Introduction

This document presents a detailed reporting on the execution of the AC4CA – IFAC Regional Course on Advanced Control for Central America. The course took place from the 23rd to the 25th of February, 2011 in the School of Electrical Engineering of the Universidad de Costa Rica, in San Jose, Costa Rica. To summarize, the three days course has been a great success. A success in participation as well as in contributions from the invited speakers that have motivated the participants with new trends in the development and application of advanced control techniques. In addition, as one of the major goals of the course was to initiate the creation of a Central American association of automatic control, several commitments were agreed in order to proceed on that direction.

The rest of the document reports the following information:

- Final Programme and Course execution: detailed final programme and highlights on its execution.
- Attendees: final list of attendees.
- Course evaluation: course evaluation form distributed to participants.
- Commitments: major achievements and commitments from participants.

Final Programme and Course execution

The final programme has been executed according to the announced one at the website. The running of the course has been really smooth. All the activities have run without any incident.

From the logistic point of view transportation was arranged from/to the participants' hotel to/from the School of Engineering every morning and after the course activities.

The course started with a formal inauguration on Tuesday 22nd February. With the participation of the Vice-rector for Administration, Mr Héctor González Morera and the Director of the School of Engineering Prof. Jorge Romero Chacón and Prof. César de Prada representing IFAC and the Spanish Association for Automation (CEA). After the different speeches a cold dinner was served to all participants allowing first interactions. The importance of having such event in Central America was raised by all of them.

The sessions continued next morning with two sets of presentations by representatives of all Central American countries. First, each representative exposed the role of automatic control on their university degrees as well as the state if the art in research. As a conclusion in all countries there is a need for action that empowers research as it is practically inexistent at present time. There is a lack of organizational structures in addition to the high difficulty of having resources to pursue research.

On a second session representatives that are in close touch with industry, raised the status and level of automation in respective country. It turns out that there is some level of automation but it is being deployed by external companies from Europe or USA that bring close solutions. There is the feeling that there is not complete trust in local engineers of automation for pursuing such jobs.

In the afternoon of the 23rd we had the first academic lecture from Prof. César de Prada, Universidad de Valladolid, Spain. The lecture concentrated on the sugar industry, raising the automation possibilities, advantages of applying modern control approaches, etc. Prof. de Prada also introduced Model Predictive Control as a way of addressing plant wide control.

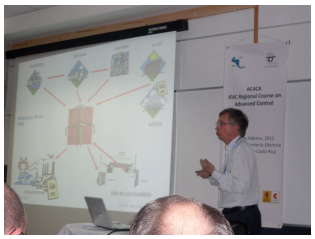
Thursday the 24th, had the lectures on water and energy. During the morning, Prof. Gustaff Olsson, from Lund University, Sweden, gave lectures on wastewater treatment systems and the important role instrumentation and control plays. Prof. Olsson also highlighted the important links that exist between water and energy. During the afternoon, Prof. Jordi Riera from the Polytechnic University of Catalunya, Spain, elaborated on modern energy systems, specifically hydrogen fuel cells and current state of the art on controlling such systems. Prof. Riera also introduced the participants into sliding control and repetitive control as potential advanced control techniques.

This second day ended with a gala dinner at Mirador Tiquicia, enjoying a lovely night view over the San Jose valley.

The last day of the course, Friday 25th, started with the lecture of Prof. Reza Katebi, from University of Strathclyde, Scotland, showing the application of advanced control techniques in different domains (Power plants, Rolling processes and Marine applications). Therefore, showing a larger perspective of potential applications.

Prof. César de Prada

Prof. Gustaf Olsson



Prof. Jordi Riera

Prof. Reza Katebi

The slides used in all lectures can be accessed at the course website at the following link: http://ac4ca.eie.ucr.ac.cr/index.php?id=lugar

The morning session ended with a round up launched by Prof. V.M. Alfaro where general conclusions from the presentations made, so far were presented, as well as a short explanation of the history of the AC4CA event. From the interactions had with

the participants it was clear that all participants found the event really interesting and profitable. In fact this has been the first time all the persons in the Central American isthmus with common interests in Automatic Control join together. Prof. V.M. Alfaro launched to the floor the question on how to continue? What would be the next steps? A series of observations and proposals arisen with the common feeling that this course has represented a unique opportunity to start collaboration and a joint venture among all the isthmus countries. A venture that is really needed, because all the identified gaps in education, research and knowledge transfer are very difficult to overcome on an isolated basis.

In order to finish the course with something more than a set of happy feelings, a series of commitments were settled. The AC4CA organization believes these commitments are the most important conclusions of the course and are summarized on a separate section.

