Outline of prospective research directions: The biobjective Inventory Routing Problem

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1 Description of the problem

In our work, we treat the Inventory Routing Problem (IRP) under two objectives: The minimization of the traveled distances and the minimization of the average inventory held over time. This we want to keep in future experiments.

At the moment, the problem is considered to have deterministic, but changing demand data. Also, this assumptions will play a role in future experiments.

On the basis of previous research, numerous prospective developments are possible and interesting. Obviously, on few of the can be sketched here, and additional ideas are welcome. In particular, we can think of progressing in the following directions:

- *Encoding of solutions I:*
  In addition to the rather straight-forward encoding consisting of simple frequencies, dual frequencies should be investigated. In detail, this means that for each customer, an initial frequency represents the first delivery interval size, while a second frequency then represents all following delivery intervals. From what we have seen, this idea should allow for a better synchronization of customers over time.

- *Encoding of solutions II:*
  Alternatively to the frequency encodings, binary encodings of delivery periods (1=delivery, 0=no delivery) can be investigated.

- *Efficient clustering of customers:*
  Research could be done in this direction.

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- *New ideas/concepts of neighborhoods:*
  The special characteristics of the biobjective IRP call for a new class of neighborhoods. Such operators should be able to modify at the same time the routing and the inventory characteristics of the solution.

- *Considering the IRP as an online-problem:*
  At the moment, we have benchmark files consisting of 240 periods. Such big data sets have been generated with the idea of treating the problem as an online-problem. In such a setting, the solution lies in computing delivery schedules for a smaller number of periods, and in adapting the solutions to the evolving demand.

Clearly, not all directions should be followed at once, but a choice has to be made in order to obtain significant results.

2 Scientific environment

The training period will take place at the Department of Logistics Management[1] of the Helmut-Schmidt-University, Hamburg, Germany. The candidate will work in close collaboration with the authors of this text, who are going to provide scientific guidance and posses some previous experiences in the described area of research. The trainee will be provided a shared office with a computer and the required software/internet access.

3 Conferences of interest

The ultimate goal of this training period is to achieve publishable results. In detail, we target high-level conferences with refereed proceedings, or a international journal.

- `http://odysseus2012.dmst.aueb.gr/`

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[1]`http://logistik.hsu-hh.de/`