Optimization and Simulation

Simulation project I

Impacts on traffic conditions

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Goals

Full application of a simulation example

- develop a simple traffic simulation
- identify the appropriate statistical indexes
- correctly use the simulation for generating results
- correctly analyze the result of simulation

Overview

Aim: chose between two alternative projects evaluating the consequences on traffic conditions in a city

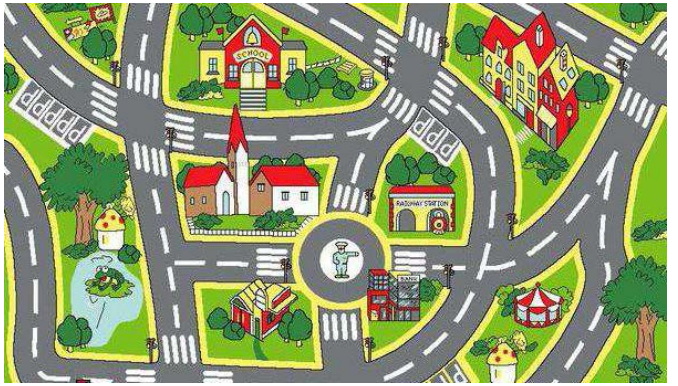
Infrastructural projects

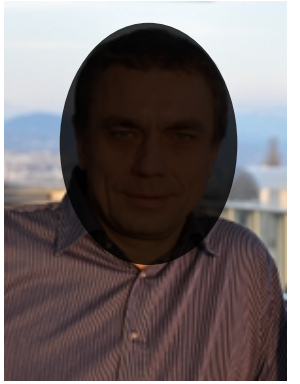
Simulation project I

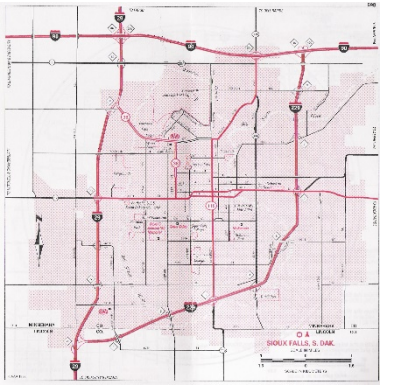
Simulation project I

The mayor of Sioux Falls

Thanks to his excellent traffic safety campaign, the mayor of Kid City, Mayor M., has been promoted to a bigger city: Sioux Falls.



