Robot-t2: Educational robot made by students and teachers of the Technical School No. 2 "Independencia", Concordia, Entre Ríos. With support from UNER (Mechatronics) and UNLP (Industrial Design) Universities.

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Introduction:

Mechatronics is a multidisciplinary branch of technology and engineering that combines systems, electronics, mechanics and control, with robotics and electronic engineering and computer science to create more complex machinery to facilitate human activities through electronic processes. control systems applied in industry.

The word mechatronics is a compound word made up of the Greek words μηχανική (mecaniké, "mechanics") and τροπος (tropos, "form"). This word was coined in 1969 by the Japanese engineer Masaharu Inaba, who used it to describe the combination of mechanics and electronics in a mechatronic system.

Mechatronics is a discipline that combines electronic, mechanical, computer and communication technology to create control and automation systems. It is applied in many fields, from medicine to mining, through the pharmaceutical, metal-mechanic, automobile, textile, metallurgical, food, and oil industries, etc. Mechatronics engineers work in companies in the automotive, manufacturing, petrochemical, metal-mechanic, food, and electromechanical industries, carrying out design, manufacturing, component programming, industrial systems, and specialized equipment activities. Mechatronics has as its immediate background research in the area of cybernetics carried out in 1936, numerical control machines initially developed in 1946, manipulators in 1951 and programmable controllers in 1968. Mechatronics was primarily concerned with servomechanism technology used in products such as automatic doors, self-service vending machines, and auto-focus cameras in the 1970s. Microprocessors were included in mechanical systems to improve their performance in the 1980s, while communications technology enabled remote operation of robotic manipulators in the 1990s. Finally, microsensors and microactuators are being used in new products. Microprocessors were included in mechanical systems to improve their performance in the 1980s, while communications technology enabled remote operation of robotic manipulators in the 1990s. Finally, microsensors and microactuators are being used in new products. Microprocessors were included in mechanical systems to improve their performance in the 1980s, while communications technology enabled remote operation of robotic manipulators in the 1990s. Finally, microsensors and microactuators are being used in new products.

Robotics is a specialty of mechatronics that deals with the design, construction, operation, structure, manufacture and application of robots and combines various disciplines such as mechanics, electronics, computer science, artificial intelligence, control engineering and physical.

Robotic arms are more common industrial robots and are made up of seven metal segments joined by six joints. These arms have six degrees of freedom, similar to human arms. Robotic arms are used to move an end effector from one location to another. They can be fitted with different end effectors tailored to a particular application, such as a robotic hand. Industrial robots are used to perform specific tasks precisely and repetitively on assembly lines. They are used in both the automotive and electronics industries. There are different programming techniques for industrial robots, such as gestural programming and textual programming.

Mechatronics and robotics have their origin in the 4th century BC with the Greek mathematician Archytas of Taranto, Hero of Alexandria, Su Sung and Al Jazari.

The term was coined in 1969 by the Japanese company Yaskawa Electric Co. and its etymology comes from the Czech word "robota" which means forced labor or worker. The first appearance of the term was in the play RUR (Robots Universales Rossum) by the Czech playwright Karel Čapek, which premiered in 1920.

The world history of robots is a long and complex one dating back to Hero of Alexandria (AD 10-70). His automata based on principles of Philo or Archimedes, made for entertainment purposes, imitated the movement of birds, served wine, and had automatic doors. Leonardo

da Vinci designed a humanoid automaton around the year 1495, and later a mechanical lion for a political allegory of the alliance between the Medici and France. The Banu Musa brothers wrote the Book of Ingenious Mechanisms in 805, with instructions given by Caliph Al-Mamun to collect lore about automata.

Al-Jazari was one of the greatest engineers in history, responsible for the first mechanical clocks moved by weights and water, automata such as the complex elephant clock animated by human beings and mechanical animals, a human-shaped automaton to serve drinks and the work The book of knowledge of ingenious mechanisms. Mechatronics is a discipline that integrates mechanics, electronics and information technology to improve products, processes and industrial systems. Pierre Jaquet-Droz was responsible for the three most famous automata of the 18th century: "The Pianist", "The Draftsman" and "The Writer". Jean Eugène Robert-Houdin incorporated automaton tricks into his shows, such as a singing bust, a writing automaton, and a "Patissier of the Palais Royal."

The term android was first popularized in 1886 by the French author Auguste Villiers, through his novel La Eva Futura. It is a synthetic anthropomorphic organism that imitates the human appearance and simulates some aspects of its behavior. Androids are produced or reproduced or made by their creator, who is similar to a human. The term refers to male-like humanoid robots, while female-like ones are occasionally called gynoids. In Western culture, the android is usually represented as an entity that imitates the human being both in appearance, mental capacity and initiative. People's attitude towards androids varies according to their cultural background. In Japan, androids are more accepted due to their humanoid appearance.

Experts have shown enthusiasm and skepticism towards humanoid robots. These robots have the ability to imitate some human behaviors and capabilities, such as bipedal locomotion. These machines can be physical or virtual, and have the ability to move, manipulate their environment, and display intelligent behavior. The Atlas robot, developed in 2013, is an example of these autonomous machines that were created in the 20th century.

Unimate was the first industrial robot created by George Devol in 1953 and patented in 1961. It was installed on a General Motors assembly line to transport and weld castings onto a chassis. Modern versions have six degrees of freedom and work at high speeds. There are also domestic robots for cleaning and maintaining the home, such as Sony's Aibo, a series of robotic pets released between 1999 and 2005. These robots have the ability to interact with humans, but are affected by anxiety about the economic impact of automation and the threat of robotic weaponry.

AIBOs were entertainment robots produced by Sony, widely adopted by universities for educational purposes, for robotics research, and for human-robot interaction. They were futuristic icons in movies, music videos, and ad campaigns. In 2006 Sony discontinued AIBO and its development, however third party support is available. AIBO was inducted into Carnegie Mellon University's "Robot Hall of Fame" and its designs won the "Good Design Award," among others.

Asian culture, especially China and Japan, also had a tradition of automata since ancient times. This tradition continues today in robots such as ASIMO, QRIO, Repliee Q1 and Aibo. NASA's Viking I was the first American robot on Mars, and its program was the most expensive and ambitious ever sent to the planet, costing $1 billion at the time. It was a successful mission that provided most of the information about Mars until the arrival of the Martian rovers.

Development:

