



SUSTAINABLE MANUFACTURING
THROUGH ADVANCED ROBOTICS TRAINING
IN EUROPE

Newsletter: Issue 1

January 2015



Contents

Welcome to SMART-E.....	2
Why SMART-E?.....	2
SMART-E people.....	4
SMART-E Consortium Experts and Associated Partners	4
SMART-E Fellows	4
SMART-E Recruitment.....	7
News and Events	8
SMART-E Induction meeting	8
Technical Training	8
In the next newsletter	9
Follow SMART-E	9
Contacts	9

Welcome to SMART-E

From the Co-ordinator, Professor Samia Nefti-Meziani

Welcome to the first edition of our six-monthly SMART-E newsletters. We hope to use these updates to keep you informed about the SMART-E network, to let you get to know our researchers, and to see how we are using advanced robotics to transform manufacturing in Europe.

SMART-E brings together some of the brightest young researchers working in robotics in Europe, alongside world-leading academic groups and companies, all striving to apply robotics to some of the biggest challenges in manufacturing.

We look forward to hearing from and working with you in the future. Do get in touch with us if you are interested in getting involved with the programme, or would just like to learn more.



Why SMART-E?

Manufacturing is the backbone of Europe's economy. In 2025 Europe's share of global manufacturing production and trade will be about 20%. Manufacturing will remain the most important driver for Europe's exports, yet the manufacturing sector is being confronted with an increasingly competitive economic climate. The BRIC countries can use their low cost advantage to access markets unprofitable to western countries. The ageing EU society means the sector struggles to find skilled personnel. Manufacturing has a significant environmental impact; generating 1/3 of all industrial waste and the EU have strict regulations governing future manufacturing. There is a need to increase supply chain efficiency, minimize the environmental burden and to better integrate workers with technology. This requires engineers with the right mix of knowledge, capability and experience to lead the major companies of tomorrow & sustain the EU's ability to compete globally.

Advanced Robotics and intelligent automation has great potential to address the above challenges. Up to 1 million new jobs are expected to be created by robots in the next five years. In SMART-E, we will concentrate on two seemingly quite different areas the Food and Aerospace. These face similar challenges

such as handling flexible materials, human machine interaction and cooperation, and task variability and flexibility. Food and drink manufacturing is the largest economic sector in the EU, accounting for 16% of manufacturing. The food industry is highly labour intensive throughout the supply chain. The Aerospace sector is a major industry in Europe worth €68.41bn in 2010.

As with the food industry, to remain competitive aerospace needs to develop innovative technological solutions to meet challenges such as flexibility, traceability, high process capability and productivity. In contrast to the food sector the aerospace industry benefits from relatively high levels of technology investment and some of the technologies developed in aerospace commonly used within aerospace such as automation, vision systems, sensor networks, handling and process control can be transferred to the food sector.

Today's industrial robots are essentially the tools of long repetitive production runs, for small lot sizes human workers are still the norm. Significant benefits could be created if these activities were automated. Additionally robot/workers must be able to switch quickly from one task to another and in spite of

advances in robotics the adaptability of humans to new tasks remains unparalleled. This is where the **soft (cognitive and physical)** approach to robotics can come into play creating robots with complex skill sets capable of **dexterous manipulation while allowing safe interaction and cooperation**. The goal is to develop advanced robots with cognitive abilities that can perform complex tasks safely & efficiently without the need to be fully pre-programmed.

The **SMART-E** training network aims to prepare the next generation of leading Advanced Roboticists to ensure a Sustainable Manufacturing sector in Europe. The network will address the skills & capacity shortage with the generation of scientific state of the art knowledge, and will develop skills and technologies that may be suited to other areas of robotics. SMART-E will improve the career prospects of young researchers, in both academia and industry by blending complementary and technical skills. This will be achieved through a transnational network of universities and robot companies, with world leading experts from different disciplines.

SMART-E will train 13 Early Stage Researchers (ESRs) and 2 Experienced Researchers (ERs)

and develop a leading European doctoral training programme in Advanced Robotics Technologies.

The programme combines state-of-the-art techniques and utilizes novel technologies in new or lesser known areas involving a team consisting of experts in Embodied intelligence, Soft Robotics, Compliant Robotics, Smart materials, Safety and Human machine interaction, autonomous systems, dextrous end effectors and statistics, and leading manufacturers and automation R&D companies. This team is furthermore supported by Universities, research laboratories and industries as associate partners.

SMART-E people

SMART-E Consortium Experts and Associated Partners

SMART-E is coordinated by the University of Salford Manchester, in partnership with the University of Sheffield, the University of Zurich, the Italian Institute of Technology, the BioRobotics Institute of the Scuola Superiore Sant'Anna, the Technical University of Munich and AGCO GmbH.

SMART-E Industrial Associate Partners

RUROBOTS
Cognitive Science at Work

FESTO

AIRBUS **BAE SYSTEMS** **marel**
INSPIRED WORK

FMEG



Shadow
Robot Company

A total of 14 associated partners, from both academia and industry are currently supporting the consortium of experts. In future newsletters we will be profiling some of our partners, highlighting their work in advanced robotics. We are particularly delighted to be working with a wide range of industrial partners. If your company is interested in working with SMART-E and our researchers, we are always looking for new companies to get involved. with the programme.

