

Tour4Me: A Framework for Customized Tour Planning Algorithms

Kevin Buchin
TU Dortmund
Dortmund, Germany
kevin.buchin@tu-dortmund.de

Mart Hagedoorn
TU Dortmund
Dortmund, Germany
mart.hagedoorn@tu-dortmund.de

Guangping Li
TU Dortmund
Dortmund, Germany
guangping.li@tu-dortmund.de

ABSTRACT

The touring problem is a generalization of the arc orienteering problem; in addition to maximizing edge profit, the touring problem optimizes attributes not depending only on single edges, for example maximizing the area covered by an tour. In this demonstration paper we provide a framework that allows for straightforward integration of new algorithms for the touring problem. We have included a new exact solver, a heuristic, and two greedy methods. Furthermore, a GUI is provided in the form of a webpage, allowing for testing of algorithms even by end users.

CCS CONCEPTS

• **Computer systems organization** → **Embedded systems**; *Redundancy*; Robotics; • **Networks** → Network reliability.

KEYWORDS

datasets, neural networks, gaze detection, text tagging

ACM Reference Format:

Kevin Buchin, Mart Hagedoorn, and Guangping Li. 2018. Tour4Me: A Framework for Customized Tour Planning Algorithms. *J. ACM* 37, 4, Article 111 (August 2018), 1 page. <https://doi.org/XXXXXXX.XXXXXXX>

1 INTRODUCTION

Most people who do outdoor activities run into the problem of finding an appropriate route. Depending on the activity from hiking and jogging to gravel and road cycling, requirements from users can greatly vary. To this end we have developed TOURGENERATOR. The tool TOURGENERATOR consists out of an intuitive UI that allows users to create tours customised to their specific demands in their own webbrowser. Furthermore, TOURGENERATOR contains a few algorithms for computing solutions for the arc orienteering problem (AOP) and the more general touring problem.

Authors' addresses: Kevin Buchin, TU Dortmund, Dortmund, Germany, kevin.buchin@tu-dortmund.de; Mart Hagedoorn, TU Dortmund, Dortmund, Germany, mart.hagedoorn@tu-dortmund.de; Guangping Li, TU Dortmund, Dortmund, Germany, guangping.li@tu-dortmund.de.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from permissions@acm.org.

© 2018 Association for Computing Machinery.

0004-5411/2018/8-ART111 \$15.00

<https://doi.org/XXXXXXX.XXXXXXX>

1.1 Related Work

1.2 Contribution

2 SYSTEM

2.1 Architecture

2.2 Data

2.3 Interface

3 ALGORITHM

3.1 Greedy Selection

3.2 Jogging Tour

3.3 Iterative Local Search

3.4 Integer Linear Programming

The integer linear program (ILP) gives the optimal solution for an instance of the AOP. The ILP used in TOURGENERATOR is a modified version from Verbeeck et al. The ILP from [] introduces a constraint for every subset of the vertices in order to avoid disconnected components, resulting in $O(2^n)$ constraints.

$$\text{somethingBad} \quad (1)$$

The ILP from [] uses Equation 1 to avoid subcycles. Instead we introduce a variable ρ_{kij} , for $1 \leq k \leq L$ and $1 \leq i, j \leq m$. Variable ρ_{kij} denotes whether edge e_{ij} is included in the path at location k .

$$\sum_{i=1}^m \sum_{j=1}^m \rho_{kij} = 1 \quad \forall 1 \leq k \leq L \quad (2)$$

$$\sum_{k=1}^L \rho_{kij} = \begin{cases} h_{ij} & \text{if } e_{ij} \text{ is an edge} \\ 0 & \text{otherwise} \end{cases} \quad \forall 1 \leq i, j \leq m \quad (3)$$

$$2 \cdot \rho_{kij} \leq p[k][i] + p[k+1][j] \quad (4)$$

We include Constraint 2 for every $1 \leq k \leq L$ so that the path only has one edge at every position.

Constraint 3.

4 CONCLUSION