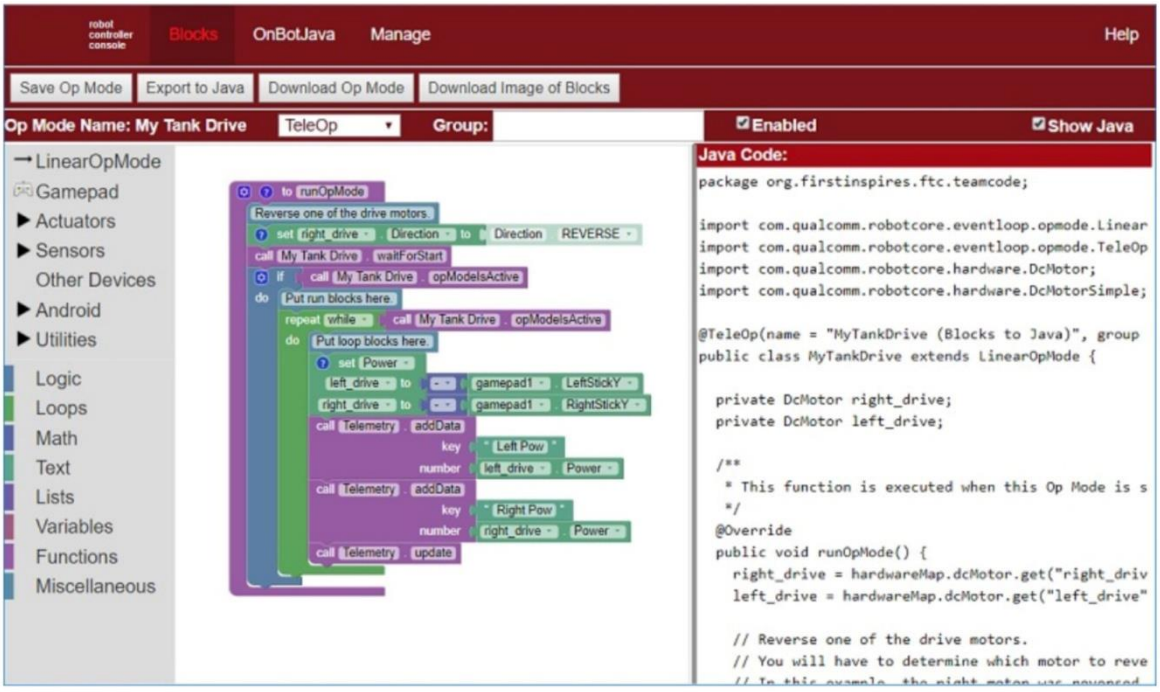
Robot-t2 is an educational robot made by students and teachers of the Technical School No. 2 "Independencia", Concordia, Entre Ríos; with the help of the Mechatronics Engineering degree

from UNER (National University of Entre Ríos) and the Industrial Design degree from UNLP (National University of La Plata).
It was presented to the National INNOVAR 2022 Contest of the MINCYT (Ministry of Science and Technology of the Nation). It was selected for its exhibition and was included in the catalog of innovative inventions and products, in the "Robotics + Artificial Intelligence" category.
The information presented was detailed below: text for the catalogue, narrating what the project consists of, what problem it solves, the reasons why it is better than the existing ones on the market (its difference with other similar products) and what is its operation.

Text for catalogue:
Robot-T2: is a didactic robot for pedagogical and educational purposes built by the Technical School No. 2 "Independencia" (Concordia, Entre Ríos) with advice from the Mechatronics Engineering (Robotics) career - UNER (National University of Entre Ríos, Headquarters Concord).

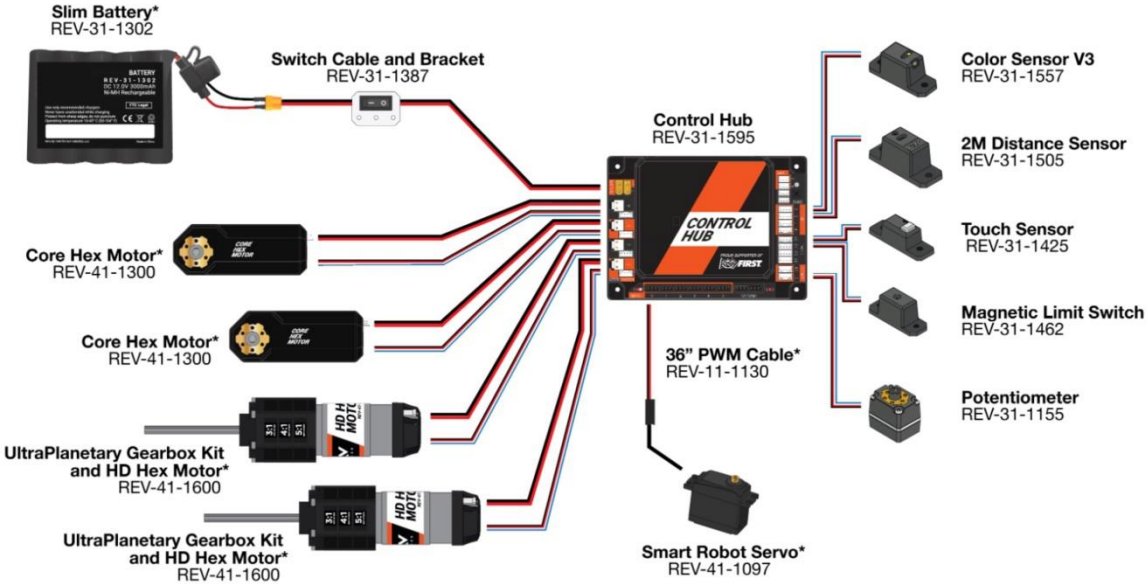
What is the project about? What problem does it solve?
Robotics seeks to accompany the implementation of new technologies in the educational system and inspire fundamental skills in today's society in students. It proposes that they use programming and robotics tools to find solutions to the great current challenges of Industry 4.0 and the current Industrial Revolution 4.0, while strengthening skills such as creativity, collaboration and teamwork. Applying programming, computing and robotics skills, students are prepared for the current world of "Industry 4.0" with an "Education 4.0" according to the new paradigm of the 4th. Industrial Revolution, where concepts such as: artificial intelligence, big data (data mining), the cloud, augmented reality, internet of things, CAD design, 3D printing, maker culture, drones, stand out.
Robotics is a means for the new generations to develop basic principles of programming and electronics, which today are very important skills that open up opportunities in the labor market (and the National Technical Education should not give it up with the advice of the University System). . It is promoted that this learning is oriented to the search for creative solutions to real life problems.
Conventional education in schools must have a focus on industry 4.0, making use of digital tools, artificial intelligence, computing and data analysis (big data) to train highly competitive technicians. Skills that are no longer the future, but the present.
Create and implement teaching and learning methods with critical thinking where the skills of being and their competencies will be decisive to survive current challenges. Articulating with the educational offer of higher education to meet the needs of the work environment. In this way we will build a solid educational offer updated to market demand.

Why is it better than the existing ones on the market? What is the difference?
It started with the acquisition of parts and purchase of standard parts from REV Robotics, for programming an OnBotJava block programming language was used that speeds up programming times and limits human errors in typing commands, said environment is loaded in a "HuB" next to a Tablet and remote controls. In order to program and then drive the robot, a private Wi-Fi network is created between the "HuB" and the Tablet and controls. There is a double advantage of interfacing (a) hardware and (b) software. By the (a) hardware interface we understand that the controls are operated by a human from a joystick that sends the information (making the human-machine interface environment very friendly) and by the (b) software interface by OnBotJava blocks; We know that in object-oriented programming,

