



2nd International Conference on Information Technology and Quantitative Management,
ITQM 2014

Reaching Consensus in Digital Libraries: A Linguistic Approach

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Abstract

Libraries are recently changing their classical role of providing stored information into new virtual communities, which involve large number of users sharing real time information. Despite of those good features, there is still a necessity of developing tools to help users to reach decisions with a high level of consensus in those new virtual environments. In this contribution we present a new consensus reaching tool with linguistic preferences designed to minimize the main problems that this kind of organization presents (low and intermittent participation rates, difficulty of establishing trust relations and so on) while incorporating the benefits that a new digital library offers (rich and diverse knowledge due to a large number of users, real-time communication and so on). The tool incorporates some delegation and feedback mechanisms to improve the speed of the process and its convergence towards a consensual solution.

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Selection and peer-review under responsibility of the Organizing Committee of ITQM 2014.

Keywords: Group decision making; consensus; linguistic information; digital library

1. Introduction

Libraries form an essential part of academic institutions, enabling and facilitating the exchange and growth of information, knowledge and culture among teachers, students and the general public¹. In this sense, libraries represent a focal point of academic life and as such serve also a societal purpose of bringing together people around common themes. This purpose is nowadays enhanced and facilitated by the use of technology and, in recent times, by the so-called digital libraries^{2,3}.

A digital library (DL) is a collection of information that has associated services delivered to user communities using a variety of technologies². In general, DLs are the logical extension of physical libraries in an electronic information society. Such extensions offer new levels of access to broader audiences of users. As the final aim of a DL system is to enable people to access human knowledge at anytime and anywhere, in a friendly multimodal way, by overcoming barriers of distance, language and culture, and by using multiple network-connected devices, it seems reasonable that

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the decisions about important issues in DLs have to be made by their own users. Therefore, we can see this problem from the point of view of a group decision making problem.

Group decision making (GDM) is a situation faced when individuals collectively make a choice from a suitable set of alternatives. This decision is no longer attributable to any single individual who is a member of the group. This is because all the individuals and social group processes such as social influence contribute to the outcome^{4,5}.

There have been several efforts in the specialized literature to create different models to properly address and solve GDM situations. Some of these proposals have provided interesting results with the help of fuzzy set theory⁶, as it is an efficient tool to model and deal with vague or imprecise options, alternatives and opinions of several decision makers^{5,7}. However, there are decision situations in which the experts preferences cannot be assessed precisely in a quantitative form but may be in a qualitative one, and thus, the use of a *linguistic approach* is necessary^{4,8}.

The *linguistic approach* is an approximate technique that represents qualitative aspects as linguistic values by means of *linguistic variables*, that is, variables whose values are not numbers but words or sentences in a natural or artificial language⁸.

On the other hand, it is clear that involving a very large number of individuals in a decision process is a difficult task but, with the appearance of new electronic technologies, we are in the beginning of a new stage where traditional decision models may leave some space to a more direct participation of the “webizens”.

In fact, Web 2.0 represents a paradigm shift in how people use the Web as nowadays; everyone can actively contribute content on-line. However, the challenge is to develop more sophisticated Web 2.0 applications with better “participation architectures” that allow sharing data to their users, trusting users as co-developers, harnessing collective intelligence, etc.,⁹. They should be able to overcome the inherent problems of the Web 2.0 Communities as^{10,11}:

- Large user base.
- Heterogeneity in the users, which present different backgrounds and use different expression domains.
- The low and intermittent participation rates.
- The dynamism of the Web 2.0 frameworks, e.g. the group of users could vary over time.
- Difficulties of establishing trust relations.

Another important mechanism that has been widely used in decision processes where lots of individuals are involved is delegation¹². In fact, classical democratic systems rely on delegation in order to simplify the decision making processes: as not all the individuals are involved in the decision process (some of them delegate on others), the final decisions are usually achieved faster and in a simpler way. Even when delegation is widely used in many different decision making environments, it is a subject whose implications and utilization is currently under intensive study^{13,14}.

In this contribution we present a new consensus tool for DLs by assuming fuzzy linguistic preference relations to represent the user preferences. As many traditional consensus approaches, it implements an iterative process in which the members of the DL interact in order to reach a consensual solution on a particular problem. As aforementioned, DLs present several different inherent characteristics that are not present in usual decision making scenarios. Thus, to overcome the difficulties that arise from those special characteristics, the proposed consensus tool implements some different modules that have been designed to tackle them.

To do so, the paper is set as follows. In Section 2 we present our preliminaries, that is, some of the most important characteristics of DLs and of group decision making problems under fuzzy linguistic preference relations. In Section 3 we introduce the new linguistic consensus tool that helps to obtain consensual decisions among DLs users. Section 4 deals with a real world application of the tool. Finally, in Section 5 we point out our concluding remarks.

2. Preliminaries

In this section we present some important information about DLs and Web 2.0, and some generalities on GDM problems.

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