Modelling and optimising the housing of homeless populations: ten month PhD review

Graham Burgess

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1 Introduction

- Homelessness in San Francisco Bay Area
- Resources available: housing and shelter
- Objectives and trade-offs
- Constraints including time-dependent shape constraints
- Models available (stochastic simulation, $M_t/M/h_t$ queue, fluid flow model)

2 Literature Review

2.1 Modelling and optimisation in healthcare settings

2.2 Modelling and optimisation in homeless care settings

For example simulation modelling of shelter for runaway homeless youths (**?**).

2.3 Simulation optimisation (SO)

2.3.1 Overview of SO methods

- Discrete SO (ranking and selection, random search, integer-ordered methods)
- Continuous SO (sample average approximation, stochastic approximation, meta modelling)

2.3.2 Multi fidelity SO methods

- From deterministic optimisation to simulation optimisation
- Ordinal transformation with optimal sampling

- Modelling the error of a low-fidelity model
  - Polynomial error terms
  - Gaussian Process error terms

3 Deterministic optimisation with low-fidelity model

- Fluid flow model
- Optimisation formulations
- Numerical results
- Further work on optimisation formulations

4 Discussion of uncertainty

- Stochastic uncertainty
- Input model uncertainty

5 Potential contributions in multi fidelity SO

- Using low-fidelity models to quickly compute gradients in RSPLINE/DSA
- Adding prior information to GMRF using low-fidelity model
- Modelling errors of the low fidelity model using GMRF

6 Conclusion