A Protocol for Intelligent Agent Systems Enabling Incidental Learning on the Web

H. Wang
School of Computing and Information Systems
Athabasca University
Alberta, Canada

Abstract - Incidental learning is learning something without intent, which usually happens during the time that is not dedicated to learning that thing. Examples of such time include work, game play and other activities for leisure. In today’s life of many people, a lot of time is spent on the surfing the Web. Should incidental learning be effectively implemented for individuals using the Web, it would make learning much more effective and efficient. This can be especially true for adult learners as they most likely have less time dedicated to learning, or don’t have any dedicated time for learning at all. In this paper, we present a protocol that is intended to be used in the design and implementation of intelligent agent systems for enabling incidental learning on the Web. The protocol prescribes the key requirements for such an intelligent agent system to meet, and depicts the steps such an intelligent agent system needs to take when rendering an incidental learning session on the web.

Keywords: intelligent agent, incidental learning, web-based learning, e-learning, computer protocol

1 Introduction

Incidental learning is learning without intent, which happens at the time that is not dedicated to learn what is learned through the incidental learning session [1]. By incidental learning on the Web, we mean that the learner has incidentally learned something useful, while browsing the web, without the intent to learn that thing. The learning of that thing is incidental to the learner. To make incidental learning more meaningful for the learner, however, what to be learned through it should not be completely random. The learning outcomes from incidental learning should be part of the learner’s general goals [2] [3], or should at least serve the learner’s interest. In order for an intelligent agent system to do this, the following key requirements must be met:

1. The learner must be capable of learning – this is the very basic requirement for incidental learning, or any learning to occur [4] [5]. An agent system designed for enabling incidental learning on the web must do its best to know whether the learner has the capability to learn, and what the learner is capable of learning X+Y but not ready to learn X*Y. It won’t help the learner at all by keeping firing up incidental learning sessions that teach the learner something he or she is incapable of.

2. Learner must have the desire to learn -- without any desire to learn, no learning can be effective. The desire can be fostered gradually through certain enabling technologies. This may be the hardest part for an agent to do – to know whether the learner has the desire to learn at a specific time. The information may be gathered during the time the learner is browsing the web, or after two or three tries of firing up an incidental learning session – when the learner has simply ignored. In any case, it is important for the agent system to know if the learner has the desire to learn at a given time; otherwise it would definitely be an annoying thing to the learner to keep firing up one incidental learning session after another.

3. Knowing the learning goals of the learner [6] [7] – what topics and subjects the learner is interested in, at what level the learner is in a particular area or topic.

4. Locating triggers to fire up incidental learning sessions – the intelligent agent system needs to be fired up at the right time while the learner is on the web. The triggers should be within the web document the learner is reading, together with the learner’s motion such as mouse click.

5. Finding the proper learning content – the system must be able to get the right learning content to form a learning session for the learner. The content can be in a learning object repository, or mined from the web on the fly.

6. Presenting an effective incidental learning session – the session must be well controlled and properly sized in terms of both content and duration.

An intelligent agent system [8] that implements incidental learning on the web for web users must address these key requirements. Fortunately today, however, we have at least two conveniences in developing and implementing such a system.
Incidental learning may happen to someone with or without consciousness. In the former case, the learning session happens incidentally while the learner is doing something else, but during the session, the learner consciously knows she or he is in the learning session, and knows what she or he is supposed to learn. With consciousness, the learner could be more motivated during the session, and the learning could be more effective.

In the latter case, not only does the learning session, if it can be called a learning session, occur incidentally, the learner doesn’t even know he or she is in a learning session, and may not even know what she or he is learning either, in an extreme case.

For some learners, learning with a clear purpose or consciously should be more effective, while for learners who are really tired of learning certain things in certain area, incidental learning unconsciously should be more effective too.

