Development new learn strategy based on artificial intelligence methodologies

-Virtual Teacher vs. Traditional Teacher-

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Abstract

In this paper, we introduce new developed strategy which will be used in E-Learning environment. This strategy is based on intelligence methodologies. Based on intelligent software agent, we aim to create and design a concept for virtual teacher (E-Teacher).

In comparison to traditional teacher, the Virtual Teacher can search new information from the internet in little time slots to update and to make his knowledge wide. Furthermore Virtual Teacher offers a lot of features as manage negotiation, autonomy, and drawing conclusion based on dynamic reasoning strategies.

Key words: Virtual Teacher, Intelligent software agent, reasoning.

1. Introduction

Artificial intelligence is the study of intelligence using the ideas and methods of computation. At present time, a definition of intelligence seems impossible. Besides the computer scientists, there are many fields as psychology, philosophy, linguistics that seek to give an exactly definition for the term “intelligence”. However, the theories which are proposed in these fields are too incomplete and too vaguely stated to be realized in computational terms. In computer science field, artificial intelligence offers a new perspective and a new methodology. It central goal is to make computers intelligence, both to make them more useful and to understand the principles that make computers intelligence possible. Artificial intelligence is used in many fields as in medicine, military, knowledge security and e-commerce. Furthermore we have used it in telecommunication especially in cellular system to optimize the resource channel allocation.

In current research project, we are working to use the artificial intelligence in the education. We aim to develop a virtual teacher based on intelligent software agent. This paper is divided as following: In second section, we introduce some definition s for the terms “Artificial Intelligence” and “Intelligent Software Agent”. In third section will be described the virtual teacher concept based on intelligent software agent. In fourth section and fifth sections, we introduce different methods which are used by virtual teacher to draw his conclusion. Furthermore, we present a comparison between virtual and traditional teacher.

2. Artificial Intelligence

Artificial intelligence [1-2] is the study of intelligence using the ideas and methods of computation. Till now, there is not only and absolutely world wide accepted definition. Due a definition of the intelligence seems impossible at the moment because the term intelligence appears to be an amalgam of so many information processing and information-representation abilities. Artificial intelligence offers a new perspective and a new methodology. Its central goal is to make computers intelligent, both to make them more useful and to understand the principles that make intelligence possible. In this section we introduce some often used definitions.

Definition 1:

“The study of mental faculties through the use of computational models”

Definition 2:

“The art of creating machines that performs functions that require intelligence when performed by people”

Beside the intelligent hardware agent, the intelligent software agent is the famous one, which is used in the artificial intelligence field. In next section, we introduce the intelligent software agent.

2.1. Intelligent Software Agent (ISA)

Researchers interpret the term *intelligent software agent*[3-5] in a number of ways. By software agent, we mean a computer program that behaves in a manner analogous to a human agent. We define the intelligent software agent as following:

"An autonomous agent is a system situated and a part of an environment that senses that environment and acts on it. Over time, in pursuit of its own agenda and so as to effect what it senses in the future."

Researchers have proposed the following characteristics as desirable qualities of software agent.

2.2. Features of ISA

2.2.1. Autonomy: An agent takes initiative and exercises control over its own actions.

2.2.2. Communication ability: An agent can engage in complex communication with other agents, include people, to obtain information or enlist help in accomplishing its goal.

2.2.3. Adaptability: An agent automatically customizes itself to the preferences of its user on the basis of previous experience

2.2.4. Mobile: An agent can transport itself from one machine to another and cross different system architectures and platform.

2.2.5. Clone: An agent can clone itself when it is needed.

2.2.6. Reactivity: agents perceive their environment (…..), and respond in timely fashion to change that occur in it.

3. Virtual Teacher Concept (E-Teacher)

As we have mentioned in previous section, virtual teacher based on intelligent software agent can manage a dialog between students any time any place in public or in private issue. Furthermore in this case, virtual teacher move from computer to computer to solve problems. In next figure, we describe the virtual teacher concept. General, the virtual teacher interact in an environment (e.g. classroom, virtual libraries), perceive the world surround him. Hence makes a decision.

