MISSION IN THE PALESTINIAN TERRITORIES (WEST BANK)
January 3rd – January 24th, 2014
Joëlle MAILLEFERT, Jean DEPREZ, Julien DEPREZ

1- Missionaries, finances

- Jean DEPREZ, retired professor of Paris-Sud University, president of the association MedLink.
His mission (January 3rd – January 24th) was supported by the French Consulate in Jerusalem, MedLink, the Schneider Foundation, Al Quds University, Bir Zeit University and Palestine Polytechnic University.
- Julien DEPREZ, manager of the DOOD (Digital Objects On Demand) company.
His mission **(**January 3**rd** – January 12th**)** was supported by the French Consulate in Jerusalem, MedLink, Al Quds University and Bir Zeit University.
- Joëlle MAILLEFERT, professor at IUT CACHAN, Paris-Sud University.
Her mission (January 17th – January 24th) was supported by the Schneider Foundation and Palestine Polytechnic University.

2- Context

Reference: Mission in the Palestinian Territories (West Bank), September 21st –28th, 2013, Jean DEPREZ (http://associationmedlink.com/cariboost_files/RPT_PAL_2013_09.pdf).
- 3D Design Software and Mechatronics Systems were two of the subjects pointed out when visiting in November 2011 Palestinian Universities and Companies. In this context, MedLink, in association with the French Company DOOD (Digital Objects On Demand), proposed a workshop "Rapid prototyping" witch introduces 3D software and 3D printing. The 3D printer is a perfect example of a Mechatronics system. After presentation of this project to different Palestinian universities, it was decided to organize this workshop in the Faculty of Engineering of Al Quds University. Bir Zeit University was also interested to acquire a 3D printer.

- The project "Supporting professional curricula in Palestine Polytechnic University" has been approved by the Schneider Foundation, PPU and MedLink. It consists in 3 phases of equipment and training of trainers in the fields of Industrial Automation and Electric Energy Distribution. The agreement of the phase 1 of the project has been signed by all partners in September 2013. A grant of 46 000 € has been received by MedLink from the Schneider Foundation, to support the equipment and the training sessions of phase 1, i.e. upgrading automation lab1.
As soon as the grant was received, MedLink ordered all the equipment to ADVANtech, a Palestinian Schneider partner integrator, who has in charge the integration and installation of the equipment in PPU, according to MedLink specifications.
A working meeting has been organized in September 2013 in PPU, between Schneider, PPU academics, ADVANtech and MedLink in order to define the implementation of the equipment in the automation lab and the agenda of installation, test and training sessions.

3- Objectives of the mission.

- Mounting and testing a 3D printer DOM ("Digital Object Maker") in Al Quds University (2 days).
- Training workshop in Mechatronics "Rapid prototyping: 3D design and Printing" in Al Quds University (4 days)
- Mounting and testing a 3D printer DOM in Bir Zeit University (2 days).
- Installation and testing industrial automation equipment in Palestine Polytechnic University (3 local control units, 3 student interfaces, 3 operative parts) (4 days)
- Training workshop1 in industrial automation in PPU (5 days)
- Preparation of workshop 2: equipment to be installed, interfaces to be designed and integrated, program and agenda.

4- Agenda of the mission

General agenda of the mission:

	Arrival in Palestine AF 1620	Al Quds Mounting and test of the 3D printer	Al Quds Training workshop "3D Design and Printing"	Bir Zeit Mounting and test of the 3D printer	Departure to Paris AF 1621	PPU Installation and Tests of the aurtomation lab	Arrival in Palestine AF 1620	PPU Training workshop1 automation lab	Departure to Paris AF 1961
Julien	03-janv	04 and 05-janv	06 to 08-janv	10 and 11-janv	12-janv				
Jean	03-janv	04 and 05-janv	06 to 08-janv	10 and 11-janv		13 to 16-janv		18 to 23-janv	24-janv
Joëlle							17-janv	18 to 23-janv	24-janv

Details of the mission:

