A Framework of Cross-Language Social Learning System

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Abstract

Social learning encourages and enables learners with common interests to communicate and share knowledge with others through social networks. However, social learning suffers a barrier on communication among learners with various language and culture background. Aiming to avoid this barrier, this paper proposes a framework of cross-language social learning system which can involve more learners’ participation on the web. With this framework, an illustrative example of task-oriented collaborative learning paradigm is elaborated. It is expected that our proposed system can stimulate more learners to share the learning resource for deep discussions as well as to promote the knowledge innovation.

1. Introduction

The booming development of Web3.0 technologies and mobile Internet is facilitating the online social interactions between users and enhancing the information propagation on the web. Recently, this promising technology is gradually penetrating into various fields, such as E-commerce, social games, and E-learning among users. Especially, social networking services as the main-stream infrastructure, play an important role in the process of knowledge innovation and sharing-in E-learning systems. The learners with common interests and the E-learning providers who are commonly targeted by the learners are grouped together to form a social learning network.

1.1 Motivations

Social learning system/community-based learning paradigm has gained great attention[1][2]. However, social interaction or communication are focused on a certain country or region where the people use the same language. Inthis case, the process of knowledge transferring and innovation is not fast. Since the communication between the various languages of the world is not direct. It is based on communication between two sides will use the language of one of the parties to the normal learning resources exchanging. Here is a motivating scenario: one day, if a learner Mr. Kim in Korea wants to participate the Chinese-based social learning system and intend to obtain some learning resource and have the useful discussions with several Chinese learners who have the common learning interests with Mr.Kim. At present, how to communicate properly becomes a serious problem. Here is a challenge question: Is there any solution to allow direct communication between learners with different language and culture background?

1.2 Contributions

With this question, this paper maintains a truth: Knowledge belongs to the World, and belongs to every people. The major contributions of this paper are summarized as follows:
1) A novel framework of cross-language social learning system is proposed.
2) Upon the proposed framework, a novel issue on task-oriented collaborative learning are elaborated as well.

1.3 Paper Organization

The remainder of this paper is organized as follows. Section 2 presents the proposed framework of cross-language social learning system, termed $g$SocLearner and the task-oriented collaborative learning based on $g$SocLearner. Section 3 concludes this paper.

2. The Framework of Cross-Language Social Learning System

This section is devoted to presenting a novel framework of cross-language social learning system $g$SocLearner which considers multiple languages communication among the learners.

2.1 Big Picture

Figure 1 depicts the framework of the proposed cross-language social learning system. Clearly, a learner initially launches a task to a cross-language social learning network. Then, our system $g$SocLearner can recommend the collaborative team for requester. The recommended team will try to communicate with the requester by cross-language server and return the learner with his/her own mother language. Note that, the $g$SocLearner has two types of recommendation:
1) Team with a Leader; 2) Team without a Leader.
After mastering the overview of our framework, we will provide the deep design and analysis of Cross-language social networking service module.

2.2 Cross-language Social Network

As mentioned before, a cross-language social networking service allows direct communication between people who have the command of different languages. A good cross-language social networking service adds its own unique feature and enables users to avoid the language barrier for better communication. In this way, their influence in the world will also increase, and more and more people will adopt this service.

The working principle of a cross-language social network is described as follows:

A particular translation module is enabled to increase the client plug-in, automatic identification of language from multilateral clients used to transfer information sent to the client server. Then the server starts to translate the information in accordance with the language, and then to the corresponding client. In other words, each client received information that can identify their own language, so that you can achieve real-time communication between multiple clients.

Example: Figure 2 presents a toy example of cross-language social networking service. As can be seen from Fig.2, Bob is a Chinese guy, Alice is an American, Slina is a Korean, the language. They communicate on the social learning platform for some homework/project discussions. Bob sends a message “你好”. Then this message “你好” is transmitted to the server. By detecting the plug, there are two users in the social network using English and Korean. First, the server should translate the message into “Hello” and “안녕하세요”. Next time, the server sends the messages to Alice’s client with “Hello” and to Slina’s client with “안녕하세요”.

2.3 Task-oriented Collaborative Learning

This section as a core technical part of our proposed framework, it mainly demonstrates how to realize the social collaborative learning for a given task among learners with various languages.

Consider the following case: An E-learning provider (e.g., Global IT company) releases an IT project to encourage social collaborative research and interactive learning among the learners by offering some awards. Since the given project should be completed efficiently before a given deadline. It is expected to build a team of learners who are good at the following areas:

- Information retrieve (IR),
- Artificial Intelligence (AI),
- Data Mining (DM),
- Computer Vision (CV).

