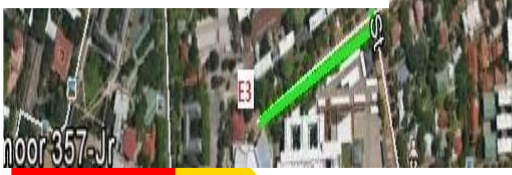
gis IN motion.



MOVE@UP

CLIENT: UP MANAGEMENT

TEAM NAME: GIS IN MOTION

DATE: 31 JULY 2023

Contents

Executive Summary

Company Overview

This company is made up of 4 diverse individuals that cover a broad range of GIS professions, after all obtaining an undergraduate degree in Geoinformatics at the university of Pretoria, and soon forming a Geospatial Company afterwards.

GIS in Motion team aims to formulate solutions based on the effective use of geographical information, and spatial and other data. The solutions maximise value for our customers by applying mathematical, and machine learning sciences to the unique spatial information.

The Problem

The problem identified by the University of Pretoria: The students (and staff) are struggling to navigate through the campus efficiently and effectively, in order to arrive at class on time. The students have a limited time of 10 minutes between each class to get to their next lecture. Many students have reported that the current maps provided are confusing and take too long to navigate with.

Mode of Transport: On foot, skateboards, golf carts and on bicycles

The target audience: The students at the University of Pretoria

The current solution that is being used, is a non-interactive map of the Campus, provided by the university.

The Solution

The proposed solution for this project is to create an interactive web-map that students can use to navigate the campus between each class.

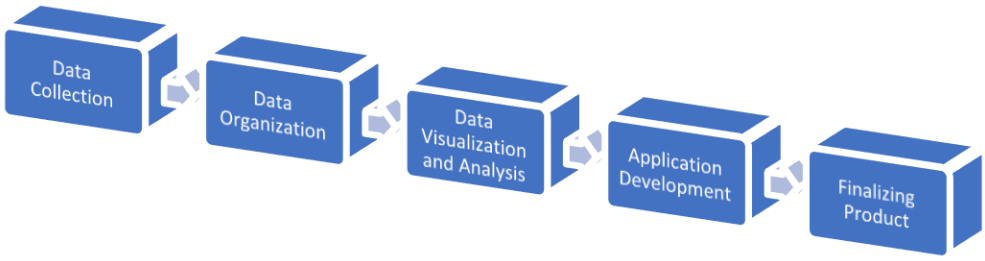
- This allows students to find solutions specifically for their individual schedules and needs.
- This solution will allow students to select their next destination and their mode of transportation, and the web-map will provide the quickest route to get to that location.
- It will be easy to use, as not to exclude any individuals that may need to use it.

This will not only make it easier for students to get to class, but it can help reduce anxiety associated with navigating the large campus, and less students that are late to class means that there is less frustration for lecturers caused by the disruptions.

Highlights

The project will take place over 3 months, covering 5 phases of development

- Data collection
- Data organisation
- Data Visualization and Analysis
- Application Development
- Finalising the Product



Financial

This project's budget is estimated to be approximately R30 000 in order to cover personnel, equipment, and travel expenses. The proposed budget only covers the current project – further requests will be completed at an additional cost.

Business/Client perspective

Background

The University of Pretoria, Hatfield Campus, has a lot of routes to get from one place to another. This includes lecture halls and buildings, libraries, shops, parking areas and places of residence. However, there are a number of issues that greatly affect the mobility of students. It is essential that student mobility is optimised, especially during the ten-minute time frame between lectures. Students often have to navigate from one place to another as swiftly as possible in order to reach their classes on times. Mobility issues are introduced through a number of factors. Firstly, there are a lack of bicycle, skateboard, and golf cart routes, which in turn causes the cyclists, skaters, and golf-cart drivers (staff) to use the same paths and routes as pedestrians. This puts students at risk, as it increases the chances of an accident occurring. Secondly, the paths and routes that are frequently used by students are quite narrow and bi-directional. This causes congestion, time delays and often drives students to use roads as their routes, where there are often cars and other vehicles. Thirdly, majority of communal areas used by students during their free time are clustered in one area, rather than dispersed around campus. This furthers the issue of congestion. Finally, although there are online maps of the campus available, there are fewer maps placed around campus which students can use whenever they want to use alternative routes, or do not have data or internet connection due to the WIFI connectivity being weak and, in some areas, non-existent.

