

SENIOR PROJECT PROPOSAL

Problem

California has a unified watering system for watering farms. Currently this system is operated by a large number of people, through a program called WCDSS. The WCDSS system contains data describing all the canals that various farms in the state are connected to along with geographic data, maximum throughput through various interconnecting canals, and fields that are growing various crops. When a farm needs to water one of its fields, they will call up the water authority, and their order will be taken down on paper, and later transferred into the WCDSS system, where an engineer can review the order, and schedule its fulfillment.

The current problem with this is that a growing number of orders can't be fulfilled right away, because of various water bandwidth limits along various canals, some orders have to be postponed until there is enough bandwidth available on all of the interconnecting canals to deliver the water (currently, no water orders are postponed more than a day, but if there is a severe drought, it might be possible that they get delayed longer). The day before all of the water orders are filled, an engineer will log into the WCDSS system, and manually find and resolve all of the bandwidth conflicts, by delaying orders.

This process should be simpler. It should be possible to have the WCDSS system run its own scheduling algorithm, so that the operator only has to review and approve water orders.

Solution

Using stable models, it is possible to express the constraints set up by the bandwidth on interconnecting canals, and express water orders. Stable models can then be reduced into an answer using an NP-Complete algorithm.

Along with the stable model solution, a set of user tools to assist the user in automating the scheduling process must be made. Once the user generates the watering schedule, it will be correctly visible in the preexisting WCDSS application system.

Schedule

It should take a quarter to get a correct and complete answer to the scheduling problem, along with basic user tools to connect to the current WCDSS database. The WCDSS schema is set up, so the solution can be entered into the database, and read with the WCDSS application.

In future quarters, depending on the permission of the maintainer of the WCDSS system, it might be possible to integrate the tools, so that the user doesn't have to exit the WCDSS application to do the scheduling.

Meeting Minimum Criteria

Independence

I will be working to generate the stable model solution for this watering problem. Various other parts of the WDCSS system are not maintained by me, and will not be considered part of this project. An off the shelf algorithm solver may be executed to generate the answer to the stable models problem.

Background Research

There is communication between me, and the maintainer of the WCDSS system. This has given me more background into the problem domain, and some specific issues that relate to irrigation.

Creativity

This project requires that I find a working solution to the canal setup and water orders as a stable model. This data will then be inputted into the WCDSS database.