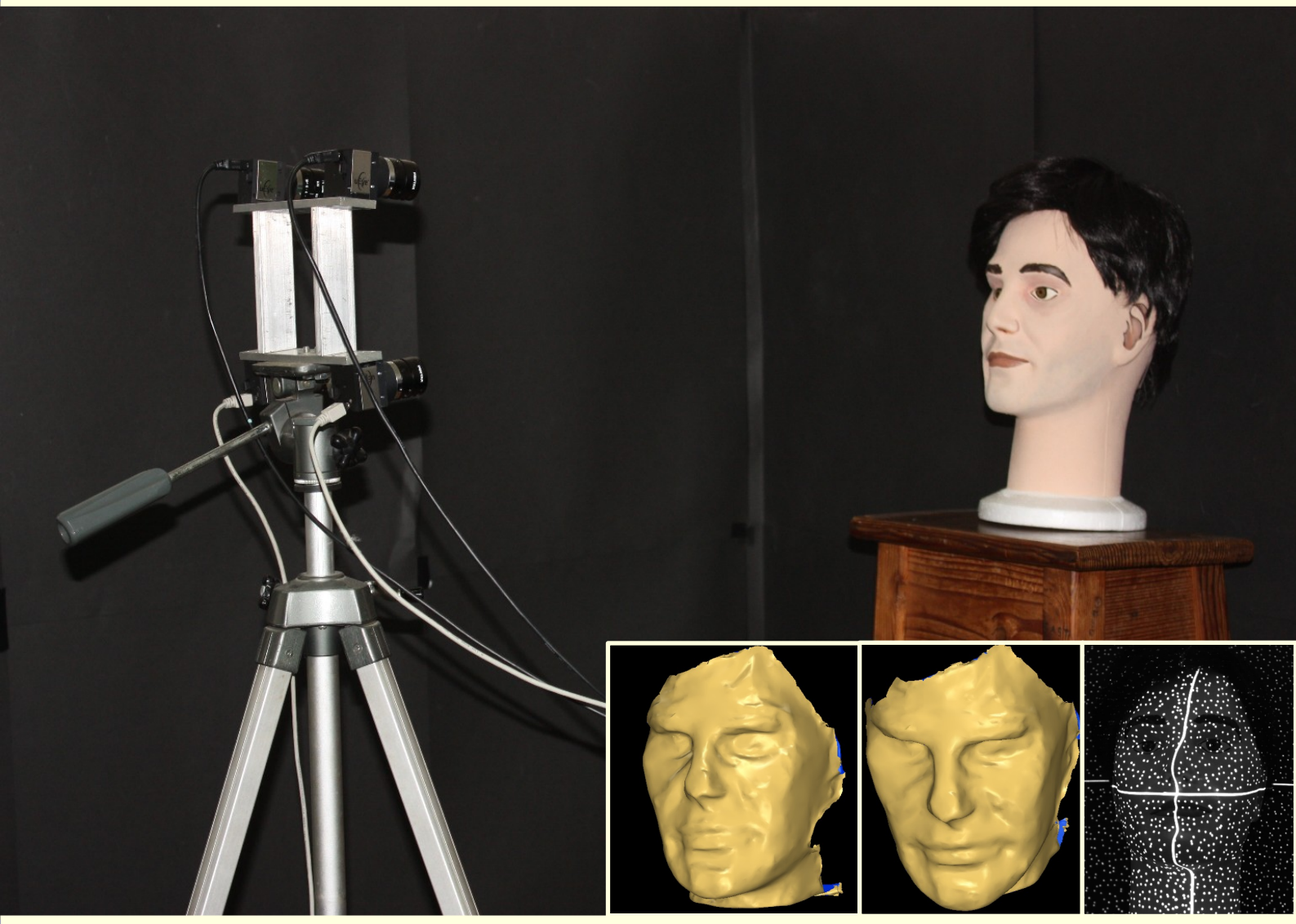
University of Malta
L-Università ta' Malta

Annual Activity Report

2008 - 2009



Department of Systems and Control Engineering

SCE

Annual activity report for the year 2008 - 2009, published by the

Department of Systems and Control Engineering
Faculty of Engineering
University of Malta
Msida, MSD 2080
Malta
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SCE-AR-01-2009

September 2009

Cover picture shows the structured light setup and results of a low cost 3D head acquisition system

Contents

1. Introduction

Welcome to the first issue of the Activity Report of the Department of Systems and Control Engineering covering academic year 2008/2009. It is our intention to publish this report regularly on a yearly basis, as required by University procedures. Such a publication gives us the opportunity to formally record and communicate the various activities and capabilities of the Department's staff members to students, the University, international academic partners, industrial collaborators and the general public.

Considering that the Department was established only 2 years ago, I am glad to note that the activities reported in this document demonstrate a degree of vigour, professionalism and commitment which are on a par with those of more mature departments that have been operational for a longer number of years. This reflects the level and dedication of all the Department's staff members, whose excellent support and contributions I readily acknowledge.

In 2008/09, despite very limited and competitive research funding opportunities as well as serious limitations on space made available for laboratory usage, the Department pursued or prepared to launch a total of eight principal research projects. These projects cover a wide range of areas which reflect the Department's focus of activities on system modelling, automation and control, image processing, machine vision, signal processing and biomedical engineering. More details about this can be found in Section 3 of the report. Additionally, several other research themes were investigated, perhaps at less advanced level, in the form of Bachelor or Master projects as outlined in Section 5 of the report.

Between October 2008 and September 2009, staff members were involved in the authorship of a substantial amount of peer-reviewed publications as listed in Section 7 of the report. A number of additional papers, not shown in the list, were also submitted during this period. These are either awaiting the results of peer review, or have been accepted and are awaiting publication.

Last academic year, staff members dedicated a substantial amount of time to the execution of two significant infrastructural projects funded by the European Regional Development Fund (ERDF) under Cohesion Policy Programme 2007-2013, amounting to a total of over one million euros. The two projects are directed towards the modernization and upgrading of the Control Systems Engineering Laboratory, and the setting up of a new Biomedical Engineering Laboratory. The projects are still in progress and this activity will therefore continue during 2009/2010. More details can be found in Section 4.