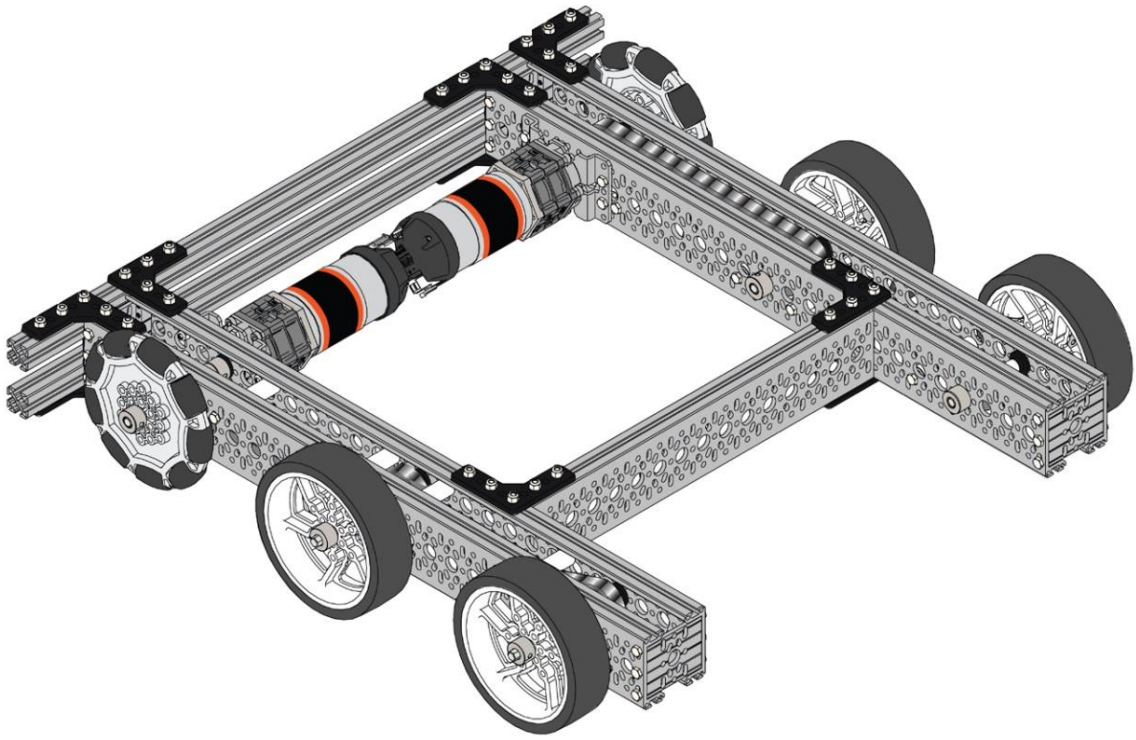


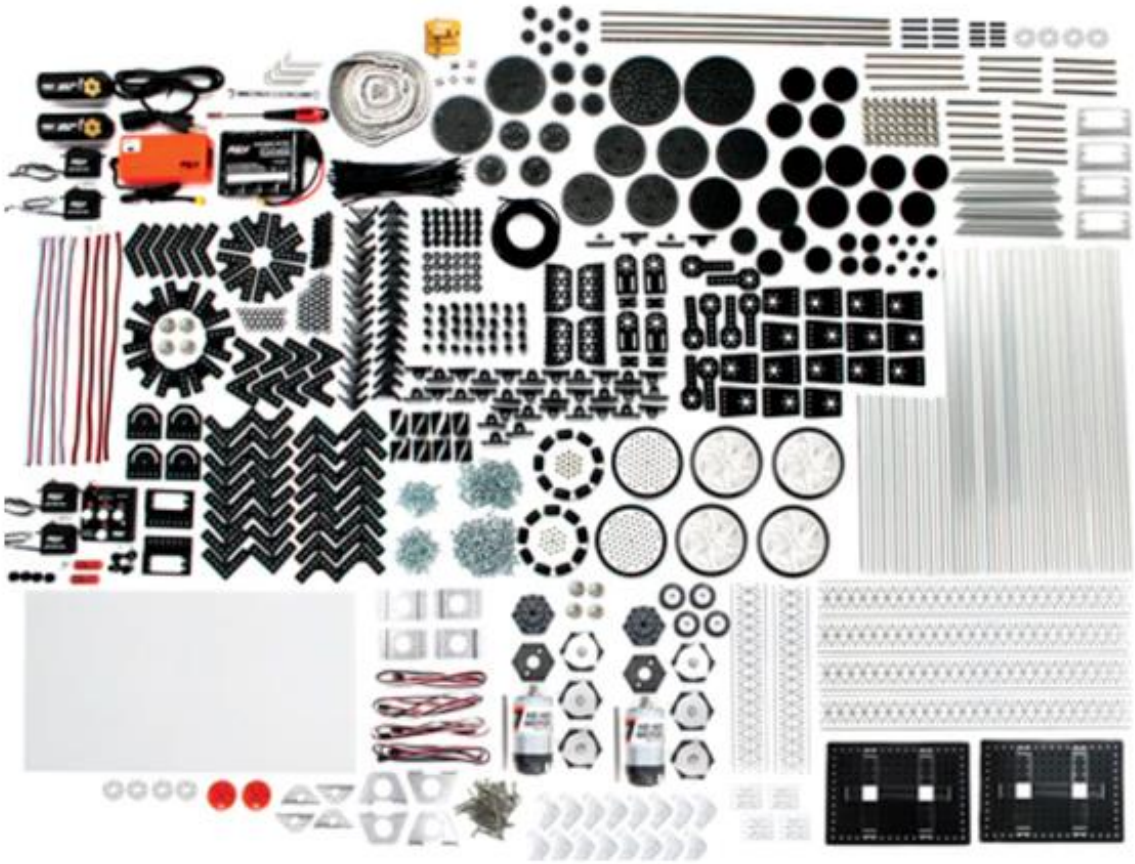
How does it work?

It works by assembling standardized structures (chassis, axles, extruded H profiles, L profiles, etc.) with other mechanical parts of machine elements (wheels, simple bearings, rack and pinion, gears, flexible transmissions such as chains, and other joining elements such as screws, etc.) moved by servomotors, actuators and direct current drive-motors powered by 12 (volt) batteries. What makes up a chassis with transmission (wheels) and a supporting structure of the "HubControl" and its power supply (batteries), then comes the design of the subsidiary structures (arms that carry out the tasks) with their corresponding motors, servos and actuators. , Works from the simplest as a simple machine (levers of various degrees, etc.),



Pieces and standardized parts, assembly of the structural chazis:





For the electronic control of the hardware, a software or block programming language OnBotJava was used, said environment is loaded in a "HuB" together with a Tablet and the remote controls. In order to program and then manage the robot, a private Wi-Fi network is created between the “Control-HuB” and the Tablet and the controls are controlled by a

