Transferring a Question-Based Dialog Framework to a Distributed Architecture

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Abstract. Inquiry skills are an essential tool for assessing and integrating knowledge. In facilitated face-to-face settings, inquiry skills were improved successfully by using a "question-based dialog" and its resulting visual representation. However, groups that work without a facilitator, or in which members collaborate asynchronously or in different geographical regions, such as Communities of Practice (CoP), cannot schedule face-to-face inquiry meetings. This paper summarizes the unmet requirements of CoPs for a collaborative inquiry tool found by previous research on the *Noracle* model and proposes a distributed Web architecture as a solution. It mitigates the need for a common infrastructure, central coordination or facilitation, addresses the evolutionary nature of communities of practice and reduces the cognitive load for the individual by filtering and organizing the representational artifacts with respect to the social network of the community. The implementation we envision in this paper aims at applying the concept to a much broader audience, ultimately replacing the need for local meetings.

Keywords: Question-based dialog · Social collaboration · Inquiry-based learning

1 Introduction

Learners often have difficulties formulating meaningful, higher-order questions that allow them to trigger deeper metacognitive processes [1,3] *Noracle* [2], the pedagogical method referenced in this paper, was developed to promote "question-based dialog" for improving inquiry skills and representing group knowledge. Digitizing this method could have benefits for groups that work without a facilitator, or in which the members collaborate asynchronously or in different geographical regions, such as a *Community of Practice* (CoP) [6], by bringing structure to typically unstructured and informal collaborative environments. However, existing software does not achieve the same quality of social or representational insight as the face-to-face method. It also does not resolve

the problem of growing communities, which require a stronger network overview to decrease cognitive load as the network evolves. Experiments with existing argumentation software demonstrated the feasibility and value of *Noracle* for predetermined small groups, but also revealed the limitations of a centralized approach in terms of scalability and cognitive load. The proposed distributed approach addresses both limitations by mimicking real world social network structures. It allows growth, networked organization of knowledge and provides a personalized view on mapped knowledge using social network based information filtering.

2   Background and Related Work

Noracle was originally a face-to-face method for collaborative "question-based dialog". A group of learners typically works on a problem relevant for the whole group, for which no answer is currently available. Salient questions are generated and exchanged among the group members in quick succession, similar to speed-dating. However, rather than offering an *answer*, the other group members are limited to offering only related or follow-up *questions*, that allow the initial questioner to further explore their own thinking on the subject.

The group, with the help of a facilitator, gathers insights about the types of questions they heard and found useful by visually documenting and clustering contributions according to shared characteristics such as how the question was asked, who asked it and why the question was helpful. This creates a representational artifact of what the group does not understand about a given theme that can offer an avenue for improving overall coherence and collaboration within the group [5]. Additionally, it provides the group with some orientation on the characteristics of good question-asking and interpersonal dynamics within the group context [2]. This implementation is inappropriate for professional CoPs of the long-tail, which do not possess the shared skills, resources, structures or geographical location for such a meeting. Digitizing *Noracle*, and particularly the process of clustering and analyzing responses, would make it possible to provide some of the benefits of the face-to-face method to CoPs without the necessity of a facilitator. However, initial trials with the argumentation software LiteMap showed that while it is possible to track users and their contributions, as well as some social aspects of collaborative processes, such software does not offer a mechanism for reducing the cognitive load, for automatically weighting individual contributions, and for positioning their representational artifacts relative to others. They also do not remove the function of a facilitator for introducing and monitoring the process [2].

