

# Multi-objective optimisation for traffic control

Authors

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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**