Robot Club Toulon : Mechanical Presentation 2022

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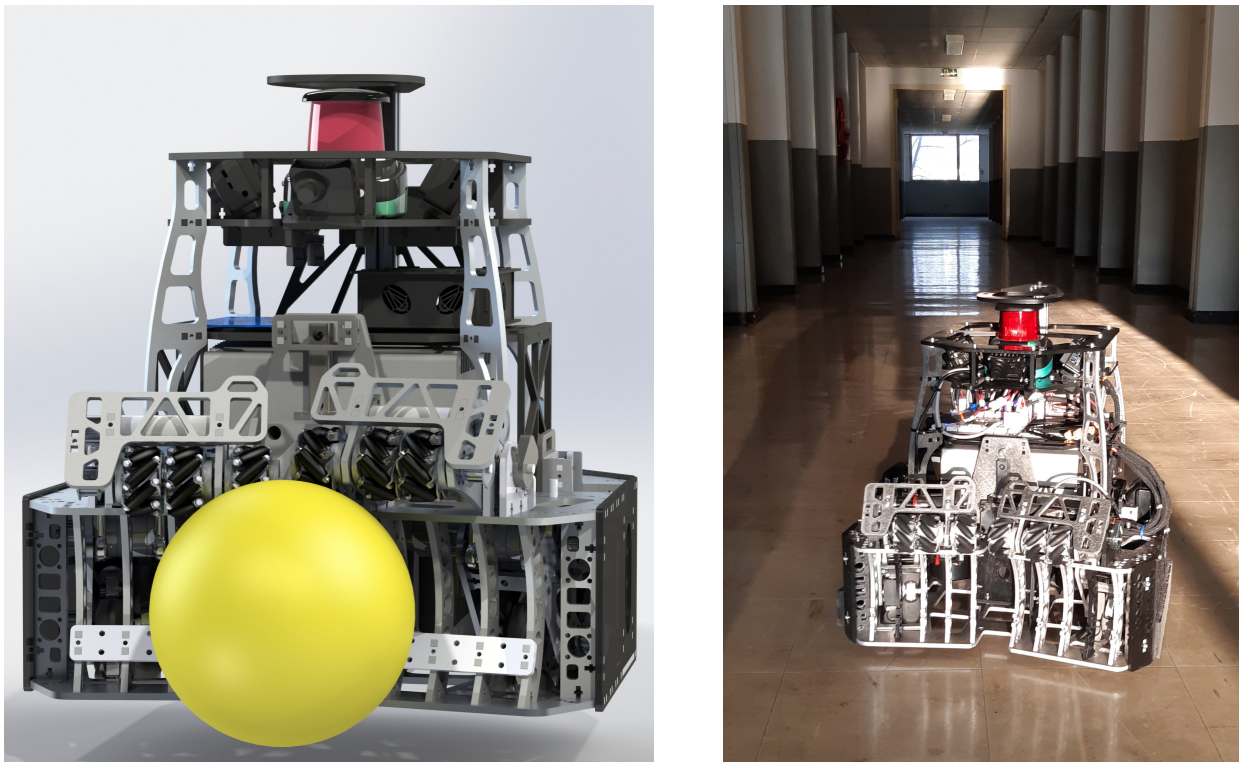

Fig. 1. Computer generated image and picture of the 2022 robot of Robot Club Toulon Team

Mechanical design of RCT robots is a 4-wheel omnidirectional robot driven by independent 150W Maxon RE40 motors having a gearbox ratio of 1:19. This platform is described in details in this document.

Compared with other teams, our robots are based on a 4 wheels platform, with its wheels placed at four out of five vertex of a regular pentagon.
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This evolution has been decided considering during a strong acceleration, most of the robot weight is pushed on the rear wheel as shown on this slow motion YouTube video featuring our robots. If acceleration is important, the front wheels will not be always in contact with the ground. In this case, using a 3 wheels robot is a real issue because the rear wheel doesn't transmit any strength and the robot can be out of control. Using a 4 wheels platform allows to keep control of the robot in any situation with always 2 rear wheels transmitting strength in contact with the ground. As shown on the video, even when the robot front wheels are not in contact with the ground, the robot is still under control and continues to accelerate.
However, the drawback when changing from a 3 wheels to a 4 wheels platform is that this type of platform is not isostatic, thus it is necessary to add some springs / damplers in order to ensure that all the wheels are in contact with the ground in a normal situation as shown in 3. In our design, spring is the silent block

