

This work is funded by the Irish Research Council for Science, Engineering and Technology (IRCSET) Embark Initiative in collaboration with Microsoft Research.

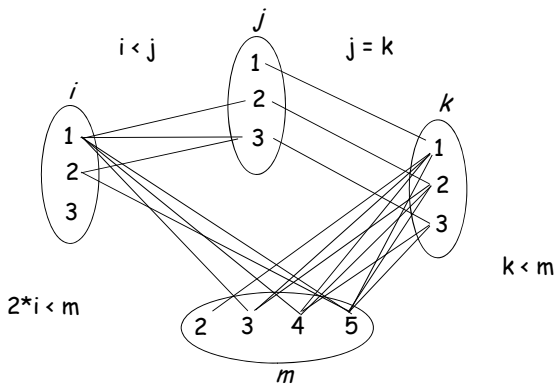
## What is Adversarial Constraint Solving?

It is the combination of constraint satisfaction techniques with artificial intelligence game playing to tackle decision problems in which two or more self-motivated agents with different goals must produce a joint solution.

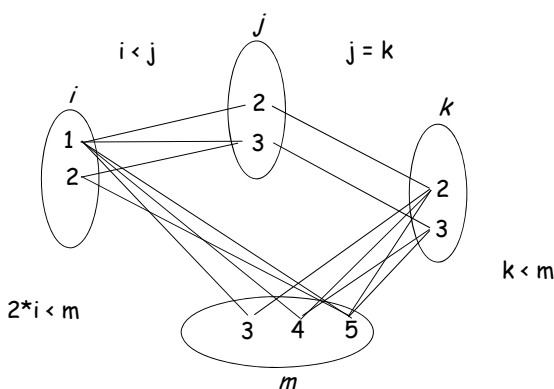
### Constraint Satisfaction Problems (CSP)

We can use constraint propagation and other techniques from constraint satisfaction to reduce the size of variables' domains.

#### Simple constraint problem



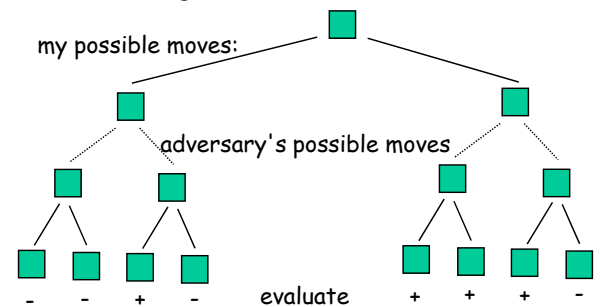
#### After Constraint Propagation



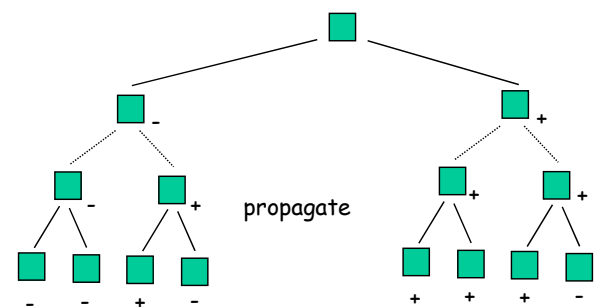
### AI Game Playing

We can let agents reason about their decisions and take into account their adversaries' possible future decisions.

Reason three moves ahead and estimate quality of the resulting states.

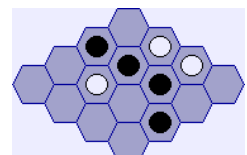


Propagate the estimates up the search tree to get estimates for moves from the current state.



We hope to guide a CSP to a good solution, which suits the agents' respective objectives, using the AI game playing algorithms and they in turn benefit from the pruned search tree which CSP provides.

We have applied Adversarial Constraint Solving to a simple abstract security model based upon the board game Hex. And are exploring the possibilities of expanding to include Soft/Fuzzy Constraints to remove the need for backtracking or Quantified Constraints which are particularly suited to modelling games.



A hex game.