

How to determine the Learners' Learning Styles in e-Learning Situation?

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Abstract: In this paper, we describe an automatic learning styles detection approach of learners in e-learning platform from observable indicators relating to their browsing and interactions. Based on the work in the fields of learning styles, user modelling, and track analysis, we propose a classification of learning style that encompasses different styles models proposed in the literature, and whose values are calculated by identifying dependent indicators at the different interaction levels identified.

Keywords: Learning style, Indicator, Learner Tracking, User Modeling, Web usage mining

Introduction

Track analysis in hypermedia environments has become a hot research topic over the last decades. The main goal of this research is to help teachers to perceive and interpret the learner's activities in e-learning situations, by exploiting and analyzing the tracks and providing knowledge on the activities, that we call learning indicators. These indicators help to understand and monitor learning in order to help tutors, content designers, and learners to have a reflexive glance on their learning methods. The identification of the learning working method is to detect the learning style. This concept, involves many domains including education and cognitive sciences. They focused on the identification of individual difference dimensions to ensure the training individualization and its improvement. Several definitions and learning styles models were proposed in literature. Some of them were implemented in educational hypermedia systems (WHURLE, CS383, ILASH, etc. [1]). The detection of these styles is based on questionnaires proposed for each model (ILS, FSQ, etc. [2]).

Our interest focuses on the automatic detection, in an e-learning framework, of learner's learning styles by the analysis of behaviors through the collection and interpretation of tracks on the learner's activities. To address this issue, we propose a methodology that identifies learning styles by interpreting observable indicators. This model will be implemented as a computing environment enabling the description of learning styles to be identified, and the indicators supporting this identification process.

1. Detection of Learning Styles from Indicators

To identify the learning style from the behavior analysis, we consider three steps in the analysis (Fig. 1):

- *Indicators' choice*: to guide the collection process, we chose to help the teacher to choose high level indicators [3] which he intends to seek from the indicators base that we build. Thus, the system generates a file of all low and intermediate needed indicators, and asks the teacher to provide additional data required for their calculations.
- *Observation*: in this phase, the system generates the necessary tracks extracted via a collection tool installed on the learner side. This tool gets specific information including visited pages URLs, time and actions.
- *Analysis and interpretation*: is the most important step. It is divided into three main stages. First, browsing path rebuilding. Second, indicators' calculation, each indicator calculation uses a dedicated method, and last the learning style deduction.

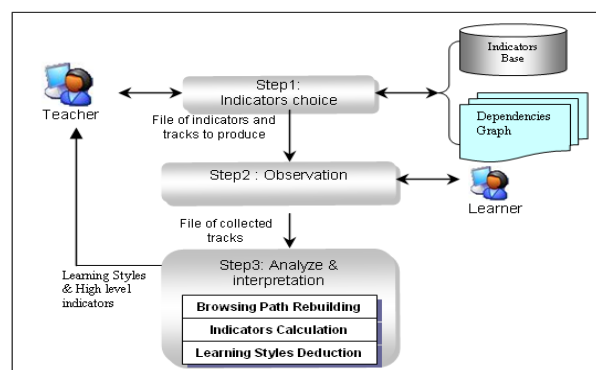


Fig.1. Learning Style Deduction Steps

The studied learning style model classifications are all interwoven. A reclassification is necessary to create a coherent model, by connecting the existing model categories. However, we have only adapted these taxonomies to our needs. This categorization attempt is based on the three elements of the learning style definition. Thus, three layers remain:

- *Educational preferences layer*: this layer includes attributes related to the preferred learning time, environment preference (individual / group, learning by project, simulation, etc.), information representations and encoding methods (verbal / imager, visual / auditory).
- *Learning process layer*: includes learning strategy, comprehension and progression approach.
- *Cognitive abilities layer*: includes motivation and concentration capacity.

To determine the learning style, we calculate the value of each layer's attribute. This value is deduced using the necessary high level indicators. Indeed, to connect the indicators to the learning styles, we also classify them according to our model layers. The possible values of each layer's attribute are chosen from the existing learning style models, by making their definitions closer.

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