Media Inquiries:

Mitsubishi Electric Turkey PR Agency

İnomist Communication Consultancy

Sibel Selvi Arslantürk sibel@inomist.com

+90 216 639 60 16 / +90 533 441 80 33

This text is the English translation of the official Turkish version of the applicable press release. It has been prepared solely as a reference and ease of use. Please refer to the original Turkish text for details and/or attributes. In case of any incongruity, original Turkish version shall prevail.

06 February 2017

Mitsubishi Electric's 6-axis robot is at the disposal of engineering students at Doğuş University for experimental practices

Chess Game: Human vs. Robot

Mitsubishi Electric, a recognized world leader in factory automation business, supports universities in their efforts to establish Robot Training Centres to raise engineers who will steer industrial robot technologies which is known to assume an increasingly more important role in industrial practices. In that respect, students at Doğuş University have already succeeded in making a robot dance as part of practical courses at Industrial Automation and Robot Technologies Training Centre, established by Mitsubishi Electric in collaboration with Doğuş University. Now, the students will have the robot play chess with a human being.

Robots which are critical for manufacturing processes at factories as part of Industry 4.0 assume an increasingly more important role in industrial practices thanks to the speed and other advantages they provide. In parallel with the industrial developments, it is indispensable to raise engineers who will be able to design codes for industrial robots used for not only manufacturing industries but also science and medicine, integrate robots to manufacturing lines and design brand-new robots. Mitsubishi Electric, a recognized world leader in factory automation and high robot technologies, provides support to educational institutions in order to enable them to raise engineers who will

steer the future of automation and high robot technologies in Turkey. Acting as a pioneer for establishment of Robot Training Centres at engineering schools in various universities, Mitsubishi Electric encourages students at Doğuş University to put their innovative ideas into practice with the help of high technology introduced through Mitsubishi Electric's 6-axis industrial robot.

The Industrial Automation and Robot Technologies Training Centre has been home to various significant projects since it was established by Mitsubishi Electric in collaboration with Doğuş University. 77 students have already received certificates of achievement as part of the training programmes organized at the training centre which undertakes national and international academic studies and projects. Engineering students were greatly appreciated with the techno-art dance show created by coding Mitsubishi Electric's 6-axis industrial robot to react to flexible dance figures like a human being in 2015 and now, they are teaching the robot to play chess.

Chess project with robot simulator

Practical technology instruction offered in conjunction with games makes it easier and more enjoyable to learn complex technologies. Thus, Doğuş University students decided to focus on chess which is especially attractive for studies of human-machine interaction according to which they are working on a specific computer software that will defeat a human being to display the progress in technology. "Chess with Robot Project" is comprised of three steps which will result in the development of a robotic system that is capable of playing chess with human beings.

During the first phase of the project, the students designed a “library for identification of hand movements” as a result of which they created a library in which operators used their hands instead of a mouse or keyboard to control the robot in simulation and move the chess pieces. A system playing chess was developed with the use of Mitsubishi Electric robot under the second phase. In that respect, human moves are made by means of a computer interface and the computer makes a move in both the screen and chessboard after validating the move in terms of compatibility with chess rules. After the human being makes a move, the robot makes another move in the interface and chessboard. The final phase of the project will be comprised of designing a visual sensor to enable the robot play chess with a human being.

Basic robot training to professionals in the industry

The Industrial Automation and Robot Technologies Training Centre was established jointly by Doğuş University and Mitsubishi Electric in order to enable engineering students to practice what they learn at robot technologies and advanced motion control courses. Use of robots for training purposes improves the creative thinking skills of individuals in addition to various other advantages such as self-confidence, communication, leadership, interpretation of objects and practice of theoretical information. Having offered certificates of achievement to 77 students since 2015, the training centre allows students to use Mitsubishi Electric robots for their summer internship programmes and graduation projects and organizes basic robot training programmes for the professionals in the industry.

Real-time communication advantage

Mitsubishi Electric robots provide scientists with a controlling infrastructure capable of real-time communication based on mathematical models they create in theory thanks to Multi CPU feature that combines various different automation disciplines including PLC CPU, Robot CPU, Motion CPU and CNC CPU. Ethernet, Profibus, Profinet, DeviceNet and CC-Link network connections integrate robots into larger systems easily in order to make it possible for operators to have access to all phases of the processes. Mitsubishi Electric robots are marked with 64 bit Risc CPU implying easy integration with peripheral equipment (e.g. image processing equipment) as if such equipment is part of its own structure. This high technology which allows 7 cameras to connect to a robot on Ethernet also comes with high speed processing ability to promote integration with Matlab and similar theoretical simulation software.

About Mitsubishi Electric Corporation

With over 90 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 endeavours to be a global, leading green company, enriching society with technology. The company recorded consolidated group sales of 4,394.3 billion yen (US$ 38.8 billion) in the fiscal year ended March 31, 2016. For more information visit: www.MitsubishiElectric.com*

** At an exchange rate of 113 yen to the US dollar, the rate given by the Tokyo Foreign Exchange Market on March 31, 2016.*

About Mitsubishi Electric Turkey Operations

Mitsubishi Electric concentrates on sales and after-sales services for HVAC systems, factory automation systems, CNC-Mechatronics systems and advanced robot technologies in Turkey. In addition, the company provides support for satellite, elevator, visual data systems, power sources and transportation-based infrastructure projects. Mitsubishi Electric, the acknowledged manufacturer of Turksat 4A and 4B satellites contributing to communication and broadcasting infrastructure of Turkey and neighbouring countries, is also recognized for the automation technology used for Marmaray project. Having incorporated a company for development and

manufacturing of room air-conditioners in Turkey in April 2016, Mitsubishi Electric intends to start manufacturing operations in Manisa plant by January 2018. For more information visit: tr.mitsubishielectric.com

About Mitsubishi Electric Turkey Factory Automation Systems

Mitsubishi Electric Turkey Factory Automation Systems division provides added value to leading industrial corporations in Turkey in a range of fields including automotive, foodstuff, packaging, metal and PVC processing machinery in terms of fast integration, efficiency, flexibility and productivity. It has adapted to "Industry 4.0", the new industrial phase, with its digital factory platform known as e-F@ctory.