the valley varies depending on the level (White, Black or Senior+):

- For the White level, the side of the valley is placed on the demarcation line between the white and yellow zones (above the red circles).
- For Black and Senior+ levels, the side of the valley is placed on the line between the yellow and white areas.

The pillars:

The pillars are wooden cylinders 7.62 cm (3") in diameter and 3.81 cm (1.5") high. They are cut from a 2X4 piece of wood. The pillars cover the mat's circles.







- For the white level, two pillars are placed on yellow circles.
- For the black level, four pillars are placed on the yellow and red circles.
- For the Senior+ level, six pillars are placed on blue, yellow and red circles.

REMEMBER THE MISSING PILLAR!

For all levels, the judge randomly removes one of the pillars before starting and gives it to the team. A team member must put the pillar back into place manually after starting. The team chooses when to reinstall the pillar.

Points will be awarded if the robot can identify the location of the missing pillar before it is reinstalled. The identification will be considered successful if the robot turns on the brick's red light once for 1 second by clearly pointing out the missing pillar.

DETAILED DESCRIPTION OF THE CHALLENGE

WHITE level	BLACK level
The white level of the challenge is intended for teams of beginners. The challenge is kept as simple as possible by keeping the problems to be solved to a minimum. For students with more experience, we recommend the Black level.	The Black level of this challenge is intended for teams with more experience. The students encounter design and programming challenges at their level.
Temps allowed	
2 minutes	
WHITE level	BLACK level
Programming:  Design:  Strategy: 	Programming:  Design:  Strategy: 
Recommended hardware	
Distance sensor	
The challenge step by step	
WHITE, BLACK AND SENIOR+ levels	
1. The team shows up with its robot and its bridge, which it can place anywhere in the start area, and selects the program of its choice.	
2. At the signal, the judge starts the timer and the team starts its robot. It must wait 5 seconds before moving.	
3. The judge removes one of the pillars randomly and gives it to the team. The team may decide to but it back right away or wait until it is identified by the robot.	

4. The robot moves toward the side of the valley, ensures that the pillars are in place and places the bridge or one of the sections of the bridge on the pillars. Neither the robot nor the bridge must ever touch the mat.
5. As needed, the robot installs the other sections of the bridge.
6. If the robot identifies the position of the missing pillar, it turns on the brick's red light for 1 second clearly pointing out the missing pillar, then turns it off. The team then reinstalls the missing pillar. The team can choose to install the pillar at any time, even if the robot fails to identify it as missing.
7. The robot must cross the bridge and stop completely in the arrival area. Attention, the robot must come down from the elevated area to get to the arrival area.
8. The timer is stopped when the robot is completely in the arrival area or when the team says STOP. If the robot leaves the area before the timer is stopped, a penalty will be applied.

SCORING

WHITE, BLACK AND SENIOR+ levels	
	MAX PTS
The robot reaches Section 2 (above the black area of the mat)	15
The robot leaves Section 2 and reaches Section 3 on the bridge (between the blue and yellow circles)	20
The robot leaves Section 3 and reaches Section 4 on the bridge (between the yellow and red circles)	25
The robot leaves Section 4 and reaches Section 5 on the bridge (yellow area after the red circles)	25
The robot leaves Section 5 and reaches Section 6 (white area before the blue area)	20
The robot leaves Section 6 and reaches Section 7, representing the arrival area (blue area of the mat)	10
The bridge is built and continuous (all sections installed), 20 points	20

The bridge is built and fragmented (at least 1 section installed but sections missing), 10 points	
The missing pillar has been correctly identified by the robot (red light on for 1 second vis-à-vis the missing pillar)	15
Total	150

PENALTIES

WHITE, BLACK and SENIOR+ levels	
Each section of the bridge that touches the ground	-20
Each time the robot touches the ground	-20
If the robot leaves the surface BEFORE the timer is stopped	-10

SUGGESTED STRATEGIES

WHITE level	BLACK level
Make a bridge that is light and easy to move	Make light bridge sections

AVAILABLE TUTORIALS (in French)

WHITE level	BLACK level
Using the distance sensor	Using the distance sensor

FAQ

As the season progresses, questions and clarifications will be made to the challenge. Don't forget to check out the FAQ here!

Q1: Can a section of the bridge exceed 30 centimeters (height) at start?

Answer: No, the whole bridge must be contained within the start area and within the 30 centimeters height.

Q2: Is there a minimum width or maximum thickness for the bridge?

Answer: No, this is not specified. But the bridge must be contained within the start area within the 30 cm height.

Q3: Is it allowed to install a section of the bridge or the whole bridge before detecting the missing pillar?

Answer: Yes.

Q4: Will the pillars be attached to the surface?

Answer: No.

Q5: If a string touches the ground or if a small part is dropped on the ground, will it be considered as if the robot / bridge touches the ground?

Answer: Yes. If any part of the robot / bridge touches the ground, a penalty will be awarded.

Q6: Can we assemble the bridge from a construction set such as Meccano, Vex, or other. Or can we print it in 3D?

Answer: You have to build your bridge using materials of your choice. The intent is that you make your own bridge, not assemble it from a construction set such as LEGO or other brands. Printing your own bridge in 3D is acceptable.

Q7: If we use an NXT robot, how can we turn on the brick light?

Answer: NXT robots can turn on the red LED of a light sensor.