Date	Joëlle	Julien	Jean	Location	Activity	Night
Friday 3rd		X	X		Paris - Tel-Aviv - Jerusalem	Jerusalem Jerusalem - Hotel
Saturday 4th		X	X	Al Quds University	Mounting of the DOM	Jerusalem Commodore - Hotel
Sunday 5th		X	X		Test of the DOM	Jerusalem Commodore - Hotel
Monday 6th		X	X		Training workshop "Rapid Prototyping : 3D Design and Printing"	Jerusalem Commodore - Hotel
Tuesday 7th		X	X			Jerusalem Commodore - Hotel
Wednesday 8th		X	X			Jerusalem Commodore - Hotel
Thursday 9th		X	X		Open day	Jerusalem Commodore - Hotel
Friday 10th		X	X	Bir Zeit University	Jerusalem - Ramallah / Mounting of the DOM	Ramallah Al Moghrabi Family
Saturday 11th		X	X		Test of the DOM	Ramallah Al Moghrabi Family
Sunday 12th		X			Ramallah - Tel Aviv - Paris	
Sunday 12th			X		Ramallah - Tel Aviv - Jerusalem	Jerusalem Jerusalem - Hotel
Monday 13th			X	Palestine Polytechnic University	Jerusalem - Hebron / Preparation of the workshop	Hebron Hebron - Hotel
Tuesday 14th			X		Preparation of the workshop / Installation and tests	Hebron Hebron - Hotel
Wednesday 15th			X		Preparation of the workshop	Hebron Hebron - Hotel
Thursday 16th			X		Tests	Hebron Hebron - Hotel
Friday 17th			X		Hebron - Jerusalem -Tel Aviv - Hebron	Hebron Hebron - Hotel
Friday 17th	X				Paris - Tel-Aviv - Hebron	Hebron Hebron - Hotel
Saturday 18th	X		X	Palestine Polytechnic University	Preparation of the workshop	Hebron Hebron - Hotel
Sunday 19th	X		X		Training Workshop "Local control of automated systems"	Hebron Hebron - Hotel
Monday 20th	X		X			Hebron Hebron - Hotel
Tuesday 21st	X		X			Hebron Hebron - Hotel
Wednesday 22nd	X		X			Hebron Hebron - Hotel
Thursday 23th	X		X		Hebron - Jerusalem	Jerusalem Jerusalem - Hotel
Friday 24th	X		X		Jerusalem - Tel Aviv - Paris	

5- Mounting and testing the 3D printers DOM ("Digital Object Maker")

Al Quds and Bir Zeit Universities bought two 3D printers designed and built by the company DOOD. MedLink was responsible of the purchase and the delivery of the machines (in spare parts) up to the SCAC of Jerusalem trough the channel of the diplomatic case.
Julien Deprez has assured the mounting and the tests of the machines in the two universities. Many teachers and students attended this work at the end of which the machines were fully operational.

The reimbursement of MedLink by the universities for the cost of the machines (800 € including 5 kg of PLA plastic raw material) is in progress.

6- Training workshop in Mechatronics: "Rapid Prototyping: 3D design and printing"

The workshop has been organized by Dr. Labib Arafeh, Dean, Najjah Zeenni Faculty of Engineering, Al Quds University.
According to the opening days during this period of Al Quds University, the 24 hours of training, originally planned on 4 days, have had to be concentrated on 3 days. The training program has been the following:

