Mat-2.177 Operaatiotutkimuksen projektityöseminaari

Decision-Making Support System for Flood Control

Project Plan

Group 4
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1. Background

Environmental Impact Assessment Centre of Finland Ltd. (EIA) is an independent research company. EIA models have been developed for watersheds, rivers, lakes, coastal and sea areas and atmosphere. This project concerns watershed management and river flood risk analysis. Risk analysis of floods and decision-making support systems for watershed management have become even more important as hydroelectric power plants have become more common.

Yangtze River in China is one largest in the world and some 400 million people live in the area watered by it. There are lots of dams and hydroelectric power plants along the Yangtze. For maximal productivity of the power plant, the surface of a basin should be as high as possible. The most safety situation conversely is that the surface is as low as possible.

2. Objectives

The project group has following tasks:

1. Determine the probability that certain river flows (case Yangtze) exceed maximum tolerance given in 50, 100 and 200 years, provided that long history of the flows is given.
2. Determine optimal actions concerning basin and reserve area usage at every moment with the condition that risk level is to be less than 0.001.
3. Design a dynamic method or application to produce optimal actions, when cost and risk levels are known.
4. Apply this method to case Yangtze.

EIA has also delivered us flow data of 6 tributary river of Yangtze, measured daily over 50 years. Also cost levels of floods, capacity of basins and delays of fulfillments of reserve areas are known. The main goal in the project is the design of the decision-making method (mentioned in 3.) to take optimal actions.

3. Plan of action

The project can be seen in two main parts. The first part is to analyze the flow data given. If the data is suitable for time series analysis, forecasting can be done by identifying the SARIMA-processes of flows and estimating the parameters. The bigger or at least more relevant part of this project is to analyze the decision-making situation.

The first question in the decision-making situation is what to maximize and how uncertainties should be involved in the decision. Maximizing the expected monetary value may not be the best approach. The risks involve great losses (including human lives) and the risk attitude of the decision maker may be relevant for the analysis.

3.1 Resources

Margareetta Ollila will be designing the decision-making method with Mikko Vuolanto. Antti Hovila and Lauri Kangas are more familiar with statistics and time series analysis and they will examine the flow data more closely. Hovila and Kangas will join the decision analysis group as soon as the first task (calculating the probabilities) is performed.

3.2 Risks

The greatest risk in achieving project goals is that the group works on virtual basis. Each member lives in different town to each other and the group communicates mainly with e-mail. This reduces idea exchange and complicates the execution of the project.

We have tried to reduce this risk and decided to have three group meetings. These meetings will ease collaboration and the execution of the project.

Problems can occur also if the support from EIA isn't adequate. The actual project initiator Jorma Koponen is already working in China at the moment and isn't available for meetings. Although, Koponen is reachable via e-mail and EIA has new contact person Arto Inkala.

3.3 Schedule

- **12.3.2004 Intermediate report will be sent to EIA for comments**
    - Task 1. performed.
    - The main principles of the decision method

- **17.3.2004 Intermediate report will be finished and sent to assistant Punkka and to opponent group**
- **19.3.2004 Presentation of intermediate report**
- **13.4.2004 Project will be finished and final report will be sent to EIA for comments**
    - Method designed and applied to case Yangtze

- **19.4.2004 Final report will be finished and sent to assistant and to opponent group**

- **23.4.2004 Presentation of the project**

Group meetings

1. Briefly after project plan presentation, 21.2.2004
    - More detailed organizing of the group tasks.
2. After the presentation of the intermediate report, on the weekend 19.-21.3.2004
    - Review of the situation and deciding how to continue towards project goals.
3. Before finishing the final report, on the week 16.