Research Review

In [1] Adi Botea (2006) reports that the speed of Planning and Search methods can be improved by using automatic abstraction. The three areas where abstraction can be used to improve the speed of Planning and Search methods are:

- In the area of fully automated AI Planning.
- In the area of grid maps.
- In the area of puzzle solving.

In the area of fully automated AI Planning, in [1] Adi Botea (2006) reports that "domain-independent planning" can be achieved by providing a planner with two inputs: a domain without domain specific information and "a problem expressed in a standard programming language". Using these two inputs the planner learns more about the problem and begins to improve its planning over time. With this method of abstraction, AI planning could see improvement in the range of ten times the previous used methods for AI planning.

In the area of mapping – "pathfinding on grid maps", in [1] Adi Botea (2006) reports that an order of magnitude improvement in speed can be obtained by using the Hierarchical Path-Finding A* algorithm (HPA*) with some domain-specific information. In [2] Adi Botea at el. (2014) describe HPA* as "a hierarchical approach for reducing problem complexity in path-finding on grid-based maps". This is a significance improvement of the A* algorithm for problems involving grid maps.

In the area of puzzle solving, in [1] Adi Botea (2006) reports that automatic abstraction can be used to solve the once popular puzzle called Sokoban. Where Sokoban is a board puzzle which is usually setup to implement a warehouse with containers needing to be moved for transport. By using planning and abstraction can be used on this type of problem to breakdown the problem into smaller more manageable problems. The abstraction converts the map into connected rooms. This approach to this problem has shown a significance improvement compared to other implementations for this type of puzzle solving.

In summary, with the use of automatic abstraction, execution speeds of Planning and Search methods can be can be significantly improved. Where the domain problem requires a great deal of domain-specific information like in puzzle solving or where the problem requires little domain-specific information as in AI Planning, automatic abstraction can be used. This provides a significant development in AI Planning and Search.

[1] Botea, A, (Spring 2006). *Improving AI Planning and Search with Automatic Abstraction.* @http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.94.2089&rep=rep1&type=pdf&cm_mc_uid=55872118217314920505684&cm_mc_sid_50200000=1492050568

[2] Botea, A., Mueller, M., Schaeffer, J., (2004). *Near Optimal Hierarchical Path-Finding.* @https://webdocs.cs.ualberta.ca/~mmueller/ps/hpastar.pdf