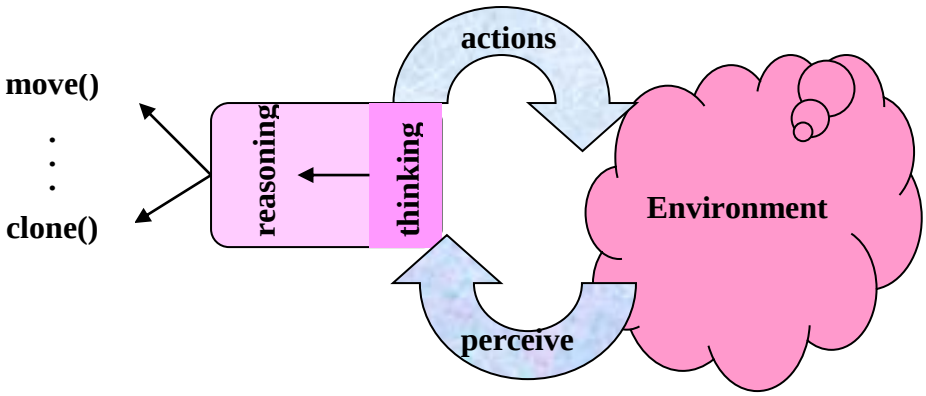

Figure 1: Virtual Teacher Concept

The major task of virtual teacher is to draw the right conclusion and to achieve plausible reasoning, in order to perform his work successfully.

4. Reasoning types

The virtual Teacher, which is based on intelligent software agent, uses different kinds of logic rules [6-7] in order to draw a plausible and right conclusion. In this section, we introduce a short survey of these logics.

Classic logic

In classic logic (monoton logic) is the drawn conclusion can not changed even the assumptions are changed and if we added new information.

4.1. Temporal logic

In temporal logic some predicates (or declarations) are true in the past but false in present time, and maybe will be true in the future. Which means, the truth of predicates are changed according to time interval.

4.2. Nonmonotonic logic

In contrast to classic logic, the nonmonotonic logic [8-9] based on the fact that even complete information may not sufficient to make a decision that will be correct forever. This would be true in a static environment, but not in a changed world. We note that changing information mostly caused to changing the previously drawn conclusion. In next section, we introduce some kinds of nonmonoton logics.

4.2.1. Default logic

A default theory consists of a set of facts which represents certain, but usually incomplete information about the world; and a set of defaults that sanction plausible but not necessarily true conclusions. That means, some conclusions may have to be revised when more information becomes available. We introduce an example of a default:

$$\frac{bird(X) : flies(X)}{flies(X)}$$

That means “if X is a bird and if it is consistent to assume that X flies, then conclude that X flies”. In absence of knowledge to the contrary it is reasonable to assume that a particular bird can fly. We assume that we have received new information that Tweety is a bird we may conclude that he flies. But if later we learn that he

can not fly, for example because he is a penguin, then the default becomes inapplicable: we are no longer allowed to assume that Tweety flies. We draw new conclusion according to the new received information. We call this kind of behavior nonmonotonic.

4.2.2. Autoepistemic Logic

One of the most prominent methods for nonmonotonic reasoning is Autoepistemic Logic. The main Idea of development this kind of logic is to give a formal account of an intelligent software agent reasoning about his own knowledge or beliefs. To illustrate it we consider the following example:

Are the Rolling Stones giving a concert in Newcastle next week?
No, because otherwise I would have heard about it.

From above dialog we can illustrate some interesting points using this example. First, it is clear that do not have any definite knowledge that the Rolling Stones are not giving a concert in Newcastle next week. In this sense, my knowledge is incomplete and, by giving a negative answer, I am making a conjecture. This conjecture is based on reflection upon the knowledge I have (if something so important is happening in my city, then I will know about it). The world autoepistemic means reflection upon self-knowledge. To proceed with the example, suppose that i buy the Newcastle Herald the morning after the conversation above, and read the head title:

The concert of the century: The Rolling Stones in Newcastle next week!

The situation has changed: Now I do know that the Stones are giving a concert, so my answer to the question above would be "Yes". This means that the old conclusion I had drawn by introspection is no longer valid and must be revised. So my reasoning is nonmonotonic. (new information has invalidated a previous conclusion).

