Appendix A. "Impact of Control" Berchtesgaden Workshop

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The idea for the workshop came about during my sabbatical at the Institute for Advanced Study (IAS), Technische Universität München (TUM), during 2008-2009. As part of the Hans Fischer Senior Fellowship offered me by IAS, funds were available to hold a workshop in my area of research. Motivated primarily by a desire to showcase the activities in control theory and applications to a research group dominated by physicists and biologists, the illustrious and enterprising Martin Buss and I began to brainstorm. Rather than limit the topic to specific control areas or applications, Martin and I developed the idea of covering control at large. Serendipitously, at the same time, the then president of the Control Systems Society, Tariq Samad, together with Gary Balas, had initiated a Task Force on Outreach, one recommendation of which was to hold a workshop where success stories and grand challenges and the overall impact of advanced control would be presented. The four of us joined forces, and with multiple sponsors from both Europe and the United States, and strong support from Patrick Dewilde, Director of IAS at TUM, we put together an international workshop on the "Impact of Control: Past, Present, and Future," held October 18-20, 2009, at the InterContinental Berchtesgaden Resort, Berchtesgaden, Germany. The sponsors included TUM-IAS, Cognitive Technical Systems (CoTeSyS), Deutsche Forschungs-Gemeinschaft, and the FeedNetBack and DISC projects from Europe and IEEE-CSS, the National Science Foundation, and the Institute for Systems Research from the U.S.

Seventy leading experts from all over the world representing academia, government, and industry attended the workshop. A range of topics related to the broad impact of control were discussed: the successes of advanced control in practice, new and emerging control technologies, grand challenges for the future, research opportunities, and barriers to technology transition.

The workshop, held over two and a half days, explored the impact of control from two distinct viewpoints. The first was applications, on the basis of which the participants were grouped into seven sessions: Aerospace, Automotive, Biological Systems, Manufacturing Automation & Robotics, Networked Systems, Process industries, and Renewable Energy & Smart Grid. After a day of deliberations, the groups made their presentations summarizing the control achievements, grand challenges, and research opportunities in their particular domain of application. The second approach addressed the workshop topic with a thematic flavor. Related breakout sessions were organized on the following topics: Application & Market Requirements, Cognitive Control, Controls Education, Implications for Research Communities, Outreach & Visibility, and Tools & Platforms. Following extended deliberations, session chairs presented key issues and recommendations related to their topic.

The workshop also featured plenary lectures by Peter Terwiesch, Chief Technology Officer, ABB; Karl Åström, IEEE Field Medal Winner, Lund Institute of Technology; and Alkis Konstantellos, Deputy Head, Embedded Systems and Control, European Commission, on industrial, academic, and government perspectives, respectively. A panel discussion was held at the close of the workshop addressing final thoughts and comments of the participants. The workshop agenda is included below.

Significant preparation was undertaken prior to the workshop to help accomplish the ambitious agenda. Given the broad scope of topics and content, care was taken to ensure several aspects: selecting participants who have played a leadership role in their domain, communicating guidelines to these

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participants in terms of questions that needed to be addressed in session deliberations, and identifying session chairs to assemble and engage each group in an extensive dialog that addressed these questions. These preparations helped the workshop participants to “hit the ground running” and arrive at consensus on the impact of control, key achievements, opportunities, and recommendations.

The Berchtesgaden Workshop Participants, Intercontinental Hotel, October 2009

Berchtesgaden Workshop Agenda