Robot Club Toulon : Mechanical Presentation 2024

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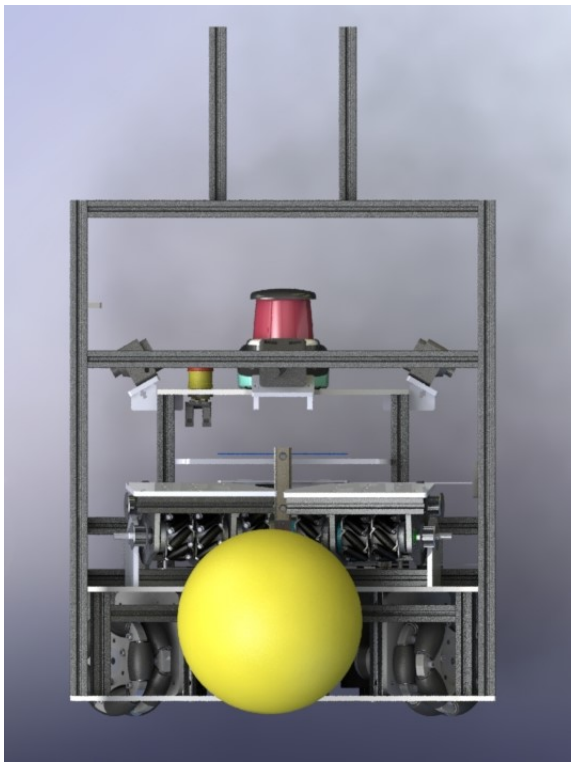

Fig. 1. Computer generated image and picture of the 2023 and potentially 2024 robot of Robot Club Toulon Team

This year we are thinking of changing our robots but we are not sure they will be functionnal for July, so in this paper we will present both our functional robots (2023) and the robots we are hoping to have by July.

1 Functional robot

The mechanical design of RCT robots is a 4-wheel omnidirectional robot driven by independent 220w Robotmaster M3508 motors having a gearbox ratio of 1:19. This platform is described bellow.

On our motor block the wheels are directly attached to the engine axle, this solution increases reactivity and greatly reduces the mechanical slack, thus allowing a clean stop.

Our four propulsion elements are placed at four out of five vertex of a regular pentagon, and at its center leans our coil gun with one capacitor on each side. RCT four wheels mechanical base is showed in details in figure 4.

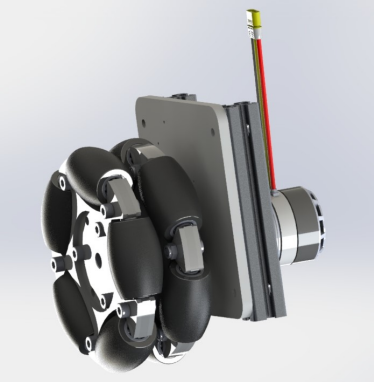

Fig. 2. RCT propulsion element

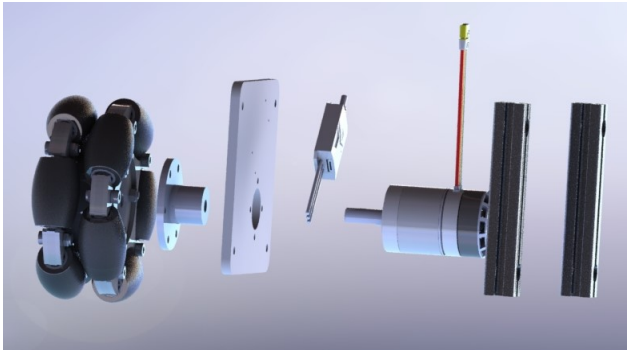

Fig. 3. Propulsion block including a Robotmaster M3508 motor with a C620 speed encoder

Fig. 4. RCT omnidirectional base view showing motor blocks, power distribution and control board card and bottom chassis

