

APPLICATION OF CONTROL THEORY AND OPTIMIZATION TECHNIQUES IN BIOCHEMICAL PATHWAYS

Hyderabad International Convention Centre, Hyderabad, India 16-18 August, 2010

Control theory is concerned with designing strategies that ensure the robust performance of a system by automatically adapting to changes in the environment. Biochemical pathways in the cell are responsible for processing environmental signals, inducing appropriate cellular responses, and regulating internal events such as gene expression. Through elaborate mechanisms, they allow cells and entire organisms to perform their basic functions. The key role played by feedback in life are manifested in the homeostatic control and regulation of biochemical pathways, which break down nutrients and provide the cell with energy and materials, and their appropriate timing in functions. Recent years have witnessed remarkable advances in elucidating the components of cellular pathways and networks of genes. They provide a snapshot of the complete genetic activity of a cell, yet the overall connectivity and functional characteristics are still poorly understood - a fundamental lacuna in understanding their control architecture. Several mathematical tools based on control-theoretic thinking have already begun making a contribution in the understanding of the robustness and evolvability in designs of real biochemical pathways. Some examples are the theory of monotone input-output systems, feedback control theory, etc. Optimization techniques (Flux Balance Analysis) are being applied to pathways as it is assumed that biological organisms generally optimize their metabolic pathways for growth. Such applications are useful in designing pathways for addressing host-parasite interactions and pathway engineering. This satellite symposium will explore the close analogies between biochemical regulatory networks and engineered automatic control systems. Feedback, which is a central theme in such analogies, and the role of stochasticity, common in intracellular setting, will be explored in connection to fault-tolerant systems in pathways. At the symposium, internationally known researchers will discuss relevant mathematical foundations and model systems from biology that would enhance the interdisciplinary discussions. In contrast to other workshops in similar areas, this one will emphasize rigorous mathematical theory along with their application.

Plenary Speakers:

- Antonis Papachristodoulou, University of Oxford, UK
- Eberhard Voit, Georgia Institute of Technology, USA
- Mogens Høgh Jensen, Niels Bohr Institute, University of Copenhagen, Denmark
- Mustafa Khammash, University of California, Santa Barbara, USA
- Pablo A. Parrilo, Massachusetts Institute of Technology, USA
- Philip Maini, University of Oxford, UK

Presentation

- Few papers will be selected for oral presentation
- Title, Affiliation and Abstract (within 150 words) of \bullet the paper should be submitted by E-mail to (ICM2010satmeet@gmail.com)
- Last date for submission: May 30, 2010
- Notification of selection:

Participation: Mathematicians, Physicists, Engineers, and Biologists who are working in the area of Control Theory and Optimisation techniques with an interest in applying it to biological systems, specifically to model biochemical pathways. Senior graduate students, postdoctoral fellows and young scientists are encouraged to apply.

Please note that all foreigners need a visa to enter India.

Total number of participants: 40

mportant Dates

i)	Last	date	for	Early	Bird Re	egistration:	June 1	5, 2010	
Fee	s:								
	Rs.4	000	(Ind	lians);	\$100	(participan	its from	outside	India)

- ii) Last date for Late Registration: July 15, 2010
- ees:
- Rs.5000 (Indians); \$125 (participants from outside India)
- iii) Onsite Registration (Depending on availability)

ees: Rs.6000 (Indians); \$150 (participants from outside India)

- Registration is compulsory for the presenter.

Registration fee includes Lunch, Tea/Coffee during meeting and Registration material

Address for correspondence : Dr. Somdatta Sinha Email : ICM2010satmeet@gmail.com Financial Assistance : Limited financial assistance may be available to young scientists. Application for funding support and other information will be available soon.

Programme Link : http://www.icts.res.in/program/Biochem Accommodation : Those wishing to stay at the venue may make reservation at groups@novotelhyderabad.com mentioning the name of the conference to avail the special conference rate. Shared accommodation can be arranged on request in nearby Budget Hotels and Guest Houses.

Organisers :

Dr. Somdatta Sinha

Mathematical & Computational Biology Group, Centre for Cellular & Molecular Biology (CSIR), Uppal Road, Hyderabad 500007, INDIA

• Prof. M. Vidyasagar

Erik Jonsson School of Engineering & Computer Science, The University of Texas at Dallas, Richardson, TX 75080- 3021, USA

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