SMART-E Fellows

SMART-E has so far recruited 10 ESRs and one ER. Meet the team below:

Saber Mahboubi-Heydarabad

University of Salford

Low cost and robust dexterous end effectors

Saber received his Bachelor's degree in Power Engineering from the University of Shahid Rajaei Tehran in 2007, and Master's degree in Mechatronics Engineering from the University of Tabriz in 2010. Before starting his PhD at the Department of Computing, Science and Engineering at the University of Salford in the SMART-E project, he worked for three years as an Automation engineer in Iran Khodro Co.



Yasmin Ansari

Scuola Superiore
Sant'Anna

***Octopus based
technologies for
manipulation in
manufacturing***



Yasmin Ansari is a Pakistani national born in Al-Khobar, Saudi Arabia. She was awarded a B.Sc. degree in electrical engineering and M.Sc degree in computer engineering from the prestigious University of Engineering and Technology, Lahore, Pakistan in 2008 and 2012, respectively. The focus of her graduate dissertation was the application of pattern recognition techniques in the healthcare sector in Pakistan to improve ward management. She also served her alma mater as a teaching assistant starting January 2010 for three semesters.

She then joined the College of Computer Engineering and Sciences in Prince Muhammad bin Fahd University, Saudi Arabia in October 2011 as a lecturer until June 2014. She also served as the IEEE Student Chapter chairman from Fall 2012. She is currently a member of the Pakistan Engineering Council.

Constantin Neacsu

Italian Institute of
Technology

***Robot manipulators for
safer pHRI***



Constantin Neacsu is what can be called an international citizen. Constantin was originally born in a small town in south-east Romania, where he completed junior school. He then moved on his own to a big city to complete his high-school studies in Bilingual English with Computer Programming in 2008. Following that, Constantin received his Bachelor and Masters in Aeronautical & Aerospace Engineering from The University of Leeds, United Kingdom, in 2014. As part of his degree, Constantin undertook an industrial placement with Cummins Turbo Technologies in Huddersfield, UK, for 1 year, where he worked as a Manufacturing Engineer.

Stefano Toxiri

Italian Institute of
Technology

***Haptic teleoperation
system for dexterous
manipulation***



Stefano Toxiri was born and grew up in Sardinia (Italy), where he earned a BSc degree in Biomedical Engineering in 2011 from the University of Cagliari. For his subsequent studies he moved to Zurich (Switzerland) and earned a MSc in Robotics in 2014 from the Swiss Federal Institute of Technology (ETH), taking part in research projects in the field of rehabilitation robotics.

Andrea Giusti

Technical University of
Munich

***Musculoskeletal based
robot manipulator***



Andrea graduated with a B.Sc. in Telecommunications Engineering in 2010 and with a M.Sc. in Mechatronic Engineering summa cum laude in 2013 both from the University of Trento, Italy. Andrea's industrial experience includes working as a Project Engineer for Whirlpool

R&D (Cassinetta, Italy) with activities in the area of system modelling, identification and control. He developed his Master's thesis within the mission LISA Pathfinder at EADS Astrium (Friedrichshafen, Germany), renamed now as Airbus Defence and Space.

Aaron Pereira

Technical University of Munich

Human-robot co-working through turn-taking



Having received an MEng. in Mechanical Engineering from Imperial College London, completing his masters project abroad at the University of California, Davis, Aaron is now working towards a PhD at the Department of Computer Science, Technische Universität München. His research interests include applying formal verification techniques to robot control, and how humans and machines collaborate.

Esra Icer

Technical University of Munich

Modular and bionic inspired light-weight robot



Esra received her B.Sc. and M.Sc. degrees in Mechanical Engineering at the Istanbul Technical University (ITU) in 2011 and 2013. She worked as a Research Assistant from 2011-2014 at the Mechanical Engineering Department of ITU. Esra's general research area is design and analysis of robotic systems and optimization. Her research interests include obtaining kinematics and dynamics of modular robots and getting optimal configuration of modular robots based on specific tasks.

Roy Assaf

University of Salford
Mathematical models for self-healing robot cells



Roy received a B.Sc. in electronics from Lebanon, a B.E. in Mechatronic and Embedded Systems Engineer from France and finally an M.Sc. in Robotics and Embedded systems from the University of Salford in the UK. He took up his post as an

ESR in the SMART-E programme at the University of Salford in December 2014.

His Masters Dissertation covers in detail the process of predictive modelling using non-linear multivariate regression. It shows the successful predictive system that was built, as well as its accurate predictions of website traffic. It also explains what goes into building a successful predictive model, especially showing the importance and impact of feature engineering, getting, transforming and modelling data into relevant features to improve the results and outcome of machine learning algorithms.