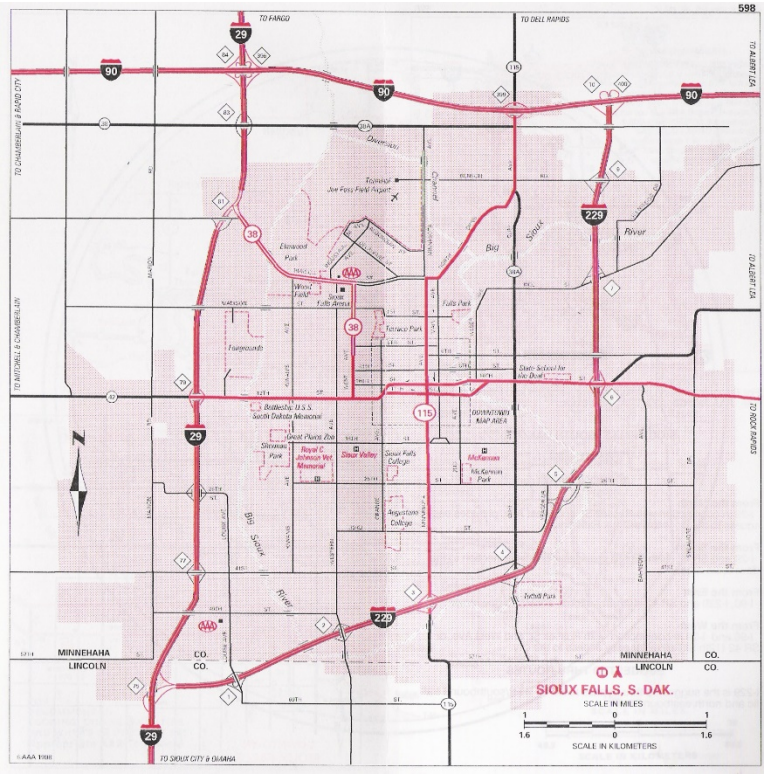


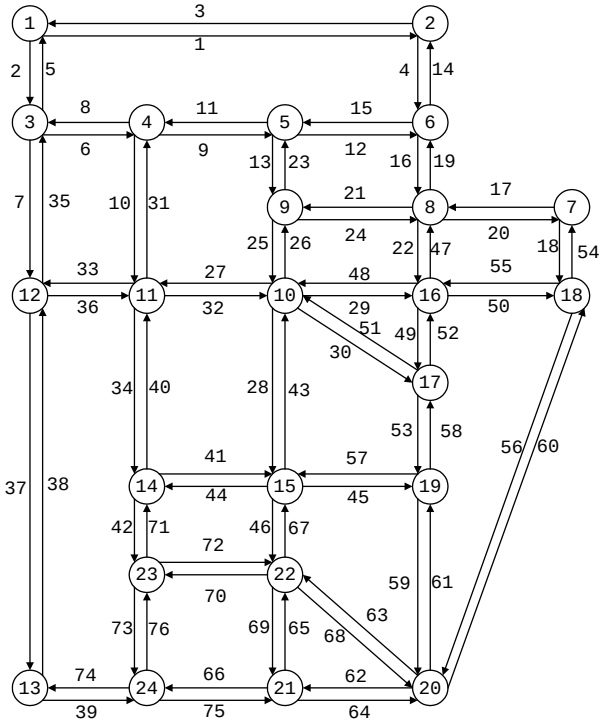


Simulation project I

The Sioux Falls network

Information: http://www.bgu.ac.il/~bargera/tntp/





Two possible projects

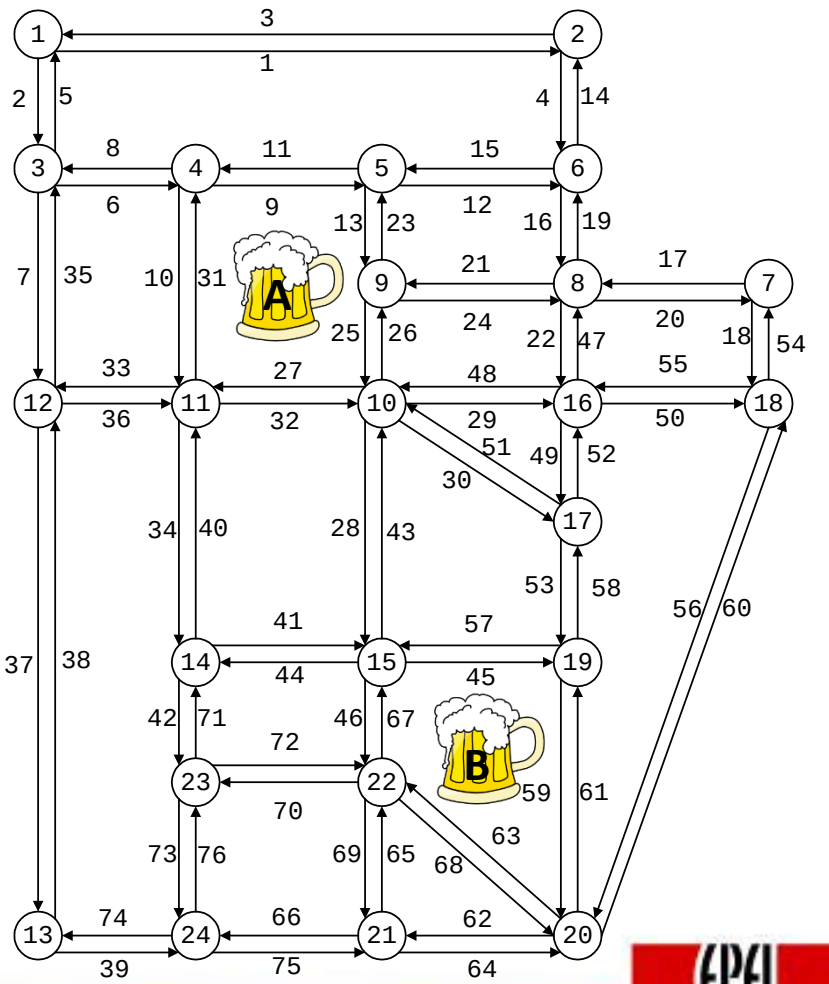
Mayor M. needs to choose between two alternative projects.

He is extremely concerned with the impact that these projects could have on traffic conditions.

Mayor M. wants to choose the one with the smaller impact on traffic conditions.

Project example

- Project: opening a new pub
- Alternative locations: A or B
- Traffic consequences: double traffic on the adjacent links
- Mayor M. concern: travel time
  - Average, extreme cases, variability?
  - Where?
- Mayor M. choice: opening the pub in the location with the smaller impact on the travel time.



The consulting company

Mayer M. needs to assesses several projects; so, he consults independent companies to evaluate the impact on traffic.

- Different projects
- Different concerns

Each consulting company evaluates the traffic impact using simulation, reports the results and suggests the best alternative.

Project focus

The focus of this project is to correctly use simulation to evaluate two alternatives and to present proper statistical indexes to evaluate the scenarios.

BE CREATIVE

(travel time, worst case, probability of spill-back, …)

Not only average.