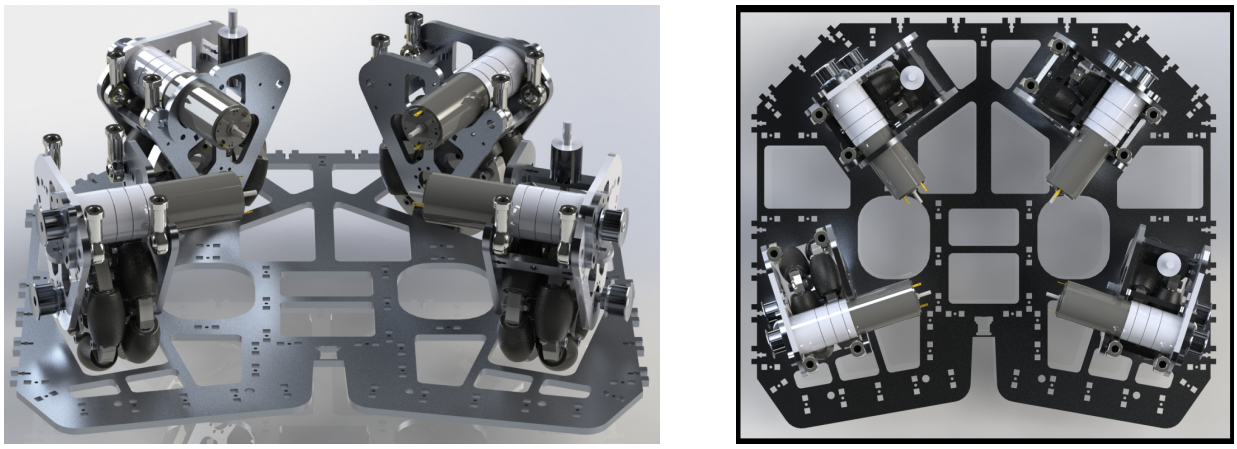

Fig. 2. 4 wheels RCT platform

which can be seen at the rear top in black on the picture.

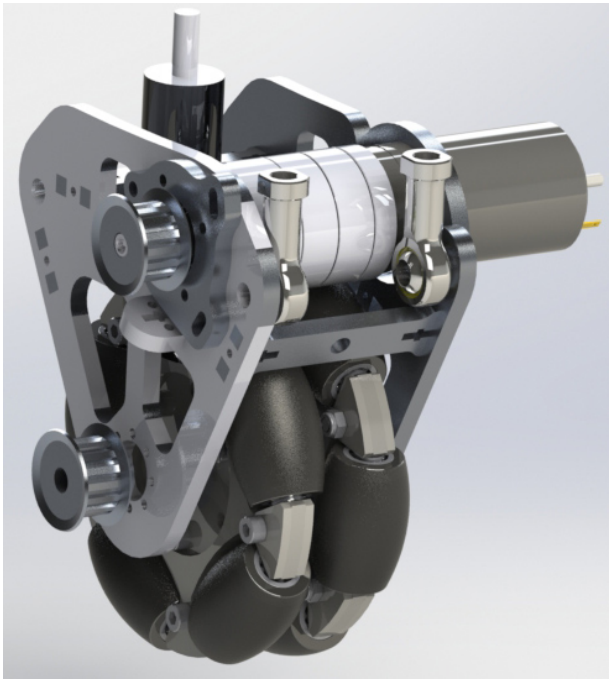

Fig. 3. RCT propulsion element

Moves done with this solution are much more reactive than the ones done with our 2019 3 wheels platform using identical motors, especially during strong acceleration phases when the robot tends to pitch up as explained before, or during hard braking phase. This choice also allow to use the robots on a sliding floor for tests and exhibitions.

RCT four wheels mechanical base is described in details in this section.

