

MATHEMATISCHES FORSCHUNGSINSTITUT OBERWOLFACH

Report No. 11/2005

Regelungstheorie

Organised by
Frank Allgöwer (Stuttgart)
Uwe Helmke (Würzburg)
Huibert Kwakernaak (Enschede)

February 27th – March 5th, 2005

ABSTRACT. The workshop “Regelungstheorie” (control theory) covered a broad variety of topics that were either concerned with fundamental mathematical aspects of control or with its strong impact in various fields of engineering.

Mathematics Subject Classification (2000): 93-xx, 49-xx.

Introduction by the Organisers

Control theory is an interdisciplinary field that is located at the crossroads of pure and applied mathematics with systems engineering. It therefore covers a wide variety of topics, ranging from fundamental mathematical aspects to real world engineering applications of industrial relevance. In particular, it has deep connections to different branches of pure and applied mathematics, including e.g. operator theory, real and complex analysis, probability theory, commutative algebra, as well as algebraic and differential geometry.

The Oberwolfach workshop “Regelungstheorie” has the traditional goal of bringing active researchers with both a mathematical and an engineering background together in order to stimulate a fruitful interaction between these communities. This diversity of our field was once again nicely reflected in the expertise of the 42 participants of the 2005 workshop from all over the world. A particular effort has been devoted to inviting newcomers from the somewhat younger generation which had the refreshing side-effect of an increase in the number of female participants.

The particular mission of the workshop was as well reflected in the various themes that have been addressed in the 29 stimulating presentations. The program has been clustered into rather coherent sessions of three lectures each revolving around

- Observer and estimation theory
- Robust and fault-tolerant control
- Behaviors
- Optimal control
- Model reduction
- System Identification
- Tracking and path-following
- Infinite dimensional systems

In addition to regular session talks of thirty minutes, each day was initialized with a somewhat longer presentation that was followed by a five-minute discussion statement. This novel feature provided an extra stimulus for lively general discussions during the subsequent coffee breaks and beyond.

As a particular highlight, Vincent Blondel and Jan Willems organized and chaired a session on open problems in systems and control on Tuesday evening. Eight contributors had the opportunity to present concrete research questions in seven minutes, followed by a brief two minutes discussion with the audience. Six of the corresponding abstracts related to the open problems have been collected at the end of this report and should, in view of the raised challenges, stimulate lots of new research initiatives.

In addition to the excellent scientific program most participants could as well enjoy the traditional Wednesday afternoon walk to St. Roman, with beautiful weather and in a wonderful winter landscape. The day was concluded by an impressive musical evening with excerpts from Schubert's "Winterreise" presented by P. Hippe (bariton) and P. Lohmann (piano).