Research Review

On important historical developments in the field of AI planning and search

AI planning is a field of AI that studies the strategies and actions for the practical needs of robotics, scheduling and other domains.

The first major planning systems developed by Fikes and Nilsson in 1971. The representation language used in STRIPS was more influential than its algorithmic approach. STRIPS' control structure was modeled on that of the **General Problem Solver** (Newell and Simon,1961), a state-space search system that used means-ends analysis. The language allowed practitioners to represent problems in a descriptive language. Planners in the early 1970s typically considered the total ordered action sequences and was achieved by computing subplans for each subplan and then appending all the subplans together. This approach, called **linear planning** by Sacerdoti (1975) was soon discovered to be incomplete and cannot solve some very simple problems.

The concepts of partial-order planning include the detection of conflicts and the protection of achieved conditions from interference which allowed a totally ordered plan to be re-ordered to avoid conflict between subgoals. The construction of partially ordered plans called **task networks** was pioneered by Sacerdoti (1975, 1977) and Tate (1997) separately.

Partial-order planning dominated for over 20 years and fell out of favor in the late 1990s as faster methods were developed. **Planning with heuristics** were introduced to overcome the shortcomings from the previous approaches by Nguyen and Kambhampati (2001). The introduction of the **ignore-delete-list heuristic** by Drew McDermott's UnPOP program created a renewed interest in state-space planning by many AI researchers that followed.

Planning and Search has real implications in the real world. As the CIO of United Parcel Service (UPS), Juan Perez, alluded to in his speech at the investor's conference that a company that delivers over 2.7 million packages daily globally and spends over $1 billion in technology services[1] will invest heavily and strategically in technology that will improve their business and customer experience. One of the new exciting enhancements in the pipeline include the new **Network Planning Tools**[2] (NPT). NPT applies advanced analytics, artificial intelligence and operations research to provide new levels of efficiency. I have no doubt the NPT initiative will incorporate the state-of-the-art research in AI planning and search.

1 UPS Press room, https://pressroom.ups.com/pressroom/ContentDetailsViewer.page?ConceptType=FactSheets&id=1426321563187-193
2 2017 Investors Conference,
https://pressroom.ups.com/pressroom/ContentDetailsViewer.page?ConceptType=Speeches&id=1487952235463-428

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2 2017 Investors Conference, https://pressroom.ups.com/pressroom/ContentDetailsViewer.page?ConceptType=Speeches&id=1487952235463-428