Overview of Proposed Solution

The solution to the issues that affect the mobility of students in the University of Pretoria, Hatfield campus is a tangible product. This product is an interactive web programming application called Move@UP. It uses data collected during the ten-minute time frame between lectures from student surveys which are distributed randomly to better understand student mobility. Secondly, from the quantitative measurement of the number of people passing a certain area/point at campus which indicates the specific points where foot traffic occurs. Followed by the physical observation of areas where bicycles, skateboards and golf carts intersect with walkways and routes used by pedestrians and these modes of transportation are tallied to determine whether their exclusive routes are needed. Lastly from the counting and finding of locations where physical maps are placed around campus. After data collection, the data undergoes data cleaning where it is saved, edited, and stored for analysis in order for Move@UP to perform at its optimum. The Move@UP application has a lot of functionalities, which include showing the students alternative paths around campus after they have selected their destinations and mode of transportation, it also facilitates the implementation of routes which can be used exclusively by cyclists, skaters, and golf cart drivers. In addition, it indicates to students which paths they have to keep left due to the paths being narrow and bi-directional. Finally, Move@UP has an offline map of campus for students to use whenever possible.

Scope and Limitations

Scope

The application will be released incrementally, in order to ensure the client is consistently satisfied with the level of output from our team. The scope is as follows:

Version 1:

Web map showing the data that has been collected throughout the data collection phase. This version is simply to ensure the client is satisfied with the rough layout of the application.

Version 2:

Added interactivity features, such as clicking on data points and changing the view from a 2D layout to a 3D layout.

Version 3:

Addition of the dashboard, that shows information that cannot be portrayed on a map in easy-to-understand tables or graphs.

Version 4:

This version involves all the necessary functionalities but includes errors and may require debugging.

Version 5:

The final version of the Move@UP Application, which involves all necessary features:

- Interactive Web Maps
- Dashboard
- Multiple ways to view the datasets

Limitations

Limitations are aspects that are assumed to be included in the application but have explicitly been excluded. In the case of the Move@UP application, the main exclusion has been real-time data. The Move@UP application cannot show “live” data, for example, where there is currently heavy foot traffic. The Move@UP application can provide an estimate as to where there may be foot traffic, but it cannot access live data, that changes continually with time.

High-level non-functional requirements

- Data collected must be reliable and accurate
- Data must be analysable, so that a solution can be proposed
- Enough data must be collected to conform to the central limit theorem
- Surveys must comply with the POPI act
- Open-source software must be used
- Software must not inhibit hardware constraints (i.e. crash the users' computer)
- The web-application must be accessible to various operating systems
- The web-application must provide a feasible solution to the problem

Project phases and deliverables schedule

Phase	Schedule
Data Collection	3 August - 15 August
Data Organization	15 August - 22 August
Data Visualization and Analysis	22 August - 12 September
Application Development	25 September - 23 October
Finalising Product	23 October - 30 October

Data Collection

The data collection process entails gathering the raw data necessary for this project. The main datasets we will be collecting are as follows:

- Foot Traffic: Foot traffic at specific points around the University of Pretoria Hatfield Campus will be collected. This will be done through counting the number of people passing a specific point over a specified time period. This data will be used to visually represent high foot traffic areas at the University of Pretoria Hatfield Campus.
- Bicycles intersecting walkways: The number of bicycles that intersect with walkways will be tallied. This is necessary for determining whether bicycle routes are needed at the University of Pretoria Hatfield Campus.
- Surveys: Surveys will be distributed to students at random, in order to gain a better understanding of student mobility. The survey will address issues such as tardiness, routes taken between lecture halls, and forms of transportation while on Hatfield campus.
- Roads/Paths: This dataset involves the roads and different pathways on the University of Pretoria Hatfield Campus.
- Buildings: The Lecture Halls on University of Pretoria Hatfield Campus. This is necessary in order to determine routes and where students are most often traveling

Deliverables for this phase include raw data.

