Tutorial Proposal

**Mathematical Approaches to User Modeling**

(MUM)

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| *Sending with full of respect*: | Tutorials Chairs of ACM UMAP 2016 |
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**Abstract**

User model is description of users’ 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. Within learning context where users are learners, I propose a so-called Triangular Learner Model (TLM) which is composed of three essential learners’ properties such as knowledge, learning style, and learning history. TLM is the user model that supports built-in inference mechanism. So the strong point of TLM is to reason out new information from users, based on mathematical tools. The research focuses on fundamental algorithms and mathematical tools to construct three basic components of TLM such as knowledge sub-model, learning style sub-model, and learning history sub-model. The research is composed as a book entitled “Mathematical Approaches to User Modeling”. In general, the tutorial aims to introduce this book in order to help scientists to implements practical researches and applications based on solid fundamental theories in which algorithms and formulas are described by the succinct way.

**Tutorial description**

The tutorial focuses on introducing the book “Mathematical Approaches to User Modeling” whose preprint version is available at <https://goo.gl/bDEXZM>. Specialized topics of the tutorial 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 tutorial 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 tutorial.

Recall that 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 objective of the tutorial. In other words, the book is mathematical guidance for researchers who are willing to use TLM for their researches. The second objective, of course, is to contribute new viewpoint and methodologies to the topic “Learner modeling – Adaptive & Personalized Educational Systems”. I am very happy and honorable if UMAP 2016 accepts my proposal of TLM along with mathematical approaches.

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

* *Section 1*: I describes three sub-models of TLM which are three topics of tutorial. 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 (Q&A) are preferable interaction means.

The expected number of participants is 10. Requested duration is half day. Participants are researchers who are interested in user modeling. The big difference of the tutorial is that I will prove mathematical formulas by board and chalk in section 1 which describes TLM in order to provide audiences the best way to comprehend these formulas. The demonstration of Zebra in section 2 is performed as video on presentation slide. Such demonstration is not important in the tutorial because it only shows feasibility of TLM in implementation. In general, the tutorial is combination of presentation slides, video, board & chalk, and Q&A. The draft presentation is available at <https://goo.gl/RgVi7e>

**Tutor’s short biography**

Loc Nguyen is a Director at Sunflower Soft Company, Vietnam. Currently, he is interested in computer science, statistics, and mathematics. He serves as reviewer and editor in a wide range of international journals and conferences. Now he is a volunteer of Statistics Without Borders of American Statistics Association. He hold a Postdoctoral degree in Computer Science, certified by Institute for Systems and Technologies of Information, Control and Communication (INSTICC). He has published 39 papers in journals, books and conference proceedings. He is author of 2 books. He is author and creator of 8 scientific and technology products. Moreover, he is Vietnamese poet who composed 1 verse story and 5 collections of 240 poems. He also has 2 music albums in which many poems are chanted by famous artists. His full CV is available at <http://cv.locnguyen.net>

Loc Nguyen does not have international experience on teaching and tutoring yet but he is very eager and enthusiastic to complete his mission as a tutorial. This is his desire.

Best regards,

Loc Nguyen