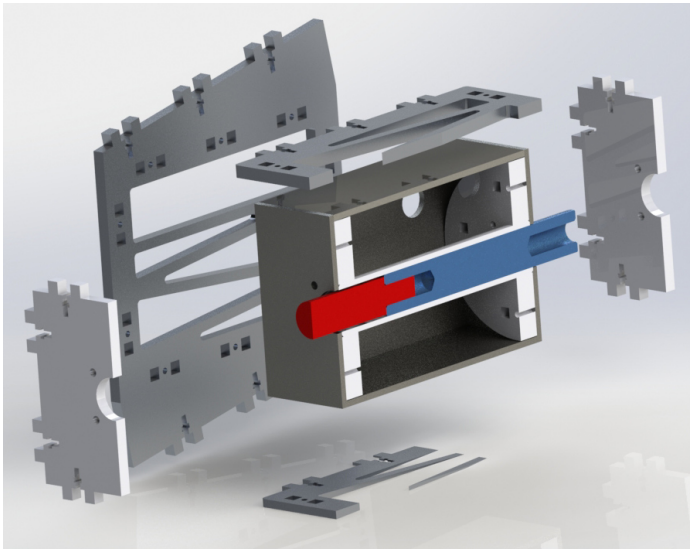

Fig. 5. Kicking system

On top of our base we have our ball handling system which consists in 5 little aluminium profiles, one axle which is linked with the motor thanks to a belt and 2 longer aluminium profiles with a piece of delrin to protect the wheels. At the back of the handling system are shock absorbers to make them stiffer and prevent the ball from bouncing back when it comes fast.

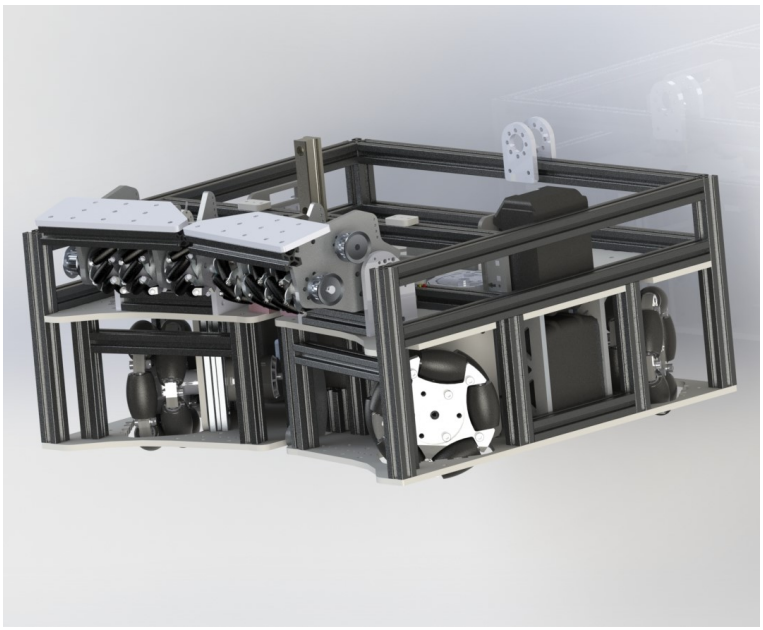

Fig. 6. RCT omnidirectional base with kicking and ball handling systems

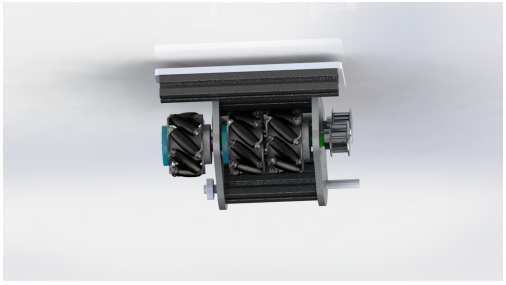

Fig. 7. Left part of the ball handling system composed of 3 mecanum wheels driven by a Maxon DCX26 motor.

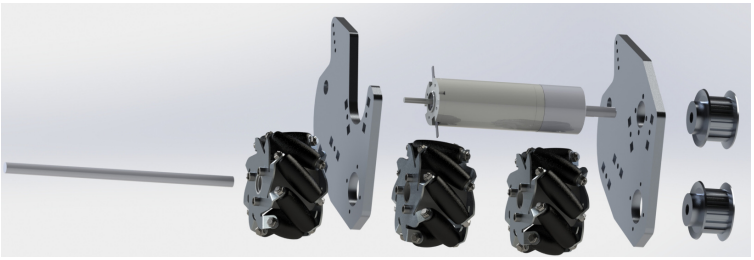

Fig. 8. Exploded view of the left part of the ball handling system.

Finally, at the top is the computer and the electronic part, which will be explained in the electrical presentation.

