

Errata to: Effective Spatial Decision Support for Charging Infrastructure Planning

Errors in method description

Errors in the theoretical description of the Route Based Network Demand (RBND) method, related to Paper I of the KTH Licentiate thesis of Ehsan Saqib, found in Section 3.1.6 on pages 29–30, are highlighted in red. The method implementation did not have these errors, hence other parts of the thesis are unaffected.

Algorithm 1: Maximize network utility via greedy network expansion with pruning and top- n limited candidate search

Data: $TR = \{(r_1, m_1), \dots, (r_d, m_d)\}, S_{cand} = \{s_1, s_2, \dots\}, CS, k, TE_{params}, top_n$

Result: $ECS = CS \cup \{s_1, \dots, s_k\}$

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1  $ECS \leftarrow CS$  // Start from CS-network
2  $u_{TE}^{ECS} \leftarrow \text{simulateTE}(TR, ECS, TE_{params})$  // Set ECS utility
3 for  $s_i \in S_{cand}$  do
4   // Set segments' utility gain
5    $s_i.ug \leftarrow \text{simulateTE}(TR, \{ECS \cup s_i\}, TE_{params}) - u_{TE}^{ECS}$ 
6 end for
7 for  $i = 1$  to  $k$  do
8    $best\_ug \leftarrow 0$  // Set best utility gain to 0
9   for  $s_i \in \text{head}(\text{sort}(S_{cand}, s_i.ug, \text{desc}), top\_n)$  do
10    // Test only top.n promising expansions
11    if  $s_i.ug > best\_ug$  then
12    |  $s_i.ug \leftarrow \text{simulateTE}(TR, \{ECS \cup s_i\}, TE_{params}) - u_{TE}^{ECS}$ 
13    end if
14    // Update best expansion (best_s)
15    if  $best\_ug < s_i.ug$  then
16    |  $(best\_s, best\_ug) \leftarrow (s_i, s_i.ug)$ 
17    end if
18  end for
19   $ECS \leftarrow \{ECS \cup best\_s\}$  // Expand ECS with best_s
20   $u_{TE}^{ECS} \leftarrow \text{simulateTE}(TR, ECS, TE_{params})$  // Update ECS util
21   $S_{cand} \leftarrow \{S_{cand} \setminus best\_s\}$  // Delete best_s from candidates
22 end for
23 return  $ECS$ 
```

The pseudocode of the algorithm that employs the described speedup mechanisms is shown in Listing 1. Lines 1-6 initialize the expanded network of charging station ECS , the current utility of the network in the TE scenario (u_{TE}^{ECS}), the utility gain of candidate segments ($s_i.ug$) to a theoretical maximum^a, and on Line 8 the utility gain of the best expansion ($best_ug$) to a theoretical minimum. The top- n limited candidate search speedup mechanism at each iteration of the network expansion is achieved on Line 9. The selective evaluation of candidate expansions of the network, or equivalently the pruning of the candidate expansions, happen on Lines 10-13. Specifically, if the utility gain $s_i.ug$ of a candidate which was estimated most recently is less than the best utility gain, then the candidate expansion is pruned and is not evaluated on Line 12. Otherwise, the utility gain of the candidate expansion is evaluated and updated. The best candidate expansion identified during the current iteration is tracked on Lines 14-17 and is subsequently added- to and subtracted from the expanded network of stations and the candidate stations on Lines 19 and 21, respectively.

^aThe closer the theoretical maximum is to the actual utility gain, the smaller the chance is that the top- n limited search misses a locally optimal greedy choice which can lead to optimization quality degradation. Because on Line 6 the actual values are calculated, during the first expansion the best expansion is immediately found and all the other candidates are pruned. This efficient initial pruning comes at the expense of having to evaluate the utility gain of every candidate. For large number of candidates the utility gains can be set based on a pre-calculated variant of the DI demand proxy for the transport route dataset TR and reasonable minimum and maximum values for the TE scenario parameters TE_{params} .

Miscellaneous errors

- Page 24, line 11: “ $\dots sc_j^i / 100 \leq sc_{min} \dots$ ” should be “ $\dots sc_j^i \leq sc_{min} \dots$ ”
- Page 28, line 2: “...BEVs...” should be “...BEV...”
- Page 28, paragraph 1, line 10: “...few seconds.” should be “...few minutes.”
- Page 28, paragraph 1, line 12: “...one to two orders...” should be “...two to three orders...”
- Page 28, paragraph 3, line 8: “...prune the candidate.” should be “...prune some candidates.”
- Page 57, paragraph 5, line 3: “...skips many partial solutions,...” should be “...skips approximately 95% of the partial solutions,...”