

교차언어의 사회적 학습 시스템 프레임 워크

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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. In this 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 *gSocLearner* and the task-oriented collaborative learning based on *gSocLearner*. 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 *gSocLearner* 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 *gSocLearner* 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 *gSocLearner* has two types of recommendation:

- 1) Team with a Leader;
- 2) Team without a Leader



Figure 1. An Overview of *gSocLearner*

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 the direct communication between people who have the command of different languages. A good cross-language social networking service add its own unique feature and enables users to avoid the language barrier for better communication. In this way, their influence in the world also will be increased, 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 sent to the corresponding client. In another words, each client received information that can identify their own language, so that you can achieve real-time communication between multiple client.

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. At 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”.

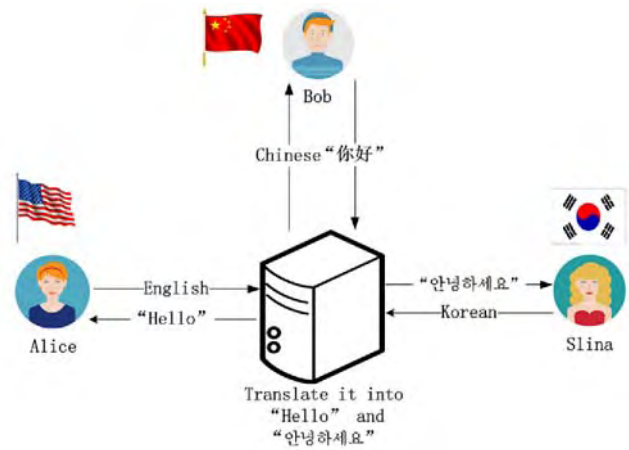


Figure 2. A Toy Example of Cross-language Social Networking Service

However, the implementation of this module requires the establishment of a huge natural language database which covers more than 80 percentage of the world. Since this database will be great, it is only regarded as a data of server port, and the port can not be placed in the user’s client. In this way, the software will reduce the amount of space for fast download. At the same time, this approach allows faster server to update its database.

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 language.

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.

$$X_{Jack} = \{(IR, 0.78)\} \quad , \quad X_{Susan} = \{(CV, 0.92)\}$$

$$X_{John} = \{(AI, 0.90), (DM, 0.85)\}$$

$$X_{Thomas} = \{(DM, 0.75)\}$$

$$X_{Jessie} = \{(AI, 0.58), (DM, 0.65), (CV, 0.87)\}$$

where $X_{Susan} = \{(CV, 0.92)\}$ 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.

Differs 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.

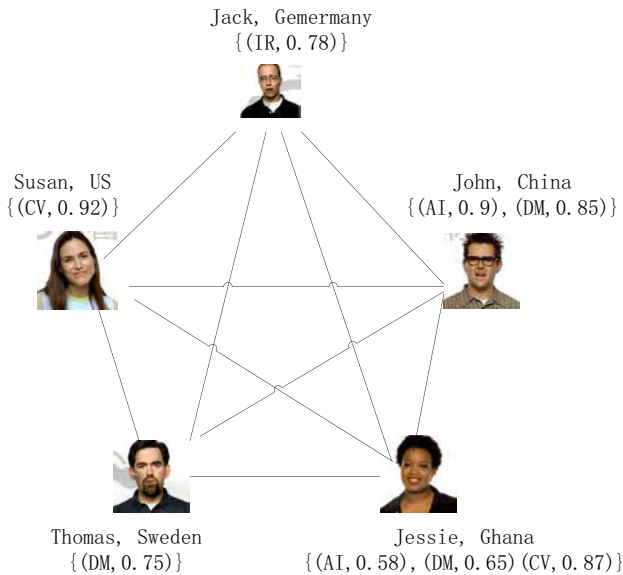


Figure 3. A Task-oriented Collaborative Learning based on Cross-language Social Networks

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 $\Gamma = \{ \langle s_1, p_{s1} \rangle, \langle s_2, p_{s2} \rangle, \dots, \langle s_t, p_{st} \rangle \}$, 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 $\Gamma = \{ \langle s_1, p_{s1} \rangle, \langle s_2, p_{s2} \rangle, \dots, \langle s_t, p_{st} \rangle \}$
 A set of learners for s_i and proficiency p_{s_i}
Output: The best collaborative team T' and SP

1. $SP \leftarrow 0;$
2. $T' \leftarrow \Phi;$
3. **for** $i=1$ **to** p **do**
4. candidate \leftarrow candidate + arg max $\{ p_{s_i} \}$
5. $T' \leftarrow T' \cup \{ \langle s_i, p_{s_i} \rangle, candidate \}$
6. **Return** T'

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

Table 1. Collaborative Teams List

Team ID	Team Members	SP
T ₁	{Jack, John, Susan}	3.45
T ₂	{Jack, Susan, Jessie}	2.93
T ₃	{Jack, John, Jessie}	3.4
T ₄	{Jack, Thomas, Jessie}	2.98
T ₅	{Jack, Jessie}	2.88

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 network 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.

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