While the learners may learn something in an incidental learning session on the web consciously or unconsciously, the intelligent agent system that enables incidental learning on the web must know what a particular learner is supposed to learn in a specific learning session, what content should be delivered to the learner, how the content should be presented to the learner, when the incidental learning session should be fired up, and when it should closed. In general, the process of incidental learning on the web can be depicted as follows:

1. Monitor user’s activities on the web within a browser;
2. Identify the point of interest within the context of what the learner is doing, or browsing in the case of web-based incidental learning;
3. Develop the point of interest further into a specific learning objective or objectives that are part of the learner’s learning goals at the time;
4. Get the proper learning content to support the learning objective or objectives, The proper learning content can be dynamically generated from the web or retrieved from learning object repositories [10] [11] [12];
5. Form a small learning session with the proper learning content to suite the learner’s personality and learning style;
6. Present the learning session to the learner and/or bring the learner into the learning session;
7. Monitor the incidental learning session.

8. Closing the session once the learner is done, or has left the session, and book keeping the learning session.

These eight steps are the core of the protocol. Any intelligent agent system that enables incidental learning on the web should follow these eight steps. The protocol can then be depicted in a flowchart as shown in figure 1.
Figure 1 -- a protocol for intelligent agent enabling incidental learning on the web

1. Form an incidental learning session for the learner

2. Present the incidental learning session to the learner

   Has the session drawn the user’s attention?

   - Yes: Present the incidental learning session to the learner

   - No: Monitor the incidental learning session

   Has the user finished the session or has left for so long?

   - Yes: Bookkeep and then close the incidental learning session

   - No: Monitor the incidental learning session
Some more strategic details can be added to the protocol. One of these details is that, if the user keeps ignoring the incidental learning session fired-up by the intelligent agent, the agent should stop doing it after a certain number of tries, or at least should present a vitally different incidental learning session next time, by refining the learning objectives and rethinking the user’s learning style.

3. Types of Incidental Learning enabled by the protocol

The unique feature of incidental learning is that learning occurred incidentally in the view of the learner. However, although the occurrence of learning may seem to be random (that’s why incidental learning is also called random learning), the knowledge and skills acquired through it don’t need to be random, especially when the incidental learning session is enabled by an intelligent agent system. That is to say, the learning outcome can be either expected or unexpected by the learner, depending on how the intelligent agent chose the learning objectives when forming a learning session. We then have the following two types of incidental learning supported by the protocol:

1. incidental learning from which something expected has been learned, we use letter E to refer to such learning, use letter E with a subscript to refer a learning goal that may consists of small gradients of learning goals or knowledge, denoted by letter e with or with a subscript. Figure 2 depicts the scenario where all learning sessions deliver expected learning outcomes to the learner. If the i, j, k and l are the same, it means all incidental learning sessions are for the same consistent learning outcomes expected by the learner;

2. incidental learning from which something unexpected has been learned, we use letter U to refer to such learning, use letter U with a subscript to refer a learning goal that may consists of small gradients of learning goals or knowledge, denoted by letter u with or with a subscript. Figure 3 depicts the scenario where all learning sessions deliver unexpected learning outcomes to the learner. If the i, j, k and l are the same, it means all incidental learning sessions are for the same consistent learning outcomes but unexpected by the learner;

There can be cases where incidental learning sessions are mixed with expected and unexpected learning outcomes. To the question of why incidental learning sessions with unexpected learning outcomes are even needed, the answer is that, some learners may not even know what he or she wants to learn. In these cases, it is necessary for the intelligent agent to set the learning path for the learner.

4. Discussions

We presented in this paper a protocol for the implementation of intelligent agent systems that enable incidental learning on the web. The protocol has prescribed the key requirements that must be met when implementing such an intelligent system, and the steps such an intelligent agent system must take when rendering an incidental learning session to a web user.

When implementing such an intelligent system to enable incidental learning on the web, one needs to overcome several technical challenges. The first challenge is to understand the learner in terms of his or her interests, short and long term learning goals as well as the learning style, and the second challenge is to getting the right learning content and to form an interesting and effective learning session, and the last but not least challenge is to monitor the learner’s activities and behaviors both in and outside the learning session, in order to make the right decision on when to render and when to close an incidental learning session. Further research and investigation into these challenges are needed, and findings from investigation into these challenges will be reported in forthcoming papers.
5. References


