Creating heuristics with machine learning[*]

László Szatmári[a]

[a]University of Debrecen
`szatmari.laszlo@inf.unideb.hu`

Abstract

Heuristic searches are the most commonly used search methods in the field of artificial intelligence. A heuristic provides an estimate of the remaining distance to the goal. With this knowledge, the search algorithms can greatly prune the search tree that has to be explored to find a solution. Heuristic function is often done by hand using human intuition but can be automated to some extent. An automatically generated heuristic might not be the best, but it can be very useful, when it is hard to create a human heuristic, or if we want to automatize the process.

A possible method of creating heuristics automatically is to apply machine learning. The simplest way is to teach a learning algorithm with a set of states whose distance-to-goal is know. The experiments show, that it can be efficient, but it could not be applied to large state-spaces. In this presentation we investigate the idea of "bootstrap learning of heuristic functions" from [1] and [2]. It requires a set of unsolved training instances, and a known weak heuristic. The algorithm solves the training instances with the current heuristic, and it improves this heuristic by learning from the solutions. The training process could be long, but with the resulted strong heuristic the new problem instances could be solved very quickly. Our contribution to the earlier results is to show the effectiveness of the algorithm on some interesting state-space problems.

Keywords: heuristic search, machine learning

MSC: 68T20, 68T05

References

[1] ERNANDES, M., AND GORI, M., Likely-admissible and sub-symbolic heuristics, *ECAI*, (2004) 613–617.

[2] JABBARI ARFAEE, S., ZILLES, S., HOLTE, R. C., Learning heuristic functions for large state spaces, *Artificial Intelligence* Vol. 175 (2011), 2075–2098.