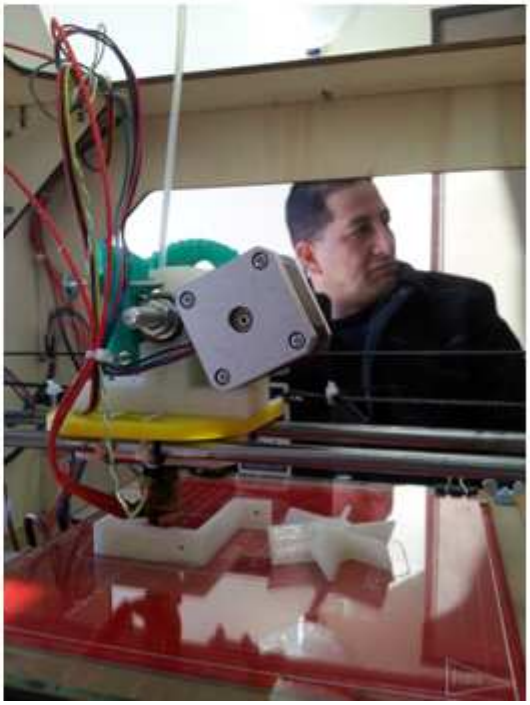
1- Introduction: Presentation of the concept and review of the different industrial and Open Source 3D printers
2- Tutorial: introduction to SketchUp 3D design software. Basic tools. Design of a mechanical piece from schematic specifications
3- The DOM (Digital Object Maker) 3D printer: 3 axis machine, extruder, power electronics for heating and stepper motors drive, MEGATRONICS microcontroller board (Atmel ATmega2560), software (ARDUINO IDE, Marlin, Pronterface, Slic3r)
4- Mechanical and firmware calibration, Slic3r and Pronterface parameterization, printing of the design.
5- Mini project: Mechatronics prototype: design and printing of the mechanical parts, programing of the control electronics, integration and test.

More than 75% of the time have been devoted to the practice.
20 participants have followed the training:

- 10 from Al Quds University
- 3 from Bir Zeit University
- 4 from Palestine Polytechnic University
- 2 from An Najah University
- 1 from Palestine Technical University – Kadoorie

All have been very active during the training, asking many questions on the hardware and software aspects of the machine, or more generally on the axis control or 3D design.

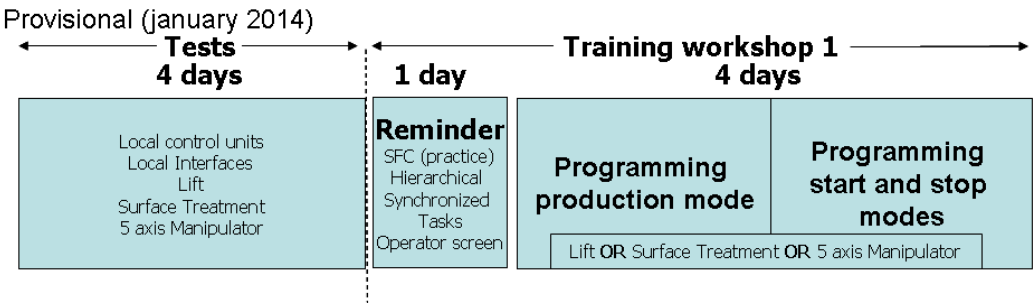



The last day was devoted to a mini project. The trainees have been divided into several groups responsible for the design and printing of the mechanical parts of a small axis control system. The whole has been integrated and successfully tested at the end of the session.

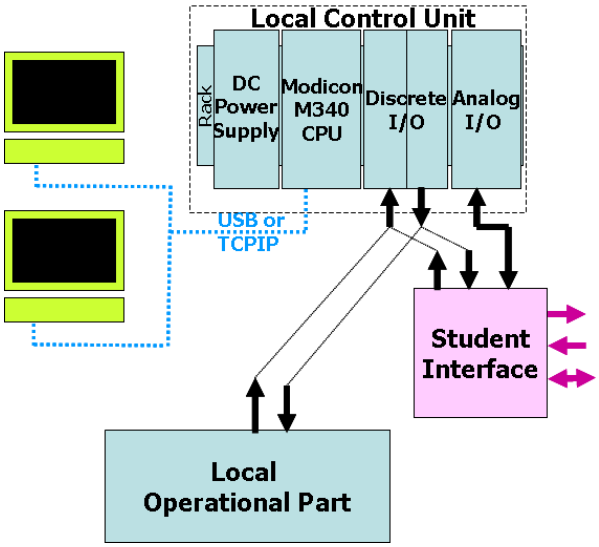
7- Palestine Polytechnic University: Installation of equipment and training in the Industrial Automation Laboratory funded by the Schneider Electric Foundation

