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BTU engineer candidates develop projects with Mitsubishi Electric robot

Robots controlled by human arm and 3D joystick

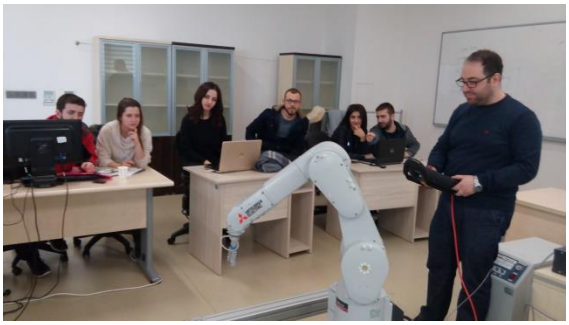
Mitsubishi Electric, which targets to contribute to the training of engineers who will lead industrial robot technologies, supports the establishment of Robot Training Center in universities. In this context, 6 axis industrial robot, PLC and driver systems, donated by Mitsubishi Electric to Bursa Technical University (BTU), are being used in the practical courses of the students. Undergraduate students, within the scope of "Industrial Robot Programming" course; while taking training on product transportation and placement via robot, different installation scenarios, realization of robotics tasks and system integration; graduate and Ph.D. students utilize robot in their thesis studies and projects. Among the prominent projects are those which allows the robot to move in synchrony with the human arm and is controlled by a 3D joystick connected from outside.

It is becoming increasingly important to train engineers who can program industrial robots which are indispensable of Industry 4.0 era, integrate them into production lines and design new robots. Mitsubishi Electric, being one of the leading brands in the field of factory automation and advanced robot technologies, supports training in order to educate experts who will lead future automation and industrial robot technologies in Turkey. Leading the establishment of the Robot Training Center in engineering faculties

of universities, Mitsubishi Electric contributes the students at Bursa Technical University in their use of advanced technology to pass on their innovative ideas with granted 6-axis industrial robots, PLC and drive systems.

Students learn to program robots

Students at Bursa Technical University aims to train engineers who are specialized in "Robotics and intelligent systems" in the field of robotics and who can provide innovative solutions to the field of automation in Turkey, learns to control and program the robots in the factory with Mitsubishi Electric robot. Undergraduate students, under "Industrial Robot Programming" course; while carrying out trainings involving product transport and placement with robots, different installation scenarios, realization of robotics tasks and system integration; graduate and Ph.D. students benefit from robots in their thesis studies and projects.



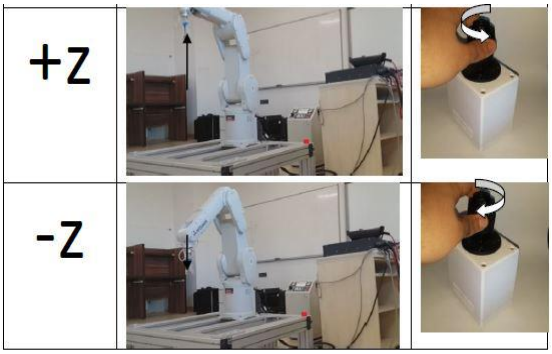
Robot synchronized with human arm

Mitsubishi Electric's human-precision 6-axis robot comes to the fore among the most sought-after projects, with the project titled "Designing Biomimetic Controller for Industrial Manipulators". The project allows the robot to move synchronously with human hand and arm movements, allowing the robots to be used easily even by those who do not dominate computer software. In a project aimed at making things easier for people which endangering the safety of people, such as repairs of nuclear spills, cases where the astranauts need to be evacuated in defense industry or space stations, with the help of sensors placed in the human body, the position of the human palm in space is calculated with kinematic equations and robotic motion information is transmitted. The robot is moving using this information.

In the project aiming to control the retaining part on the end of the robot, an intelligent sensor is used that generates electricity from the muscles in the human body and makes sense of these muscle movements. Thanks to the intelligent sensor attached to the human arm, the control the robot holder is provided by opening and closing the human hand. Therefore both the orientation of the robot and the opening and closing movement of the holder on its end can be controlled synchronously with the human body. In the next

step of this application, which does not require a software for a new command, it is aimed to recognize the freedom of movement by removing the cables that enables communication between the sensors attached to the human body and the robot, and provide the possibility to operate without any need of a computer.

Robot control with 3D joystick



Another project performed with Mitsubishi Electric robot aims to control the robot arm by means of a 3D joystick connected from outside. Industrial robots, which are involved in a wide variety of tasks in manufacturing systems, are controlled with the help of keys on the teach pendant, and moving the robot using these keys requires expertise. In the project developed with Mitsubishi Electric's 6-axis robot, a 3D joystick is used to direct the robot which is much easier to use than a hand control. Within the scope of the project presented as a declaration in International Conference on Advanced Technology and Science (ICAT'2017); the ethernet protocol is used to connect the joystick to the robot controller. The joystick controller obtained at this point directs the robot in three axis and provides a more effective control.

About Mitsubishi Electric Corporation

With over 95 years of experience in providing reliable, high-quality products, Mitsubishi Electric Corporation is a recognized world leader in the manufacture, marketing and sales of electrical and electronic equipment used in information processing and communications, space development and satellite communications, consumer electronics, industrial technology, energy, transportation and building equipment. Embracing the spirit of its corporate statement, Changes for the Better, and its environmental statement, Eco Changes, Mitsubishi Electric endeavors to be a global, leading green company, enriching society with technology. The company recorded consolidated group sales of 4,238.6 billion yen (US$ 37.8 billion) in the fiscal year ended March 31, 2017. For more information visit: www.MitsubishiElectric.com*

** It was calculated by 1 USD = 112 Yen exchange rate announced by the Tokyo Foreign Exchange Market on March 31, 2017.*

About Mitsubishi Electric's Activities in Turkey

Mitsubishi Electric's main fields of activity in Turkey are; air conditioning systems, factory automation systems, CNC mechatronic systems, and advanced robotics. In addition to these activities, the company also supports satellite, elevator, visual data systems, power supplies and transport infrastructure. Mitsubishi Electric, the producer of Turksat 4A and 4B satellites, which contributes to the communication and publishing infrastructure of Turkey and neighboring countries, is notable for its satellites as well as the automation

technology used in the Marmaray project. In April 2016, Mitsubishi Electric, which has established a domestic air conditioning development and production company in Turkey, is preparing to make production in January 2018 in the Manisa factory. For more information; tr.mitsubishielectric.com

About Mitsubishi Electric Turkey Factory Automation Systems

Mitsubishi Electric Turkey Factory Automation Systems; provide added value in terms of rapid integration, productivity, flexibility and productivity to the leading industrial companies in Turkey in various fields such as automotive, food, packaging, metal and PVC processing machines. The new industry, also called "Industry 4.0", responds with e-F@ctory, i.e. the digital factory concept. For more information; tr3a.mitsubishielectric.com