DRATS: Dynamically Re-Allocated Team Search

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Andrew is to be warmly congratulated on a very well written senior thesis. His expository writing is excellent, and the presentation (especially the pseudocode) is first class. I also really enjoyed the tone struck, which strikes a nice blend of presenting results but including some good criticism and setting future direction. The thesis introduces the idea of 'Team Search', in which a group of computational agents work together by posting hints on local blackboards. Team Search is then augmented with DRATS, which supports the dynamic reallocation of agents across teams based on an offline statistical analysis of expected value. The overall performance of DRATS is some 15% better than that of Cooperative search, and some 8% better than Team search. Although not a break through improvement, this is suggestive of the value of Andrew's methods especially when one considers that a fairly naive approach to metadeliberation is taken in this work.

Section 5.3, in which DRATS is described, would have benefited from a worked example of how DRATS samples values to compute the estimated value of a reallocation, and then finally makes a reallocation decision. Was there any consideration made of 'thrashing' by the way, where agents are reallocated to often? I was left wondering whether a “slowed down” DRATS would work well, in which agents only move from team to team every few rounds rather than every round?

Section 6.2 presents some empirical analysis of the size of agent teams selected over the course of DRATS. It suggests that DRATS tends to favor a number of small (1 agent) teams, together with 1 larger agent team. I wonder whether this could be explained using Markov chain analysis? Consider a linear chain 1,2,3,4,5,6 with 3 points initially positioned at '4'. Suppose that it is a point will move to the left with probability 0.2, stay put with prob. 0.7, and move to the right with probability 0.1 (i.e. with a bias to the left). In state '1' the left probability is rolled into the 'stay put' probability, and as such there is a 0.9 probability of staying in the state. Modeled this way, I suspect that there is a bias towards the left-hand accepting state. A simple model of this kind could suggest a bias in the neighborhood definition of DRATS.

The analysis in Section 6.4 was especially interesting. I was intrigued to see that as the initial solutions become more complete the statistics seemed to favor larger team sizes.
In fact, DRATS also seems to favor selecting at least one larger team size over time. I was pleased to see the comparison made between DRATS and the performance of a static algorithm with the same team configuration. This seems to make for a natural comparison. Looking ahead, smarter metadeliberation (e.g. with dynamic programming), that leverages the Normal form of the statistical data, seems a promising approach.