Marcin Kadleczka

Graduate Student CS

Goal

The main goal of this project is to implement heuristics optimization algorithm for Asymmetric Traveling Salesman problem (ATSP).

General remarks

This proposal is divided into 2 sections. The first one describes the Adaptive Memory Programming (AMP) technique, which will be implemented as the metaheuristics search technique. The second part is about the methodology of the experimental part.

On the base of AMP search algorithm we try to evaluate the behavior of all 5 methods, which are special cases of AMP scheme. Thus the hardest part is to design and implement AMP in such way that all others algorithm are the special cases of AMP for some choice of parameters.

Metaheuristics search technique

Adaptive Memory Programming is a quite new issue in the search algorithm and contains the extracted common characteristics from the Tabu Search, Genetic Algorithms, Scatter Search, Ant Systems and Local Search (the simplest one) methods (it is based on [E. D. Taillard 1998] paper) as:

- A set of solutions or data structure that aggregates the particularities of the solutions produced by the search is memorized,
- A provisory solution is constructed using the data in the memory,
- The provisory solution is improved using a Greedy algorithm or more sophisticated one,
- The new solution is included into the memory or is used to update the data structure that memorizes the search history.

The AMP can be a good example of metaheuristics, and the scheme of it is shown below:

```java
AMPSearch()
InitializeMemory()
while stop criterion is not achieved do {
    s = GenerateProvisorySolutionFromMemory() ; // Diversification phase
    s' = ImproveProvisorySolution(s) ; // Intensification phase
    UpdateMemoryWithNewSolution(s);
}
```

**Experimental methodology**

We implement ATSP problem generator and the AMP algorithm is planned to be tested on these instances. The AMP algorithm could be also evaluated on some benchmark problem in order to compare results with other search algorithm.

The evaluation of the hypothesis about results of searching and the properties of the search space such as search ratio, basin size, basin radius is also planned. Some methodology of such experiments can be found in [Marcin Kadluczka et al. 2002].

**Bibliography**