Attendees

As presented in the first report to scrutinizer, the event had a total of 50 participants were selected and attended the course. In addition, during the course three companies (SIEMENS, National Instruments and EMERSON) had stands during the three days.

The fact of having people from industry as well as students and academics made coffee breaks very interesting communication points were participants also took advantage of sharing ideas and comments with the speakers.

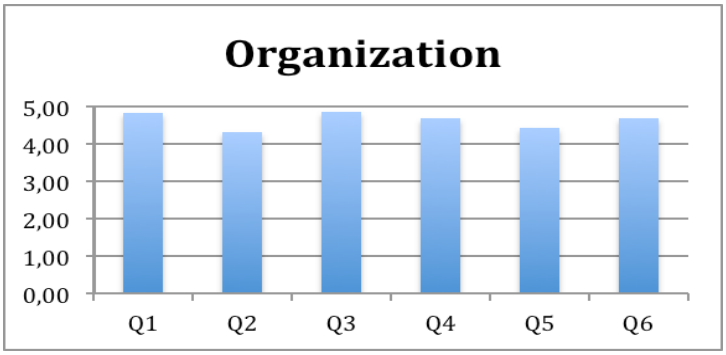
Evaluation

An evaluation form was confectioned and distributed to the participants as part of the documentation package. The form (translated here to English) is attached to this report as an annex. With a scale that ranges from 0 to 5, it can be seen in the next graphic charts that the course has satisfied the participants' expectations.

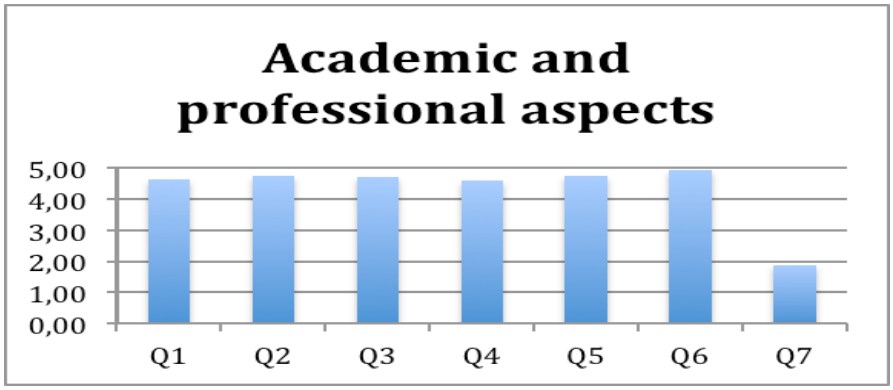
The questions have been structured in three categories. Questions and statistics corresponding to each one of the three groups are shown next:

	Organization	5	4	3	2	1	N/A
Q1	How do you rate the information has been provided about the event (logistics, talks, general organization, etc..)?						
Q2	Did you find the website a useful resource for the dissemination of the course?						

Q3	Was information about the agenda and scheduled events was sufficiently clear?						
Q4	How do you see the development and implementation of the course?						
Q5	Do you think the course objectives were clearly established?						
Q6	How do you rate the management of transport and accommodation?						

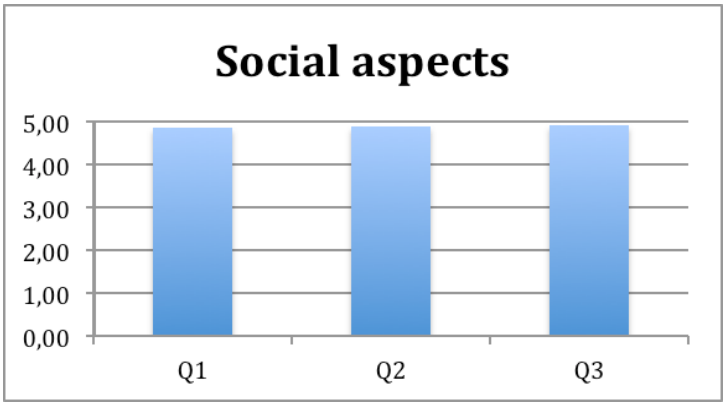


Academic and professional aspects		5	4	3	2	1	N/A
Q1	How do you rate the topics chosen?						
Q2	Were the topics covered useful to enhance your interest in advanced control techniques?						
Q3	Do you think the speakers have been chosen wisely?						
Q4	Do you think the material provided is useful?						
Q5	The presentations have motivated you to delve into new techniques Advanced Control?						
Q6	After seeing the potential benefits of applying advanced control, do you think that Central America should take actions to promote it?						
Q7	Did you know, before this event, the International Federation of Automatic Control (IFAC)?						