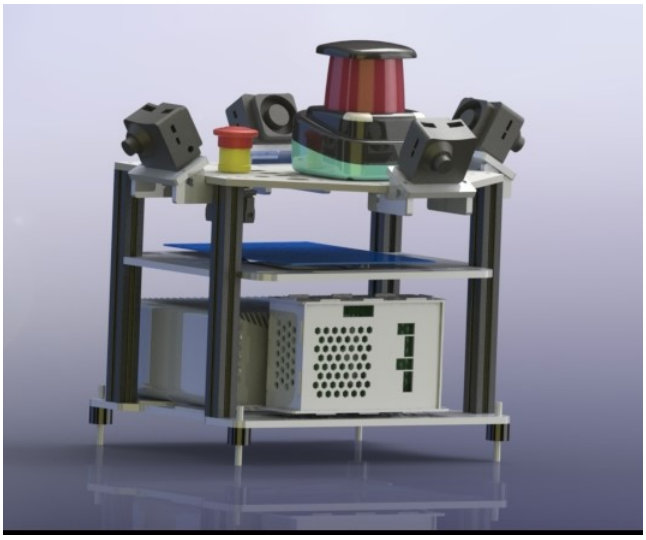

Fig. 9. Top assembly of the robot including the embedded PC and the motor controller board for driving motors and managing quadrature encoders. This assembly can be removed form the robot by removing 4 screws for transportation. A Pepperl+Fuchs R2000 lidar is present as well as four JeVois Pro smart cameras.

2 New swerve drive robot

The new base has been design using 4 swerve drives, integrated in a rectangular shaped design. Each propulsion motor of the swerve drive is a 500W brushless one, leading to interesting acceleration, as well as a faster top speed. For improving reliability of the robots, most of the parts will be manufactured in aluminium, and the upper part of the robot will be mainly in carbon fiber to lower the gravity center of the robot.

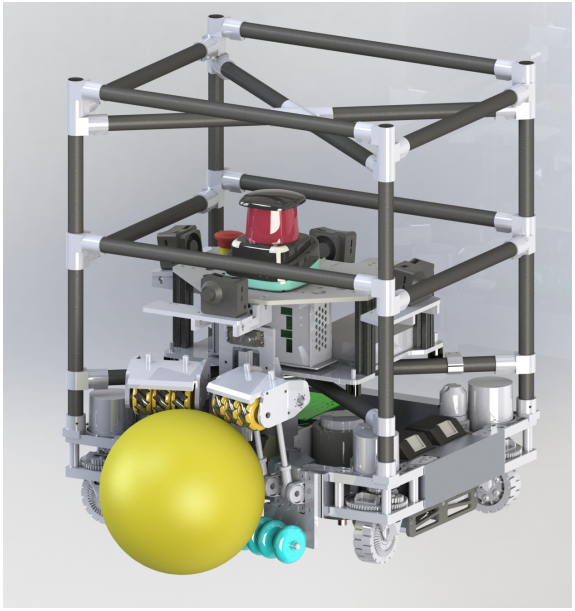

Fig. 10. Generated image 2024 robot of Robot Club Toulon.

3 Goalkeeper

We first introduced two arms on our goalkeeper last year during RoboCup in Bordeaux, but they were not ready enough and had a lot of drawbacks. This year, the two arms mechanism has been replaced by a single arm one, having an extension. Our goal is to be able to detect and intercept a ball in more or less 0.5 second. This requires fast detection and powerful actuators, as well as safety measures to protect people and other robots. In order to reduce the potential harm of the system, foam has been molded around it as shown on Figure 11.

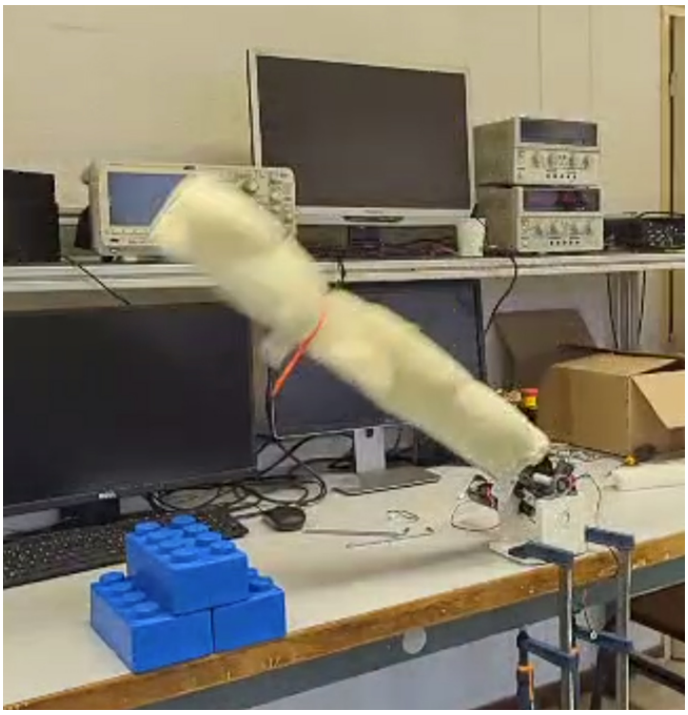

Fig. 11. RCT keeper arm in test