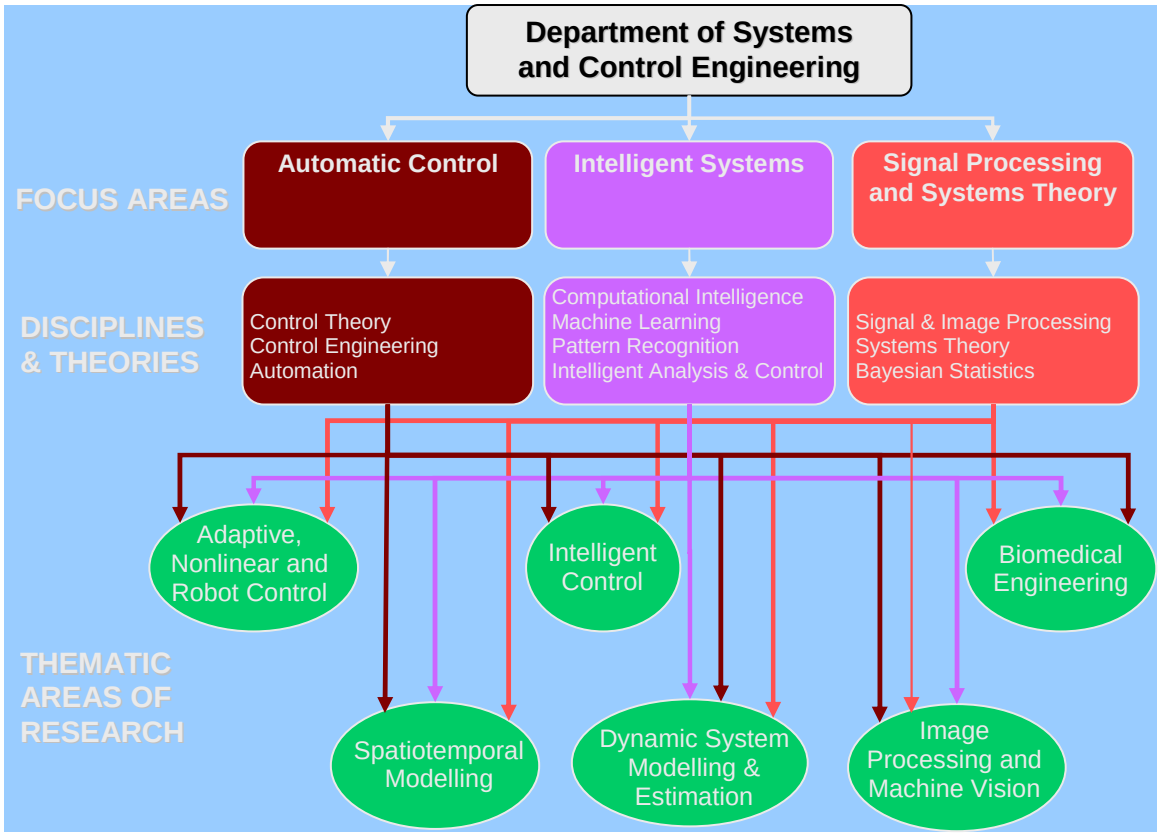
The Department has introduced a significant amount of new study units within the restructured degree programmes offered by the Faculty of Engineering. Details are shown in Section 8. During the past year, several staff members have been designing and preparing the course material for these new study units. This activity will

continue for the next few years as all the new units are gradually introduced in the different years of the restructured course programmes. Staff members of the Department were also involved in the preparation of course material for the dual Master's degree programme offered jointly by the University of Malta and James Madison University on Sustainable Environmental Resource Management which will commence in 2009/2010.

It is not possible to be exhaustive in this short introduction. In the above text, I have only mentioned briefly a few highlights which do not cover the whole extent of activities for 2008/09. Various other actions by staff members were dedicated to memberships on boards and committees, peer review of international papers, interventions with the general public through radio and TV programmes, hosting of colleagues from overseas, attendance at courses or meetings, and much more. I invite you to read all about this in the rest of the report.

In conclusion, I would like to thank all the Department's staff members for a very fruitful academic year. I sincerely appreciate your dedication, commitment and the support given to me in leading the Department. I am sure that the Department has an interesting academic year ahead, and an even more promising future, to look forward to.

Prof. Simon G. Fabri
Head of Department



2. Staff Members

Associate Professors:

Prof. Ing. Kenneth P. Camilleri, *B.Elec.Eng.(Hons.), M.Sc. (Sur.), Ph.D. (Sur.), MIEE, MIEEE, ACIArb*

Prof. Ing. Simon G. Fabri, *B.Elec. Eng. (Hons.), M.Sc. (Sheff.), Ph.D (Sheff.), SMIEEE* – Head of Dept.

Assistant Lecturers:

Ms. Alexandra Bonnici, *B.Eng. (Hons.), M.Phil, MIEEE*

Ing. Marvin K. Bugeja, *B.Eng. (Hons.), MIEEE*

Ms. Tracey Cassar, *B.Eng. (Hons.), MIEEE*

Mr. Kenneth Scerri, *B.Eng. (Hons.), M.S. (Oakland), MIEEE*

Research Assistant:

Mr. Owen Falzon, *B.Eng. (Hons.), MIEEE*

Systems Engineer:

Mr. Robert Zammit, *B.Eng. (Hons.), Dip.Ind.Electr.,CGL*

Laboratory Officer II:

Mr. Noel Agius

Executive Officer:

