Planning in Supply Chain Optimization Problem

State Space Planning started with General Problem Solver (GPS) in 1959. While the GPS was able to solve small problems like the Tower of Hanoi, it was unable to express or solve problems that were more complex. In 1971 STRIPS was conceived to address some of the problems with GPS. STRIPS introduced the notation that now is the basis for most planning languages, a development that let it express more concepts that GPS was able to. If the reader take the time to go through the original STRIPS paper, cited below, it will be evident that the notation used to describe the state space is very similar to the one used in the Cargo Planning Problem.

In the 1970s the common approach was linear planning, which functioned by solving all subgoals, then stringing together those actions into a total goal. However these planners had a limitation in that they couldn't solve obvious problems. One such famous problem was called the Sussman Anomaly. In the Sussman Anomaly the planning engine must take a step backwards, to then take two steps forward to solve the problem. The problem cannot be solved by breaking the problem into two subgoals then combining the steps. To avoid this problem a new class of solver called the goal regression solver was introduced. In this method the steps between two solutions were combined non linearly together to come up with a workable plan that could solve the Sussman Anomaly. For a number of years after this methodology of Partial Order Planning dominated research. However in the late 90s partial order planning fell out of favor to State Space searches once again.

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Based on a cursory review of Supply Chain optimization literature, my field of work, it seems that PDDL is a common method for considering when solving Supply Chain constraint problems. The paper *Planning in Supply Chain Optimization Problem* by N.H. Mohamed Radzi etal. details approaches used for applying PDDL to solve the problem of determining the optimal plan. In the paper six common supply chain actions STACK ORDER, CHOOSE BRAND, OVERTIME, NORMAL TIME, OUTSOURCE and SHIP ON TIME with the goal of shipping on time. The problem included temporal components as well and tested solutions with three different solvers. Unfortunately the paper concluded by essentially stating that none of the

solvers had worked particularly well, but that several potential improvements have been identified.

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