Historical developments in the field of Artificial Intelligence:

Planning and search

Artifical Intelligence (AI) planning arose from investigations into state-space search, theorem proving, and control theory and from the practical needs of robotics, scheduling, and other domains. [1] A brief overview of three developments in the field of AI planning and search are presented in this report. The first planning system presented is STRIPS (STanford Research Institute Problem Solver), the second one is Action Description Language (ADL) and Problem Domain Description Language (PDDL), an advancement of STRIPS language, and lastly Graphplan.

In the early 1970s, the STRIPS planning system was developed by researchers from the SRI (Stanford Research Institute). It was the first major planning system used as a planning component of the software for the robot Shakey. The project was to create a robot that could navigated and pushed objects in a multi-room environment. The state of the robot can only be changed by actions where the world model is represented by a set of well-formed formulas.[2] The actions were defined as three sets of state variables; the precondition list which is a combination of positive literals, no negative literals are allow, the add list and the delete list which were both combination of positive or negative literals. STRIPS is the basis for other description languages such as ADL and Problem Domain Description Language (PDDL).

ADL, an advancement of STRIPS, made it possible to encode more realistic problems[1] by allowing the effects of an operator to by conditional. Then, PDDL was introduced as a standardized syntax for representing planning problems in AI. This language includes the ability to express a type structure for the objects in a domain, typing the parameters that appear in actions and constraining the types of arguments to predicates, actions with negative preconditions and conditional effects and the use of quantification in expressing both pre- and post-conditions. These extensions are essentially those proposed as ADL. [3]

Graphplan a propositional planner was invented in 1995. It always returns the shortest-possible partial-order plan or states that no valid plan exists. It starts by constructing a compact structure called Planning Graph instead of starting to search immediately into the problem. It is important to note that Planning Graph is not a state-space graph, but it is a flow. Also, it is based on domain information, goals, initial conditions of a problem and an explicit notion of time.[4]

To conclude, STRIPS planning system influenced a lot of research and development in the field of AI. A brief overview of STRIPS, ADL/PDDL and Graphplan was discussed in this report, but they are more such as Repop, SATplan or binary decision diagrams.

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[1] Norving, P and Russel, S (2010), Artifical Intelligence: A Modern Approach. Third Edition

[2] STRIPS : A new approach to the application of theorem proving to problem solving, http://ai.stanford.edu/~nilsson/OnlinePubs-Nils/PublishedPapers/strips.pdf

[3] PDDL Background, https://www.cs.cmu.edu/afs/cs/project/jair/pub/volume20/fox03a-html/node2.html

[4] Fast Planning through Planning Graph Analysis, https://www.cs.cmu.edu/~avrim/Papers/graphplan.pdf