Web-HIPRE: Eight years of decision analysis software on the Web –

History, users and applications

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Abstract: Web-HIPRE is a decision analytical software available on the Web. The software was introduced in 1998 and since then it has been applied in several real life applications and decision analytical courses. In this paper, we describe the history of Web-HIRPE and analyze user statistics and the results of the recent user survey. We also describe two applications in lake regulation management as well as in nuclear emergency management. Web-HIPRE is a part of the Decisionarium Web site for global decision support.

Keywords: Multicriteria decision analysis, Decision support systems, World Wide Web

1. Introduction

The availability of Web-based tools is a necessity for studying the opportunities of e-participation in practice. Learning by doing is the only way to develop new practices for applying decision analytical tools in e-participation (Hämäläinen et al., 2006). We believe, however, that new models and approaches should be taken into use with small steps. That is, we should first apply simple models and when the public has received enough positive experiences on these, we can move on for advanced tools.

In this paper, we describe the history of the Web-HIPRE software (Hämäläinen and Mustajoki, 1998; Mustajoki and Hämäläinen, 2000). It is a decision analytical tool that supports multiattribute value theory (MAVT) based methods (Keeney and Raiffa, 1976) as well as the Analytical Hierarchy Process (AHP) (Saaty, 1980). It is the Web implementation of the earlier HIPRE 3+ software (Hämäläinen and Lauri, 1995) providing group decision support facilities through the Web. The first version of the software was introduced in 1998, and as far as the authors know, it is the first Web-based general purpose MAVT software that provides tools for problem structuring, preference elicitation and sharing the results over the Web. Web-HIPRE still remains one of the few general purpose decision analytical software packages available for on-line use on the Web (see e.g. Maxwell, 2004). Web-HIPRE is a part of the Decisionarium Web site for global decision support (Hämäläinen, 2000, 2003), which also provides other software such as Opinions-Online (Hämäläinen and Kalenius, 1999) for global participation and surveys.

The architecture of Web-HIPRE takes advantage of the possibilities of the Web to support decision making processes. Web-HIPRE is an interactive Java applet, and therefore all the features of the Java-based approaches apply to it. These include, for example, the possibility to carry out interactive processes without any installations on local computers, the possibility to remotely use the software and platform-independency. Web-HIPRE models can be studied collaboratively through the Web to understand the other DMs' preferences. The individual preferences can also be aggregated to group preferences with a group model in which the effects of individuals can be studied by carrying out sensitivity analyses on the weights of the DMs.

Web-HIPRE has been applied in several real life applications and decision analytical courses. The software has been visited over 80000 times and there are more than 3000 registered users. In this paper, we analyze user statistics of Web-HIPRE and the results of the recent user survey. We also describe in detail two of our applications of Web-HIPRE in lake regulation management and in nuclear emergency management. For other applications of Web-HIPRE see, for example, Sarkis and Sundarraj (2003), Shah and Sarkis (2003), Talluri and Ragatz (2004) or Geldermann et al. (2006).

2. History of Web-HIPRE and user experiences

The development of Web-HIPRE, as well as its predecessor HIPRE 3+, initiated from the needs of the practice to support the decision analytical process. In the development of HIPRE 3+, the energy policy evaluation cases (see, e.g. Hämäläinen, 1988) played a major role, whereas the development of Web-HIPRE started from the needs of the lake regulation projects (see e.g. Marttunen and Hämäläinen, 1995). The needs of the behavioral studies on decision analytical methods were also considered in the development of the software (see e.g. Hämäläinen and Alaja, 2003).

In 2006, we carried out a survey among the registered Web-HIPRE users. In this paper, we describe the results of this survey and discuss the strengths and weaknesses of the software. Based on the user experiences, we also discuss the usefulness of the different features of the software.

3. Application of Web-HIPRE in lake regulation policy evaluation

We describe the application of Web-HIPRE to support participatory environmental decision making in a case of the regulation of Lake Päijänne in Finland. In this case, a steering group was set up to represent the various stakeholder groups. The preferences of the steering group members were modeled with Web-HIPRE or HIPRE 3+, and the results were discussed collaboratively. The public was involved in the process by arranging public meetings in which the results of the steering group meetings were presented and discussed. As an optional element, we demonstrated a possibility for the public to use Web-HIPRE through the Web to model and analyze their preferences. However, in general this can be considered to be too sophisticated a task to be carried out independently. The approach can be further extended to a Web-based framework for public participation in which Web-based tools are also applied to communicate with the public (Hämnäläinen et al., 2006).

Our experiences show that the use of Web-HIPRE to model the different views of the steering group members can provide substantial help to support the public decision making process. On the other hand, the study also emphasizes the need to train researchers and practitioners to apply the methods correctly.

4. Application of Web-HIPRE in decision conferencing to support nuclear emergency management

We also describe the interactive use of the group approach provided by Web-HIPRE in decision conferencing, which is a collaborative and intense way to support group decision making (Phillips, 1984; Phillips and Phillips, 1993; French, 1996; Hämäläinen and Leikola, 1996). The studied two conferences dealt with the planning of later phase countermeasures in nuclear emergency management. Our focus is on the independent and interactive use of Web-HIPRE in one-day decision conferences. The participants' individual use of the software in the preference elicitation phase was an essential new characteristic of the conferences.

The results of the study support the applicability of the approach but emphasize the need of simple models and easy-to-use software. The approach is considered especially applicable in preparedness planning but the decision process could include elements of this approach also in a real emergency situation.

5. Conclusions

The introduction of Web-HIPRE has opened up new opportunities to support MAVT modeling. In general, the majority of the user experiences on Web-HIPRE are positive. Our experiences obtained from the case studies strongly support interactive use of advanced MAVT software with group facilities, such as Web-HIPRE, in decision conferences, assuming that these are carefully planned in advance. The experiences also support applying MAVT methods within a steering group representing various stakeholders in a participatory process. However, in both cases, much of the success depends on how well the authorities can implement the different tasks of the process. In this respect, collaboration between decision analysis researchers and policy support administrators is very important.

We believe that Decisionarium-like Web sites providing software for various purposes with multiple methods are a very applicable way to promote the use of decision analytical methods in e-participation.

In this respect, our experiences obtained with Web-HIPRE have given credibility to this approach. Another way to proceed is the open source software, but so far there has been only minor development in this area.

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