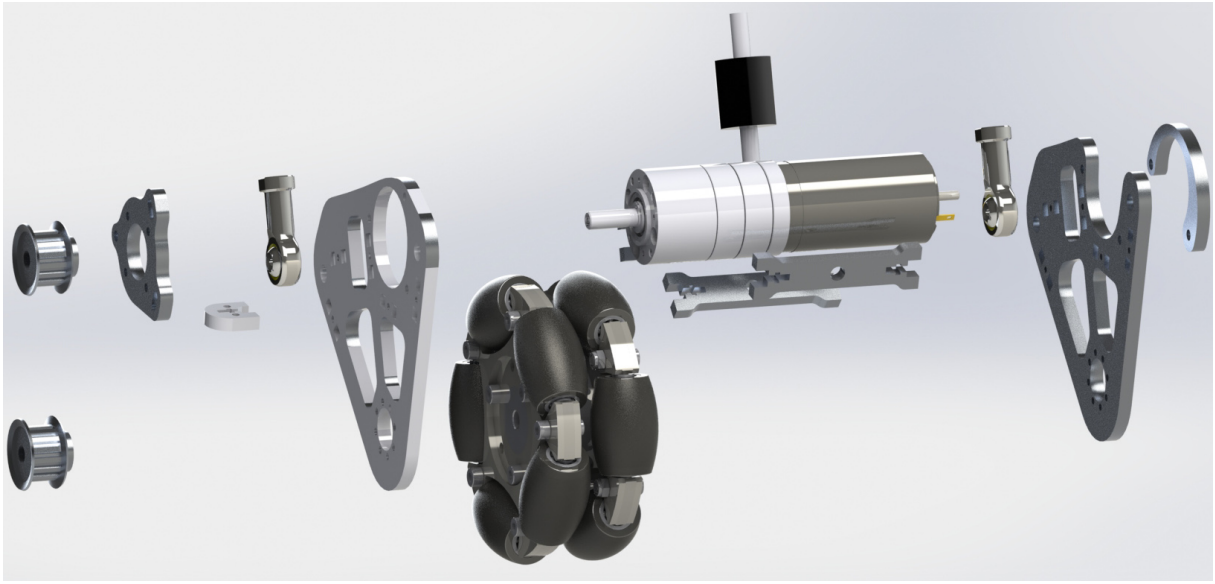

Fig. 4. Propulsion block including a Maxon RE040 motor with a CUI AMT102 quadrature encoder, and a 165mm chain transmission with sprockets. Maximum speed can be adjusted through the pulley teeth ratio. Axis are iron ones with key for locking sprockets, wheels and motors.

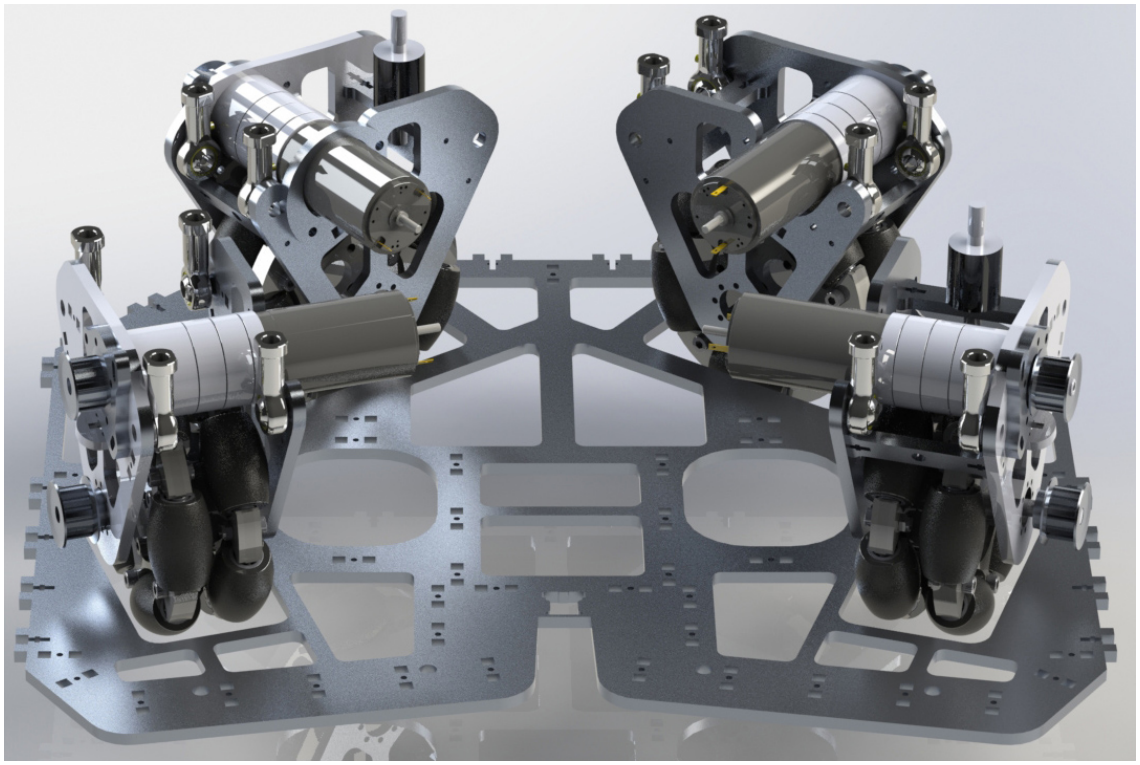

Fig. 5. RCT omnidirectional base view showing only motor blocks and bottom chassis