Ms. Allison Sultana, *Dip. Mgt.*

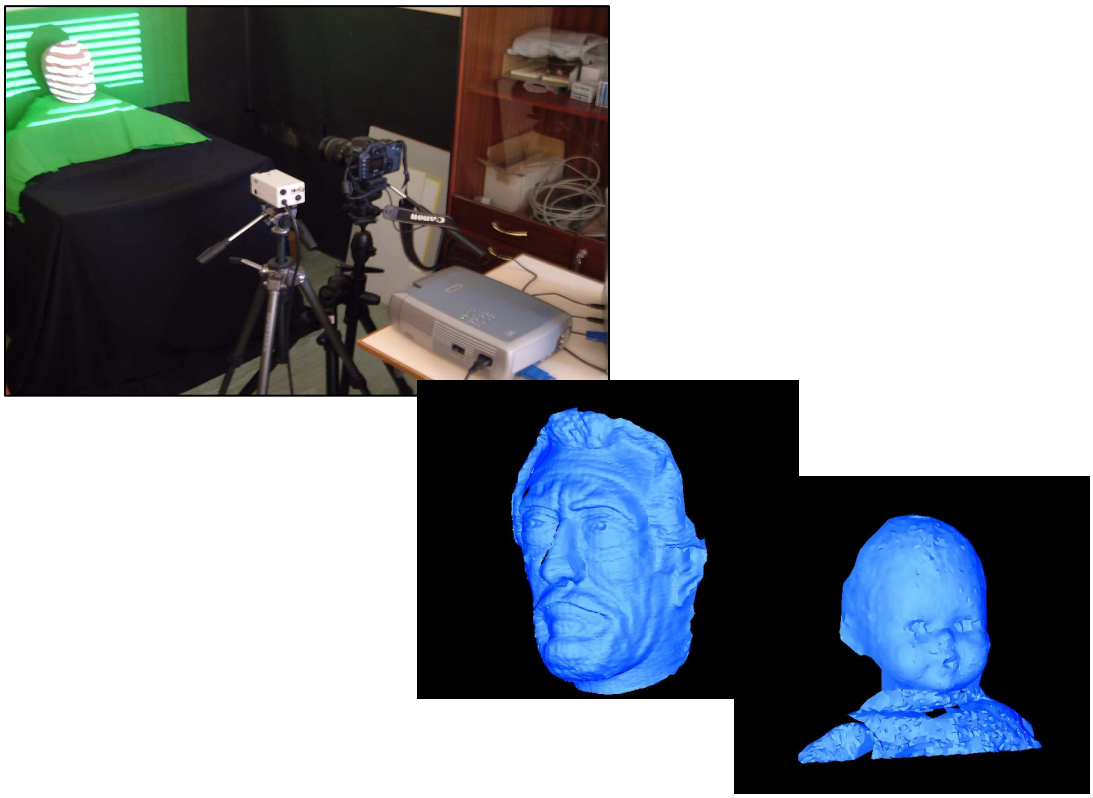
3. Research activities

The department attracts funding for research projects from various sources including EU research grants, Malta Government R&I grants, University research grants and industrial partners. The results and outcomes of these projects are typically published in peer-reviewed journals and international conference proceedings. The projects are led by academic staff members of the Department and often include the participation of postgraduate students whose research contributions lead to the award of Doctoral or Master degrees. The following describes the main projects which have been in preparation, ongoing or concluded during 2008/09.

3.1 Low Cost 3D Head Acquisition

Main investigators: Prof. Kenneth P. Camilleri and Ms Stefania Cristina.

This is an industry-academia collaborative project funded by a grant from the National RTDI Programme 2004. It is concerned with the development and implementation of a 3D object acquisition system, specifically for the acquisition of the 3D data of a person's head, with the added objective of low instrument cost and rapid acquisition. To this effect, methods to overcome the difficulties arising from passive illumination systems are being investigated because they can offer generally simpler and more versatile solutions to 3D data acquisition. The project also investigates and develops data fusion algorithms that are needed for the instrument to meet the specified requirements.

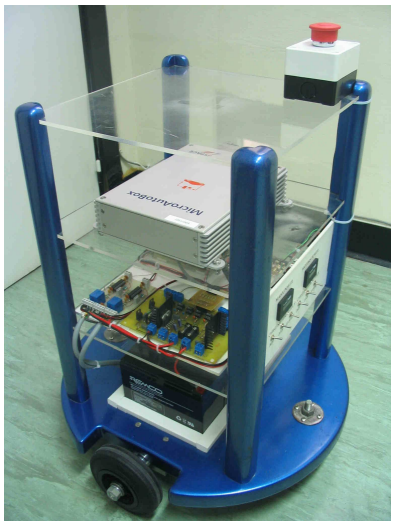


3.2. Computational Intelligence Techniques for Control of Complex Systems

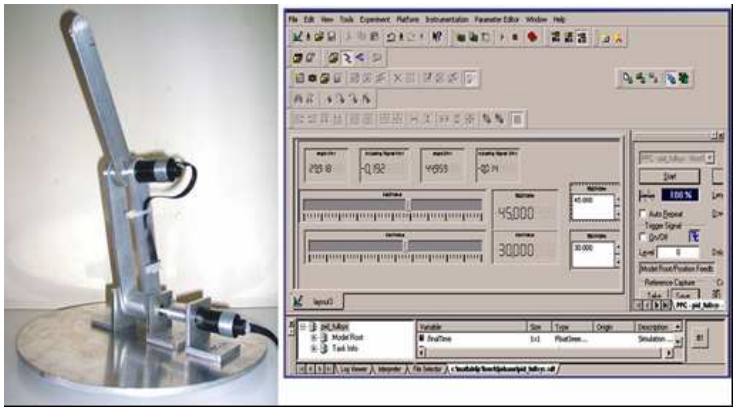
Main investigators: Prof. Simon G. Fabri and Ing. Marvin Bugeja.

This project, funded by the National RTDI Programme 2004 over a period of three years, investigates and develops control algorithms based on advanced computational intelligence techniques, such as neural networks, in combination with advanced adaptive control theory for versatile control of complex systems. Such systems typically require that the controller is able to autonomously anticipate and handle plant faults, plant uncertainty and plant complexities, such as nonlinearities, that cannot be modelled accurately or are unknown. A controller that is able to meet such elaborate levels of performance and autonomy must exhibit features that are normally attributed to human *intelligence*. These include the ability to adapt to unanticipated situations, to learn complex and previously unknown behaviour, and the capacity for automatically planning reliable control strategies. In essence, such automatic controllers attempt to mimic the intelligent traits and self-organising features found in nature. Possible applications include control of robotic systems, industrial process control, aeronautic systems and control of advanced manufacturing processes.

In this work, particular emphasis was placed on the use of neural networks for control of *Neurobot*, a mobile robot that was developed by the Department, and for motion control of a robotic arm. The novel contributions from this research have been presented at several international conferences. Ten papers are published in peer-reviewed engineering journals, book chapters and conference proceedings.



Neurobot, the mobile robot.



Motion control of a robotic arm.

3.3 Intelligent Control of Solar Water Heaters

Main investigators: Prof. Simon G. Fabri, industrial collaborators.

This is another industry-academia collaborative project due to commence in October 2009. It is funded by the National R&I Programme 2008. The Department's input to the project aims to develop an intelligent, innovative and autonomous electronic controller to reduce the electrical energy consumption of solar water heaters when the temperature of the water needs to be bolstered by the electric heater due to insufficient solar exposure. The proposed controller will take account of various parameters such as time of day, degree of cloud cover, the temperature of the stored water, the rate of hot water use and other similar features. Such a controller should result in a much more efficient and effective control of the operation of the solar unit backup heater.

