Multi-objective optimisation for traffic control

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Introduction

1 Attacking the freeway

1.1 The freeway control system

Overview of the freeway control system

1.2 Infrastructure weaknesses

For Matthias to write, taxonomy of weakness (hard/soft...)

1.3 Attack scenarios

taxonomy of scenarios, here are the scenarios of interest for the present work

1.3.1 sensors

describe sensors-spoofing-based attack scenarios

1.3.2 Localised attacks

Attack

1.3.3 full control / TMC

describe full control-based attack scenarios

2 Problem formulation

2.1 The freeway model

2.1.1 A macroscopic model : CTM

2.1.2 The control : ramp-metering

2.2 Using adjoint control to achieve an objective

adjoint mathematical formulation

2.3 Several objectives : Interactive multiple objective optimisation

motivation : queue limitation and quantisation for example Pareto front, description of the method

3 Attacks

3.1 Scenario 1 : "congestion on demand"

3.1.1 Problem statement

What we want : "paint a jam on space and time" : is it reachable, how could we reach it ?

3.1.2 Formulation : Custom density objectives

choice of the custom TTT with its parameters, strength and weakness

3.1.3 Implementations

"Box" objective choice of objective and results (images, graphs...), AIMSUN

Partial objectives : morse attack short paragraph, images from the smartamerica-demo ?

Space and time images Cal logo (short paragraph, just the result)

3.2 Scenario 2 : "Catch me if you can"

3.2.1 Problem statement

Escaping from a car-chase, explain why we cannot use a method like before

3.2.2 Formulation : Multi objectives

Defining every objective function that we want to minimise, and how we will search for solutions in the Pareto front

3.2.3 Implementations

Show different steps of the algorithm, of exploration and "convergence"

Conclusion