joystick. The robot has the "Control Hub" which is similar to a human brain; decisions are made and actions are taken based on the code stored in it, all the actuators and sensors are connected to the control hub through the various input and output ports (imput-output).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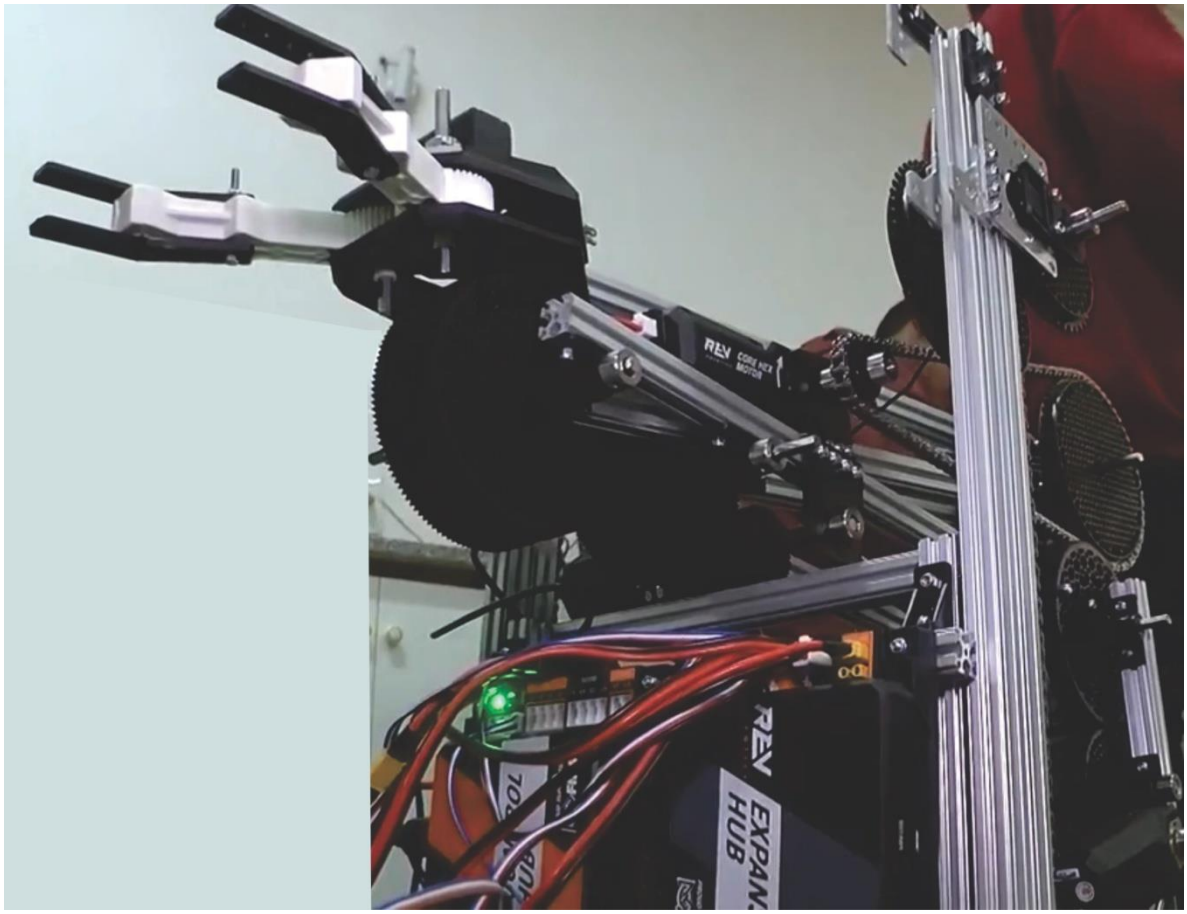
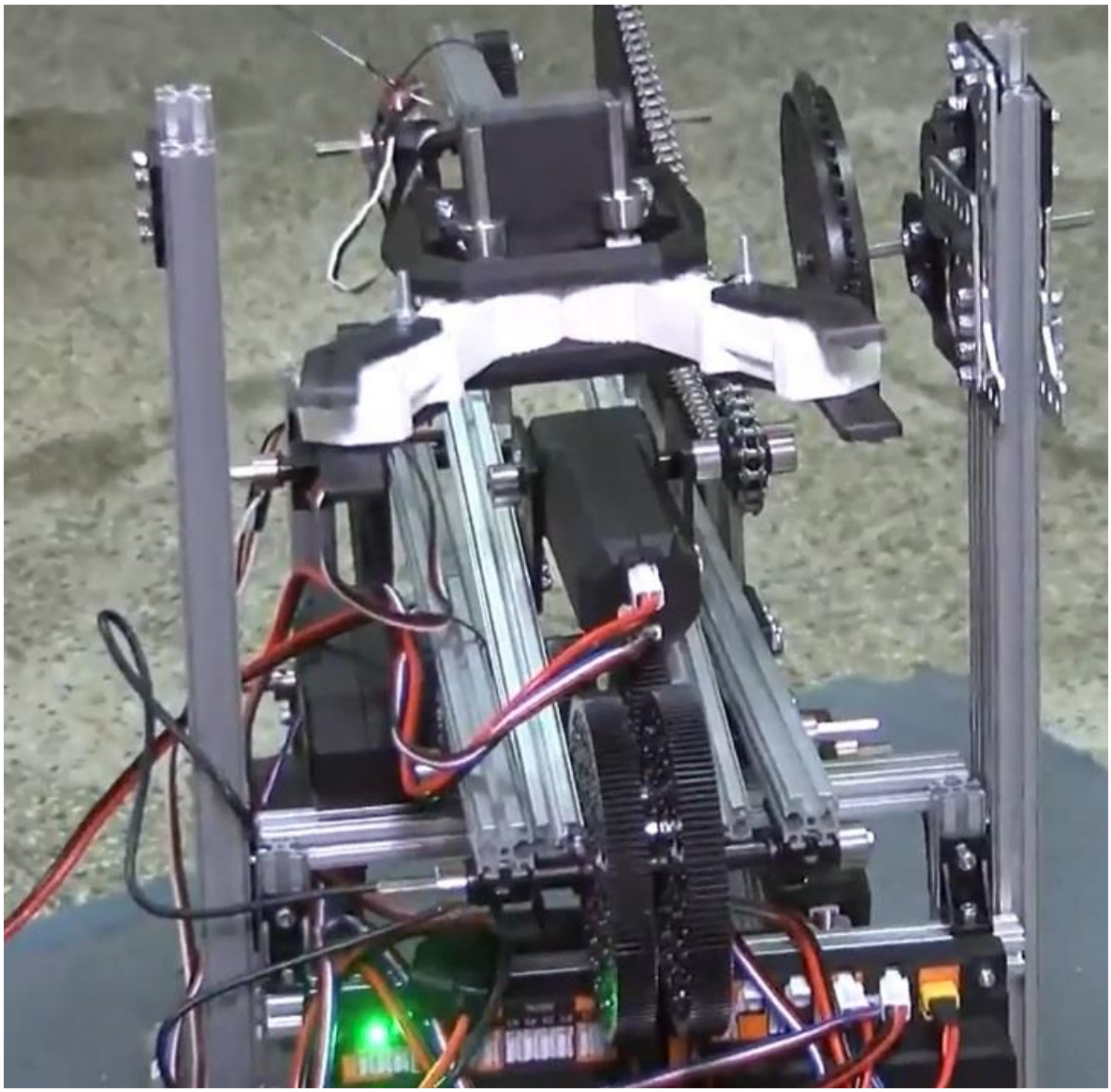
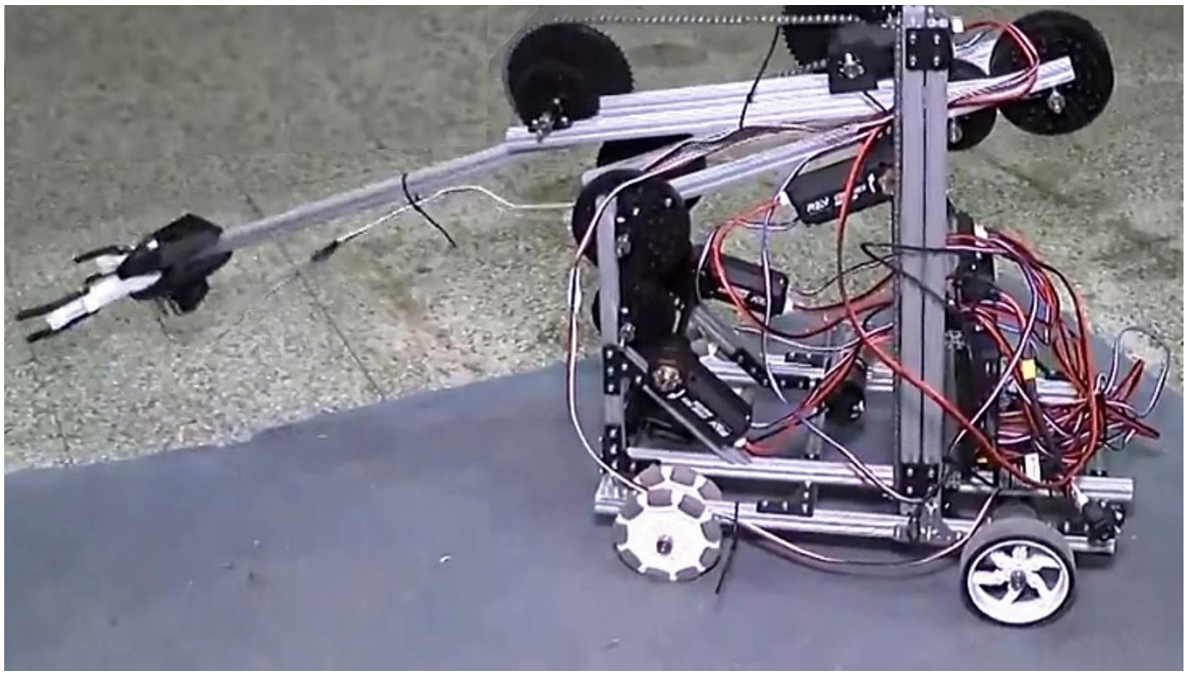
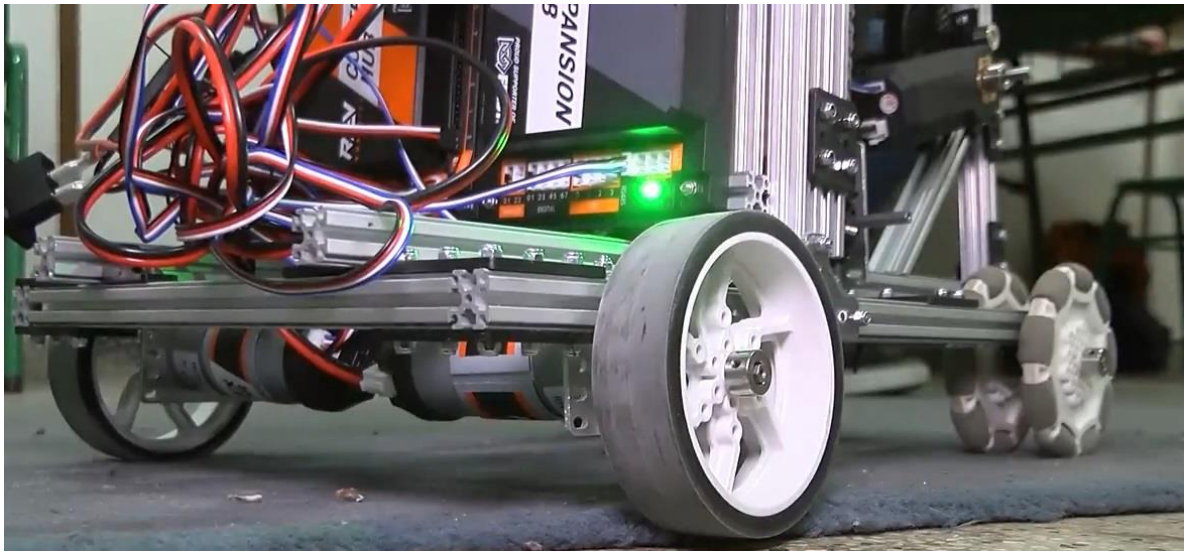
Photos.
Below photos of Robot-T2.





