CroM-SoM 7 juli 2016

Smart City Definition:

There is no widely accepted definition of smart city. Wikipedia's definition is under development; its landing page for "smart city" is emblazoned with the caveat, "This article may be unclear or confusing to readers." Broadly, the basic idea behind a smart city initiative is to improve the integration of information technology with city services.

Related research:

- In the **Kumbh Mela Experiment** we plan to develop sophisticated methods and algorithms to aid planners and event managers in managing extremely large crowds. The project aims to deliver the core components of an entire crowd management solution, all the way from designing and building personnel devices for tracking movement, to developing advanced computational models to help predict how the crowd may evolve. This leads to a vision of a living simulation where various data sources (personal devices, video cameras, smart phones, monitoring drones) can be fused into models and executed on an advanced compute infrastructure capable of providing both planning, as well as real-time reactive decision-making. This proposal addresses three key research areas related to the understanding and management of huge human crowds: (Data Collection; Data Analysis; Modelling and Prediction. Done with, camera's drones and bracelets)

- Looking Further Crowd Control, Maarten van Steen.

Uses cards that have a chip in them to monitor and control crowds.

- Looking Futher Crowd Simulation, Mark Hogendoorn en Tibor Bosse

Panic in big crowds, take personal mood into account, use sociological, psychological models, evaluate these theories with real data. Want to calculate in dangerous situations and direct people towards a save direction, send them this on their mobile phone.

In the news:

- Gemeente wil oneindige toeristenstroom kunnen voorspellen

They use GPS, telephone poles, hotel stays, and public transportation data. They say that predicting the movement of tourist is easy since the most tourists are very predictable (Ber Baron van gemeente). He says that 80 percent of the tourists do exactly the same in the same order.

- Slimme stad of dataslurper?
- Tolerantiegrens drukte bij veel Amsterdammers overschreden
- Drukte in de stad in vijf jaar verdubbeldAmsterdam's
- Intelligent Approach to the Smart City Initiative
- DATA-DRIVEN CITY MANAGEMENT: A Close Look at Amsterdam's Smart City Initiative

Other stuff:

- New Yorker Melange

Simular done research:

- AMS - CROWD MONITORING SYSTEM FOR SAIL2015

One of the challenges of large scale events, such as SAIL2015, is to guarantee smoothly flowing visitor flows. Prerequisite for effective crowd management is real-time information on pedestrian flows in the area. In this project we have developed a real-time crowd monitoring system, including real-time data collection using multiple sensors and visualization of the traffic state in the overall area.

The basis of the crowd monitoring system is real-time data. Four types of data have been collected: counts resulting from counting cameras, travel times based on Wifi sensors, speeds and routes using GPS trackers and personal characteristics based on social media. The GPS trackers have been distributed to visitors willing to participate in this research project. Dedicated software has been developed to combine these data sources and to fill in the blanks for locations for which no information was available. The resulting information (flows, speeds and densities) has been visualized in a dashboard (see figure). Each link is visualized with a color showing the quality of the situation: blue

indicates few people and high speeds, while orange and red mean more people and low speeds. (Data: counting cameras, travel times based on Wifi sensors, speeds and routes using GPS trackers and personal characteristics based on social media)

- AMS - <u>FROM NEEDS TO KNOWLEDGE:</u> CHALLENGES AND OPPORTUNITIES FOR CITY-SCALE CROWD SENSING IN INTELLIGENT CITIES

Citizens are key actors in intelligent cities. They are the lifeblood of the city ecosystem, and they have a privileged viewpoint over the status of the city. The term *smart citizen* (or *smart community*) characterizes users of a city that, through social media and decentralized, open urban infrastructures, take an active role in the sensing, organization, and response to long-standing or emerging urban issues. Despite the success of many initiatives, like the *Amsterdam Smart Citizen Lab*, experience shows that there are several pressing, open issues that hamper the large-scale and sustainable transformation of citizens into *smart citizens*. The main objective of this project is the identification of the key societal, technical, and scientific challenges that need to be overcome in order to transform the *Smart Citizen* vision into a solid reality. The project will identify and involve relevant stakeholders, to elicit their requirements, survey their information needs, and discern the main causes of frictions.

<u>Amsterdam Smart Citizen Lab</u>

- AMS- <u>REVEALING SPATIAL AND TEMPORAL PATTERNS FROM FLICKR PHOTOGRAPHY: A CASE STUDY WITH TOURISTS IN AMSTERDAM</u>

<u>thesis presentation</u>

<u>thesis</u>

Thesis by Sander van der Drift on new methods delivering meaningful insight into the spatial and temporal patterns of tourists in urban spaces.

An exploratory visual analytics approach was used to identify temporal distributions, spatial clusters and popular routes of tourists in Amsterdam by making use of geotagged photos from social media platform Flickr. The presented methods combine the analytical strength of humans with the data processing power of computers, using geovisualisations and charts to explore data, find patterns, and draw conclusions from its outcomes. For this research, the metadata of 2,849,261 geotagged photos was

harvested from Flickr and stored in a spatial database. From this dataset, 393,828 photos were located in the municipality of Amsterdam. A semi-automatic classification method classified 39,1% of the users as tourist with a very high precision and recall. The temporal distribution of tourists and locals is compared for different temporal granularities. A method is presented to assess photo timestamps by making use of photos that contain a real clock. An existing grid-based clustering method was implemented and improved to explore Amsterdam's spatial distribution of tourists in Google Earth. The major tourist hotspots are detected using the density-based clustering algorithm DBSCAN. Finally, the most probable routes of tourists between subsequent photo locations were estimated and aggregated into a route density map. A qualitative approach was used to validate the study outcomes by interviewing eight tourism experts of the municipality of Amsterdam. Their knowledge about the city bears a good resemblance with the detected spatial clusters and route density map of tourists. Despite several imperfections of geosocial data, we conclude that the methods provide meaningful insight into the spatial and temporal patterns of tourists in urban spaces and are a valuable addition to traditional tourism surveys.

