Learning a heuristic function

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Introduction

- Heuristics for node selection are often based on the *relaxation principle*.
- Learn search control to guide planner;
- The closer the relaxed problem is to the origi-nal problem the more informative the heuristic is;
- The more relaxed the problem is, the easier to compute the heuristic;
- Related work:
  - Yoon, S. W.; Fern, A.; and Gi-van, R. 2006. Learning heuristic functions from relaxed plans. In ICAPS, 162–171

$$H(s, A, g) = \sum_i w_i \times f(s, A, g)$$

Technical approach

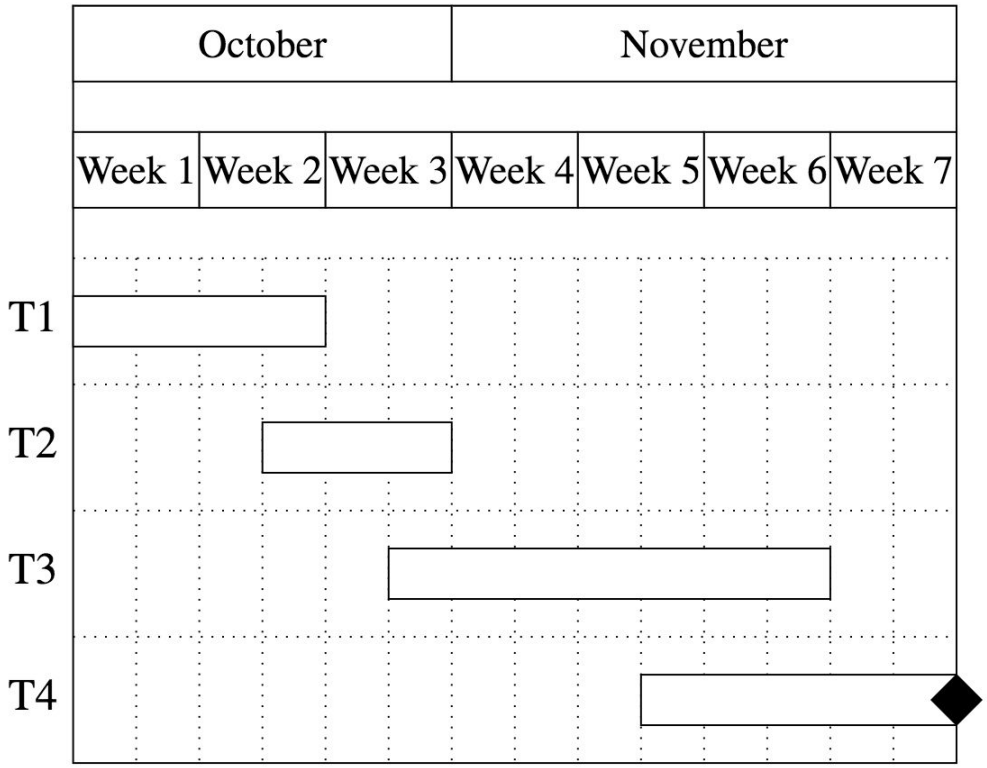
- Two main steps:
  1. Export data from planner;
  2. Use the data to estimate a heuristic function;

1. Exporting data:
   a. Run the planner for a set of problems of the same domain;
   b. Capture the literals of each state and the cost to objective;

State	Literals	Cost
S_0	(clear ?x) (onTable ?x) (holding ?x) (on ?x ?y)	C
S_g	(clear ?x) (onTable ?x) (holding ?x) (on ?x ?y)	0

- Is a linear function enough to capture the pattern of the data?

Project Management



- T1: Investigate related work;
- T2: Adapt planner to export data;
- T3: Perform experiments;
- T4: Write report.

Conclusion

- Machine learning may help finding a good heuristic;
- We can collect a reasonable amount of data from planners;
- A nonlinear function may yield better results;
- Compare to standard heuristics.

References

[Ghallab, Nau, and Traverso 2004] Ghallab, M.; Nau, D.; and Traverso, P. 2004. Automated planning: theory & practice. Elsevier.

[Jiménez et al. 2012] Jiménez, S.; De LaRosa, T.; Fernández, S.; Fernández, F.; and Borrajo, D. 2012. A review of machine learning for automated planning. The Knowledge Engineering Review 27(04):433–467.

[Yoon, Fern, and Givan 2006] Yoon, S. W.; Fern, A.; and Gi-van, R. 2006. Learning heuristic functions from relaxed plans. In ICAPS, 162–171.