Syed Taimoor Hassan Shah *Scuola Superiore Sant'Anna* ***Soft Robotics and morphological computation***



Taimoor Shah received his B.Eng. (Hons.) degree in Mechanical Engineering from the N.W.F.P University of Engineering and Technology, Pakistan, in 2007, and the M.Eng. degree in Computational Science & Engineering from National University of Sciences & Technology (NUST), Pakistan, in 2013. He served as Mechanical Design Engineer from 2010 to

2013 at NUST, in the R&D project "Development of a tele-surgical training robot & simulator". His research interests are in the field of soft robotics, mechanical/ mechanism design and CAD/ CAM.

Martijn Zeestraten

Italian Institute of
Technology

***Dexterous teleoperation
for a compliant robot
within unstructured
spaces***



Martijn Zeestraten is a Dutch researcher studying and living in Genoa, Italy. In 2008, he was awarded a B.Sc degree in Mechanical Engineering at the Technische Hogeschool Rijswijk, the Netherlands. The topic of his B.Sc dissertation was analysis of elastomeric friction in a rollercoaster propulsion system. In 2012, he was awarded a M.Sc Degree (cum laude) in Mechanical Engineering with a specialization in Bio-robotics at the Delft University of Technology, the Netherlands. The topic of his M.Sc thesis was combining Programming by Demonstration and Learning from Exploration. He researches techniques that allow robots to learn (semi-) autonomous

manipulation skills for unstructured environments.

Martin Eder

University of Zurich

***Morphological
computation based
control of soft robotic
structures (ER)***



Martin Eder received his diploma degree in mechanical engineering from Technische Universität München, Germany. He worked as a PhD student in the field of compliant robotics at the chair for Robotics and Embedded Systems, Department of Informatics, Technische Universität München. Since April 2014 he is employed as experienced researcher (ER1) affiliated to the Artificial Intelligence Laboratory, Department of Informatics, University of Zurich. He works on the development of morphological computation based control architectures for soft robotic structures. His research interests include the design and control of soft robotic mechanisms.

SMART-E Recruitment

SMART-E is still recruiting! If you would be interested in joining us as an ESR, we would be very keen to hear from you. In particular, there is a vacancy at AGCO GmbH, our industrial partner in Germany. If you fulfil the criteria below, please do contact the SMART-E project manager!

Desired Profile of the Applicant

- Excellent Master's degree (or equivalent) in computer science, engineering, agriculture or related disciplines (typically mathematics, physics)
- Strong background in at least one of the following areas: Robotics, Control theory, Signals and systems, Artificial intelligence
- Good programming skills in at least one programming language, e. g. MATLAB, C/C++, Python
- Fluency in spoken and written English, knowledge of the German language is a bonus
- It is desired that the candidate is enthusiastic about agricultural technologies
- The candidate has not resided or carried out his/her activity in Germany for more than 12 months in the last 3 years

Also, in the new year, we will be recruiting for an Experienced Researcher to join the team at SSSA. Do get in touch if you would be interested in this role.

News and Events

SMART-E Induction meeting

The SMART-E partners kicked off the programme in November 2013 at the Media City campus of the SMART-E Coordinator, the University of Salford. One year on, on 5 December, Salford welcomed the SMART-E partners back to Media City, but this time with

our freshly recruited researchers!

The December event was an opportunity for the SMART-E researchers to meet with each other for the first time, and to get to know a bit more about the programme, what activities lie ahead, and how they can shape the next three years to develop their skills, expertise and careers in robotics.

After this induction, the researchers are now about to embark on some intensive training, with a 2 week programme of Shangh'Al lectures and practical sessions organised by the University of Zurich coming up in January, and the first of the SMART-E bespoke, complementary training weeks at the University of Sheffield Advanced Manufacturing Research Centre in February.



Technical Training

In October, the Technische Universität München hosted the first of the SMART-E technical training weeks for Work Package 3 (Safety and Human Robot Interaction and Cooperation). Over a week in Munich, the researchers were able to discuss their research topics in depth and meet with BMW, Festo and DLR to discuss how their work would contribute to industrial scenarios. Workshops for work packages 1 (dexterous, soft and compliant robotics in manufacturing) and work package 2 (reconfigurable and logistics robotics) will be held in the early 2015.



In the next newsletter

In the June 2015 edition:

- Learn more about our plans for our summer school in 2015
- Find out more about some of our researchers' projects
- Meet our partners

Follow SMART-E

- Visit the SMART-E web page and sign up for regular updates:
www.smartemariecurie.eu
- Follow us on Twitter:
<https://twitter.com/SMARTEITN>

Contacts

SMART-E Project Coordinator
Samia Nefti-Meziani,
University of Salford
(s.Nefti-Meziani@salford.ac.uk)

SMART-E Project Manager
Laura Dawson,
University of Salford
(L.M.Dawson@salford.ac.uk)

Debbie Millard
University of Salford
(D.M.Millard@salford.ac.uk)

SMART-E Newsletter Editor
Laura Margheri,
*The BioRobotics Institute,
Scuola Superiore Sant'Anna*
(laura.margheri@sssups.it)