Data Organization

Data Organization involves cleaning the data and putting it into a suitable format. The data collected from the previous step will be organized into spreadsheets, where they will be saved in the .csv file format. Data with a spatial aspect will include the latitude and longitude, and exported to a shapefile. Deliverables for this phase include organized information in spreadsheets and shapefiles.

Data Visualization/Analysis

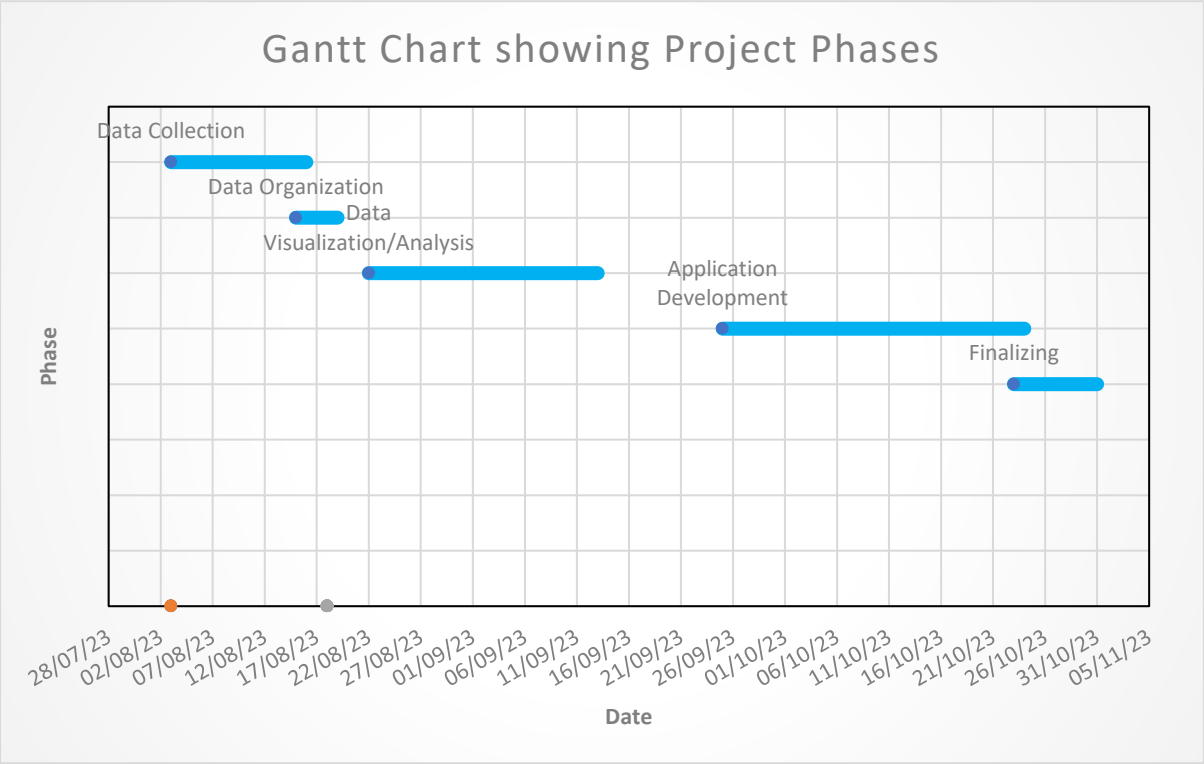
Data visualization involves portraying the gathered data in a way that encourages understanding. This will be done on an open-source GIS software, such as QGIS. Using the data, maps will be produced in order to show the gathered data in a digestible manner, as well as showing spatial relationships. Deliverables for this phase include maps.