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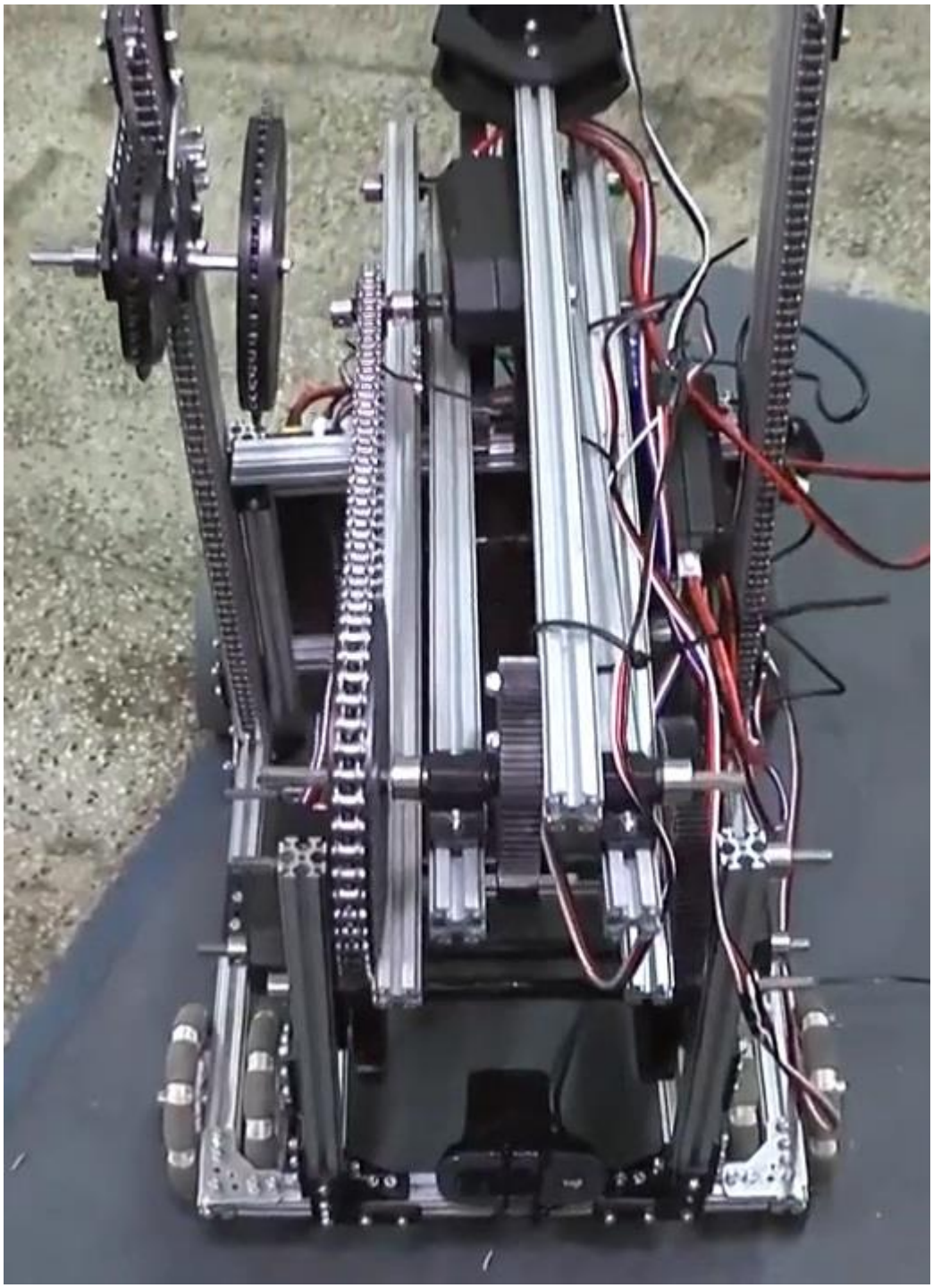