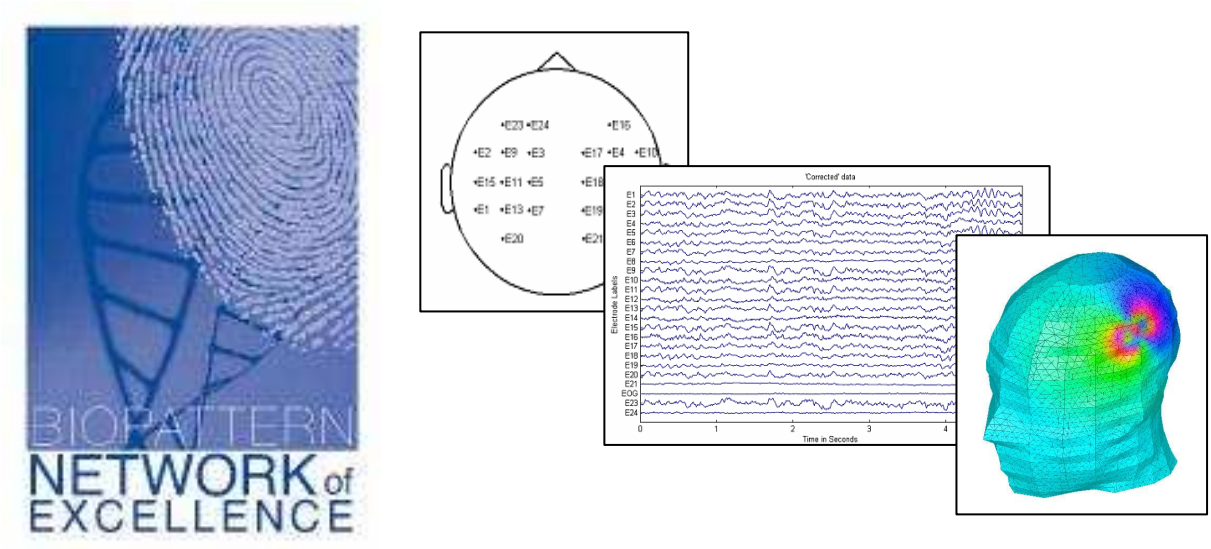
3.4 Biopattern Network of Excellence

Main investigators: Ms Tracey Cassar, Prof. Kenneth P. Camilleri, Prof. Simon G. Fabri, Dr. Joseph Muscat (Dept of Mathematics)

BIOPATTERN is a €4 million Network of Excellence project on biomedical signal analysis funded under the Sixth Framework Programme of the European Union. The University of Malta is one of 31 European partners in this network. The other partners range from universities to research institutes, health service providers and private companies. The University of Malta is represented by staff from the Department of Systems and Control Engineering (Prof. Simon Fabri, Ms Tracey Cassar and Prof. Kenneth Camilleri) and the Department of Mathematics (Dr Joseph Muscat), collectively functioning under the iBERG research group.

This project aims to integrate those relevant elements of European research to make Europe a world leader in eHealth by developing intelligent computerized analysis of a person's biological and health profile. This analysis would be made remotely accessible to patients and clinicians where the information is applied to combat serious diseases such as cancer or Alzheimer's disease. The input of the Maltese group to this project is mainly concerned with the development of algorithms for computerized analysis of electrical brain signals (EEG) so as to localize the source of activity within the brain, thus permitting diagnosis of brain diseases such as epilepsy.

The novel contributions which include the research input of the Maltese group to this network have been presented at several international conferences, including ten papers which are published in peer-reviewed biomedical journals and conference proceedings.

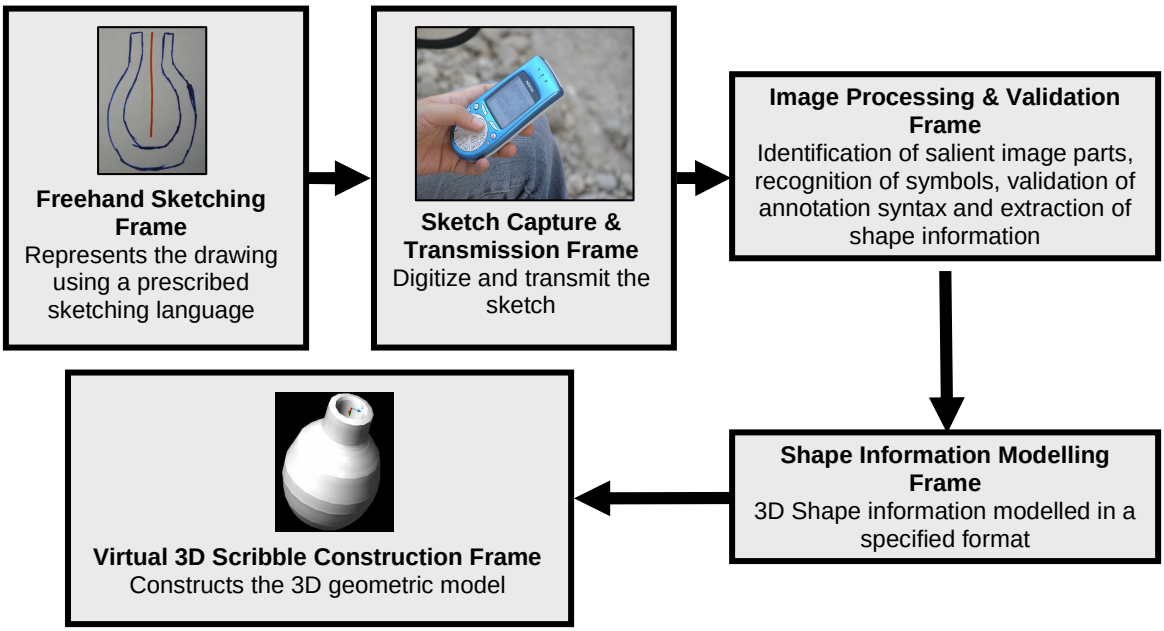


3.5 Early Stage Design for Rapid Prototyping

Main investigators: Prof. Kenneth P. Camilleri, Ms. Alexandra Bonnici, Prof. Jonathan Borg (Dept of Industrial Manufacturing Engineering), Dr. Philip Farrugia (Dept of Industrial Manufacturing Engineering)

This project is funded by a research grant from the University of Malta. It is a joint collaboration between the Department of Systems and Control Engineering and the Department of Industrial Manufacturing Engineering. The project concerns the development, implementation and evaluation of a computer-based tool that supports the automatic and remote generation of 3D models from 2D freehand paper-based sketches and scribbles. The aim of this research is to give designers the possibility to create virtual prototypes directly from paper-based scribbles using minimal effort. The work falls into two main areas, namely the area of Rapid Prototyping Technologies and Design and that of Image Processing, Perceptual Understanding and Machine Intelligence. Since the driving factor of the project is to allow designers to create 3D models from paper-based scribbles, the research activity focuses on methods with which the designer may represent drawings as well as the interpretation of these drawings, such that 3D models that represent the designer's intent may be obtained rapidly.