Application Development

This phase involves the production of the Move@UP Application. The application will be coded in python or javascript, and the deliverables include interactive web maps and a dashboard, showing necessary information.

Finalizing the product

This phase includes fixing any errors and optimizing the Move@UP Application, where the final deliverable is an efficient, polished and effective application



Budget

This Project will take place over 3 Months, covering 5 phases of development.

We understand that the university does not have a large budget, and thus, we have tried to be as considerate as possible, only charging for the necessities, and using open-source programs and data.

Assuming that the product launch is successful, the company requires a 7% share in the profits made by the university.

This budget proposal also, does not include maintenance or changes after the product launch - that will occur at additional costs.

PHASE 1: Data Collection				
3 - 15 August = 12 Days				
Location: University of Pretoria				
	Amount	**Rate**	**Flat Fee**	**Total Cost**
Personnal (x4)	15 Hours	R212/hr		R3 180.00
Equipment			R2 000	R2 000.00
Travel Expenses	120km	R4.25/km		R510.00
			Total	**R5 690.00**
Justification:	The personnel would include all the members of the team, over the course of the 12 days in order to get the most accurate and unbiased data.			
	The Equipment includes the software and hardware maintenance used in the data collection as well as any physical equipment used.			
	Travel expenses are covered with the standard South African rate, as stipulated by SARS			

PHASE 2: Data Organisation

15 - 22 August = 8 Days

Location: University of Pretoria

	Time	Rate	Flat Fee	Total Cost
Personnal (x4)	20 Hours	R212/hr		R424.00
Equipment			R2 560	R2 560.00
Travel Expenses	0	R4.25/km		R0.00
			Total	**R2 984.00**
Justification:	The personnel would include all 4 the members of the team, over the course of the 8 days in order to get the most accurate and unbiased data.			
	The data organisation will be done using open-source platforms, so equipment fees would mainly cover the maintenance costs of the hardware used - this was calculated using the company standard of 4% of Replacement Asset Value			
	Travel expenses are covered with the standard South African rate, as stipulated by SARS			

PHASE 3: Data Visualisation and Analysis

22 August - 12 September = 22 Days

Location: University of Pretoria

	Amount	Rate	Flat Fee	Total Cost
Personnal (x4)	25 Hours	R212/hr		R5 300.00
Equipment			R0	R0.00
Travel Expenses		R4.25/km		
			Total	**R5 300.00**

Justification:	The personal would include all the members of the team, over the course of the 22 days in order to get the broadest Geovisualisation as possible, in order to make the most accurate assessments
	The Equipment includes the software and hardware maintenance used in the data collection as well as any physical equipment used. This fee, was charged in the previous phase and will only be charge every 30 days that the project takes place over
	Travel expenses are covered with the standard South African rate, as stipulated by SARS

PHASE 4: Application Development				
25 September - 23 October = 29 Days				
Location: University of Pretoria				
	Amount	**Rate**	**Flat Fee**	**Total Cost**
Personnal (x4)	30 Hours	R212/hr		R6 360.00
Equipment			R2 560	R2 560.00
Travel Expenses		R4.25/km		
			Total	**R8 920.00**
Justification:	The personal would include all the members of the team, over the course of the 29 days in order to get the broadest Geovisualisation as possible, in order to make the most accurate assessments			
	The Equipment includes the software and hardware maintenance used in the data collection as well as any physical equipment used. This fee, was charged in the previous phase and will only be charge every 30 days that the project takes place over			
	Travel expenses are covered with the standard South African rate, as stipulated by SARS			

PHASE 5: Finalising Product

23 October - 30 October = 8 Days

Location: University of Pretoria

	Amount	Rate	Flat Fee	Total Cost
Personnal (x4)	22 Hours	R212/hr		R4 664.00
Equipment			R2 000	R2 000.00
Travel Expenses	100km	R4.25/km		R425.00
			Total	**R7 089.00**
Justification:	The personal would include all the members of the team, over the course of the 8 days in order to get the broadest Geovisualisation as possible, in order to make the most accurate assessments			
	The Equipment includes the software and hardware maintenance used in the data collection as well as any physical equipment used. This fee was charged in the previous phase and will only be charged every 30 days that the project takes place over. The equipment also includes the product testing that will occur on campus, with the participants			
	Travel expenses are covered with the standard South African rate, as stipulated by SARS			

