Workshop Proposal

**Mathematical Approaches to User Modeling**

(MUM)

*Send with full of respect: UMAP 2016 – Workshop Organizers*

**1. Workshop Chair Information**

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This is the first time I undertake a high position and big role like this workshop chair.

**2. Abstract**

The workshop is a mini-conference focusing on introducing the book “Mathematical Approaches to User Modeling”. Specialized topics of the workshop are chapters of the book. Main contents of such chapters are materials for composing papers. In other words, these papers summarizes important works inside the book.

User model is description of user’s information and characteristics in abstract level. User model is very important to adaptive software which aims to support user as much as possible. The process to construct user model is called user modeling. As the title suggests, the book focuses on mathematical approaches to user modeling. The book includes seven main chapters:

* Chapter I is a survey of user model, user modeling, and adaptive learning.
* Chapter II introduces the general architecture of the proposed Triangular Learner Model (**TLM**) and its user modeling system Zebra.
* Chapter III, IV, V describes three sub-models of TLM such as knowledge sub-model, learning style sub-model, and learning history sub-model in full of mathematical formulas and fundamental methods. These are the most important chapters.
* Chapter VI gives some approaches to evaluate TLM and Zebra.
* Chapter VII summarizes the research and discusses future trend of Zebra.

Please pay attention to chapters II, III, IV, and V. Chapter II gives essential aspects of TLM and Zebra according to general viewpoint. Chapters III, IV, and V are the heaviest ones filled with a lot of knowledge. Therefore, three main topics of the workshop correspond to chapters III, IV, V as follows:

* Topic 1 is “*Knowledge sub-model*”.
* Topic 2 is “*Learning style sub-model*”.
* Topic 3 is “*Learning history sub-model*”.

In general, the first difference of the book is to introduce my innovative works in mathematics, probability, user modeling, machine learning, data mining, and adaptive learning. The second difference is that the user modeling system Zebra is implemented as computer software associated to the book, available at internet link:

<http://www.locnguyen.net/st/dissertations/zebra>

The Zebra system is demonstrated at the end of the workshop.

**3. Motivation**

User model is the most important to support adaptive systems which aim to serve users by the best way. There is a large amount of information stored in user model, which motivates the book to propose three essential features of users in adaptive learning context when users are learners. Researchers only focus on such essential features: knowledge, learning style and learning history. These features form a triangle and this is the reason that TLM is abbreviation of Triangular Learner Model. In order to encourage researchers to have an assertive manner in doing practical and experimental researches based on the proposed user model TLM, the research provides fundamental methods, mathematical theorems and formulas to prove the solidity and validity of such TLM. This is the ultimate motivation of the workshop. In other words, the book is mathematical guidance for researchers who are willing to use TLM for their researches.

**4. Workshop Format**

The main purpose of the workshop is to introduce the book “Mathematical Approaches to user Modeling” and so the workshop has three sections:

* Section 1: I describes three sub-models of TLM which are three topics of workshop. Fundamental methods and mathematical formulas related to these sub-models are main subjects. Relevant papers are also mentioned.
* Section 2: The default implementation of TLM, the user modeling system Zebra, is demonstrated. Implementations of proposed algorithms are also mentioned. Researchers are encouraged to implement and use TLM by their own ways.
* Section 3 is the discussion. Researchers will discuss together about TLM, fundamental methods and mathematical formulas. Questions and answers (QA) are preferable interaction means.

The expected number of participants is 10. The expected number of program committee is 2. Requested duration is half day. This is the first workshop in my research career. I am very honorable and happy if it is successful and gains a URL in UMAP2016 proceedings. I need and expect an assistance from workshop organizers to develop and implement my ideas. This is very important for my research career.

Followings are papers which will be submitted to the workshop:

* The paper “Review of A User Modeling System for Adaptive Learning”. This paper will also submitted to the Special Issue “Adaptive Educational Technology Systems” of the Systems (ISSN 2079-8954) journal. The paper summarizes the book with regard to its adaptive learning applications.
* The paper “Beta likelihood estimation for Specifying Prior Probabilities in Bayesian Network”. This paper mentions how to improve knowledge sub-model of TLM based on Bayesian network.
* The paper “New version of CAT algorithm based on maximum likelihood estimation”. This paper is also submitted as a full paper of UMAP2016. This paper focuses on evaluating users’ study results based on computerized adaptive test (CAT). Mathematical results are described in detail.

Following are papers relevant to workshop which will be submitted later. They are post-workshop publications.

* The paper “Uncovering problem in hidden Markov model (HMM) is solved by finding out the longest path of graph”. This paper is not submitted to the workshop because its result is not used directly for TLM. Note that HMM is used to construct learning style sub-model of TLM.

Best regards,

Loc Nguyen