

## Controls for Societal Challenges Special Tutorial Session Recap

The 2011 American Controls Conference hosted a CSS Outreach Fund sponsored two-session series aimed at exploring how the field of controls can play a role in addressing important societal challenges. The motivation for these so-called “Controls for Societal Challenges,” sessions came from the National Academy of Engineering’s recently issued list of grand challenges for engineering that were focused on the following four basic human needs; sustainability, health, vulnerability, and joy of living. The organizers felt that although the depth and breadth of controls and systems theory are well poised to address many of these fundamental issues, we have often lacked the context specific knowledge. The goal of the sessions was thus to bring together the controls community with researchers specializing in areas that form the building blocks of sustainable energy and sustainable infrastructures such as energy, food supply, transportation, and climate change. These topics were divided into a session on energy and another on sustainable infrastructures. The sessions were introduced by Tariq Samad who framed the sessions in terms of the recent report on Challenges for Controls, which looks at complementary issues and questions about the new directions for the field of controls.

The first session focused on energy systems and was moderated by Datta Godbole, the Director of Honeywell Global Technology Labs Knowledge Systems. It featured three presentations by panelists with expertise in a broad array of energy system related topics from technology specific issues to a macro-level overview of energy grid related challenges. Paul Fleming of NREL discussed wind turbines and presented previous controls related successes, current NREL projects and new control challenges in further advancing the technology. Ajilli J Hardy of the GE Global Research Center explained geothermal energy and discussed ways to make this source of renewable energy more accessible and cost effective. In the last presentation of the session, Massoud Amin of the University of Minnesota provided an overview of controls and dynamical systems related issues involved in developing a sustainable energy infrastructure: from global emissions planning and transportation to efficient device technologies. The presentations were followed by an interactive discussion with the audience. This interdisciplinary discussion helped to frame some relevant problems for control experts, and both the panelists and participants expressed interest in finding ways to have future sessions like this.

The second session focused on the broad area of sustainable infrastructure and sustainable development. In particular, the theme of problems and issues specific to the third world with four presentations along with a brief talk by Roy Smith of ETH Zurich where he described his experiences in Africa during an Engineer’s Without Borders program. The talks were followed by a panel discussion. The first speaker, Pramod Khargonekar of the University of Florida discussed how a systems perspective can be used to analyze the interactions between improving living standards in the underdeveloped world, technology driven productivity growth and world-wide increasing demand for natural resources and energy. In the second presentation, Viswanath Talasila of Honeywell Bangalore discussed transportation modeling, specifically the need for new modeling and analysis techniques to deal with heterogeneous traffic patterns, which are found in India and are very different than the lane specific traffic flow in the USA and Europe. He also presented results from EUCLiD, a project that focused on how sustainable technologies used in Europe need to be adapted to an Indian context and discussed how this case study can be extrapolated to find new ways for US and European researchers to form successful collaborations with their counterparts in India. In the third presentation, Indra Vasil, a plant biologist from the University of Florida, described how a partnership between plant biology and engineering can help to secure future world food production. The session concluded with an overview of technologies and projects aimed at enabling sustainable development through life-cycle management by George Lo of Siemens Corporate Research.

Both sessions were well attended and the panel discussions led to lively interactions between the presenters and the audience where a number of interesting questions were raised. A number of the attendees and panelists expressed interest in having continuing discussions about the role of controls in energy and sustainable development. The presenters and audience members had some great ideas on how the controls community can get more involved in research in these areas. The slides that were presented in both sessions are posted at: <http://www.cds.caltech.edu/controlsforsociety/acc11.html>.

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