AIND Planning Project
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Research Review

Planning is a very important aspect of artificial intelligence and is related to state-space search, theorem proving, and control theory. In the following 1 pager review, a summary of 3 aspects of planning will be shown: 1) STRIP, the first major planning system, 2) Linear programming and interleaving, and 3) Binary decision diagrams. (Info from AIMA, 3rd Edition.)

1) Linear plans:
STRIPS (http://ai.stanford.edu/~nilsson/OnlinePubs-Nils/PublishedPapers/strips.pdf)

STRIPS, which stands for Stanford Research Institute Problem Solver, is a problem solving program developed in 1971. The problems tackled by this paper are those faced in robotics: re-arranging objects, navigating in where a very large and complex state space is needed to fully represent the problem. The world is represented as a set of well-formed formulas (wffs). Operators are grouped into families called schemata. Examples of operator: goto to move a robot from one point to another. goto(m,n). Preconditions are added to every operator created.

For the search strategy in STRIPS, all the operators are applied to get successors models. The operators would continue to be applied in a breadth-first fashion, until the whole model was produced. STRIPS uses a heuristic in its search function.

2) Nonlinear plans
Nonlinear nature of plans, Sacerdoti (http://www.ijcai.org/Proceedings/75/Papers/028.pdf)

The problem with the planning algorithms like STRIPS, is that they generally considered totally ordered action sequences. A nonlinear approach is necessary to tackle these problems. NOAH was developed by Sacerdoti. NOAH stands for Nets of Action Hierarchies. It is a problem solving system that uses a nonlinear representation of plans.

The basics of NOAH, is that it uses a data structure called procedural net. This net is a network of nodes, each with information like: procedures and pointer to other nodes. These nodes represent actions. There are different types of nodes like: GOAL, PHANTOM, SPLIT, and JOIN. Each node points to a body of code which executes some functions. This way, we can represent a nonlinear plan

3) Constrained based approach: GRAPHPLAN

Fast Planning Through Planning Graph Analysis, Blum and Furst, 1997.
(https://www.cs.cmu.edu/~avrim/Papers/graphplan.pdf)

Graphplan is a STRIPS like domain based planning algorithm that uses a compact structure called a planning graph before starting the search part of the problem. The planning graph encodes the problem in a way that constraints from the problem become available to reduce the amount of search done. These planning graphs can be constructed quickly in polynomial time, reducing the overall time for the planning and search algorithm.