FONDAZIONE BRUNO KESSLER
MAGAZINE

ProM Camp: full immersion in INDUSTRY 4.0 for students

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Over 20 students from six schools, five from Trentino and one from Verona, participated in the technology and prototypes "full immersion" in the Polo Meccatronica laboratories

The first edition of ProM Camp, the full immersion in mechatronics promoted by Fondazione Bruno Kessler and Trentino Sviluppo, with the funding of the Caritro Foundation, has been successfully completed. It aimed to encourage high school students to cultivate new skills in the field of Industry 4.0. The work carried out by the students and the predictive maintenance industrial prototype designed during the laboratory week held March 5-9 in the mechatronics laboratories, using technologies, machines and knowledge provided by FBK and ProM Facility experts, were presented on Friday. April 20 at the laboratories of the ProM facilities in Rovereto.

The event was attended by the Vice President and Councilor for Economic Development and Employment of the Autonomous Province of Trento **Alessandro Olivi**, the President of Trentino Sviluppo, **Flavio Tosi**, and the president of Fondazione Bruno Kessler, **Francesco Profumo**.

“When we imagined and created the Mechatronics Hub”, said Olivi, “we did it to allow kids to have a place and a space in which to study, imagine and transform their ideas into projects for the future. These students have worked on new technological infrastructures together with researchers and I hope that one day they will be the players in the companies that will drive this district. I believe the project they have developed and presented today is the demonstration that, with this hub, we have made first of all an investment for the jobs of the new generations “.

“At the beginning when we talked about mechatronics”, continued Tosi, “many people did not believe it was possible to develop a district of this kind in Trentino. Now, after just a few years, everyone knows what they are talking about when mechatronics is mentioned and there are already many companies that have chosen to invest in this sector in Trentino. Polo Meccatronica is a place that is growing and that promotes initiatives, including the ProM Camp, which make it real and alive. The strength of this center is that it is not made up of companies only, research only, or schools, but of the union of all this”.

“The project presented today”, Profumo pointed out, “is a good example of how local institutions and research organizations can cooperate for training purposes. It is no longer a matter of school-

work alternation, but of school-work alliance. Fondazione Bruno Kessler has twenty years of experience in making this camp formula for kids, thanks to WebValley, and we can say that it works. The FBK researchers turned from teachers to tutors and made it possible for almost a small miracle to happen in just five days. The kids have developed a real prototype for predictive maintenance, a modern aspect of production, increasingly important in sharing economy. The teaching model developed is very engaging for students who become the main players, with a strong alliance between teaching method and technology, created in spaces of contamination between different areas “.

The FBK researchers working group (Fabio Antonelli, Amos Collini, Claudia Dolci, Luca Herzog, Andrea Maestrina, Tal Melamed, Silvio Ranise, Marco Roveri) was also present and a representative of the participating students illustrated the results of the project. Principals Giuseppe Rizza (ITT Marconi, Rovereto), Laura Scalfi (CFP Veronesi, Rovereto) and Laura Zoller (ITI Buonarroti, Trento) also took part.

The camp included lessons with FBK expert aimed at identifying practical hands-on solutions for the prototype.

A group of 22 students coming from high school specializing in science and technology, selected by the schools themselves, was offered a 5-day educational program March 5 to 9, 2018, aimed at developing a prototype system for predictive maintenance in Industry 4.0.

The students were then divided into two groups that were assigned the task of creating a prototype of the integrated overall solution. The participants were provided the technology infrastructures and FBK researchers who followed them during the different phases of the project.

In particular, the students developed a prototype of predictive maintenance applied to a cooling fan. The system is able to automatically warn users when the piece is about to break so that maintenance is more effective and faster than the traditional scheduled maintenance, thus allowing productive organizations to save money and time. All this was made possible by using sensors, data collectors, cloud platforms, analysis algorithms, machine learning techniques, data transmission, storage and visualization, as well as considering and contextualising cyber-security and privacy issues.

At the end of the activities, the two groups prepared a presentation to illustrate the results achieved and each one organized a demo of the integrated solution. The presentation and the demo were then discussed in front of principals, teachers and FBK researchers. Overall, the students have achieved the goals set, showing a high degree of self-organization and initiative that led them to exceed the (already high) objectives initially set.

The challenge program has been recognized credit accrual for the Alternating School and Work Program (38 hours).

In a second phase of the project (April-September 2018) the students will be able to continue the activities, deepen the topics covered during the camp and apply the skills acquired in concrete working contexts thanks to individual internships at Fondazione Bruno Kessler, in the ProM Facility or at an interested company.

The ProM Camp and the following traineeships will constitute an experimental model of student involvement to be replicated also with the interested companies.

Participating Schools

The schools that participated in the Challenge are as follows:

? ITT “Guglielmo Marconi”, Rovereto, with 5 students;

? CFP “G.Veronesi”, Rovereto, with 2 students;

? ITT “M. Buonarroti “, Trento, with 5 students;

? Lorenzo Guetti High School, Tione, with 3 students;

? ENAIP Tione, with 2 students

? ITIS G. Marconi, Verona, with 5 students;

Total: 22 students, selected by the schools.

Units involved

The activities were organized and followed by the tutors of the following groups:

? FBK CreateNet – OpenIoT (Fabio Antonelli, Luca Capra, Andrea Maestrini)

? FBK ES – Embedded Systems (Marco Roveri)

? FBK ST – Security&Trust (Silvio Ranise, Tal Melamed)

? FBK RIS – Research and Innovation for Schools (Claudia Dolci)

? ProM Facility Team (Paolo Gregori, Amos Collini, Luca Herzog)

Training contents

The program covered the following contents:

? Introduction to Industry 4.0 for contextualization purposes (Fabio Antonelli)

? Introduction to Predictive Maintenance and architecture of the solution (Marco Roveri)

? Introduction to Arduino, configuration, installation and sensor configuration, acquired data acquisition and transmission (Andrea Maestrini)

? Introduction to Digital Signal Processing and feature extraction in Python (Marco Roveri)

? Introduction to general and Industry 4.0-related CyberSecurity & Privacy issues and secure communication configuration (Silvio Ranise)

? Introduction to security in IoT, Python cryptopraphy techniques and to Bluetooth Low Energy (Tal Melamed) secure communication

? Introduction to Machine Learning in Python (Marco Roveri)

? Introduction to communication via MQTT and serialization with Google Protocol Buffer in Python (Marco Roveri)

? Introduction to’edge/gateway computing and use of rapid prototyping tools for IoT applications, such as Node Red (Luca Capra)

? Organization and logistics (Claudia Dolci, Amos Collini e Luca Herzog)

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