ORG2008: ORG Graduate Students Seminar
on Theoretical/Applied combinatorics & Optimization, Modeling & Computing

TITLES / ABSTRACTS

1. **Total Dual Integrality and Integer Polyhedra** (15-minutes presentation)
   by CHEN, Qin, PhD student, University of Hong Kong.
   
   Abstract.

2. **A Topic on Combinatorial Optimization** (20-minutes presentation)
   by CHEN, Zhibin, PhD student, University of Hong Kong.
   
   Abstract.

3. **Binding Numbers** (30-minutes presentation)
   by LAW Ka Ho, PhD student, University of Hong Kong.
   
   Abstract. The binding number is one of the many important parameters of a graph. It relates in some way to the minimum degree, connectivity and toughness, and characterises some other important properties of the graph such as the existence of cycles and Hamiltonicity. In this talk, the binding number will be defined and some important results will be derived or stated. Its extension for use in bipartite graphs will also be discussed.

4. **A Tabu Search Based Algorithm for Cargo Loading Problem** (20-minutes presentation)
   by PAN, Li, MPhil student, University of Hong Kong.
   
   Abstract. Given a finite set of three-dimensional rectangular items and an unlimited set of identical three-dimensional bins, the cargo loading problem is to determine the minimum number of used bins to contain all the items without overlapping. The problem is NP-hard. We propose a new tabu search based algorithm with a binary tree heuristic algorithm as its inner heuristic. Extensive computational testing on problem instances from literature shows that the new approach on average yields good results compared with some recent heuristics from the literature.

5. **Manpower Planning of an Airport Baggage Service: Data/GP Models and DSS** (25-minutes presentation)
   by ZHU, Minyue, MPhil student, University of Hong Kong.
   
   Abstract. Goal Programming (GP) models and Decision Supporting System (DSS) are two powerful tools dealing with manpower planning problems, not only on research level, but also as practical tools for industrial implementation. Goal programming is often useful as an optimization modeling technique for generating shift-duties of worker schedules. In our project in baggage service agency in Hong Kong International Airport, we proposed three model formulations based on the base fixed-length shift duties generation model to approach various combinations of goals of manpower planning. Such an optimization modeling is built upon the essential foundation of a detailed data modeling and its analysis for all the driving parameters and demand/supply input necessary for numerical computations. Hence, the data model and GP model thus form the two integral components of the overall
automation system the DSS, which is an automatic computer based and user-friendly system to support the manager on planning decisions.

6. A Parsimonious Model for the Generation of Phyllotactic Patterns (15-minutes presentation)
by CONG, Yang, MPhil student, University of Hong Kong.

Abstract. An interesting phenomenon about phyllotaxis is the divergence angle between two consecutive primordia. Very often, the angle observed is close to the golden angle \( \theta = 360(1 - r)^{\circ} \) where \( r = (\sqrt{5} - 1)/2 \). In this talk, a dynamic model based on Max-Min principle for generating 2D phyllotactic patterns will be introduced. I will illustrate that instead of considering the influence of all existing primordia, only considering the two predecessors is enough to fix the birth place of the new generated primordium. Further, I will give a measurement to evaluate pattern uniformity and provide some interesting numerical results.

7. Optimal Control Policy for Probabilistic Boolean Networks (15-minutes presentation)
by JIAO, Yue, MPhil, University of Hong Kong.

Abstract. In this talk, we consider optimal control policies for probabilistic Boolean networks (PBNs). Boolean networks (BNs) and PBNs are useful and effective tools for modeling genetic regulatory networks. A PBN is essentially a collection of BNs driven by a Markov chain process. It is well-known that the control/intervention of a genetic regulatory network is useful for avoiding undesirable states associated with diseases like cancer. Here we first introduce a new formulation for the optimal control problem. Experimental results are given to demonstrate the efficiency of our proposed formulations and methods.

8. Modelling Default Data via a Hidden Markov Model (20-minutes presentation)
by LEUNG, Ho Yin, MPhil student, University of Hong Kong.

Abstract. HMM is a traditional way for interpreting a single observation sequence. For multiple sequences, we introduce a new HMM model that arrives at a single hidden sequence. Efficient algorithm will be presented. We will then compare the hidden risk state process obtained by our HMM and the traditional HMMs using default data in 4 sectors.
[ Joint work with Wai-Ki Ching ]

9. A New Multivariate Markov Chain Model with Applications to Sales Demand Forecasting (20-minutes presentation)
by LI, Tang, MPhil student, University of Hong Kong.

Abstract. Markov chains are popular tools for modeling a lot of practical systems including categorical data sequences. Multiple categorical sequences occur in many applications such as inventory control, finance, data mining and bioinformatics. In many situations, one would like to consider multiple categorical sequences together at the same time. The reason is that the data sequences can be correlated and therefore by exploring their relationships, one can develop better models. In this paper, we propose a new multi-dimensional Markov chain model for modeling multiple categorical data sequences. We test the proposed model with both synthetic data and practical sales demand data.
[ Joint work with Wai-Ki Ching, Li-Min Li and Shu-qin Zhang. ]
10. **Predicting Protein Functions by Classification**  (15-minutes presentation)
by **LI, Limin**, PhD student, University of Hong Kong.

Abstract.