Total Proposed Budget			
Phase	**Time Period**	**Location**	**Total**
Phase 1	12 Days	University of Pretoria	R5 690.00
Phase 2	8 Days	University of Pretoria	R2 984.00
Phase 3	22 Days	University of Pretoria	R5 300.00
Phase 4	29 Days	University of Pretoria	R8 920.00
Phase 5	8 Days	University of Pretoria	R7 089.00
		Total	R29 983.00

Project success factors

1. Driver: Lack of mobility at the University of Pretoria Hatfield Campus. Poor route choices of pedestrians and bicycles results in congestion, which makes it difficult for students to get to class on time.
2. Constraint: There are limited route choices available and, where there are multiple route choices, many students stick to familiar paths. As a result, heavy volumes of pedestrians and bicycles are channelled along a select number of pathways that cannot handle the volume of foot- and bicycle-traffic.
3. Important: A web-application needs to be created which can show areas that are frequently congested.
4. Nice-to-have: The web-application should also show students the best route to take between two points on the campus.

Appendix

Brett Harzon

+27 72 380 0061

brettharzon@gmail.com

Hatfield, Gauteng, ZA

About Me

I am a third-year student at the University of Pretoria studying towards a BSc in Geoinformatics.

I have a passion for problem solving, particularly in spatial analysis, and I enjoy the challenges in my GIS and programming modules. My aim is to further my studies next year by enrolling for BSc Hons in Geoinformatics to qualify as a GISc Practitioner.

Interests

- GYM
- RUNNING
- MAPS
- ORIENTEERING
- MUSIC
- HUMAN GEOGRAPHY
- LANGUAGES
- EXPLORING

Education

2021 – 2023

BSc Geoinformatics, University of Pretoria

2016 – 2020

National Senior Certificate, Jeppe High School for Boys

Completed with 7 Distinctions

Achievements and Leadership

- Top 10 Academic throughout School
- Earned my Leaping Wolf award through Scouts South Africa in 2013
- Completed my Grade 5 music theory exam through ABRSM with distinction in 2017
- Performed a movement of a piano concerto with the Rand Symphony Orchestra in 2018
- Performed with the Jeppe Pipe Band at the Basel Tattoo in Switzerland in 2018
- Performed with the African Skye Pipe Band at the South African Tattoo in Pretoria in 2018
- Was awarded first place in multiple solo bagpipe competitions
- Completed my Grade 8 piano exam through ABRSM with merit in 2019
- Full Colours for Academics
- Half Colours for Pipe Band and Orienteering
- Was awarded the title of Pipe Major of the Jeppe Pipe Band in 2020
- Awarded the Headmaster's Award
- Member of the Golden Key Society

Skills

- Languages: English (fluent), Afrikaans (conversational), German (B1), isiZulu (first-year university)
- Completed a 2-hour "Introduction to SQL" course as well as a 4-hour "Introduction to Python" course through DataCamp
- Computer Literacy: Proficient in Microsoft Word, Excel, and PowerPoint as well as experience in basic programming skills in SQL, PostgreSQL, Python, C#, and JavaScript
- Completed Volkswagen's Advanced Safety Driving Course in 2021
- Instruments: Piano, clarinet, bagpipes, harmonica, saxophone

References

Jeppe High School for Boys

(011 614 1938)

KEREN BENJIMAN

GIS TECHNICIAN

I am a hardworking individual, currently finishing my BSc in Geoinformatics at the University of Pretoria. I am passionate about solving problems through spatial solutions, and aim to make a difference through the amalgamation of geography and information systems.

