University of Glasgow | School of Computing Science

Urban Data Timeline

Yordan Yordanov

School of Computing Science
Sir Alwyn Williams Building
University of Glasgow
G12 8QQ

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Abstract

We show how to produce a level 4 project report using latex and pdflatex using the style file l4proj.cls

Education Use Consent

I hereby give my permission for this project to be shown to other University of Glasgow students and to be distributed in an electronic format. **Please note that you are under no obligation to sign this declaration, but doing so would help future students.**

Name: ______________________ Signature: ________________________

Contents

Chapter 1

Introduction

1.1 Background

Smart cities today represent a perception to integrate both information and communication technologies in an acceptable and maintainable fashion to manage their infrastructure and facilities. The optimal goal is to enhance the quality of life and satisfy the residents needs. ICT gives to the people, who maintain these cities, the great opportunity to directly follow what is happening and take actions accordingly. This can be done only by processing the huge amounts of information, collected from sensors, in real time and providing knowledge and information the keys for discovering inefficiencies.

However, the biggest asset of a smart city is not the number of cameras or sensors but the people that occupy it. A third of the internet users (Ofcoms 2015 communications marker report, published on 6 August) represent their smartphone as the most important device for going online. A third of the population owns a smart device and use it every day to bank, shop and access social media. Social media streams, such as Twitter, have a reputation to be extremely useful source of information. Anybody can understand what is happening all around the world in real time. With that comes various opportunities for developers to implement systems that automatically detect and track events as they happen. Smart cities can benefit from that as what better way to improve efficiency than for example identifying and reporting road accidents to the emergency services.

Aiming to help with analyzing these massive amounts of data, the Urban Big Data Centre was established by the UK Economic and Social Research Council to address social, economic and environmental challenges facing cities. Their researchers are undertaking innovative projects, covering topics from big data management to linking and analysing the multi-structural urban data. Such project is the Integrated Multimedia City Data.

1.1.1 Integrated Multimedia City Data[2]

Integrated Multimedia City Data (iMCD) is one of the Urban Big Data Centres inaugural projects, funded by the Economic and Social Research Council. It is designed to provide the UBDC with innovative primary data sources. The project consists of four strands: representative household survey, tracking of real-time urban sensors, internet based visual media collection and internet based textual media collection.

The core research strand is the representative household survey that aims to gather data about peoples attitude and behaviour when it comes to information and communication technologies, traveling and learning. Part of the participants are given GPS and life logging sensors that will record their activities and travel. Meanwhile the visual and textual data, referring to Glasgow and surrounding areas, is to be collected from the internet. All of it together is able to show how Glasgow performs as a smart city. The Terrier IR team provides various data web services so that all these sources can be browsed and queried.

1.1.2 Web Services

Describe what a web service is

1.1.3 Web Application

Describe what a web application is

1.2 Aims

This project aims to build a tool for the fusion and visualisation of timely data collected from the UBDC for their project, described earlier (iMCD). Past data from various urban data streams, such as social media posts, news, blogs, traffic information, environmental sensors and many more has been provided. The tool should be able to query all this data and come up with a timeline representation of observations that might be of interest to the user. This application is initially build to be used by the **general public** but may as all be valuable to local researchers who follow or compare peoples opinions, businessmen who want to know how their business is developing, media that want to report what are the public impressions about an important event and even politicians while running their campaigns.

1.3 Motivations

Smart cities bring a lot of advantages. They can opt for better urban planning and development by making more efficient use of the infrastructure to improve productivity and services but also to reduce the waste of fuel and energy. Furthermore their intelligence can change and enhance the way authorities respond to changing circumstances. On the other hand, achieving all these goals is a challenging process. Huge amounts of information, created by social feeds, environmental sensors, traffic, news and many more, have to be gathered, stored and analysed. This project aims to combine and visualise all these data strands so that some can look at the cities from a different angle and possibly extract new tendencies and patterns, not possible to discover by following only a single resource. This will help us identify problems or challenges that we had not been aware of and provide effective solutions that we all as citizens can only benefit from. (maybe add something for releasing this tool to the general public)

Chapter 2

Related Work

There are applications that have been developed to accomplish similar if not the same goals, but most of them are concentrating on a single data stream. This chapter is presenting a short description of related products, along with key differences and correlations in comparison with the goals of this project.

2.1 The Fox Jumps Over

The quick brown fox jumped over Uroborus (Figure 2.1).

The quick brown fox jumped over [1] the lazy dog.

2.2 The Lazy Dog

The quick brown fox [3] jumped over the lazy dog.

Google Maps Timeline [5]

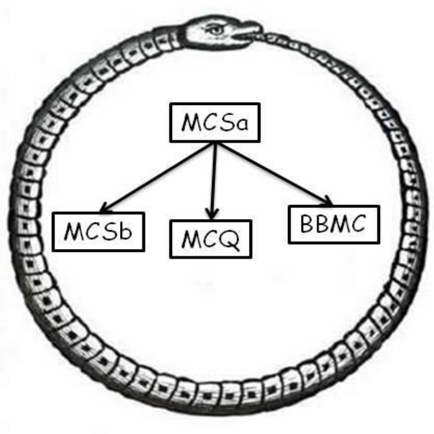


Figure 2.1: An alternative hierarchy of the algorithms.