The schedule and the contents of this part of the mission have been defined during the mission of Jean DEPREZ in September 2013. Adjustments have been made to the program during the preparation phase of the workshop:



7-1 Installation and test of the equipment used during the training

The following equipment, funded by the Schneider Foundation, has been installed with Rifat SHARAWI (ADVANtech) and tested:
- 3 local control units (Modicon PLC and I/O modules) defined by MedLink and integrated by ADVANtech
- 3 student interfaces defined by MedLink, designed and built by ADVANtech
- 3 local operative parts (lift, surface treatment and 5 axis manipulator), chosen by MedLink, designed and built by Schneider Electric and interfaced by ADVANtech.




Local control unit


Student interface


Surface treatment


Lift


5 axis manipulator

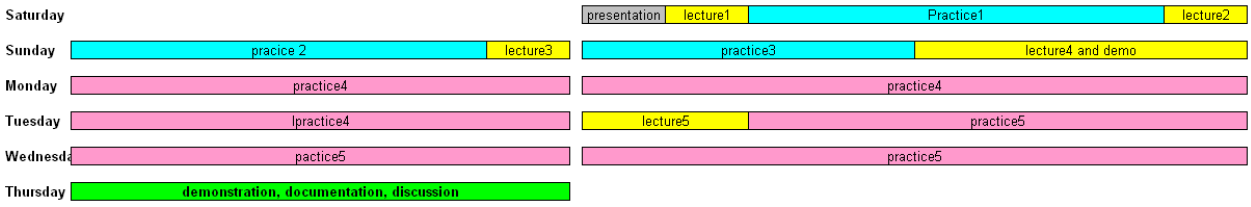
Four days were initially planed to install and test the equipment. Due to logistic problems for the delivery and some delay to design the connections cables between the different parts, only two days were available…
Fortunately, the integration and the realization of the equipment by ADVANtech were well done, within the specifications. The test programs developed by MedLink using simulation in France were

directly operational. Only a few details of connections had to be modified during the tests. The equipment was fully ready for use before the beginning of the training workshop.
A reserve: the technology used for the 15 multi-wire connection cables is neither convenient nor reliable. The training could be done with them but their long-term reliability is not assured. In addition, it does not allow for flexibility with regard to the possible evolution of the operatives parts (addition of sensors or actuators).
MedLink will provide other cables (with the help of IUT Cachan) which will be brought to PPU for the next workshop.
We have also noted and repaired some malfunction of the 5 axis manipulator. We will communicate this information to Schneider Electric, as well as suggestions for the improvement of the operation of the 3 systems.

7-2 Training workshop 1: "Local control of automated systems"

The workshop has been organized by Dr. Raed Amro, Dean, Faculty of Engineering, Palestine Polytechnic University and Mekawi IRHAIS, manager of the new automation laboratory.

The following program (35 hours) has been established after discussion with the participants:



1- Introduction and reminders (Lecture1 0.5h, Practice1 2.5h)
Creating basic applications with UnityPro
Programming in LD, FBD, SFC, ST, Digital Inputs and Outputs, Analog Inputs and Outputs
Testing the application using the student interface
2- Programming SFC in ST, operator screen (Lecture2 0.5h, Practice2 2.5h)
3- Hierarchical graphs, tasks synchronization (Lecture3 0.5h, Practice3 2h)
4- Normal production of Operational Parts (Lecture4 and demo 2h, Practice4 10h)
(Lift OR Surface treatment OR Manipulator)
- Identification and tests of sensors and actuators
- Programming manual mode, basic and advanced automatic production
5- Start and Stops modes (Lecture5 1h, Practice5 10h)
- Programming the security SFC
- Programming the emergency and default management SFC
- Programming the work SFC
- Programming the initialization SFC
- Programming the production SFC (starting, normal, ending)
6- Demonstrations, documentation, discussion (3h)

Eight trainees have followed all the training. One other made a brief appearance at the beginning. Rifat SHARAWI, from ADVANtech has attended most of the training sessions.