SKILLS

- Proficient in Geographic Information Systems, including ESRI and Open-Sourced software
- Coding in C#, Python and SQL
- Computer Literate in Microsoft Excel, Word and PowerPoint

EDUCATION

HIGH SCHOOL

Matriculated with academic excellence

Mitchell House College | 2013 - 2020

BSC GEOINFORMATICS

Bachelors Degree in Science

University of Pretoria | 2021 - 2024

EXPERIENCE

DIGBY WELLS ENVIRONMENTAL

GIS INTERN - 2023

Worked at Digby Wells Environmental, under their GIS division. Digby Wells is an environmental consultancy, and I assisted in digitizing and georeferencing on multiple projects.

ACHIEVEMENTS + OUTREACH

- Consistently high performing academic throughout High School and Higher Education.
- First place in the Tritech National Science Fair, where we dealt with issues regarding water consumption
- Volunteered at the CANSA pediatric ward
- Frequent volunteer at the Wetnose Animal Shelter

INTERESTS

- Reading
- Art
- Programming
- Geography

REFERENCE

info@digbywellsenvironmental.com
reception@mitchellhouse.co.za

CONTACT

kerenbenjiman@gmail.com
076 084 8630

Prudence Mcena

CONTACT

1104
Prospect
Madelief
Hatfield
0028
Gauteng

E-mail: prudence.mcena01@gmail.com

Phone: 060 992 3343

Date of Birth 25 June 2001

Nationality South African

Gender Female

Driving License B

OBJECTIVE

Seeking a position as a final year geoinformatics student in the GIS in Motion team to not only design but also develop a geoinformatics solution that will benefit the University of Pretoria, towards improving mobility by producing an interactive web programming application.

Education and Qualifications

BSc Geoinformatics — February 2021 - Present
University of Pretoria

Social commitments

- Mentor to a student from my bursary.
- Take part in the RAG program within my residence (Madelief). This program is an outreach program which aims to help society as best as we can. This is achieved by food drives, the renovation of a library (recent project) and likes.

Computer Skills

- Microsoft Word
- PowerPoint
- SQL
- Python, C# and JavaScript (Basic programming)
- ArcGIS
- QGIS
- Excel

Interests

- Travelling
- History
- Human behaviors

References

- Madelief University of Pretoria residence – 012 362 6774

SUZANNA SPOONER

CONTACT

078-934-8471

spoonersuzi@gmai.com

PROFILE

I am an ambitious and confident young woman, that is currently completing my final year of a BSc Geoinformations. I have focused on developing communication, time-management, and interpersonal skills through working in groups and collaborations. I enjoy problem solving, specifically in the geospatial field.

INTERESTS

- Running
- Maps
- Food and Culinary
- Meteorology

EDUCATION

IEB International Secondary Certificate (IEB-ISC) – Durban Girls' College

2014-2018

Completed Matric with Academic Excellence

BSc Geoinformatics University of Pretoria

2020 – 2023

EXPERIENCE

Internship with Risckape

Riskcape is a Geospatial company that builds solutions based on the intelligent use of geographical information, and spatial and other data. Our solutions maximize value for our customers by applying actuarial, mathematical, and machine learning sciences to our unique spatial information.

I completed a year's internship with them, working with the Geo-actuarial department

Community Service at Ithemba Lethu Children's Home

I completed over 20 hours of community service at Ithemba Lethu Children's' home, that consisted of taking care of the orphans at the home and helping with meals and organization.

SKILLS

Time Management: attended 2 time-management workshops provided by the university of Pretoria

Completed a 2-hour "Introduction to SQL" and a 4-hour "Introduction to Python" course through DataCamp

Computer Literacy: Proficient in Microsoft Word, Excel, and PowerPoint as well as experience in basic programming skills in SQL, PostgreSQL, Python, C#, and JavaScript

REFERENCES

John Dann

Phone: 076-432-4066

Email: johndann@riskscape.com

Relationship: Director of Riskscape

Durban Girls' College

Cell: 031-268-7200