This research has led to several international conference presentations, twelve papers published in peer-reviewed engineering journals and conference proceedings, and a Patent.

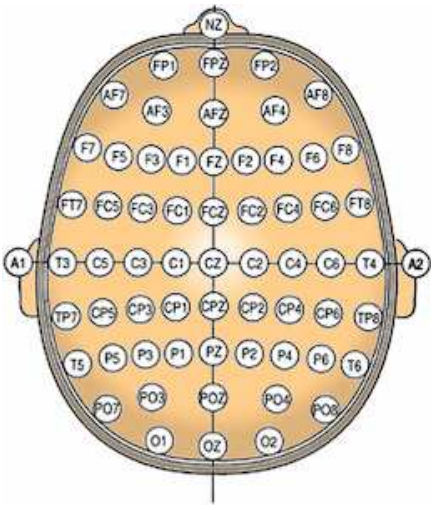


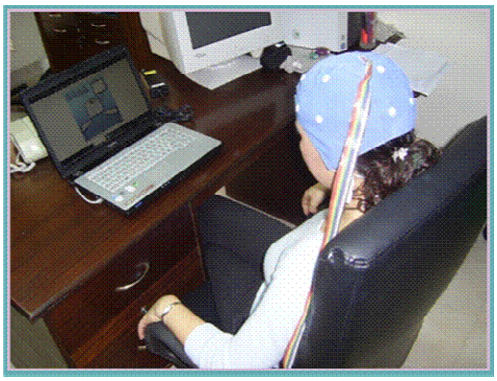
3.6 Brain Computer Interfacing

Main investigators: Prof. Kenneth P. Camilleri, Mr. Owen Falzon, Ms. Tracey Cassar, Prof. Simon G. Fabri

This project is funded by a research grant from the University of Malta and the Malta Government Scholarship Scheme which is providing support for one research student. A Brain Computer Interface (BCI) system is a communication system where a person has the ability to communicate with a computer through his or her brain signals rather than using the peripheral nerves and muscles. Generally electroencephalographic (EEG) data is recorded non-invasively from the human subject and this is then processed to extract reliable features to classify the tasks being performed, such as left/right hand movements, foot movements or tongue movements. These tasks are then mapped into computer based commands to move a cursor on a screen or select from sets of letters, amongst other examples.

The department has so far focused on the extraction of parametric features to classify real or imagined left and right index finger movements. Specifically the recorded EEG data is initially 'corrected' to remove artefacts such as eye or muscle movements, then an autoregressive model is fit to the data and the parameters of such a model are found through a Kalman filter. These estimated parameters are then used as features to classify the task being performed. Current work is targeted towards the building of a framework which allows a better understanding of the process involved in the performing of the requested tasks with the end goal of extracting more reliable features to enhance the classification scores obtained.

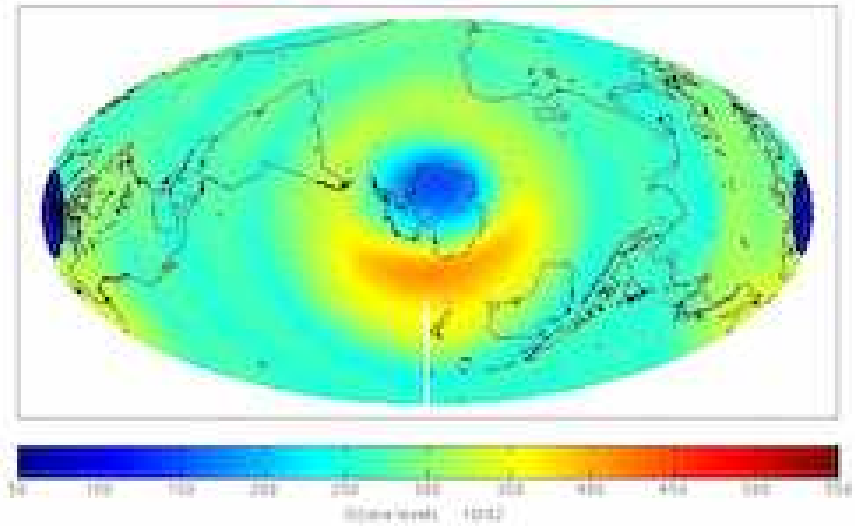




3.7 Spatio-temporal System Modelling

Main investigators: Mr. Kenneth Scerri in collaboration with Prof. Visakan Kadirkamanathan at the Department of Automatic Control and Systems Engineering, University of Sheffield and Dr. Michael Dewar at the School of Informatics, University of Edinburgh.

This research, which originated at the Department of Automatic Control and Systems Engineering in the University of Sheffield, has seen the input of staff members from the Department of Systems and Control Engineering. Various natural systems, such as weather and climate change dynamics, the spread of an infection in human tissue, signal patters in the human brain, the spread of an epidemic, the invasion patterns of birds, insects and plants, house price variations over a region or country, traffic flow dynamics; all exhibit a complex spatio-temporal behaviour. Classical models of such systems which try to represent such behaviour by either ignoring spatial relationships or temporal dynamics have been proven to have serious limitations. Thus the last decade has witnessed a growing interest in developing more complex models that take into account the spatio-temporal relationships within these systems. The contribution to this area has focused on developing new models to efficiently represent spatio-temporal behaviour and provide methods for estimation of these models from gathered spatio-temporal data. These models and methods are currently being applied to model the spatio-temporal evolution of ozone concentrations in the earth's atmosphere.



Ozone concentration levels over Antarctica.