Google stores a history of where anybody that uses its location services goes. All this data is collected by your device sensors and the navigation you use and then visualized with the Google Maps Timeline feature. It is advertised to be an easy way to view and remember places somebody has been on a given day at a given time. Without any input, the timeline shows predictions of when you have arrived or left a place. One of the key features is highlighting when you have visited the most places and how you had travelled. The application does not offer sharing as Google wants your information to remain private. As far as human interaction goes, you are allowed to correct, confirm or delete a place where Google thinks you had been but even after deleting, it can still be seen that you had passed by that area. In 2009, the company released a similar feature called Google Latitude that offered sharing of location history but the project was closed down [4].

This product has the same initial goal to visualize timely data originating from different streams like navigation history, pictures, travel and walking routes. However what it has in common is it uses a vertical timeline to display the events, it allows searching based on a specific day, month, year and has a way to show (via bar chart) how active you have been every day in the past few weeks.

Social Media Timeline

All social media websites in the likes of Twitter and Facebook use some sort of a timeline to visualize their user's personal information. However they differ on the way they organize their posts. Facebook describes a timeline to be a place on your profile where you can see your own posts, your friends' activities and stories you're tagged in, sorted by the date and time they were posted. On the other hand, Twitter displays a stream of tweets from accounts that you have chosen to follow. Making use of machine learning algorithms, posts that you are likely to care about more are displayed first.

Despite of the fact that social media applications has as a main goal the delivery of a secure and reliable tool for communication, they also provide their users with the ability to visualize their personal data streams like photos, events, group activities and accomplishments. Both Facebook and Twitter use a vertical timeline and allow for searching based on keywords. One of the key features is infinite scrolling that make the illusion of one endless stream of events by making use of the million users, posting every day.

Chapter 3

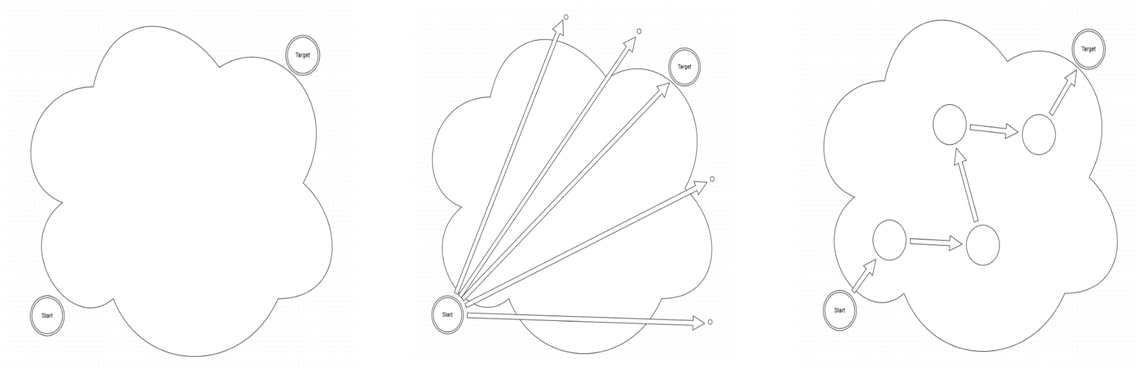
Project Planning

3.1 Project Management

When a new product is developed, it is not clear how it will end up and if it will fulfil the user's requirements. The developers can see the first steps but there are plenty of problems or challenges that can not be predicted from the beginning (Figure 3.1a). That is true for any project, no matter how much planning is put in. However there is a possibility that everything is done the right way but there is a high probability to drift away from the initial target (Figure 3.1b).

This project follows the Agile methodology (Figure 3.1c) for software development. It is an interactive approach that splits the work into a number of iterations (sprints). Each of these sprints last one week. It starts with a meeting and demonstration of the work done in the previous sprint. As an outcome of these meetings feedback from the project supervisors is received, based on the extent to which their requirements are met. Moreover, these meetings allow discussions of the issues that are experienced and compare the available workarounds. At the end of a meeting, it is agreed upon exactly what work will be done during the next sprint. Following this scenario, at least one new feature is introduced after each sprint and changes to previous features are performed as early as possible. By the end of this project, 23 iterations are to be performed.

3.2 Requirements



(a) Start of a project. (b) Waterfall methodology. (c) Agile methodology.

Chapter 4

Design

The quick brown fox jumped over the lazy dog.

Chapter 5

Solution

The quick brown fox jumped over the lazy dog.

5.1 Choice of technology

5.2 Components communication

Chapter 6

Components

6.1 Model

6.2 View

6.3 Controller

6.4 Challenges

Chapter 7

Evaluation

7.1 Product evaluation

7.1.1 Initial phase

7.1.2 Final phase

7.2 Testing

Chapter 8

Future work

Appendices

Appendix A

Running the Programs

An example of running from the command line is as follows:

```
> java MaxClique BBMC1 brock200_1.clq 14400
```

This will apply $BBMC$ with $style = 1$ to the first brock200 DIMACS instance allowing 14400 seconds of cpu time.

Appendix B

Generating Random Graphs

We generate Erdós-Rënyi random graphs $G(n, p)$ where n is the number of vertices and each edge is included in the graph with probability p independent from every other edge. It produces a random graph in DIMACS format with vertices numbered 1 to n inclusive. It can be run from the command line as follows to produce a clq file

```
> java RandomGraph 100 0.9 > 100-90-00.clq
```

Bibliography

[1] Peter Cheeseman, Bob Kanefsky, and William M. Taylor. Where the really hard problems are. In *Proceedings IJCAI'91*, pages 331–337, 1991.

[2] Integrated Multimedia City Data. http://ubdc.ac.uk/blog/2014/september/urban-life-captured-through-survey-sensors-and-multimedia/. Accessed: 2016-03-05.

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[5] Google Maps Timeline. https://www.google.co.uk/maps/timeline. Accessed: 2016-03-02.