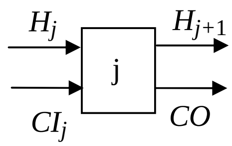
Lecture 6 – add II: Prize Problem II

was solved by Mr. Da Wang. The solution here details one way to set up the equations so the connections can be easily changed. (Mr Da used another way)



Let there be *n* units. Connect the hot water lines linearly, from H_1 = Hin to H_{n+1}. We have now the relations for unit *j*

$$H_{j+1} + CO_{j+1} = H_j + CI_j$$

$$H_{j+1} - CO_{j+1} = a(H_j - CI_j),\ j = 1...n$$

and the connections are described by the list `ind`,

$$CI_j = CO_{ind(j)},\ j = 1,2,...n$$

Eliminate the CI to obtain

$$H_{j+1} + CO_{j+1} = H_j + CO_{ind(j)}$$

$$H_{j+1} - CO_{j+1} = a(H_j - CO_{ind(j)}),\ j = 1...n$$

and the connections to inflow

$$CO_1 = Cin, H_1 = Hin$$

so we have 2*n*+2 equations for the unknowns H_i, CO_i, i = 1:*n*+1.
There remains to set up the system matrix for the linear system, and to run through the possible permutations in `ind` – for 5 units, 24 different. Of course, enumeration of all different permutations of integers 1:*n* is a programming exercise in itself which cannot be solved by stacking loops. Probably a recursive algorithm is easy. But brute force will not solve the problem for *n* = 100. Suggestions for other algorithms?