Give MSE of your estimates

Project code

Action to do

- Analyze the network with `SinouxFallsAnalysis1.m`
- Load the Sioux Falls scenario with `NewSiouxFalls.m`
- Simulate with `QueueingSimulation2.m`

Extension of `QueueingSimulation1` to a network

- A road Network has more than one road
- Roads have the same properties as before
- Roads are connected at intersections
- Every intersection has the following properties
  - Turning probability p_{ij} from i to j
  - Network exit probability p_{i*}
  - $p_{i*} + \sum_j p_{ij} = 1$
  - `scenario.TURNS`

Extension of `QueueingSimulation1` to a network

Event	Trigger event	State variable e.g.
(simulation start)	Generation Simulation end	
Generation	Generation Arrival	
Arrival	Departure (queue=1)	Queue + 1
Departure	Departure (queue > 0) **Arrival**	Queue – 1
Simulation end		

DEPARTURE -> ARRIVAL

In addition to **DEPARTURE -> DEPARTURE**

DEPARTURE -> (possible) **ARRIVAL**

Vehicle on road *i*

- Turns into road *j* with probability p_{ij}
- Leave network with probability p_{i*}
- If vehicle turns into road j (i.e. doesn't leave the network)
    - Create **ARRIVAL** event on road j
      at time $t + t_j^0$
      (vehicle enters at the beginning of the road)

Project presentation

Contents

- Initial problem (Mayor M. concern)
- Simulation approach
- Suggested indexes (from qualitative concern to quantitative indexes)
- Results
- Suggested best alternative

Code

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

Project presentation

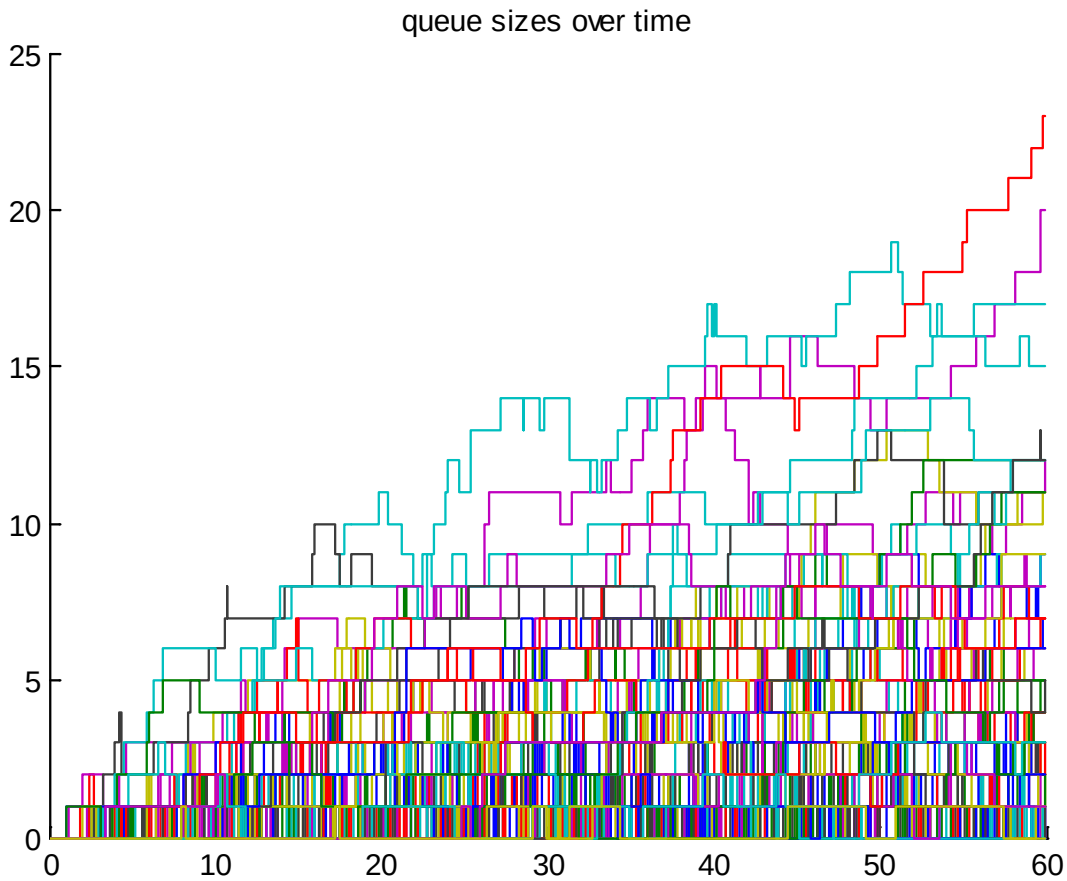
Schedule

Group	Name	Time	Reviewed by
1	Hameri Tuure Eelis Murashkin Mikhail Lederrey Gael Buntinx Vincent Christian	9:15-9:45	Group 6
2	Binder Stefan Yves Gabriel Pereira Barbosa Santos Ana Clara Molyneaux Nicholas Alan Kirci Mervegül	9:45-10:15	Group 1
3	Carraro Luca Tarquini Danilo Besson Adrien Georges Jean Kuznetsova Ekaterina	10:15-10:45	Group 2

Group	Name	Time	Reviewed by
4	Damergi Eya Thurm Boris Fabietti Luca Shafieezadeh Abadeh Soroosh	11:00-11:30	Group 3
5	Kruyt Albertus Christiaan Usui Takafumi Saijets Santtu Muscinelli Samuel Pavio	11:30-12:00	Group 4
6	Lamotte Raphael Ali Francis Wolfensberger Daniel Voutilainen Arttu Gozel Olivia	12:00-12:30	Group 2

Example: Group 6 asks questions to Group 1

My results

My results

Sioux Falls – random run