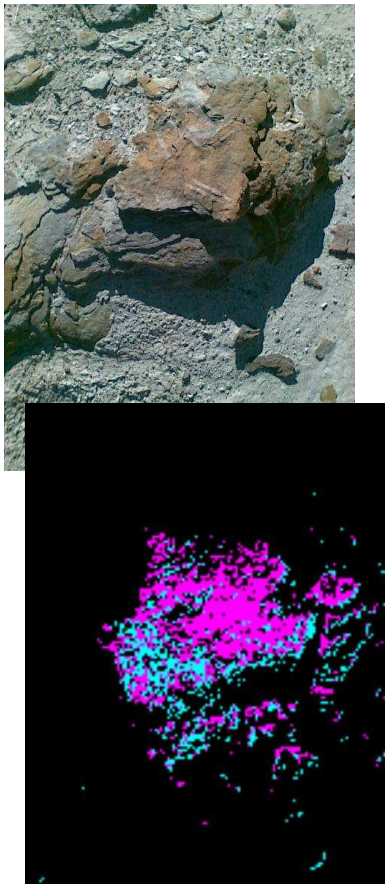
3.8 Computer Vision for Planetary Exploration

Main investigators: Ms. Alexandra Bonnici in collaboration with Dr. Patrick McGuire at the Department of geophysical Sciences, University of Chicago.

Planetary exploration by autonomous robotic systems cannot be carried out successfully unless significant testing of the underlying computer-vision algorithms is performed. The Cyborg Astrobiologist project, in collaboration with Patrick McGuire[1] (currently at the University of Chicago) has demonstrated the use of a wearable computer system, capable of testing computer-vision algorithms as part of semi-autonomous exploration systems at remote geological and astrobiological field sites. This project showed that the exploration system could viably and robustly be utilized during remote field missions to localize interesting geochemical or hydrological features using the lower end of the spectral resolution, making use of three-colour imagery to distinguish between regions of unusual colour. The Department of Systems and Control Engineering has contributed to this project by allowing the system to be ported from a wearable computer and a camera to a camera-phone (a mobile phone with integrated camera), using the phone to capture images which are then transmitted to a remote computer for processing after which they are sent back to the user's mobile phone.

[1] http://epsci.wustl.edu/~mcguire/

Using a camera-phone to capture a "planetary" terrain



Processing of the image

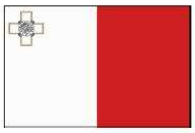
4. Infrastructural projects:

The Department of Systems and Control Engineering, benefiting from more than €1 Million from the European Regional Development Fund (ERDF) under the Cohesion Policy Programme 2007-2013, is investing a great deal of time and effort of each of its staff members to two major infrastructural projects, namely, the modernizing and upgrading of the Control Systems Engineering Laboratory and the setting up of a new Biomedical Engineering Laboratory.

The Control Systems Engineering Laboratory services the University's practical teaching and research activities in the area of Automatic Control Engineering and will be upgraded by the acquisition and installation of state-of-the-art equipment to be used for research and didactic purposes. The equipment focuses on modern automation technology including process control, mechatronics, robot control, programmable logic control, CAD tools for control system design, embedded control systems, vision-based automation and automatic access control.

The new Biomedical Engineering Laboratory consolidates the ongoing biomedical engineering research activities of the Department where engineering expertise is applied to medical, health and rehabilitation problems. Intended mainly for advanced teaching and research, this laboratory will be equipped with a variety of equipment that facilitates the acquisition and analysis of data from the human body, allowing researchers to develop new tools and techniques that will assist physicians and health practitioners in their duties in favour of a better health care.

These infrastructural projects will benefit transfer of knowledge to students, and indirectly to industry and society, as well as the research and development activities of the members of the Faculty of Engineering and its postgraduate research students. These laboratories will serve to attract students to specialize in the areas of Automatic Control Engineering and Biomedical Engineering, stimulate collaboration with overseas universities and research institutions, and enable joint research and development projects with industry and relevant stakeholders.



Operational Programme I – Cohesion Policy 2007-2013
Investing in Competitiveness for a Better Quality of Life
Equipment part-financed by the European Union
European Regional Development Fund
Co-financing rate: 85% EU Funds; 15% National Funds

Investing in your future

5. Student Supervision

5.1 B.Eng. students

Project title	Student	Supervisor
Signal processing of cyclic voltammetric measurements to discriminate between neurotransmitters in vitro solutions	Azzopardi Carl	Prof. K. Camilleri
Control of a robotic finger with non-conventional actuators	Aquilina Nicholas	Prof. S. Fabri, Dr. M. Saliba
Geo-location by view analysis	Balzan Emanuel	Prof. K. Camilleri
Active vibration and noise Control	Dimech Steve	Prof. S. Fabri
Multiple model adaptive control	Gauci Melvin	Prof. S. Fabri
Head motion tracking	Sapienza Michael	Prof. K. Camilleri
Spatio- temporal modelling of the ozone layer	Tabone Sarah	Mr. K. Scerri
Identifying globally salient line paths from scribbled drawings	Vella Clifton	Ms. A. Bonnici
Control of a rotational inverted pendulum	Zahra Steve	Ing. M. Bugeja
Analysis of brain networks during specific mental states	Zhu Tingting	Ms. T. Cassar, Prof. K. Camilleri

5.2 M.Sc. students

Project Title	Student	Supervisor
Fusion of stereo image data from multiple views for 3D data acquistion	Cristina Stefania	Prof. K. Camilleri
Implementation and testing of neural network-based algorithms for real-time control of a robotic manipulator	Nathalie Maes (Erasmus student)	Prof. S. Fabri

5.3 M.Phil / Ph.D candidates

Research Title	Candidate	Supervisor
Combining the X-basis of vision to provide a valid 'human vision' interpretation of scribbled drawings	Bonnici Alexandra	Prof. K. Camilleri
Computational intelligence methods for dynamic control of mobile robots	Bugeja Marvin	Prof. S. Fabri
Multiple modelling of EEG data to classify different mental tasks	Cassar Tracey	Prof. K. Camilleri, Prof. S. Fabri
The application of signal modeling and computational intelligence techniques for the analysis of EEG data	Falzon Owen	Prof. K. Camilleri

6. External lecturers and visitors

From the University of Le Havre, France…

On the 6th November 2008, the department hosted two academics from the University of Le Havre, France who delivered lectures to 4th year B.Eng. Electrical Engineering students taking the Control Engineering elective study-unit. Dr. Francois Guerin presented a detailed account of research projects taking place within the Electrical Engineering and Automation Research Group at Le Havre, and Dr. Florence Lecroq delivered a lecture on Programmable Logic Control systems. This visit was funded by the EU Socrates-Erasmus programme.

From Kempen University College, Belgium…

The department hosted Dr. Bart Vanrumste from the Bioseciences and Technology Department of K.H. Kempen University College in Geel, Belgium between the 21st and 22nd April 2009. Dr. Vanrumste delivered a series of three talks on Signal Processing for Biomedical Engineering on the following three topics:

- *Detection of movement in patients with epilepsy during sleep*.
- *EEG source localization*.
- *A video system for the detection of pain in demented elderly*.

