Predicting learning styles based on students’ learning behaviour using correlation analysis

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Past research has proposed various approaches to automatically detect students’ learning styles to address problems associated with traditional research methods (i.e. questionnaire). However, results obtained through traditional research methods have issues in terms of accuracy and precision which need to be addressed. In general, the existing automatic detection approaches are only able to provide satisfactory results for specific learning style models and/or dimensions, or even only work for certain learning management systems. The aim of this study is to propose an automatic detection of learning styles from the analysis of students’ learning behaviour by constructing a mathematical model. This study specifically explores the relationship between students’ learning behaviour and their learning styles. To investigate this relationship, a pilot experiment was conducted with 33 students. The students used Moodle platform, a learning management system, as supplementary online learning material for Java programming. The students’ learning behaviour was tracked and recorded. Thirty students’ data (i.e. their learning behaviour and learning styles; measured using the Index of Learning Styles (ILS) instrument) were analysed using the proposed correlation analysis to identify the relationship. The remaining three students’ learning behaviour data were used to predict their learning styles. The findings are discussed with regard to accuracy of automatic detection of learning styles using the ILS instrument.

Keywords: Automatic learning style assessment, learning behaviour pattern, student modelling.

E-learning is the use of computer technology to transmit information to individuals1. However, many e-learning systems do not take individual differences into consideration. These differences include the ability of learners, background, goal, knowledge foundation and learning style2,3. Several studies4,5 considered learning style as an important factor in determining learning effectiveness during the learning process.

To overcome these constraints, the same learning contents were provided to different learners. The learning contents were also provided to adapt to students’ requirements and needs1. Detection methods play an important role in adapting to the learning environment. There are several limitations in the detection methods of the current learning style. For instance, learning style detection can only be applied in a specific model of learning style (LS) dimension and cannot be adjusted to adapt to LS preferences in a different learning environment. In this study, a new approach was introduced to automatically detect learning styles.

The key contributions of this paper are as follows: (i) Review past detection methods and approaches in automatically detecting learning styles, especially the accuracy and precision of the detected results, learning style and learning management system (LMS) compatibility; and (ii) propose a new method to detect learners’ learning styles based on their learning behaviour patterns. In this study a direct link of a mathematical model is constructed between learners’ learning behaviour patterns and their learning style preferences. The rest of the paper is organized as follows: in next section, related work from literature review is discussed. We have then explained the research framework of the proposed approach. Experiment of the proposed approach is then presented along with recommendation for future work and discussion.

Related work

The traditional approach of learning style identification requiring students to fill up questionnaires is rather simple and carried out manually. The drawbacks of using questionnaires are that the questions are fixed and students may tend to answer questions arbitrarily. Other challenges of traditional learning style identification include identifying students’ lack of motivation and self-awareness about their learning preferences6,7. Therefore, a precise and accurate way of identifying learning styles is needed.

The automatic learning styles detection method is designed to solve problems in the traditional questionnaire in order to avoid intentional or unintentional inaccurate answers and to save students’ time in filling up questionnaires. These current detection methods use attributes such as personality factors, behavioural factors and time8,9.

The automatic detection of learning styles has been gaining significance over time in the e-learning field as it

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