Search, Planning, & CSPs Making Sense Of It All

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How Do Search, Planning & CSPs fit together?

- Keep in mind these are all very general frameworks
- We typically think of search as the most general:
  - Start
  - Goal
  - Actions
  - Costs
- We can formulate almost anything as search, even in a not entirely unnatural way:
  - Shortest path
  - Sorting
  - Planning
  - CSPs
- Not everything that can be solved as search should be solved as search. The fact that you are holding a hammer doesn't make everything a nail.

Algorithm vs. Concept

- There are times when we will talk about search as a specific algorithm, i.e., something maintains a queue, pops things off the queue, expands them, etc.
- Other times we will talk about search as a more abstract concept, e.g., finding a minimum of a function by gradient descent can be thought of as a kind of search, even though we don't maintain a queue

CSPs

- Can formulate CSPs as search
  - Goal = satisfying assignment
  - States = partial assignments
  - Actions = assigning values to variables
- Using a generic search may not be a good idea:
  - We don't care about the path
  - We don't care about costs
  - We have a largish branching factor
  - We may miss opportunities to exploit structure in the problem, e.g., noticing the structure of the constraint graph

Planning

- We can formulate planning as search
  - Goal = plan goal
  - States = Situations reachable from start state
  - Actions = plan actions
- This seems like a better fit for search than CSPs (and it is), but
  - The branching factor is huge
  - The goal is usually a state set
  - Difficult to come up with good heuristics
- We need to do something more clever than simply applying generic search techniques

Notional View of Problem Classes

NB: To make this rigorous we would need to be a bit more precise and rigorous in our definitions than what is expected/required for this class.