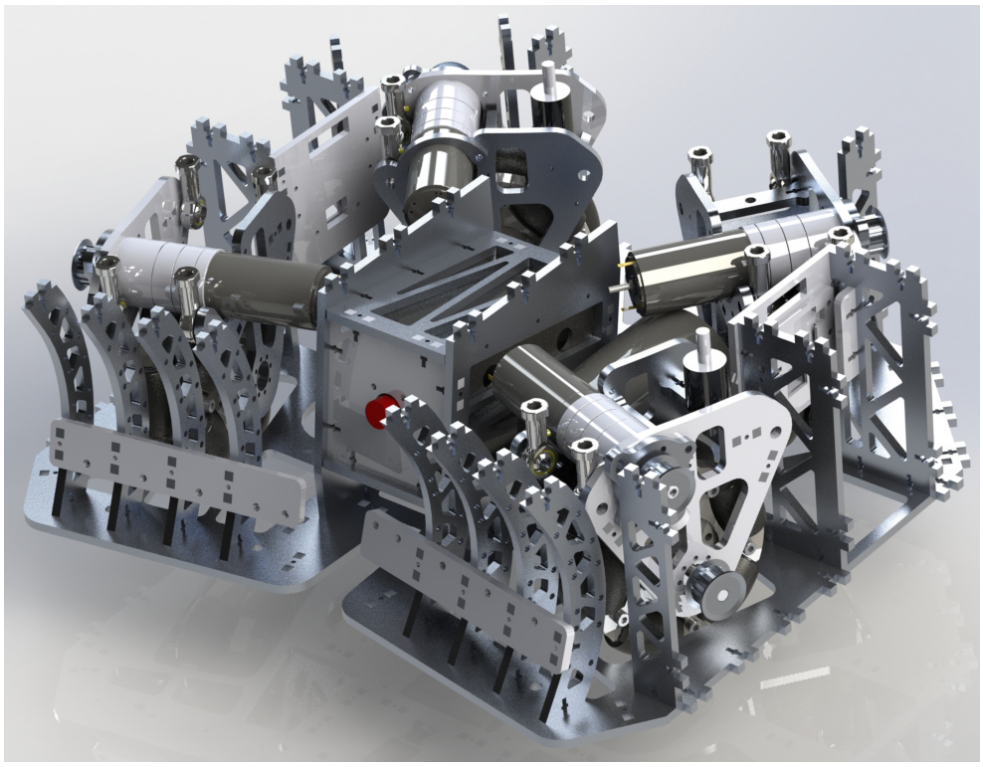

Fig. 6. RCT omnidirectional base with coilgun integrated

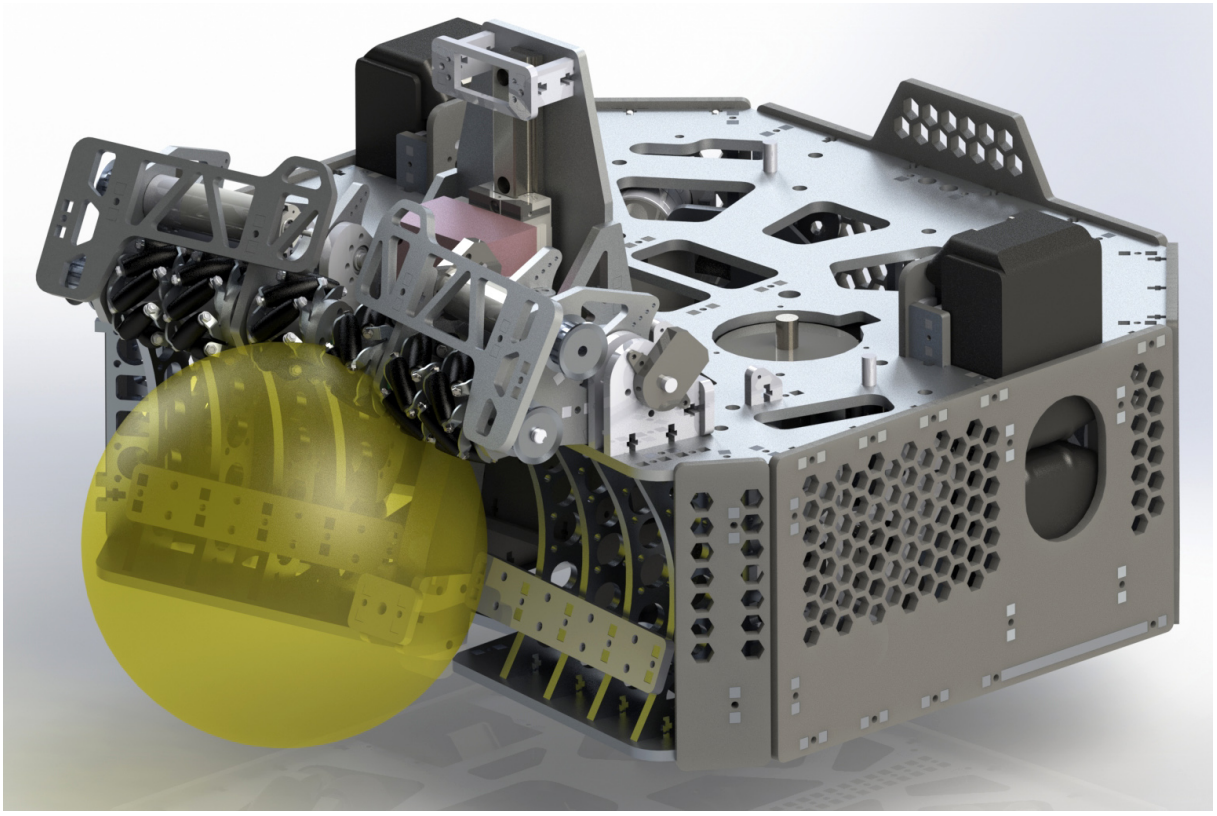

Fig. 7. RCT omnidirectional base with