

ON STOCK MARKET TRADING AND PORTFOLIO OPTIMIZATION: A CONTROL SYSTEMS PERSPECTIVE (T-2)

James A. Primbs (Stanford University)

B. Ross Barmish (University of Wisconsin)

Daniel E. Miller (University of Waterloo, Canada)

Yuji Yamada (University of Tsukuba, Japan)

Time: 8:30am – 5:00pm

Room: Grand Ballroom G (North)

The purpose of this one-day workshop is to explain how control theoretic tools and associated mathematical concepts can be used in stock and option trading. While introducing the requisite mathematical tools, the speakers will also provide a number of case studies to demonstrate application of various trading algorithms, portfolio balancing techniques and the use of both technical and fundamental analysis. The topic of back-testing of candidate trading strategies will also be discussed and we will describe and demonstrate various simulation codes. Finally, the workshop will include formulation of a number of new and exciting research problems for the control field. A number of trading concepts will be explained in the context of a basic feedback loop with the control corresponding to modulation of the amount invested as a function of time. A state space setting will be used and both stochastic and deterministic models will be considered. We will pose new research problems that are aimed at both certification of robust performance and portfolio optimization.

This workshop will target members of the control community that are seeking an easy-to-digest introduction to trading from a systems theoretic point of view. In this context, our goal is to bring the attendee “up to speed” and then go on to describe new classes of research problems having both theoretical and applied components. Modeling of markets will be described under the assumption that the audience is only minimally familiar with trading mechanics. Accordingly, considerable time will be dedicated to tutorial material and existing literature in the financial journals. This tutorial material will include a review of basic terminology such as margin, short selling, bid-ask spreads, liquidity, put and call options, volatility and various technical indicators. Finally, to provide a balanced perspective to the technical analysis methods which we describe, the workshop will also include a lecture on stock trading based on fundamental analysis. This suggests a number of new lines of research on trading which are based on combining both fundamental and technical indicators.

MODEL PREDICTIVE CONTROL: DESIGN AND IMPLEMENTATION USING MATLAB (T-3)

Liuping Wang (RMIT University, Australia)

Time: 8:30am – 5:00pm

Room: Grand Ballroom F (North)

Model Predictive Control (MPC) has a long history in the field of control engineering. It is one of the few areas that have received on-going interest from researchers in both the industrial and academic communities. Three major aspects of model predictive control make the design methodology attractive to both engineers and academics. The first aspect is the design

formulation, which uses a completely multivariable system framework where the performance parameters of the multivariable control system are related to the engineering aspects of the system; hence, they can be understood and 'tuned' by engineers. The second aspect is the ability of method to handle both 'soft' constraints and hard constraints in a multivariable control framework. This is particularly attractive to industry where tight profit margins and limits on the process operation are inevitably present. The third aspect is the ability to perform process on-line optimization.

This one-day short-course gives an introduction to model predictive control, and recent developments in design and implementation. Beginning with an overview of the field, the course will systematically cover topics in optimization, receding horizon control, MPC design formulations, constrained control, as well as real-time simulation and implementation using MATLAB® and Simulink® as a platform. The simulation and implementation procedures are demonstrated on a laboratory apparatus. The course is suitable for engineers, students and researchers who wish to gain basic knowledge about model predictive control, as well as understand how to perform real time simulation and implementation using MATLAB and Simulink tools.

WORKSHOP FOR HIGH SCHOOL TEACHERS

THE POWER, BEAUTY AND EXCITEMENT OF A FIELD THAT SPANS SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS

Sponsored by IEEE CSS and AACC Technical Committees on Control Education, the National Science Foundation, and University of Kansas

Bozena Pasik-Duncan (University of Kansas)

Pamela Whiffen (Gifted Science and Math Specialist, Scottsdale, AZ Unified School District)

Dominique Duncan (Yale University)

Time: 3:00pm – 7:30pm

Room: Grand Ballroom E (East)

The purpose of this workshop is to increase the general awareness of the importance of systems and control technology and its cross-disciplinary nature among high school teachers and students. The workshop activities include presentations by control scholars and remarkable speakers, informal discussions, and the opportunity for teachers to meet passionate researchers and educators from academia and industry. The talks are designed to be educational, inspirational and entertaining showing the excitement of being an engineer.