DIAL: serendipitous\textsuperscript{*} DIAlectic Learning

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Abstract

Killer applications, such as Excel and other ones, may be retrospectively considered as potential excellent Learning Environments in different specific domains and also in meta-cognitive skills even if there was no learning intention neither in the designer nor in the user. We briefly present a patented methodology for knowledge acquisition and construction widely and successfully used for five years, interpreted as a Learning Environment for its users engaged in domain-dependent interactions.

1. Introduction

Advanced Learning Technologies (ALTs) today are those that support Learning by stimulating it through Dialogues with Systems. These may range from the simplest, locally loaded programs to Web applications where Artificial and Human Agents collaborate to animate the Dialogues. A view of Human Learning as a potential, indirect side effect of Dialogues was the agreement resulting from discussions by eminent scholars, as it is summarized in [1]. This conjecture will be assumed here as an axiom.

A wide range of architectures may be conceived for Systems adequate to support Learning: from Tutoring Systems to Learning Environments [2]. We are addressing the last approach (LEs), where, among other properties, at least the following two may be considered applicable:

LE’s popular property \#1: Most LEs embody some “true” knowledge that is supposed to be acquired by the learner by interacting with the system. Socratic tutoring methods attempt to emulate the autonomous discovery process for the causes of inconsistencies by the learner as a consequence of challenging him/her with dialectic arguments. In spite of these pedagogical suggestions, few LEs are founded on these principles. Rather, most LEs developers wish “the truth in a domain” to be acquired by learners exposed to “the truth”. Historical examples in-clude the PLATO genetic simulations in the 70ties, simulations such as Thingleab or Cabri in the 80ties. Recent trends [3], on the contrary, privilege methods and tools facilitating the acquisition of meta-cognitive skills, the so-called soft skills, with respect to domain dependent “true” knowledge and skills: the issue being that as a consequence of the rapid technological progress and the corresponding obsolescence of useful concepts and skills, one should learn to learn.

LE’s popular property \#2: Usually, developers of ALTs have a learning purpose in their mind before they design a System. Human learning is the explicit goal justifying and motivating the development of most LEs. In the reality, one may argue about the percentage of knowledge acquired by humans when exposed to settings purposely dedicated to teaching (e.g.: schools, training centers, …), with respect to the proportion acquired as a side effect of normal life activities.

Concerning 2, we adopt the approach opposite to the one of the majority of LEs developers. Concerning 1, we challenge the view that the “true” knowledge should be in the machine: knowledge to be learned is not in the LE but in the humans interacting (arguing) with DIAL.

2. DIAL: an overview

The DIAL system is an application of a methodology for knowledge construction, called \textit{Phi Calculus} [4;5], which has been experimented since 1994, in collaboration with the Lawyer’s Company Fidal-KPMG grouping 1200 lawyers in France. Lawyer’s daily activity consists of understanding, proving and comparing contracts. The issue for innovation, for them, is that laws, norms, and events change continuously, so contracts have to be modified as well accordingly. In order to assist the lawyers in their activity, the Company has identified classes of contracts, and for each class has decided to offer lawyers a contract “template”. It is the construction of these templates that is assisted by the methodology \textit{Phi Calculus} and the tool it has generated, called fid@ct. This tool assists the iterative
and interactive process of designing a template for each class of legal contracts: a team of two novice lawyers proposes and experiments a template, and a senior lawyer points out how to revise it. The cycle is repeated until a template is judged coherent by the senior. The Company has patented the methodology and the computer tool [6].

From a widespread perspective, Phi-Calculus may be seen as a methodology that organizes knowledge evolution in a situation of conception within an artificial agent supervised by a human agent. Phi-Calculus features are currently implemented in DIAL, in such a way to automate the assistance to the user by combining both machine learning techniques and the mechanism of constraint propagation.

The user should organize his/her universe of discourse in a Hierarchy of Terms. Then he/she, in relation to particular situations from his/her working domain, may build Examples as follows: for each example, (i) he/she builds a Formula as a conjunction of terms from the hierarchy, signing up, for each term of the Formula, whether it is observed as Present or Absent in the situation; then (ii) he/she classifies the Formula as a Positive/Negative Example of one of the Terms of the Hierarchy.

Once asked, DIAL may obtain Constraints out of Examples: within DIAL, Constraints are logical rules relating the Terms that appear in the Formulas of the given Examples. The user may choose what Constraints to keep.

Also, the validation of Constraints is provided: the user may propose to DIAL some situations different from those that the system already knows as Examples. By means of its Constraint Propagation mechanism, DIAL is capable to anticipate to the user what Terms he/she should use or not, as he/she formulates situations. Also, the system signs up Constraint Violations whenever the user does not follow its advertisements. This is an important issue: it may provoke the user to realize the necessity of revising Constraints, if, for instance, he/she disagrees with the behavior exhibited by DIAL due to its knowledge (Constraints).

3. Conclusions

We argue that learning may occur during interactions with DIAL by perspective users of any kind, in a fashion similar to the one testified by the activities of the Lawyers. At the moment, the only “real” users have been 20 teams of three Lawyers, that succeeded to build approximately 20 “contract templates”, each consisting of 800 to 1800 terms constrained by 500 to 1000 constraints. Their “learning” in the “contract domain” is proved by their activity, converging to successful “descriptions” of template contracts, by their own self evaluation statements and by the commitment of about 400 Fidal-KPMG’s lawyers willing to use the template contracts in their daily professional life. Since DIAL is “domain independent” we may argue that similar effects may occur in any domain.

The DIAL system, therefore, implements a dialectical approach where the LE represents a challenging, rational mirror [7] of the partial knowledge constructed and agreed by the partners of the conversations. Looking retrospectively, DIAL is an attempt to follow the guidelines of Soloway [8] that advocates for programming in the large “a research methodology that supports theory building, as opposed to methodologies that support theory testing”.

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References


