Mat-2.177 Operations research project work seminar

Decision-Making Support System for Flood Control

Status report

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1. Objectives

There are no changes to the project objectives. Project objectives according to project plan are

1. to create a decision making method which determines optimal actions when costs and risk levels are known,
2. to determine the probabilities that certain flows exceed maximum tolerance in 50, 100 and 200 years and
3. to apply the decision making method to case Yangtze.

2. The current situation

There is a slight change of aspect in the forecasting the flows. Earlier it was planned that some kind of SARIMA-time series model would be used. However, the risk evaluation covers also long term events, e.g. how many floods in 200 years. SARIMA-models cannot be used to approach these kinds of questions, so it is more convenient to just use distributions of flows. The examination of the case flow data supports the assumption that daily or monthly flow distributions are identical every year (i.e. independent of year) and there is only seasonal time dependence.

The main interest is though the method for decision making. We have formulated the following key principles for the method:

a. Firstly, the decisions are maid discretely, and the time interval for two sequential decisions is Δt. "Continuous decision making" is achieved by $\Delta t \to 0$

b. In every decision situation the distributions of at least 2 following flows during the two subsequent time intervals are known. For example, if $\Delta t = 1$ day, it is required that the distributions of today's and tomorrow's flows are known.

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These principles don't tie the method for determining the distributions of flows. In certain situations it could even be very beneficial to use SARIMA-model to create the distributions. This decision making method isn't yet strictly formulated, but the main idea is clear.

The probabilities for certain flows exceeding the maximum tolerance haven't yet been calculated. This task has shifted, but creating the theoretical framework has extended its importance, and the calculation of the probabilities is relevant only in examining the case. These probabilities can be calculated directly from the distributions, which will be fitted with the data.

In addition, the project group members have familiarized themselves with decision making and flood control by literature and few articles.

3. Continuation

As already mentioned earlier, the probabilities for flows exceeding tolerance will be calculated later. New order for tasks to be achieved is that firstly to complete the theoretical decision making method. After this task, applying this method to case Yangtze and calculating the probabilities will be performed.

Firstly an exact formulation of the decision making situation is needed. This will be finalized by the end of March. Formulation includes also the decision about the criteria to be optimized. There will (certainly) be a lot of debate on this before the decision making method is finalized.

Documenting project work will be a large task itself and it will be started immediately after the presentation of this status report.

The project group will meet twice: 21.3. and 19.4. These meetings will help organizing the group's work and sum up the ideas and results.

4. Risks

The risks are the same than in the project plan. Although, the incoherence of the group has been greatly emphasized as we haven't been able to organize a group meeting. Also the haste of group members has lately been involved.

On the contrary, the support from EIA has been good, and the risk with inadequate support deals mainly with Inkala's vacation (Koponen will be reachable via e-mail, though).