For example, this global IT company has five candidates: Jack, Susan, John, Thomas, Jessie from different countries with different languages, and with the following set of skills and the corresponding proficiency of skills.

\[ X_{\text{Jack}} = \{ (IR, 0.78) \} \]
\[ X_{\text{Susan}} = \{ (CV, 0.92) \} \]
\[ X_{\text{John}} = \{ (AI, 0.90), (DM, 0.85) \} \]
\[ X_{\text{Thomas}} = \{ (DM, 0.75) \} \]
\[ X_{\text{Jessie}} = \{ (AI, 0.58), (DM, 0.65), (CV, 0.87) \} \]

where \( X_{\text{Susan}} = \{ (CV, 0.92) \} \) indicates the candidate Susan has the skill of Computer Vision with the proficiency of 0.92 as shown in Figure 3. There is no communication cost between users due to the cross-language social networking service guarantees the communication cost.
as 0.

Diffe rs from the existing studies[3][4] that consider the communication costs between users, one big benefit of our framework is to reduce the communication cost to zero.

\[
\text{Susan, US } \{(CV, 0.92)\} \\
\text{John, China } \{(AI, 0.9), (DM, 0.85)\} \\
\text{Thomas, Sweden } \{(DM, 0.75)\} \\
\text{Jessie, Ghana } \{(AI, 0.58), (DM, 0.65), (CV, 0.87)\}
\]

Figure 3. A Task-oriented Collaborative Learning based on Cross-language Social Networks

Therefore, recommending the best collaborative learning team is becoming an important research issue in the task-oriented collaborative learning. As mentioned in our framework, gSoCLearner is also in charge of recommending the best team with/without team leader.

To evaluate the best collaborative learning team, an important evaluation metric is proposed as follows,

**Definition 1 (Sum of Proficiency)** In a cross-language social learning network, for a given team \( T \) of learners for a task \( \Gamma = \{<s_1, p_{s1}>, <s_2, p_{s2}>, ..., <s_t, p_{st}>\} \), the sum of proficiency \( SP \) of \( T \) is defined as

\[
SP = \sum_{i=1}^{t} p_{s_i}
\]

where \( t \) is the number of required skill in \( T \), and \( p_{s_i} \) is the proficiency of skill \( s_i \).

Due to the length limitation of the paper, we discuss the team recommendation without a leader only. An algorithm for recommending the best collaborative learning team is shown in Algorithm 1.

**Algorithm 1** Recommending the Best Collaborative Team

**Input:** A cross-language social learning network

A task \( \Gamma = \{<s_1, p_{s1}>, <s_2, p_{s2}>, ..., <s_t, p_{st}>\} \)

A set of learners for \( s_i \) and proficiency \( p_{si} \)

**Output:** The best collaborative team \( T' \) and \( SP \)

1. \( SP \leftarrow 0; \)
2. \( T' \leftarrow \Phi; \)
3. for \( i=1 \) to \( p \) do
4. \( \text{candidate} \leftarrow \text{candidate} + \arg \max \{p_{si}\} \)
5. \( T' \leftarrow T' \cup \{<s_i, p_{si}>, \text{candidate}\} \)
6. Return \( T' \)

Based on the above algorithm, the collaborative learning team candidates are consequently listed in Table 1.

<table>
<thead>
<tr>
<th>Team ID</th>
<th>Team Members</th>
<th>SP</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>[Jack, John, Susan]</td>
<td>3.45</td>
</tr>
<tr>
<td>T2</td>
<td>[Jack, Susan, Jessie]</td>
<td>2.93</td>
</tr>
<tr>
<td>T3</td>
<td>[Jack, John, Jessie]</td>
<td>3.4</td>
</tr>
<tr>
<td>T4</td>
<td>[Jack, Thomas, Jessie]</td>
<td>2.98</td>
</tr>
<tr>
<td>T5</td>
<td>[Jack, Jessie]</td>
<td>2.88</td>
</tr>
</tbody>
</table>

After taking the proficiency of skills into account, the best collaborative learning team is \( T_1 \) since this team has the largest sum of proficiency. That is to say, this project can be easily conducted by this best team and finish it efficiently in order to catch the deadline.

**3. Conclusions**

This paper targets at promoting the socially learning interactions among learners. Firstly, it pioneers a systematical architecture on Cross-language social learning system. Further, a framework named gSoCLearner including collaborative learning based on cross-language social networks is presented. We believe that the cross-language social networking services will be a new starting point for social networking platforms as well as online learning.
Acknowledgments

This research was supported by the MSIP (Ministry of Science, ICT and Future Planning), Korea, under the C-ITRC (Convergence Information Technology Research Center) (IITP-2015-IITP-2015-H8601-15-1009) supervised by the IITP (Institute for Information & Communications Technology Promotion).

References