Par gregorysmith / Mis à jour: 28 Oct 2019

Case study on the effect of the machine learning on congestion handling, Debrecen, Hungary

Case study on effect of the machine learning on congestion handling

Kovács Gergely
Debrecen University – Engineering
Faculty – Mechatronical Department
Derebcen, Hungary
kovigerri@gmail.com

Abstract—This case study tries to describe detailed, the effect of Machine Learning on traffic light program controls. It also shows in what way do ML solves complex traffic situations, in non-trivial cases

Keywords—machine learning, traffic light, traffic control, case study, effect of machine learning (key words)

I. INTRODUCTION

This case study is a side paper, to the main thesis on a ralated topic [2]. It tries to go deeply into the details to analize and argue on several optimization methods.

II. DETAILED SITUATION OVERVIEW

In the first part of the study i will describe the problem itself. This issue is an ongoing congestion around a residential part of Debrecen city in Hungary which is called Tócókert. The Derék street is an important part of the local transport system, and several institutions can be found around here.

The most important infrastructure places are:
- Jégcsarnok - the city's ice rink
- LIDL - supermarket
- Bus station endpoint - important bus station
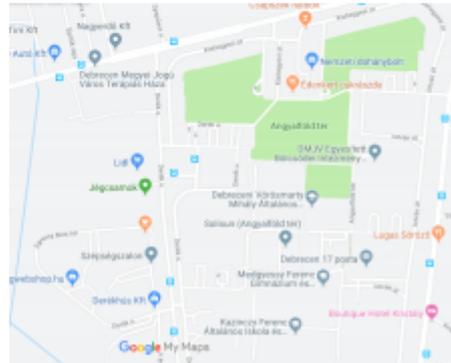- Residential living houses

Fig 1. Location of city part

Fig 2. Detailed map

Fig 3. Sattelite image with marked junctions. Green marked ones - considered in this paper.

A. Map

On the map we can see described above places. Because these places have high customer flows, we need to take into consideration both the pedestrian and vehicle flows. At peak times, the parking lots getting use to their full capacity, and pedestrian crossings need to let through a lot of people.

Also, worth mentioning that in the city's perspective, this street lays right next to one of main entrance roads. This is the Kishegyesi street, and on this way a lot of people get to their jobs. One main flow generator is the National Instrument factory at the end of the Kishegyesi street. Around 1000 people work in this factory, generating high flow all the day, and the site is growing every year [1].

Here is the map of the junctions, altogether with lane descriptions, positions of the traffic lights and road signs.

Mobility management
Safety and urban mobility
Traffic and demand management
Urban mobility planning

In brief

This case study, produced by the [Engineering Faculty](#), Mechatronical Department at Debrecen University shows the results of the KnK Venturi Traffic Optimisation Machine Learning (ML) System on a given traffic problem. The solution provided by machine learning demonstrates the problem-solving capabilities of new technologies.

Context

The city of Debrecen in Hungary is currently in the midst of a traffic revolution. There have been many traffic improvements implemented in the years preceding 2019, making the city a perfect place for innovative ideas to prosper.

This paper presents a case study which focuses on using machine learning to find a solution to recurring congestion in parts of the city where on workdays, at peak rush hours, major disruption and delays are encountered by commuters. Consulting with local traffic managing company and the Debrecen city administrations [Smart City Office](#), the study team at Debrecen University were assigned to resolve this issue, with the help of machine learning.

In action

The team wanted to develop a self-healing system for the city, able to detect and propose a simple solution for different traffic issues. This means that the machine learning system was developed in order to design reliable Traffic Light Programme (TLP). The system is capable of isolating the out the types of infrastructure improvements that could be implemented, such as; changes to road lanes, traffic lights, new restrictions on traffic turning, etc.

Results

The result, detailed in the case study, was a Traffic Light Program (TLP) which can manage the practicalities of peak traffic - to prevent congestion from forming at peak times. The case study document also describes a potential infrastructural change involving a secondary lane extension which was recommended by the ML system.

Challenges, opportunities and transferability

The biggest issue for the team was to analyse the whole affected road section. As the road section studied during this project is 2 km long, it proved very difficult to capture all the necessary information at the precise moment congestion started to form - or isolate the exact cause. So the team took several measurements on different sections of the road and then equivalised them to produce realistic simulations. This approach can be easily transferred to any other traffic handling situation analysis.

In Depth

The detailed evaluation of the subject is presented in the paper, available to download below.

Description

This case study is a part of a documented series about traffic optimisation with a functioning optimisation system. The project often referred to as KnK Venturi is a Hungarian, Debrecen based initiation to build a better traffic system, based on current hardware. This optimisation system is a link between the future's self-controlling traffic solutions, and already existing systems, as it can be used in both old and new systems.

Keywords
machine learning
traffic light
traffic control
case study
effect of machine learning
Share on
[ ](#)
[ ](#)
[ ](#)