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#11: DCSP (AE4M36MAS tutorial)

- Tutorial time: 27 Nov 2012 @ 14:30
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1) DCSP Modelling

- Definition of DCSP (variables, domains, constraints, agents)
 - CSP + each variable owned by one agent
- Why DCSP?
 - Often problem instances come already distributed without a way to bring all the information together into one place (naturally distributed problems)
 - Additional individual goals of agents
 - privacy
 - individual interests / preferences
 - semi-cooperative agents
 - Additional limits/restrictions on communication between agents ...No trusted third party, privacy concerns
 - Costly to formalize constraints and preferences for all possible cases
 - *However, distribution cannot increase efficiency*

2) Preprocessing

- Filtering algorithm
 - Pseudocode (cf. [Vidal](#))
 - each agent executes FILTERING()
 - Example of the map colouring problem with 3 agents
 - Can be used for preprocessing → result
 - solution ... rarely (Vidal: Figure 2.4) ... *trace the filtering algorithm*
 - slight reduce of the domains ... usually (Figure 2.6) ... *just say what is the solution*
 - cannot reliably detect problems that do not have a solution (Vidal: Figure 2.5)

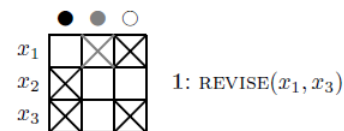


Figure 2.4: Filtering example. The agents start out with some prohibited colors as indicated by the black crosses. On the first step x_1 does his `REVISE` and eliminates the color gray from consideration. It then tells everyone else about this. Then x_2 does its revise and eliminates the color gray from its domain.

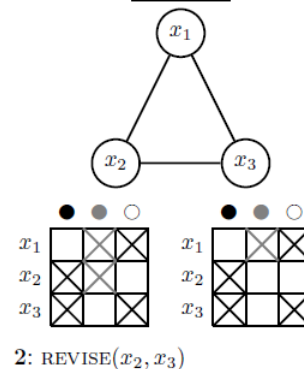
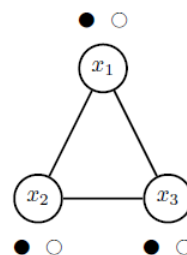


Figure 2.5: Example of a problem that does not have a solution and the filtering algorithm cannot that fact.



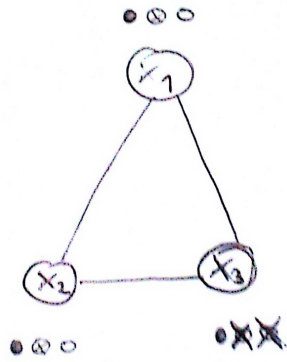


Figure 2.6

3) Search

Target Tracking

- Goal: In a big room, there are several targets to track. Every target must be tracked at least by one camera. A camera can be oriented to N/S/E/W
- Variables, domains: Camera with the domain of {N, S, E, W}
- Agents: cameras
- Constraints: At least one camera tracking each target which is situated between two cameras (binary).

Pseudocode of ABT (cf. Vidal)

- j ... name of an agent
- x_j ... current variable value of the agent

ABT on Target Tracking problem

- *priority*: the agent's fixed priority number. All agents are ordered.
- *local-view*: current values of other agents' variables.
- *current-value*: current value of agent's variable.
- *neighbors*: initially, the set of agents with whom agent shares a constraint.
- *assumptions*:
 - messages never lost, arrive in the same order as they were sent
- *flow of messages*.
 - MaxPriority \rightarrow ... HandleOK? ... \rightarrow MinPriority
 - MaxPriority \leftarrow ... HandleNoGood ... \leftarrow MinPriority



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