This visit was funded by the EU Socrates-Erasmus programme.

From the University of Southampton, United Kingdom…

On the 2nd June 2009 the department hosted Ms. Charmaine Demanuele, a PhD student at the University of Southampton U.K, who presented a talk entitled *Analysis of Very Low Frequency Neuronal Oscillations in Electromagnetic Brain Signal Recordings: A Blind Source Separation Approach*.

7. Staff publications (Oct 2008 ~ Sept 2009)

R. Grech, T. Cassar, J. Muscat, K.P. Camilleri, S.G. Fabri, M. Zervakis, P. Xanthopoulos, V. Sakkalis, B. Vanrumste, "Review on Solving the Inverse Problem in EEG Source Analysis", Journal of NeuroEngineering and Rehabilitation, 5:25, November 2008.

G. Azzopardi, K.P. Camilleri, "Offline Handwritten Signature Verification using Radial Basis Function Neural Networks", WICT 2008, November 2008, Malta.

C. Mangion, K.P. Camilleri, "An Investigation on Server-Side Object-Scene Recognition Performance using Coarse Location Information and Camera-Phone Captured Images", WICT 2008, November 2008, Malta.

M. Desira, K.P. Camilleri, "Handwritten Signature Verification by Independent Component Analysis", WICT 2008, November 2008, Malta.

M. Dewar, K. Scerri, and V. Kadirkamanathan, "Data-driven spatio-temporal modeling using the integro-difference equation," IEEE Transactions on Signal Processing, Vol. 57, Issue 1, January 2009, pp.83-91.

K. Scerri, M. Dewar and V. Kadirkamanathan, "Estimation and model selection for an IDE-based spatio-temporal model," IEEE Transactions on Signal Processing, Vol. 57, Issue 2, February 2009, pp.482-492.

M. K. Bugeja, S. G. Fabri and L. Camilleri, "Dual adaptive dynamic control of mobile robots using neural networks," IEEE Transactions on Systems, Man and Cybernetics, Part B, Vol. 39, Issue 1, February 2009, pp. 129-141.

L. Wendt, C. Gross, P.C. McGuire, A. Bonnici, B.H. Foing, V. Souza-Egipsy, R. Bose, S. Walter, J. Ormö. E. Diaz-Martinez, M. Oesker, J. Ontrup, R. Haschke, H. Ritter. "The Cyborg Astrobiologist: Teaching Computers to Find Uncommon or Novel Areas of Geological Scenery in Real-time", European Space Agency International Conference on Comparative Planetology: Venus - Earth - Mars ESTEC, Noordwijk, The Netherlands, 11-15 May (2009).

P. Farrugia, J.C. Borg J.C., K.P. Camilleri, "Cameraphones as New Design Tools", International Conference on Engineering Design, ICED'09, August 2009, Stanford University, California, USA.

8. Teaching activities

The teaching activities of the Department are currently focused on the undergraduate degree courses in engineering. As of academic year 2008/09, the Faculty of Engineering introduced newly-structured Bachelor degree programmes in Electrical and Electronic Engineering, Mechanical Engineering and Industrial Engineering. The Department is responsible for the delivery of several study-units within these new programmes, as well as the previous B.Eng.(Hons) programmes in Electrical Engineering and Mechanical Engineering which are gradually being phased out.

During academic year 2009/10, the Department will also offer study-units within the B.Sc.(Hons) ICT course in Communications and Computer Engineering and participate in the M.Sc. on Sustainable Environmental Resource Management which is jointly offered by the University of Malta and James Madison University, USA.

In 2008/09, a substantial amount of effort has been spent on the design of a taught Master's programme focusing on the areas of study which fall under the scope of the Department. This exercise is expected to be concluded in the near future. Plans are also in hand to develop a collaborative Master's programme on Biomedical Engineering and Medical Physics with participants from the Faculty of Science and the Institute of Health Care.

Departmental study units offered in the new degree programmes		
SCE1101	Continuous-time Dynamic Systems and Signals I	5 credits
SCE1202	Continuous-time Dynamic Systems and Signals II	5 credits
SCE2111	Automatic Control Systems I	5 credits
SCE2102	Discrete-time Dynamic Systems and Signals I	5 credits
SCE2213	Automatic Control Systems II	5 credits
SCE2210	Introduction to Control Systems	5 credits
SCE2110	Automatic Control Systems I	6 credits
SCE3111	Control Systems Design	5 credits
SCE3112	Control Systems Technology and Automation	5 credits
SCE3113	Digital Control Systems	5 credits
SCE3114	Systems Engineering	5 credits
SCE3105	Discrete-time Dynamic Systems and Signals II	5 credits
SCE3106	Computational Intelligence I	5 credits
SCE3110	Feedback Control Systems	5 credits

9. Staff activities

Staff Member	Activities
Ms. A. Bonnici	Reviewer or committee member for international conferences, including: - The Eurographics Workshop on Sketch Based Interfaces and Modelling. - International Conference on Advanced Engineering Computing and Applications in Sciences, 2009.
Ing. M. K. Bugeja	Reviewer for journal submissions, including: - IEEE Transactions on Systems, Man and Cybernetics (Part B). - International Journal of Systems Science . Reviewer or committee member for international conferences, including: - International Conference on Advanced Engineering Computing and Applications in Sciences, 2009. - The European Control Conference (ECC), 2009.
Prof K. P. Camilleri	Member on various University boards including Faculty Board of Engineering, Board of Studies of M.Sc. (Engineering) Degree Programme, chairperson of the Faculty Research Ethics Committee and of the Non-academic Work Resources Committee. Project Leader (Biomedical Engineering Sub-project) of the ERDF Project "Strengthening of the Analytical Chemistry, Biomedical Engineering and Electromagnetics RTDI Facilities". Reviewer for journal submissions, including: - IEEE Transactions on Image Processing. - Optical Engineering. Member of the international programme committee of several international conferences, including: - The Seventh IASTED International Conference on Biomedical Engineering (BioMED 2010). - The Third International Workshop on Intelligent Interfaces for Human-Computer Interfacing (IIHCI-2010).

- The Third International Conference on Advanced Engineering Computing and Applications in Science (ADVCOMP 2009).

Ms. T. Cassar

Contact Person (Biomedical Engineering Sub-project) of the ERDF Project "Strengthening of the Analytical Chemistry, Biomedical Engineering and Electromagnetics RTDI Facilities".