The starting level was very heterogeneous. Three trainees had widely the required level (two had attended a previous workshop organized by Schneider in Bethlehem in January 2012), the other five were beginners or refractory to the use of another language than the one (Ladder) that they were familiar with…
The 3 first sessions were devoted to lectures and basic practices in order to reduce this gap. We have assisted in priority the participants with the lower level and it was an efficient mutual assistance between the trainees. Only one participant (Fouad ZARO) didn't consider useful to participate actively in this upgrade. He left the workshop at the end of this first phase.

Three groups, that we have tried to balance, have been then constituted to work during 3 days on the operative parts. The practical aspect (and fun) of this phase has allowed, with one exception, to overcome the technical difficulties or the reluctance of the trainees initially in difficulties. The participants were well involved, some of them working at home in the evening (and even at night for Muder SWEITY!) to be able to test their programs as soon as the opening of the laboratory in the morning. The last session was partly devoted to the demonstrations of the work done by each team. The demonstrations on the lift and the surface treatment have been very conclusive, corresponding perfectly to the required specifications. The team working on the 5 axis manipulator was not able to go to the end of the specification, but the work done was of good quality.

We have collected all of the programs and the documentation made by the participants on the 3 operative parts. We are going to do the synthesis and return the complete folder to all participants who will be able to benefit from the work of their colleagues.

In addition to this program, we have tested and perform a demonstration of the local control by PLC of an inverter ATV31 connected to the AC motor of a belt conveyer. This equipment will be used during training workshop2

7-3 Preparation of the training workshop2: "Remote control of automated systems, Supervision"

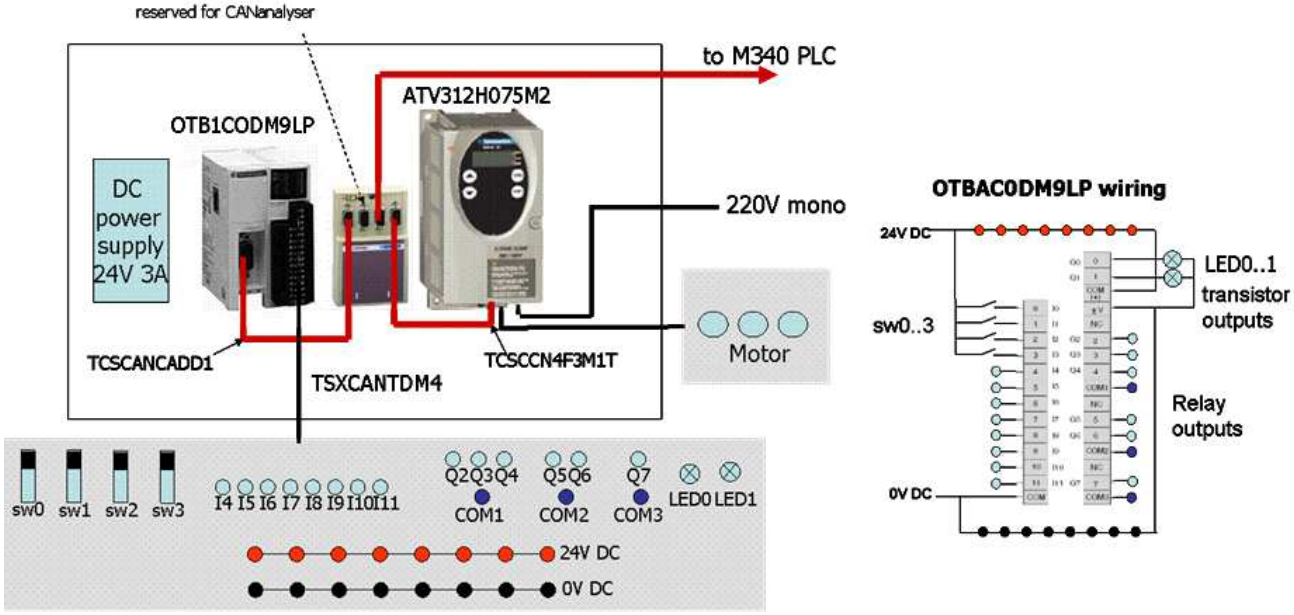
The last hour of workshop1 was dedicated to the preparation of the training workshop2 which should take place from 18th to 25th April, 2014.