kicking and ball handling systems

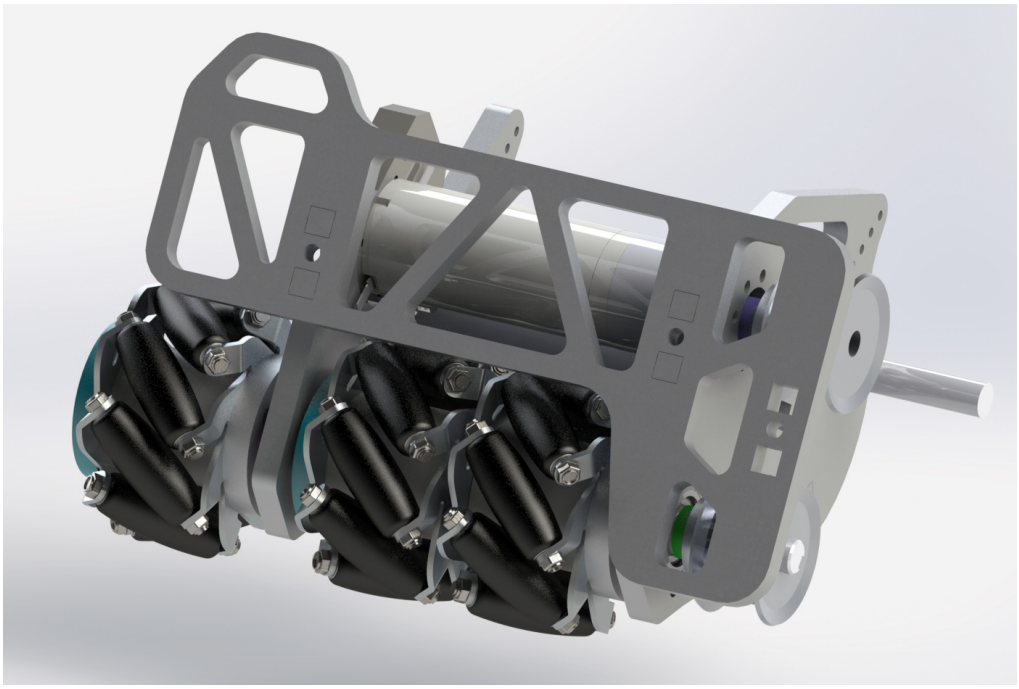

Fig. 8. Right part of the ball handling system composed of 3 mecanum wheels driven by a Maxon DCX26 motor.

