Optimization and Simulation

Optimization project

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Goals

Full application of a **simulation-based optimization** example:

- Simulation
  - develop a discrete-event simulation
  - identify the appropriate statistical indexes
  - correctly use simulation for generating results
  - correctly analyze the result of simulation
  - use variance reduction techniques
  - use bootstrapping technique
- **Optimization**
  - **identify the decision variables**
  - **identify the objectives**
  - **develop the optimization algorithm to explore the space**
  - **identify the "optimal" solutions (multi-objectives)**

Overview

Aim: identify the “optimal” system configuration

Example

simulation-based project: traffic simulation

Simulation project example

Traffic simulation of Kid City

Discrete event simulation to represent the traffic in Kid City

What is the best street to close?

Decision variables:

- Close roads

Objectives:

- traffic conditions (queue-length)
- cost

Keep in mind

The Optimization Problem

Objective: identify the best location for the road closure.

Objective function example:

maximum average-queue-length in the city

cost of closing the road

$$\min_{x \epsilon X} Z(x)$$

$$Z = \theta\{f(x)\}$$

where

- *x* is the network with road *i* closed
- *f(x)* is the desired indicator at solution *x*, e.g. average-queue-length with road *i* closed, and cost of closing road *i*
- $\theta\{.\}$ is the statistic considered, e.g. maximum, 95-percentile, average

Keep in mind

Recommendations

"Optimization Project":

- expand the discrete-event simulation
- embed the discrete-event simulation in the optimization algorithm

Attention: computational time

Individual group project

Individual group project

Group	Project	Title
Group 1	Project 2	Jeans store management
Group 2	Project 3	Drone delivery service
Group 4	Project 4	Airline yield management
Group 5	Project 5	Call center staffing
Group 6	Project 6	Train service
Group 7	Project 7	Online movie streaming

All information already present in the project description

Project presentation

Presentation

30 minutes per group. 20 min presentation + 10 min questions

Contents

- Problem description
- Decision variables, objective function
- Optimization algorithm
- Results
- Suggested “optimal” configuration

Code

Send me the code of this and previous laboratories, and the presentation by email (same day of the presentation)

Schedule, 30.05.2017, Room GC B1 10

Group	Time	Reviewed by
7	09:15-09:45	Group 1
6	09:45-10:15	Group 7
15 minutes break		
5	10:30-11:00	Group 6
4	11:00-11:30	Group 5
15 minutes break		
2	11:45:12:15	Group 4
1	12:15-12:45	Group 2

Example: Group 1 asks questions to Group 7