The following topics will be treated during this workshop:
- Set up of a local TCP-IP network
- Touch screen (Magelis HMISTU665)
- Local AC drive control (inverter ATV312H075M2)
- CANOpen local network – remote I/O (OTB1CODM9LP)
- CANOpen remote control of AC drive.
- Remote control of operatives parts (conveyers MD1AMP002, induction motor bench MD1AA529)
- SCADA software (Vijeo Citect)
- Local supervision
- Remote supervision

The prerequisites for this training workshop are:
- Good knowledge on Unity Pro software and on the hardware used in Workshop 1
- Basic knowledge on TCP-IP: IP address, DHCP, switch, router, port
- Basic knowledge on AC drives: Induction motor, PWM 3 phases inverter, U/f scalar control
- Basic knowledge on CAN network: data frame, identifier, priorities

It is suitable that, before the workshop, PPU
- Equips the conveyer belts with sensors and actuators in order to built 2 automated systems for remote control.
- Adds to the Induction motor bench a connector in order to control the powder break with an external DC voltage.

The general architecture of the remote control unit has been defined with ADVANtech:



9- Conclusion

Globally, the objectives of the mission have been achieved.

- Training workshop in Mechatronics: "Rapid Prototyping: 3D design and printing"

Both printers have been installed and are operational in Al Quds and Bir Zeit Universities. On the two sites, teachers and students have been trained to be able to use the printer and make the current maintenance. They have been encouraged to inform Julien of their possible difficulties and their successful printings.
20 teachers of 5 Palestinian Universities attended the training organized in Al Quds. They have received and have experimented the basic techniques to perform the 3D design of a prototype and its printing.

We have insisted once again on the need for interdisciplinary and practical implication of the teachers who intervene in the faculties of engineering. The participants have appreciated these qualities in Julien. The latter has strongly emphasized the importance of self-training and the many sources of training available in Internet, especially in Mechatronics.
We had very interesting exchanges, concerning the place of the practice in the training of engineers. In order to motivate the students, some teachers are willing to put the practice in the centre of the training, as early as the first semester. This is new, even revolutionary in the Palestinian Universities... We appreciate this evolution, which we suggest to our Palestinian colleagues for many years...

- Training workshop: "Local control of automated systems"

Despite some anxiety related to the delay in the delivery of the equipment and the low initial level of some participants, we have achieved the objective of this workshop.
The needed equipment has been installed and tested. It is operational. The planned training program has been completely done. The very good involvement of the trainees has allowed them to become familiar with the operatives parts and to learn an adapted programming methodology, often new for them.
We would like to emphasize the very good organization of the workshop by the manager of the new automation laboratory, Mekawi IRHAIS. We also enjoyed the team spirit of most of the participants and, which is not usual, their involvement in the production of documents which will be the trace of this training workshop.

We would like to thank our Palestinian colleagues for their professional and private warm welcomes. As often during our missions, we have had the pleasure to be received in their families and share very good moments.
Despite the disruption of the university calendar resulting from climate-related difficulties in December, we had all facilities to carry out the two workshops. Thank you to the administration, to the teachers and staff who were mobilized for this purpose.

Finally, we thank our partners – French Consulate in Jerusalem, Schneider Foundation, Schneider Electric, Advantech, IUT Cachan - Paris Sud University – for their trust and financial, logistical, technical or pedagogical supports.

Paris, February 3rd 2014

Jean DEPREZ
MedLink