Research Review

Planning in Artificial Intelligence (AI) has used problem-solving languages to solve problems since the inception of the STRIPS (Standford Research Institute Problem Solver) in 1971 (Fikes et al., 1971). In any given world model, it is assumed there are a set of operators which change the state of the model. STRIPS searches through different combinations of world models to find a sequence of operators which transform an initial state into a desired goal state.

The inception of STRIPS allowed researchers to use a repeatable framework to solve problems such as robot navigation (Fikes et al., 1971). A world model of an exploring robot deals with a large number of state spaces. STRIPS provided conventions which allowed for such complex state spaces to be represented by a set of well-formed formulas. Once the well-formed formulas were conceived, searching for a goal state could begin.

Building on the foundations set by STRIPS, Edwin Pendault proposed ADL (Action Description Language) in 1987 (Kaufmann, 1987). Pendault discovered that STRIPS could be improved if operators were allowed to be conditional and if the open world principle was included. Without these, STRIPS could only be used on closed world systems and only positive operators could exist. With these restrictions, STRIPS operators are not able to recreate actions which effects rely on the events they are performed in. By adopting the open world philosophy and incorporating positive and negative operators, ADL could be applied to many more real-world scenarios (Pendault, 1994).

PDDL (Planning Domain Definition Language) was created by Drew McDermott and colleagues in 1998 as an attempt to standardise Artificial Intelligence planning languages (McDermott et al., 1998). It took the best attributes of ADL, and other planning languages such as UMCP (Universal Method-Composition Planner) and combined them to create a language usable by all for the International Planning Competition (IPC).

PDDL takes a fundamental approach when expressing domains. It describes what dependants are in a space, what actions are available, the combination of different actions and their effects on the domain.

The advantage of PDDL is its ability to be used as a baseline for researchers to compare performances on different problems. This reusability has led to several subsequent versions of PDDL, each attempting to improve on the last. PDDL 3.1 was used the official language during the deterministic track of the 2008 and 2011 IPC's (Helmert, 2008)

(Kovacs, 2011).

In any field, a common language is essential to ensure consistency amongst researchers, their experiments, their results and to drive the field forward. Without a unified language, there would be no baseline to work from, everyone would be taking the field in different directions without understanding what others were doing/had already done. By defining a common tongue, PDDL, ADL and STRIPS have all provided effective methods for researchers to collaborate, compare results and solve increasingly complex domains.