It is worth to note that quite a few participants did not heard about IFAC prior to this event.

Social Aspects		5	4	3	2	1	N/A
Q1	How do you rate the opportunity to contact the researcher speakers?						
Q2	How do you rate the opportunity to make contact with Central American professionals and academics in the field?						
Q3	Based on this experience, how positive do you see a continuity in some kind of meeting in Central America within the scope of advanced control?						



Commitments

As part of the concluding Friday morning session: "*Conclusiones y perspectivas de desarrollo de la automatización y el control automático en Centroamérica. Promoción de la ACDCA*" [1], several thoughts and commitments arisen. During the session, Prof, V.M. Alfaro exposed the genesis of the AC4CA event and the main goals IFAC has on those regional courses. Among them and as a way of providing a sustained framework for the development and execution of activities related to advanced control, the creation of an association (at regional, say Central America, level) is envisaged as a need. Along these lines, participants from all countries and participating groups (students, academics and professionals) identify the current moment as a great opportunity to carry out this idea. In fact, the AC4CA event has been the first time this group of people that shares advanced control as its main interest meets and shares experiences, problems and perspectives of actuation.

All the participants agree that their countries have poor; if any; development in research and need to progress on such respect. In addition this should have a major repercussion on the industry-academy link. Actually, it turns out that the major deployments on advanced control technology and equipment is pursued by foreign brands. Intensification in cooperation and knowledge transfer is identified.

It is recognized that it will be very difficult to progress at national level. Therefore, cooperation among the Central American countries is requested. Several benefits of constituting a Central American Association of Automatic control are identified:

1. Creation of a network of people with different expertise, all related to automatic control.
2. At graduate level, work towards a "homogenization" of the control courses that are thought at the different universities. This will help to establish common specialization courses, joint master courses development and possible doctoral activities, etc
3. Organization of specific courses where some specialists could be invited.
4. Creation of a web page were activities, participants, national contact points, etc, are shown.

[1] *"Conclusions and perspectives for the development of automation and automatic control in Central America. Promotion of the ACDCA"*

In order to proceed, it is decided to create national committees integrated by one representative from each sector: student, academic and industry. Each committee will have the duty of identity needs and opportunities and to report them in order to confection an integrated vision at regional level. The deadline for reporting such needs and opportunities is 30 April 2011.

Some committee members are proposed with the commitment of providing the remaining names in short (remember that from El Salvador and Honduras there were no students and from Panama only academic representatives attended the course):

Integration at regional level: Prof. V.M. Alfaro / O. Arrieta (CR)

Guatemala: (S) Roberto Méndez / (A) Luis Fernando García /(P) Juan Carlos Sánchez
Panamá: (S)/(A) Ignacio Chang /(P)
El Salvador: (S) / (A) David Flamenco /(P) Ricardo Rivas
Nicaragua: (S) Cristóbal Zelaya / (A) Fernando Flores / (P) Yamil Jiménez
Costa Rica: (S) Fabián Abarca+ Mauricio Espinoza /(A) Víctor Alfaro + Jorge Blanco / (P) Jhonny Alvarado
Honduras: (S) / (A) Gabriela Garay / (P) José Gross

These committees are also defined as the initial national committees that will act as contact points for the matters regarding the start-up of the Central American association of automatic control. As an association, it is needed to be legally created in one country. From this respect, Prof. V.M. Alfaro will look at the conditions and implications for the creation of such association.

The need for another common meeting has been stated and recognized by everyone. On such respect, each one of the national committees will report possibilities for pursuing such meeting. It is during such meeting that the next step for the creation of the association will be executed. However, it should also be pointed out that displacements among all these countries are not easy as it may seem from the outside. Even geographically close, to travel from one country to another turns out to be really expensive for them. Therefore introducing a difficulty in achieving frequent meetings.

If such association is created, Prof. V.M. Alfaro raises the point that this will allow the possibility to finally become an associate IFAC member. However, the association will need to show some activity prior to become an IFAC member. This is to say that, for example, an annual or biannual meeting at regional level can be organized. It is agreed that if such activity could be achieved and finally, for example, the Latin-American Conference on Automatic Control could move to Central America that will really be an achievement.

Final Comments

Just as a closing remark, the organization would like to thank IFAC-Foundation the opportunity of organizing such event. It has represented a unique chance for the area to move one step ahead on unifying common interests and goals for the development of the Automatic Control field in the area.

The organization truly believes that the event has accomplished the IFAC-Foundation goals and further actions are now starting in order to consolidate the results of the meeting and establish a solid network of professionals with common interests to share in education as well as research and knowledge transfer.