

Part 1: Constraint Satisfaction Problem

Scheduling

Defining the problem

For the CSP of scheduling M employees going to N meetings given T time slots, we can define the problem as follows:

The **variables** are the meetings in $N = \{n_1, n_2, \dots, n_n\}$

The **domain** is the set of time slots $T = \{t_1, t_2, \dots, t_n\}$

We define two **constraints** on the variables as follows:

1. No two meetings that share an employee can share the same time slot
2. Meetings that share employees can be assigned time slots such that the difference in the time slots is greater than the travel time between the two meetings.

CSP heuristics:

- We decided to first select the **most constrained variable** for expansion. We did this by sorting the meetings in descending order of the number of employees. This finds a solution faster than assigning meetings with fewer employees.
- Next we choose the **least constraining value** to assign to the meetings. We do this again by sorting. But here we sort the time slots available by the number of meetings assigned in ascending order. This fails quickly if a sequence of assignments is not valid. Although this proved to be complex since we searched for a recursive solution and a copy of the time slots had to be sorted at each recursive step.

Solutions:

problem1.txt

Attempted assignments: 34760

Meeting 1 is scheduled at time 5
Meeting 2 is scheduled at time 5
Meeting 3 is scheduled at time 12
Meeting 4 is scheduled at time 12
Meeting 5 is scheduled at time 1
Meeting 6 is scheduled at time 12
Meeting 7 is scheduled at time 1
Meeting 8 is scheduled at time 1
Meeting 9 is scheduled at time 7
Meeting 10 is scheduled at time 3
Meeting 11 is scheduled at time 12
Meeting 12 is scheduled at time 7
Meeting 13 is scheduled at time 9
Meeting 14 is scheduled at time 1
Meeting 15 is scheduled at time 7
Meeting 16 is scheduled at time 10
Meeting 17 is scheduled at time 10
Meeting 18 is scheduled at time 3
Meeting 19 is scheduled at time 3
Meeting 20 is scheduled at time 7

problem2.txt

Attempted assignments: 207036

No solution exists

problem3.txt

Attempted assignments: 910125

Meeting 1 is scheduled at time 12

Meeting 2 is scheduled at time 9

Meeting 3 is scheduled at time 12

Meeting 4 is scheduled at time 9

Meeting 5 is scheduled at time 6

Meeting 6 is scheduled at time 1

Meeting 7 is scheduled at time 10

Meeting 8 is scheduled at time 12

Meeting 9 is scheduled at time 1

Meeting 10 is scheduled at time 4

Meeting 11 is scheduled at time 3

Meeting 12 is scheduled at time 9

Meeting 13 is scheduled at time 1

Meeting 14 is scheduled at time 12

Meeting 15 is scheduled at time 9

Meeting 16 is scheduled at time 1

Meeting 17 is scheduled at time 6

Meeting 18 is scheduled at time 12

Meeting 19 is scheduled at time 4

Meeting 20 is scheduled at time 1

Meeting 21 is scheduled at time 6

Meeting 22 is scheduled at time 7

Meeting 23 is scheduled at time 3

Meeting 24 is scheduled at time 12

Meeting 25 is scheduled at time 9

Meeting 26 is scheduled at time 3

Meeting 27 is scheduled at time 1

Meeting 28 is scheduled at time 1

Meeting 29 is scheduled at time 4

Meeting 30 is scheduled at time 6

Meeting 31 is scheduled at time 12

Meeting 32 is scheduled at time 7

Meeting 33 is scheduled at time 12

Meeting 34 is scheduled at time 12

Meeting 35 is scheduled at time 7

Meeting 36 is scheduled at time 4

Meeting 37 is scheduled at time 12

Meeting 38 is scheduled at time 9

Meeting 39 is scheduled at time 12

Meeting 40 is scheduled at time 12