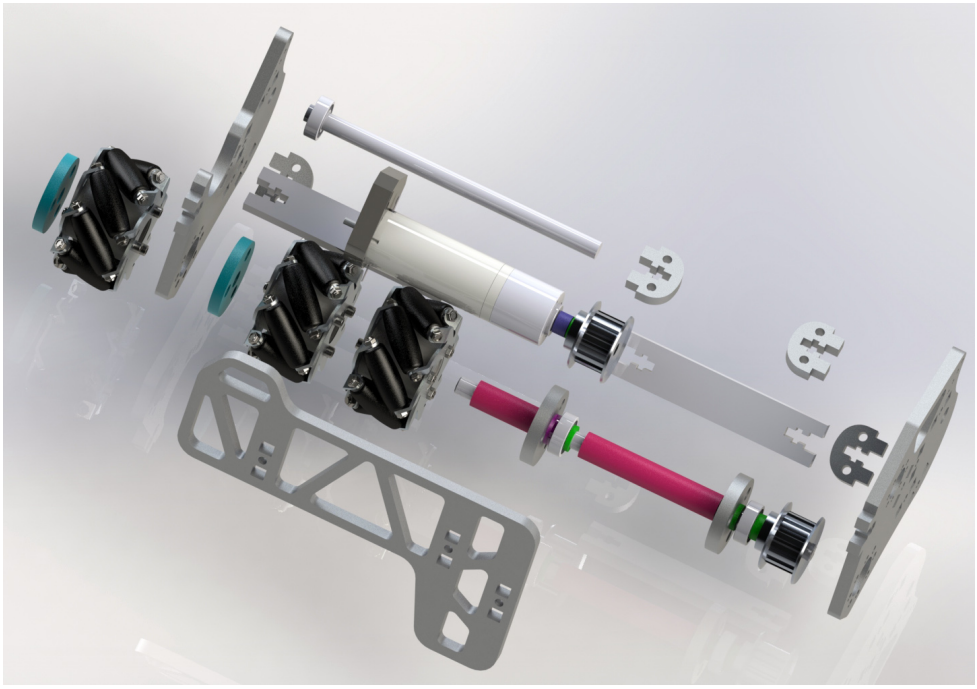

Fig. 9. Exploded view of the right part of the ball handling system.

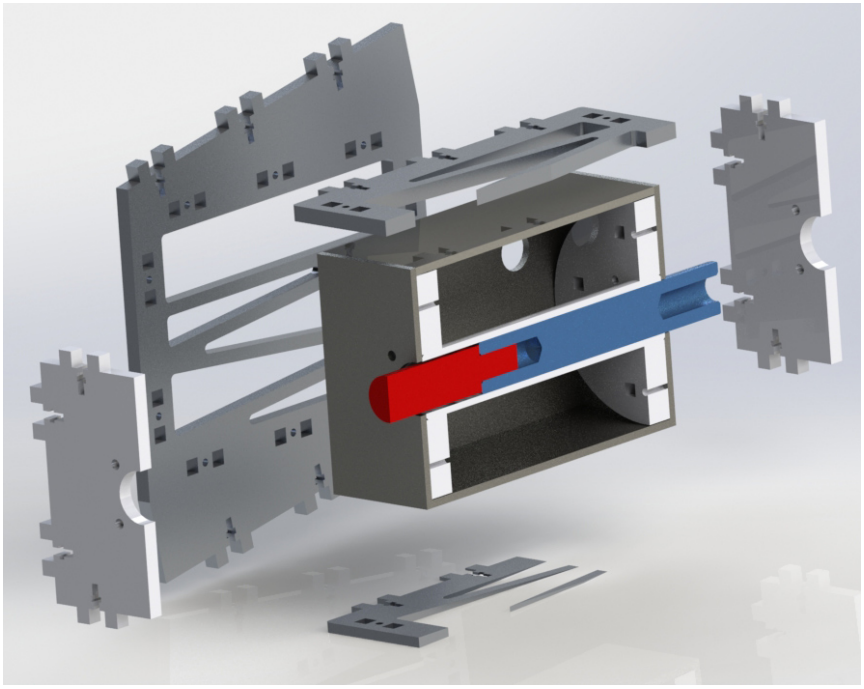

Fig. 10. Kicking system

Fig. 11. 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.