

SCORPION



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This year's game consists in taking power cubes on the floor and dropping them in different zones: in the exchange on the floor, on two switches at 23cm height and on a scale at 152cm height. The power cubes which are put in the exchange enable different power ups such as FORCE, LEVITATE, or BOOST. At the end, every robot which can climb at a 213cm height bar earn additional points.

The match lasts 2min30. During the first 15sec of the game the robot is autonomous and until the end of them it is tele-operated. During the 30 last second, the robot can climb and defeats the boss.



# - Points' value

# • In autonomous period

Action	Points	Difficulty /5
Crossing the line	5pts	1
Possession of the switch	2pts + 2pts/sec	3
Possession of the scale	2pts + 2pts/sec	5

# o In tele-operated period

Action	Points	Difficulty /5
Possession of the switch	1pt + 1pt/sec	2
Possession of the scale	1pt + 1pt/sec	4
Cube in the chest	5pts	1
Boost	Double the points if possession of the switch or the scale	1
Parking on the platform	5pts	1
Climbing achieve	30pts	5pts

# o Ranking points

Action	Ranking Points	Difficulty /5
Crossing the line + Possession of the switch or the scale on the autonomous period	1	4
Climbing of the 3 robots on the tele-operated period	. 1	5
Victory	2	
Tie	1	



#### Montreal regional strategy

The robot puts the cubes in all areas; which means the scale, the switch and the exchange. It is able to climb and to defend by attacking the opposed switch.

**Positive points:** bring a lot of points; versatile; veritable plus in an alliance.

**Negative points:** complex, not reliable

### Detroit Championship strategy

The robot brings to focus on the switch and the exchange thanks to a mechanism which limits the mouvements, it is able to climb and to defend by attacking the opposite switch.

Positive points: fast, light, plus in an alliance, brings a lot of points.

Negatives points: a lot of changes on the first version; it doesn't stuff the scale.

# GOALS

- Drive Base
  - o Fast and nimble
  - o Simple
  - o Very movable
  - o Two speeds
    - A High Speed for long ways
    - A Low Speed to defend, for shorts ways and for powerful accelerations
- Mechanism to catch cubes
  - Able to take cubes in all configurations (33cm or 28cm)
  - o Fast
  - Able to push out cubes
  - o Reliable
  - o Easier for the driver

- Mechanism to manipulate cubes
  - o Fast
  - o Reliable
- Mechanism to climb
  - o Raise the robot of 30 cm
  - o Reliable
- Programming
  - Visual recognition
  - o Acceleration ramp
  - o Crossing the line during the autonomous period
  - Possession of the switch during the autonomous period
  - Precise control of the movement of the pivot



# DRIVEBASE TANK

# **Characteristics**

- Chassis
  - o Aluminum profile of 25x50mm
  - o Simple design
- Bumpers' clamp
  - o Aluminum profile of 25x25mm
- Drop center of 2mm
  - o Easier to turn
- 6in wheels for a better crossing
- 2speeds custom Gearbox
  - o 2 CIMS
  - o Ballshifter
  - o High gear
    - Reduction of 6:1
    - Max speed 15ft/s
  - o Low gear
    - Reduction of 13:1
    - Max speed 8,70 ft/s



- Transmission with belt and pulleys (HTD 5M 9mm wide)



#### <u>Prototype</u>



It is the intake we used for Montreal Regional. This intake is composed of two articulated arms with five maroon ANDYMARK compliant wheels and powered by one 775pro per arm, taut by elastics.

We designed a brand-new intake inspired from this prototype and the Cheesy Poofs' intake. In fact, we lightened and solidified it; it weighs just 3.5kg (7.2 lb). There are thirty maroon ANDYAMARK compliant wheels of 2" powered by two 775 pro.

### **Characteristics**

- 15 maroon ANDYMARK wheels of 2" per arm
- integrated reduction
  - o 2 775 pro
  - o Reduction of 6:1
  - Belt and Pulley GT2
    3mm and HTD 5mm
- Actuator to apply a pressure on the cube and to adapt the breadth of the opening
  - o Stroke 100mm
  - o Bore size 20mm
- 25x50mm aluminum profile
- U-profile for the arms





# **ARM AND PIVOT**

## Advantages

- Enable to catch and to put cubes on the both side of the robot
- Simple, composed with only one articulation
- Rugged
- Compact
- Light

### **Disadvantages**

- Need a lot of changes in a short time in comparison with the previous design
- Isn't able to put cubes in the scale
- Limit the place on the center of the robot

### **Characteristics**

- Motorized by 1 CIM
  - o Gearbox integrated in the pivot's structure
  - Reduction of 117:1 with these different floors:
    - 84:11
    - 60:26
    - 18:16
    - 100:17
- Custom gear in steel and aluminum
- Chain inside the profile
- Simple design of the arm
  - Aluminum profile of 50x50x2mm of 580mm weigh
- Pivot's structure with aluminum profiles of 25x25x2mm





#### **Characteristics**

- Autonomous period
  - o Encoders and gyroscope
    - PID
  - Able to start from the three places
  - o Able to put cubes on the switch in its two positions
- Tele-operated period
  - Pivot's CIM's encoder
    - PID
    - Predefine positions for the arm
  - o Linear acceleration
    - Improve the pilot's driving
    - Prevent the tension fall
    - Limit drive base and structure's effort