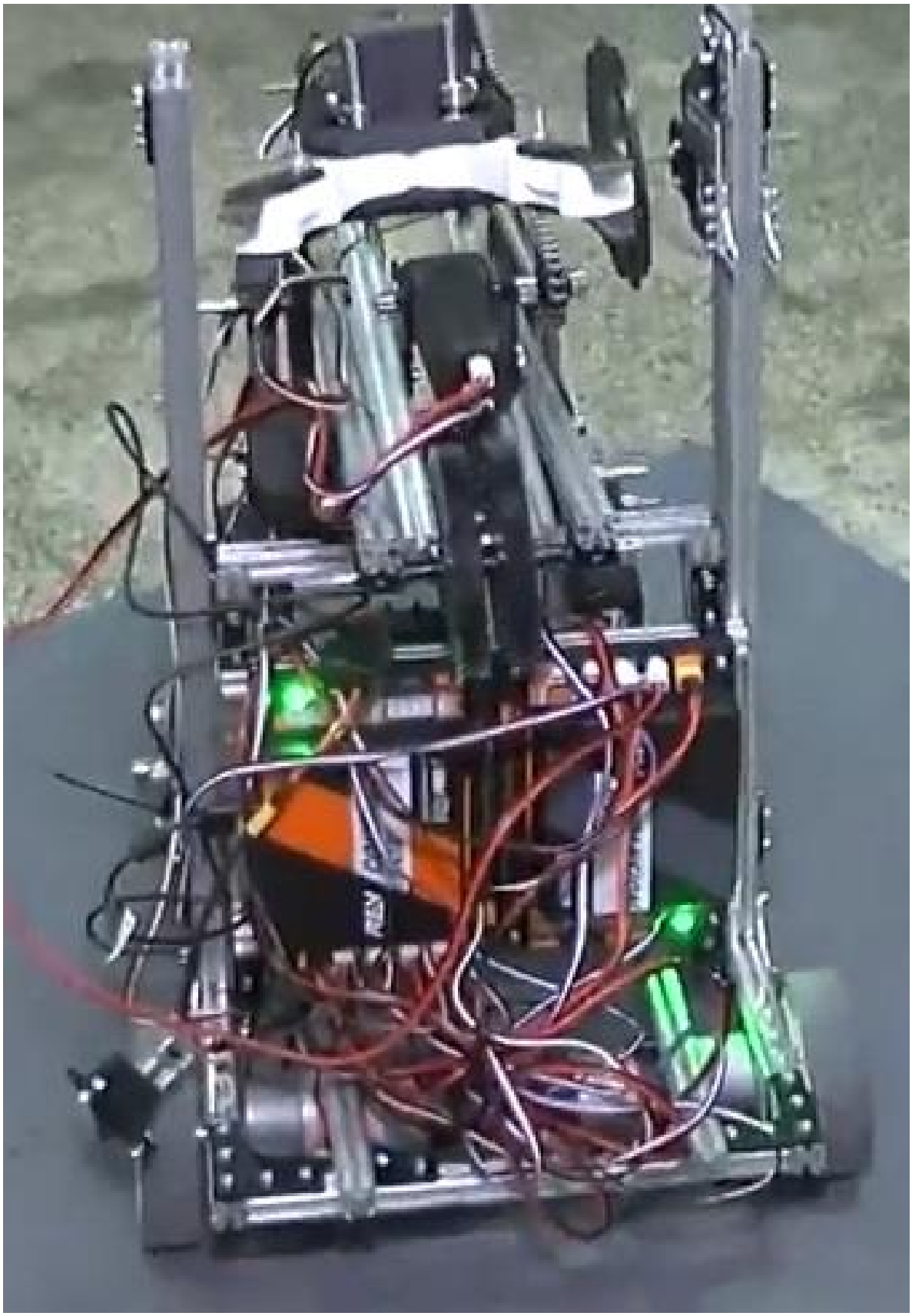

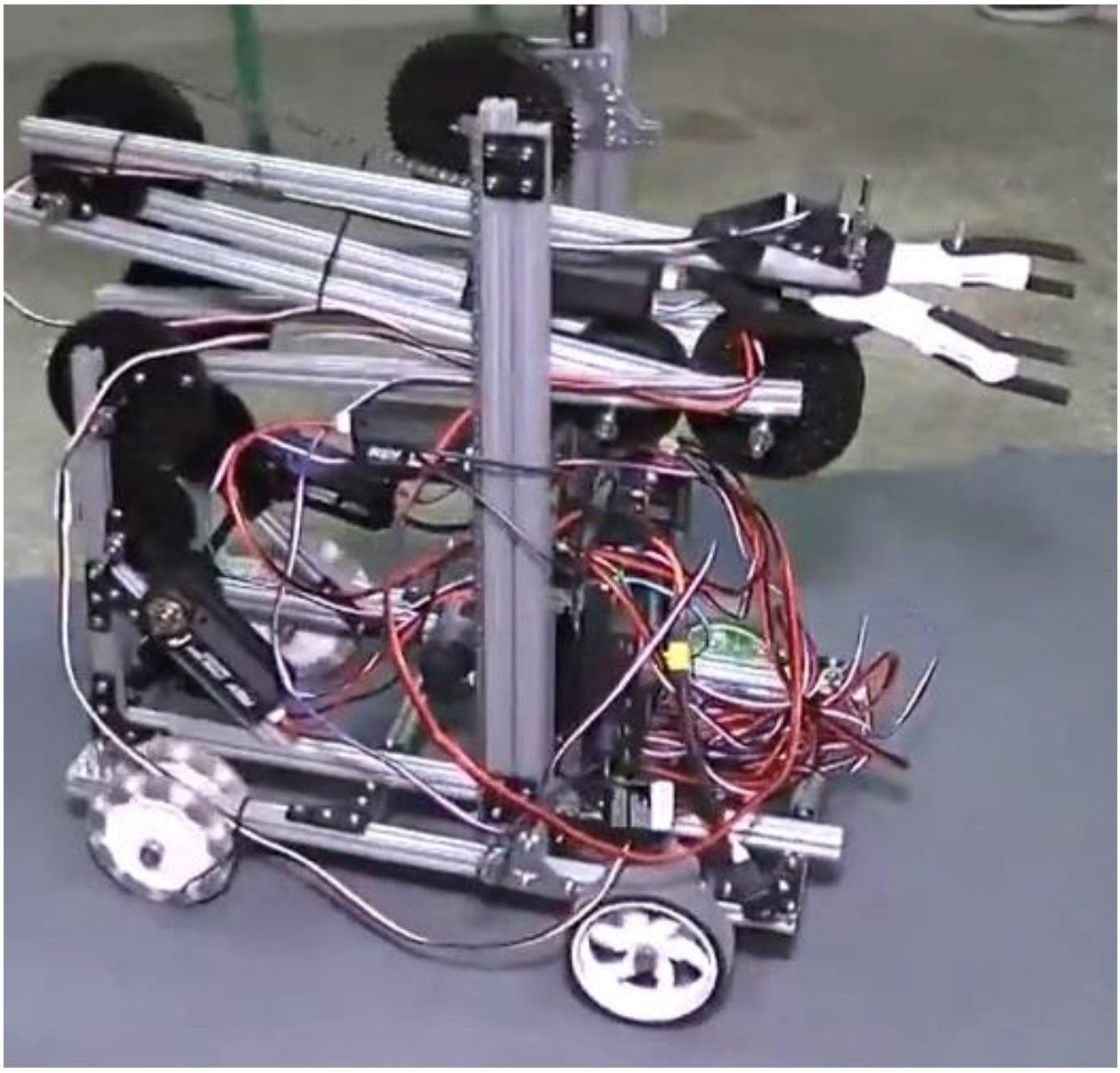

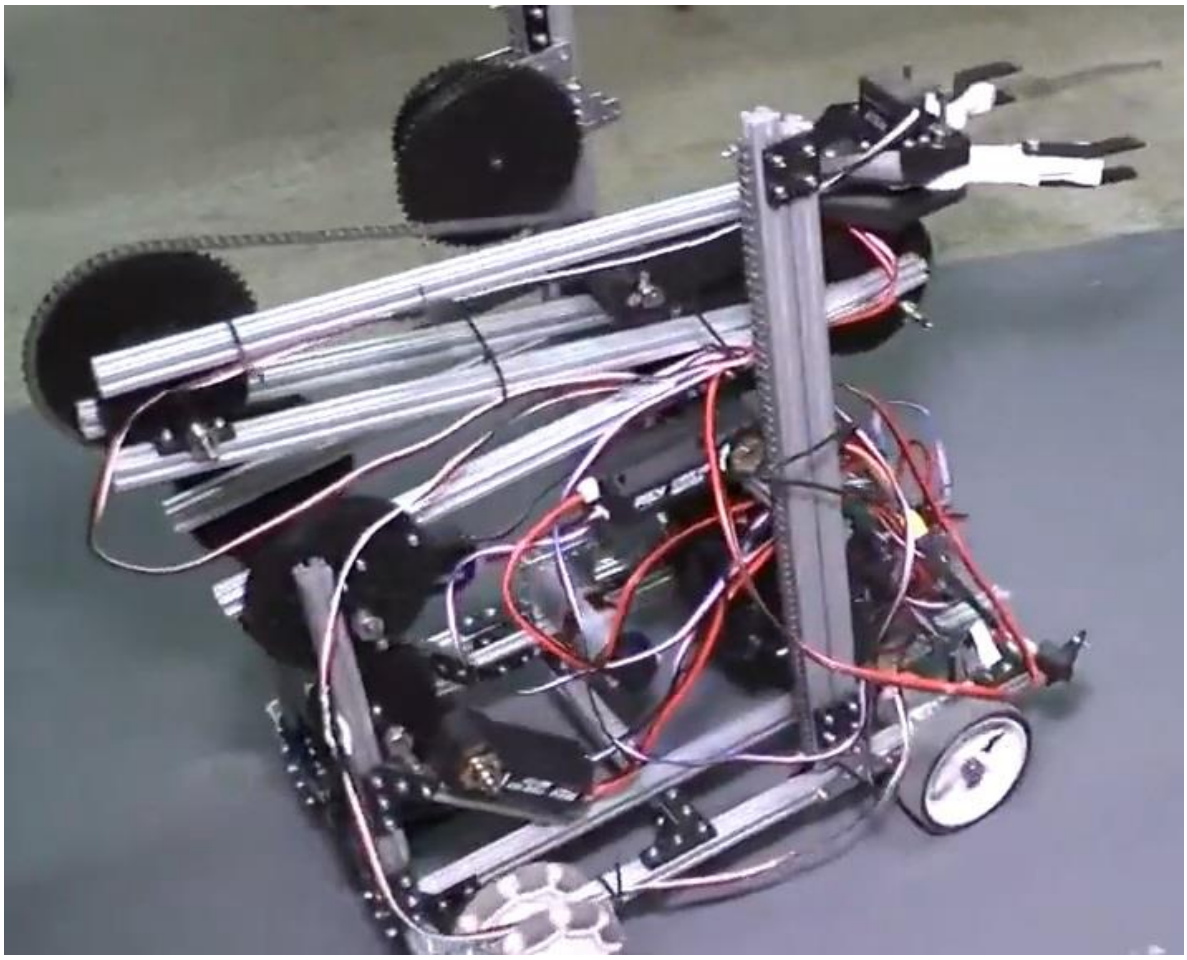

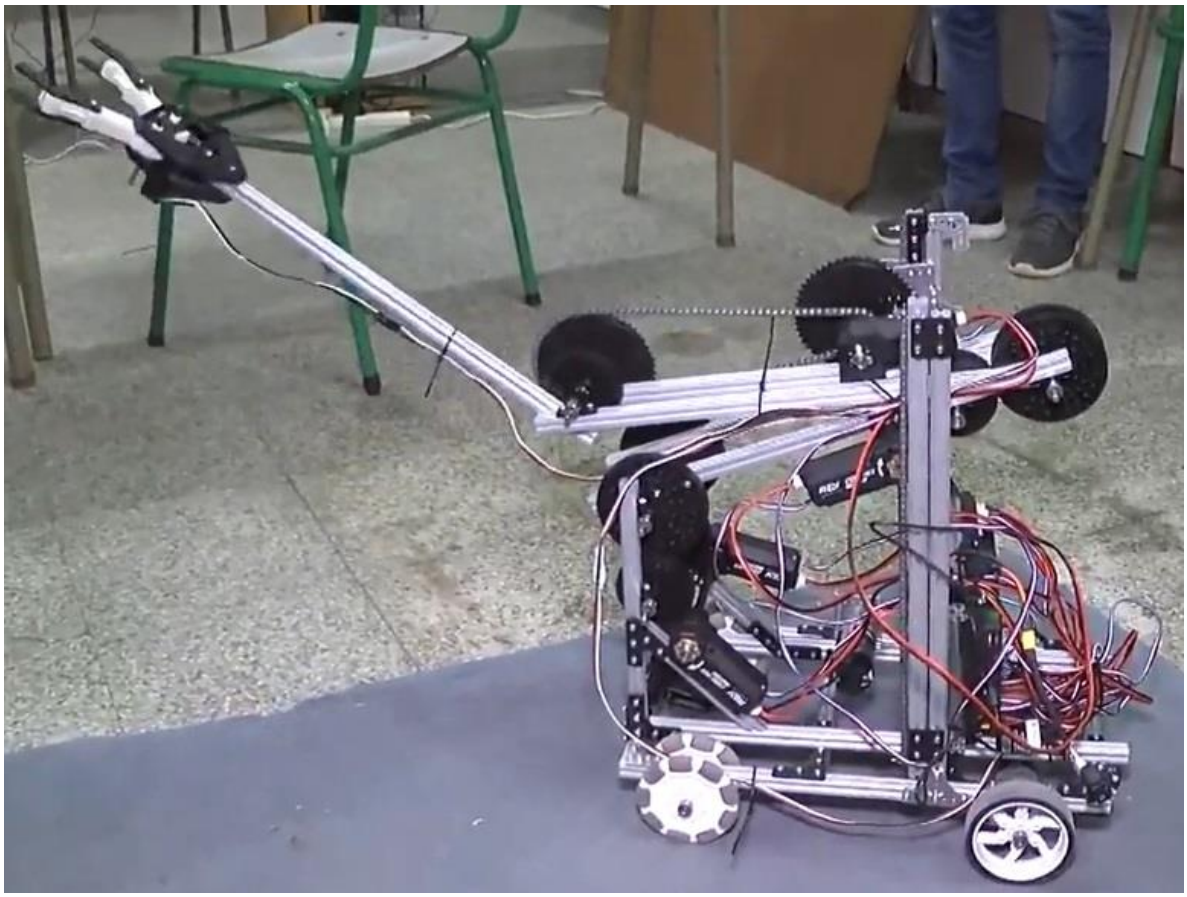

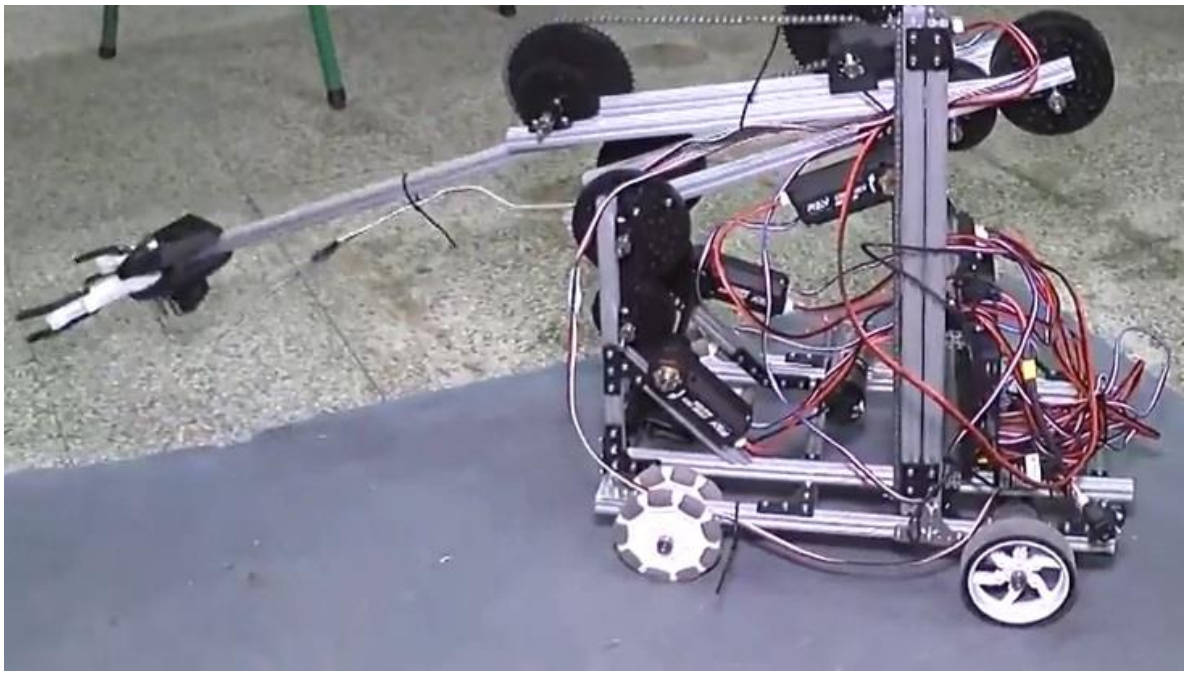

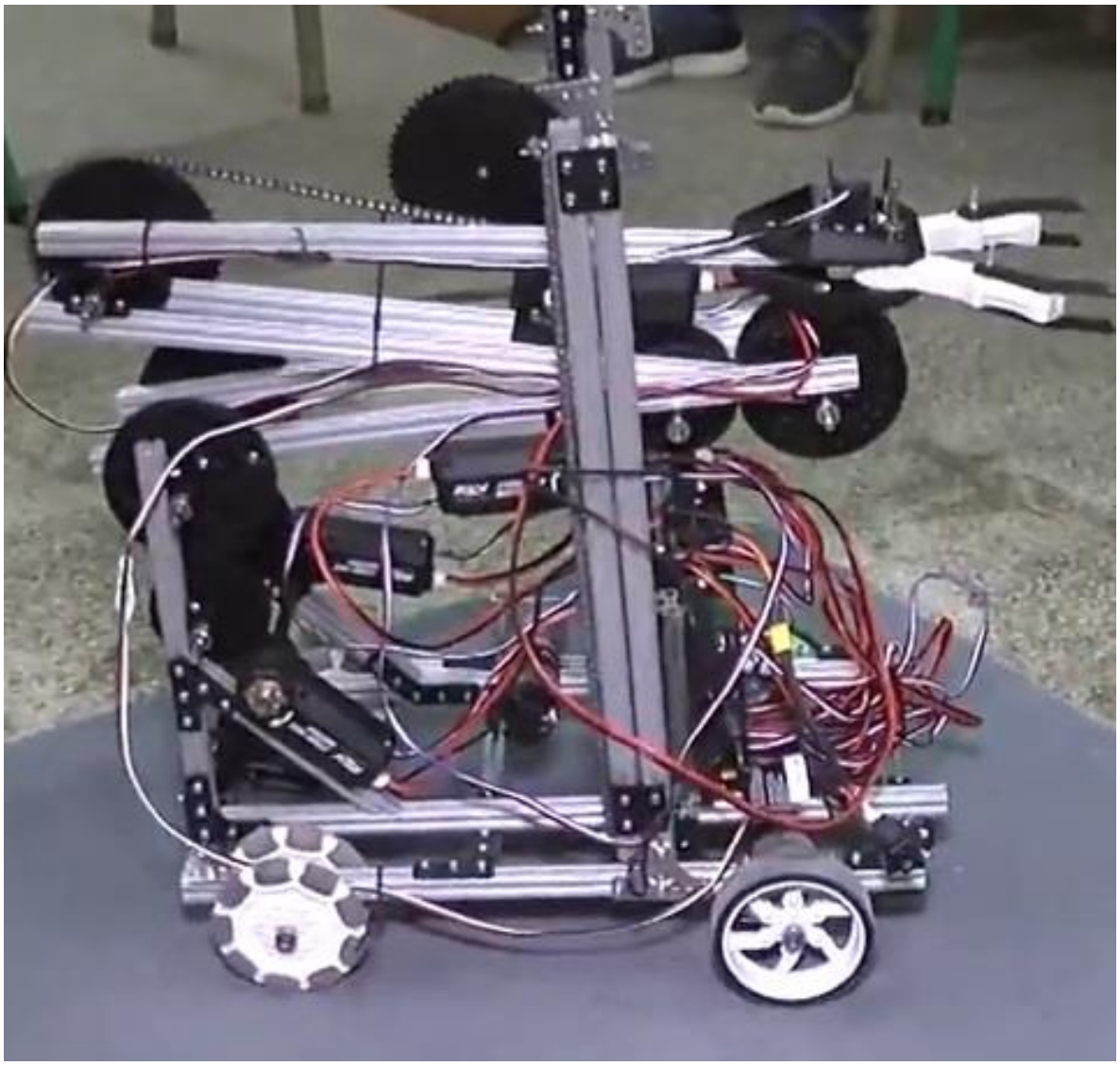

Conclusions:
Robot-t2 is an educational robot made by students and teachers of the Technical School No. 2 "Independencia", Concordia, Entre Ríos; with the help of the Mechatronics Engineering degree from UNER (National University of Entre Ríos) and the Industrial Design degree from UNLP (National University of La Plata). Complying with the requirements of the specialty of the career in computing of the Technical School, programming and robotics.
It was presented to the National INNOVAR 2022 Contest of the MINCYT (Ministry of Science and Technology of the Nation). It was selected for its exhibition and was included in the catalog of innovative inventions and products, in the "Robotics + Artificial Intelligence" category.
See official catalogue, on page 139 of the following link: https://www.innovar.mincyt.gob.ar/catalogos/catalogo_innovar_2022.pdf
With the following image:

This demonstrates the potential of its teachers, the technical and technological capacity of Technical School No. 2 and the creativity of its students.
For a 4.0 education according to an Industrial Revolution 4.0.

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