3   A Distributed Question-Based Dialog Framework

Rather than a facilitated group activity with a determined, synchronized starting and end point, our vision is a *continuous community activity*, where community membership is not necessarily stable. New or existing community members with
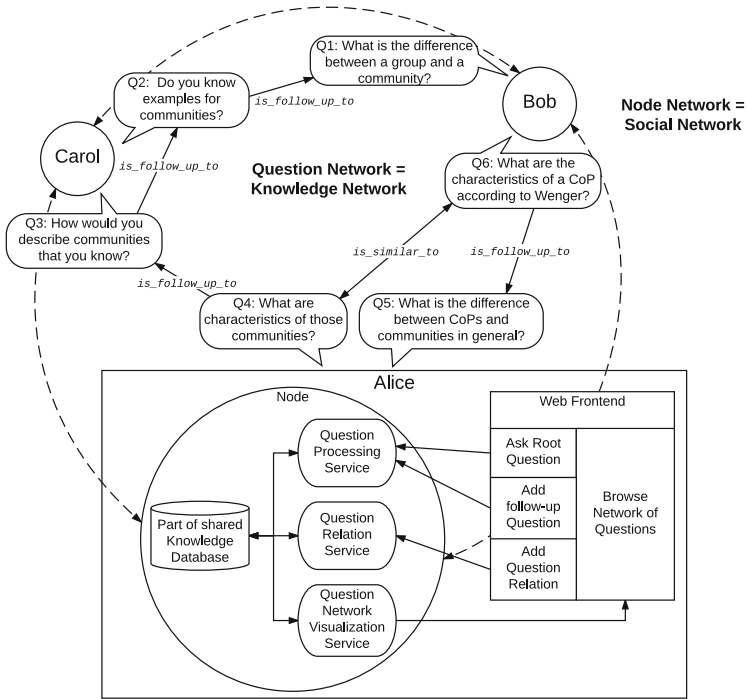
Fig. 1. Distributed question-based dialog framework

difficult queries can trigger a thought exchange with a knowledgeable community using the digitized *Noracle* space. The community's existing social network structure can be used to push requests for follow-up questions, all of which are quickly situated in an existing network of questions that represent the community's knowledge on the issue. Similarities or duplicates in questions represent the weight of certain contributed questions and their linkages. Reflection on different points of view, concepts and ideas related to question are triggered by exploring the question network that has been built around the question. The communities' knowledge is explored, potential gaps are identified ultimately reaching a deeper, more complete understanding of the underlying issue.

As the underlying technological basis, we chose the las2peer [4] framework, an open source implementation for distributing community services in a peer-to-peer infrastructure, featuring easy scalability and workload distribution with self-replicating services and shared, secure data control that avoids a single point of failure. A las2peer network consists of interconnected nodes, which share their workload between each other. Either communities create a new network within their community, or they connect their nodes to an already existing network to share their experiences with other communities. It is also conceivable for small communities to rely on externally hosted networks without the need to provide own hardware. With an eye on our target group – small, long-tail CoPs –,

this flexibility in terms of deployment is important, since especially smaller communities cannot afford a complete setup of a full-featured client-server approach. On the other hand, relying on externally deployed solutions, like cloud-based approaches, shifts the control of the application and data away from the community to the service provider, generating a "black-box" view on the used applications.

Taking together this distributed architecture of las2peer and the theoretical underpinning of the question-based dialog framework of Noracle, we propose a *Distributed Question-Based Dialog Framework*, which is depicted conceptually in Fig. 1. Each participant is represented by her own *Node*, containing a full-featured set of services needed to realize a complete question-based dialog framework. By connecting their node to other participants nodes, users form a *Network of Knowledge-Sharing Nodes*, with already existing information on each node being distributed across all participants. This way, new communities can form dynamically, with members connecting and leaving at any time. This flexibility in terms of participation is especially important in the domain of CoPs, since they often do not have fixed schedules and rely on dynamic tool support that eases their collaboration scenarios. Additionally, the connection to our proposed solution does not rely on external infrastructure, with each member of the CoP being able to either start a new network or join an existing one, having all the tooling needed included in her *Node Package.*

4   Summary and Outlook

In this paper we described our vision of transferring a question-based dialog framework named *Noracle* to a distributed architecture. By this, we hope to render the concept for otherwise not supported long-tail CoPs usable. We are currently in the process of implementing and evaluating our approach. Ultimately, we want to compare, if the digitized *Noracle* framework produces similar results than its face-to-face equivalent.

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