Reviewer for submissions to the Journal of Selected Topics in Signal Processing.

Reviewer or committee member for international conferences, including:

- The Third International Conference on Advanced Engineering Computing and Applications in Science (ADVCOMP 2009).
- International Symposium on Optical Engineering and Photonic Technology.

IEEE Malta Student Branch Adviser.

Prof S. G. Fabri

Head of the Department of Systems and Control Engineering.

Deputy Dean of the Faculty of Engineering.

Member on various University boards including the Board of the Institute for Sustainable Development, the Board of the Institute of Linguistics, the Faculty Board of Engineering, the Faculty Postgraduate Subcommittee, the MSc in Engineering Board of Studies (Chair), the B.Eng. Board of Studies, the Academic Work Resources Committee, the Programme Validation Committee, the Research Fund Committee.

Leader of the ERDF Project "Modernizing the Control Systems Engineering Laboratory at the University of Malta".

General Chair of the Third International Conference on Advanced Engineering Computing and Applications in Sciences, ADVCOMP 2009.

Member on the Editorial Board of the International Journal of Systems Science.

Reviewer for journal submissions, including:

- IEEE Transactions on Automatic Control.
- IEEE Transactions on Robotics.
- IEEE Transactions on Neural Networks.
- Automatica.
- Medical Engineering & Physics.
- International Journal On Advances in Intelligent Systems.

Reviewer or committee member for several international conferences, including:

- International Conference on Advanced Engineering Computing and Applications in Sciences, 2009.
- IEEE Conference on Decision and Control, 2009.
- IEEE International Conference on Robotics and Automation,2009.
- 7th IFAC Symposium on Intelligent Autonomous Vehicles.
- International Conference on Informatics in Control, Automation and Robotics, 2009.

Member on the IEEE Region 8 Student Paper Contest (2010) Committee.

Mr. K. Scerri

Contact Person of the ERDF Project "Modernizing the Control Systems Engineering Laboratory at the University of Malta".

Reviewer for submissions to the IEEE Transactions on Signal Processing.

Member of the Malta Scientific Committee of the Third International Conference on Advanced Engineering Computing and Applications in Sciences, ADVCOMP 2009.

10. Participation in courses, meetings & conferences

Training course on Capacity Building on Cohesion Policy 2007-2013 Operational Programmes I and II:

Mr. Kenneth Scerri and Prof. Simon Fabri attended a training programme organized by the Planning and Priorities Coordination Division of the Office of the Prime Minister on Capacity Building for Cohesion Policy 2007-2013. The training sessions were held between the 18th and 27th November 2008 at the MCC in Valletta.

Space Transportation Assets Valorization in Europe (STAVE) workshop:

Ms. Aexandra Bonnici, Prof. Kenneth Camilleri and Mr. Kenneth Scerri attended a one day workshop held on the 15th April 2009 at Villa Bighi, Kalkara. The workshop was offered through a project funded under the 7th Framework Programme entitled STAVE. The aim of the project is to identify and valorize skills for space transport opportunities within the 12 new EU member states.

Entrepreneurial Finance for Academics seminar:

Prof. Kenneth Camilleri and Prof. Simon Fabri participated in a one day seminar on entrepreneurial finance for academics which took place on the 26th May 2009 at the Old University Building in Valletta. The seminar was delivered by Mr. Pierre Nadeau of Malta Partners Ltd in collaboration with the Department of Banking and Finance.

Research meeting on Spatio-temporal Modelling:

On the 1st June 2009, Mr. Kenneth Scerri attended a research meeting on Spatio-Temporal Modelling at the Department of Automatic Control and System Engineering, University of Sheffield, UK.

European Space Agency meeting:

On the 17th June 2009, Prof. Kenneth Camilleri and Prof. Simon Fabri attended a meeting at the University of Malta where delegates form the European Space Agency (ESA), hosted by the Malta Council for Science and Technology, presented an overview of potential collaboration opportunities between Malta and ESA.

Bioinformatics workshop:

Ms. Tracey Cassar and Ms. Alexandra Bonnici attended a workshop on Bioinformatics held at the Faculty of Science, University of Malta between the 6th and 10th July 2009. The workshop was presented by Dr. Phaedra Agius.

CERN meeting:

On the 7th July 2009, Prof. Simon Fabri attended a meeting at the University of Malta with delegates from CERN (European Organization for Nuclear Research) who were hosted by the Malta Council for Science and Technology. The meeting briefed academics on the research opportunities at CERN and possible collaborations with Malta.

Course on 3D Gait Analysis:

Professor Kenneth Camilleri, Ms. Tracey Cassar and Mr. Owen Falzon attended a 3-day course on 3D Gait Analysis. The course, organized by the European Society of Movement Analysis in Adults and Children, was held between the 14th and 16th September 2009 at King's College, London.

11. Collaboration with third parties

International collaboration…

Mr. Kenneth Scerri collaborated with the Department of Automatic Control and System Engineering at the University of Sheffield, UK on "Novel Methods for Estimation of Spatio-Temporal Systems".

Ms. Alexandra Bonnici collaborated with Dr. Patrick McGuire at the the University of Chicago on the "Cyborg Astrobiologist" project.

Ms. Tracey Cassar, Prof. Kenneth Camilleri and Prof. Simon Fabri collaborated with Technical University of Crete and the Foundation for Research and Technology in Greece on EEG analysis of epileptic children.

Professor Simon Fabri and Ing. Marvin Bugeja collaborated with academics from James Madison University, USA on the preparation of study-units for the International Masters Degree Programme in Sustainable Environmental Resource Management (SERM).

Competitions…

Ms. Alexandra Bonnici and Prof. Kenneth Camilleri participated in the 'ICDAR 2009 Document Image Binarization Contest (DIBCO 2009)' with their image binarisation algorithm originally published in the Proceeding of the Eurographics 2004 Workshop on Sketch-based Interfaces and Modelling, France.

Popular media…

Prof. Kenneth Camilleri was interviewed on the radio programme 'Research Matters' on Campus FM where the department's research and initiatives in the field of biomedical engineering were discussed.

Early in 2009, Prof Simon Fabri and Ing. Marvin Bugeja featured on two episodes of the popular TV programme *Gadgets Malta* where they demonstrated and explained the operation of the Inverted Pendulum and Neurobot the Mobile Robot, both of which were developed in the department's Control Systems Engineering Laboratory.

Later in 2009, most of the department's staff featured in an another educational TV programme called X-Lab where the main research activities were demonstrated and explained in layperson's terms.