Tourist detection method?

The literature describes two different approaches to identify tourists from the metadata of photography. *This first approach uses the spatial and temporal characteristics of photographers.* Amongst the researchers that applied this method are Girardin, Dal Fiore et al. (2007), Van Canneyt, Schockaert et al. (2011) and Sun, Fan et al. (2013). *Photographers are classified as tourist if all their photos in the study area are taken in a short time period*. All other users are classified as locals.

Several other scholars used an approach that makes use of the photographer's *home location. When a photographer specified his or her home location, it is attached as metadata to all their photos.* Straumann, Çöltekin et al. (2014) demonstrated that the majority of the users in their study area had disclosed their location in their user profile. They have developed a semi-automatic method to geocode the country of residence of every user. Wood, Guerry et al. (2013) *verified that the entered location information by Flickr users is generally correct.* The researchers derived the photographers' origin from the location that they specified in their Flickr profile and compared this with the

nationalities of visitors recorded by immigration points. They found a strong correlation and concluded that geosocial data can be a useful source for studying the nationalities of visitors. The dataset with tourist photos was used to quantify the visitation rates of 836 recreational sites around the world. A comparison between the official number of visitors of recreational sites and the number of photographers taught them that geosocial data is a reliable source for the estimation of visitation rates.

* Tourist classification based on users home location, in this way 43,2 % of his unique users was "unclassified", not a tourist or a local

- AMS- BEAUTIFUL NOISE

Tourism is positive. Many businesses thrive on tourism. However, no one wants to see the Vondelpark bursting at its seams, public transport grinding to a halt, or crowds queuing to get into the Rijksmuseum and shuffling from exhibit to exhibit... *Beautiful Noise* processes data that tourists and Amsterdam's residents share on social media for policy and decision makers to use in their work. In other words, *Beautiful Noise* turns random messages into relevant information.

Proposes to use social media like: Twitter Flicker and Instagram to gain insight in the dynamics of tourism.
- How to identify different groups of people
- Difference between real tourists and commuters
- Language detection methods
- Social media profile
- Mining and pattern detection systems for spatial and temporal activities

(Mattijs Danes, Sander van den drift, Arend Ligtenberg)
- Hackathon N8

At the hackathon, participating teams are asked to come up with for real viable and innovative solutions to create balance in the city. New ideas, tools and technologies need to be created to solve urgent problems. These ideas should deal with:
• Smart crowd management
• Increased mobility and accessibility

- Smart signage and public wayfinding
- Enhanced visitor experience and engagement
- Crowd insights and analytics

Improved public safety and security

DigitasLBi LABS wint Museumnacht Hackathon 2015

Het winnende concept ViRTiQ stelt museumbezoekers in staat om uit de fysieke rij te stappen en in een virtuele rij plaats te nemen. Stap je in de virtuele rij, dan geeft ViRTiQ je ook nog suggesties hoe je deze gewonnen extra uren kunt spenderen. Dit gebeurt gepersonifieerd gebaseerd op onder andere open data zoals locatie, tijd en type toerist. ViRTiQ houdt ondertussen in de gaten wanneer je aan de beurt bent, zodat je bij terugkomst direct het museum in kan. Amsterdam ontdek je immers niet in de rij van een museum. De jury gaf in het juryoordeel aan dat ze met name onder de indruk zijn van de manier waarop de app gebruik maakt van real time open data, Internet of Things en de dubbele functionaliteit van zowel spreiding als het belichten van andere toeristische mogelijkheden.

Similar current research:

AMS - Hidden Amsterdam

This project supports the Hidden Amsterdam Festival, a 3-day festival, to be held in 2017, that aims at letting citizens and tourists discover "hidden" parts of the city. Those areas are often not visible from the main streets and shopping districts. To be able to discover these areas, a "3D map" is necessary. Unfortunately, at this moment, such 3D maps are built manually. The aim of the project is therefore to investigate methods to automatically construct such maps, and to investigate how socio-economical data based on mobile technologies can be used to improve the map.

Ideas:

- Use Beacons to track users, is nice because it does not require internet connection – not a good idea, this requires building an app, has a lot of security layers and users have to have their Bluetooth on at all times.

- We can use CBS hotel nationalities to check our data (probably not very up to date data)
- Combine different tourist detection methods to get the best result (based on previous research).
- When you just use the home location for tourist detection (The Netherlands) this means you will exclude all Dutch tourists (Wood Guerry et al 2013 demonstrated that the entered location information by Flickr users is generally correct)

People to talk to?

- Prof Arjan van Timmeren, Scientific director AMS
- Ger Baron, Amsterdam's chief technology officer
- Berent Daan, (Baron's ally and Amsterdam's director of research, information and statistics. the one who implemented agile development processes with his teams and works with city departments to share data.)