#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)

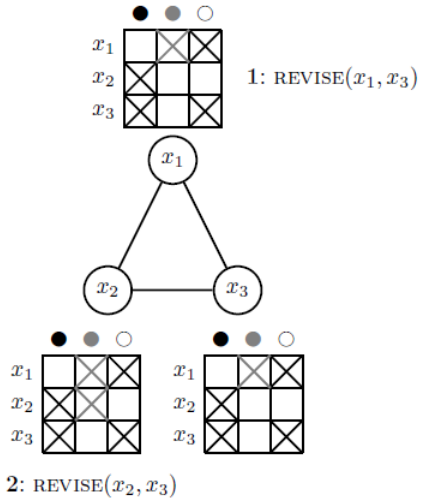

Figure 2.4: Filtering example. The agents start out with some prohibited colors as indicated by the black crosses. On the first step x_1 does his REVISE and eliminates the color gray from consideration. It then tells everyone else about this. Then x_2 does its revise and eliminates the color gray from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

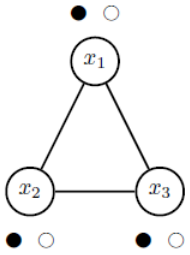

Figure 2.5: Example of a problem that does not have a solution and the filtering algorithm cannot that fact.

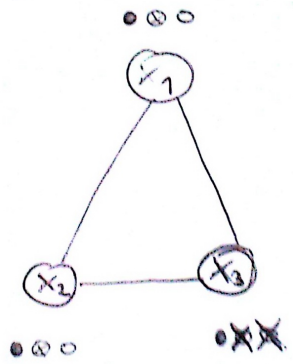

Figure 2.6

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 → … HandleOK? … → MinPriority
  - MaxPriority ← … HandleNoGood … ← MinPriority