AIND Artificial Intelligence Nanodegree

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Planning & Search Historical Research Review: State of the Art

Human along all history created ways to establish itself in a safe and productive environments. Since the metal discovery (& furthermore) the efficiency is being increased and the quantification as part of human's way of growth has arrived in a global escalated concept which, nowadays, is vastly used to build homes, to deliver products in near real time, to put people together around the globe

Basically what happened during all these years was the planning skills that we achieved to implement in order to get our process less fuzzy and more accurate, efficient, valuable, and many others advantages. The logic-based knowledge for reasoning problems in real life took human beings from an instinctive community to the most rational that has ever lived in earth. The basics of a planning problem are: GIVEN (pre-conditions), FIND (actions), TYPICALLY (possible states)

Specialized AI algorithm brought this concept to the cognitive era trying to workaround classical model's difficulties such as: uncertainty, multiple and competing objects, ongoing processes. From this point of view, to maintain the goal and anticipate interactions with the problem is hardly to accomplish. And so there is the AI coming up many studies and feasible solutions [1]

One of the most commented/reviewed theory applied in AI developments is the Markov Decision Process (MDP) [2], which has 4 fundamentals components: S (state), A (action), R (reward) and Pr (transition). It can be used under many situations, problems and the policies (preconditions to use the model) are adaptable

The classical path planning trough last decades ended up to solve path planning for autonomous driving problem which has some brand new difficulties (3D kinematic state space, expectation arrival time, obstacles, GPS conditions, weather conditions, computational power, etc…). A modern approach to solve the problem is the A* (A star) algorithm which estimates the

cost to reach the final goal and the current explored environment to make the decision about the best path to take.

In real life problem for self-driving vehicles the obstacle's variable can be sometimes stochastic or non-stochastic. A common way of penalizing proximity to obstacles is to use a potential field. All above concepts lead to create a « Hybrid-State A* Search » [3] to implement and reach the final location of an autonomous vehicle. The resulting path is guaranteed to be drivable

In the end, but not less important, during the last decade researches on algorithms for conditional and probabilistic planning increased in order to maximize the performance, the algorithm's strength and to cover a wider range of problems. [4]

References:

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