

Paths Ahead Symposium

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Honoring Professor S. K. Mitter

1. Applauding your efforts to keep control at the forefront
2. Bringing in ideas from the group at Imperial College, the Lions group in France, ideas from mathematical programming, ideas from stochastic calculus.....
3. Efforts to build a community through hosting visitors, organizing joint research projects, organizing social occasions, etc.
4. Outreach to mathematics, physics and biology
5. Service to others , sitting on exams outside MIT, encouraging students to look for the bigger picture, ...

In examining the paths ahead resource allocation is key

The National agenda:

Energy, Food, Transportation, Health Care, Entertainment

Our skill set:

Invention, Development, Methodologies, Basic Research

Enabling better use of technology, defining the right technology,
discovering new uses for existing technology...

What defines our craft?

1. Strong analytical skills
2. Skill at building dynamical models
3. Cross disciplinary thinking
4. Timely adoption of new technologies

What challenges do we face?

1. Maintaining a flow of new talent into the field
2. Getting the tradeoff between depth and breadth right
3. Making others aware of the value we add
4. Repackaging our ideas to include new technologies
5. Maintaining awareness of the national agenda

How do these differ from other areas of engineering?

Other areas of engineering have similar merits and similar problems. Areas come in, and go out of, style, making. The life cycle differs from area to area. But, because “systems” occupies a position of something like a meta-engineering area it has a little more permanence and hence the opportunity/need for evolutionary change.

As illustrated by the sequence

Servomechanisms laboratory,
Electronic Systems Laboratory,
Laboratory for Information and Decision Sciences,
.....

Topics: Some thoughts

1. Need to stop thinking of yesterdays results as research problems: for now, we know enough about linear systems, Gaussian noise, ... Think about why the hidden Markov approach to simultaneous identification and estimation has been so much more successful than the linear-Gaussian versions of the problem.
2. Make an effort to suppress the differences between the continuous and the discrete, do not magnify them.
3. Incorporate more statistical learning into our courses, especially the basics.
4. Work on ways to incorporate the cost of implementation into our optimal control computations.

Application Areas

Good problems are where you find them:

1. Networks, networks, networks... Communication, Sensor, Social, ... This seems to call for different thinking, but there are a number of active programs that are getting results. Not just power control in communication networks, but a range of issues involving “just enough” control for constrained situations.
2. Natural information processing and control... couples to biology and medicine, a huge range of problems on the neurobiological side involving Poisson process, limited information control, diagnostics, treatment, ...

Application Areas

Continued...

3. Quantum control offers a number of totally new problems and a refreshingly different slant on old problems. Entry fee may be seen as being a little high but the results can be rewarding.
4. Robotics is just coming into its own as an applied field. Control is central in many cases. The models are usually known but the inter relationship between hardware and software is still a major stumbling block. A great opportunity to take computer control to the next level.

Is there an especially promising new area of theory?

In the past we have found almost endless opportunities in a succession of mathematical topics such as: linear algebra, functional analysis, stochastic processes, game theory, differential geometry, etc. I do not see a strong candidate for the future, however, there are results in graph theory being used by researchers in studying controlled formations, and there are results in information theory being used in limited formation control, etc. This requires imagination!

A guess would be that some of the methods being used to study condensed matter physics will find further application in the study of the control of ensembles and network phenomena. These methods may be very different from what we have been used to.

For our Honoree, some final thoughts

1. We appreciate your efforts to give our field a sense of style.
2. We admire your efforts to help the careers of young people.
3. We recognize the special role that MIT plays in the engineering world and your efforts to give our field an important position in the institution.

Of course, there is much more to be done and we
Will be looking to you for more of the same.

Adieu

Life's but a walking shadow, a poor player that struts and frets

15 minutes

his ~~hour~~ upon the stage and then is heard no more: it is a tale

told by an idiot, full of sound and fury, signifying nothing.