4.2.3. Cirumscription logic

Cirumscription is the third main formalism for nonmonotonic reasoning, besides Default Logic and Autoepistemic Logic. As we have mentioned above nonmonotonic reasoning is intended to draw conclusions from incomplete information in cases where classical logic is insufficient. Circumscription in its simplest forms sticks to predicate logic (classic logic) using a very simple idea: given classic logic theory, it enhances this theory by a set of additional formulae. Then usual reasoning in the sense of classical logic is used. Let us consider the example about the Tweety,

$$\forall X\,(bird(X) \wedge \neg abnormal(X) \rightarrow flies(X))$$
$$bird(tweety).$$

The rule says: ”All birds that are not abnormal fly”. But from the rule we can not prove that Tweety is not abnormal, indeed Tweety may be abnormal, after all. For that we want to deduce

$$flies(tweety)$$

The idea of circumscription is to minimize the set of objects for which the predicate *abnormal* is true to those objects *a* for which there is definite information that *abnormal(a)* is true. In our case, there is no evidence about any bird being abnormal. Therefore we add the formula

$$\forall X \neg abnormal(X)$$

to the set of circumscription theory. Now it is easy to see that the desired conclusion $flies(tweety)$ follows from union of theory and circumscription theory.

5. Comparison

In this section we compare the traditional teacher to virtual teacher.

Reasoning: The traditional teacher draws his conclusion based on classical logic mostly. But as we have mention above, the virtual teacher uses different ways to make a plausible reasoning.

Moving: In contrast to traditional teacher, the virtual teacher can move any time from any place to another place.

Knowledge: Often, the traditional teacher use old knowledge which has studied in high institute (e.g. universities, colleges), and the least of traditional teachers who are update his knowledge on participation in new additional courses, at same time the virtual teacher can update his knowledge daily from the internet or other references.

Learn methods: The virtual teacher use new learn methods as multimedia data, as audio and video.

Cloning: In real world, there is once teacher for each classroom, in virtual world the virtual teacher has the ability to clone itself according to the number of the student in the classroom.

Emotions: Traditional teacher behaves mostly emotional and can not behave pure rational like virtual teacher.

6. Future works

The Idea of the integration of the intelligent software agent in education system is absolutely new, and in computer science department at the alqasemi college, we are the first, who is working in this field. In the future, we are working to implement and realize the virtual Teacher.

إجمال

في هذا المقال سنعرض طريقة تعليم حديثه سيتم استخدامها في مجال التعلم عن بعد. هذه الطريقة ترتكز في الأساس على الذكاء الصناعي. بمساعدة بما يدعى "العميل الإلكتروني الذكي" سوف يتم إنشاء وتطوير "المعلم الإلكتروني" بحيث يملك القدرة على التنقل بمحض إرادته, إدارة الحوار, وجمع المعلومات وقدرته على الاستنتاج المنطقي السليم.

תקציר

במאמר נציג שיטת לימוד חדשה בתחום למידה מרחוק. השיטה מבוססת על בינה מלאכותית. בעזרת "הסוכן האלקטרוני החכם" נפעל להקים ולפתח את "המורה האלקטרוני" ברמה שיכול לעבור ממקום לאחר לפי רצונו, ולנהל דיאלוגים, ולאסוף אינפורמציות ויכול להסיק היסקים לוגיים נכונים.

7. References

[1] Russel, S. and Norvig, P.: *Artificial Intelligence: A modern Approach*, Prentice- Hall, 1995

[2] Charniak, E. and McDermott, D.: *Introduction to Artificial Intelligence*, Addison-Wesley, 1986.

[3] Nwana, H.S. and Ndumu D.T.: *An introduction to agent technology*, BT Technology Journal, Vol. 14 No. October, 1996.

[4] Lenat, D. B.: *Artificial Intelligence*, Scientific American, September, 1995.

[5] Harrison, C. G., Chess. M. D., and Kershenbaum: *Mobile Agents: Are they a good idea*, IBM T. J. Watson Research Center, 1995

[6] Raiyn, J.: *Logik als Wissensrepraesentation*, Diplomarbeit, Uni-Siegen, 1998.

[7] Schoening, U.: *Logik fuer Informatiker*, Wissenschaft- Verlag, 1992.

[8] Antoniou, G.: Nonmonotonic reasoning, Gambridge, Massachusetts, 1996.

[9] Ginsberg, M.: Nonmonotonic Reading, Morgan Kaufmann Publisher, USA, 1987.