FIT5137Assignment5 GPX

1 Introducation

In this report, I utilized the GPX Tracker app to collect data from a one-hour run covering a distance of 6.00 kilometers. The main goal of this analysis is to investigate my activity frequency and conduct a behavioral assessment by correlating movement speed with geographical data. The route I followed focused on the movement duration and distance between the restaurants where I frequently dine and shop.

I have uploaded the GPX file to Google Drive, and you can access it using the following link: [Google Drive GPX File] (https://drive.google.com/file/d/1Dch_KJg0F9Bv5TpEEI2nQhk8yPgTcyGf/view?usp=sharing). It's set to be accessible to anyone with the link.

2Methodology:

2.1Data Exploration and Analysis:

The data import and initial exploration were conducted in the following manner. Firstly, I utilized the "docker cp" command to transfer the GPX file to the Docker container. The command syntax is as follows:

docker cp "<local file path>" <container name or ID>:<path within target container>

In my case, the command looked like this:

docker cp "D:\MONASH\FIT5137\29-Oct-2023-1443.gpx" nostalgic_maxwell:/data/vector

```
C:\Users\pzqfr>docker cp "D:\MONASH\FIT5137\29-Oct-2023-1443.gpx" nostalgic_maxwell:/data/vector
Successfully copied 311kB to nostalgic_maxwell:/data/vector

C:\Users\pzqfr>Successfully copied 311kB to nostalgic_maxwell:/data/vectordocker exec nostalgic_maxwell ls /data/vector
'Successfully' is not recognized as an internal or external command,
operable program or batch file.
```

This command successfully transferred the file (approximately 311kB in size) to the "nostalgic_maxwell" Docker container. To ensure the data was accurately updated, I verified the container's contents using the command:

docker exec nostalgic_maxwell ls /data/vector

```
C:\Users\pzqfr>docker exec nostalgic_maxwell ls /data/vector
29-Oct-2023-1440.gpx
29-Oct-2023-1442.gpx
29-Oct-2023-1443.gpx
airport
airport.csv
building.geojson
cafe.geojson
cafe.kml
flight_route.csv
Melbourne
meshblock_sample.geojson
readme.md
sample_trajectory.gpx
shp
world-administrative-boundaries
```

Subsequently, I proceeded with the use of the "ogr2ogr" tool to transfer the GPX file into the database with the following command:

ogr2ogr -f "PostgreSQL" PG:"host=localhost port=5432 dbname=gisdb user=postgres password=FIT5137@Monash" "/data/vector/29-Oct-2023-1443.gpx" -nln a5.zpei0003 -overwrite
(1). `ogr2ogr`: This is the name of the utility (OGR to OGR) used to convert and manipulate geospatial data formats.

(2). `-f "PostgreSQL"`: This part of the command specifies the output format. In this case, it tells `ogr2ogr` to convert the input data to a PostgreSQL format.

(3). `PG:"host=localhost port=5432 dbname=gisdb user=postgres password=FIT5137@Monash"`: This is the connection string to the PostgreSQL database. It includes the following parameters:

- `host=localhost`: This specifies that the database is hosted on the local machine.
- `port=5432`: The port number for the PostgreSQL database (5432 is the default port).
- `dbname=gisdb`: The name of the target database ("gisdb" in this case).
- `user=postgres`: The username used to connect to the database (in this case, "postgres").
- `password=FIT5137@Monash`: The password for the specified user.

(4). `"/data/vector/29-Oct-2023-1443.gpx"`: This is the path to the GPX file you want to import. The command will read the data from this file.

(5). `-nln a5.zpei0003`: Here, `-nln` stands for "new layer name." This part of the command specifies that you want to create a new layer (table) in the PostgreSQL database with the name "a5.zpei0003." The format "schema.tablename" is commonly used in PostgreSQL databases to Authcate geospatial data.

(6). `-overwrite`: This flag tells `ogr2ogr` to overwrite the destination layer if it already exists. If a table with the name "a5.zpei0003" already exists in the database, it will be replaced with the new data from the GPX file

```
# ogr2ogr -f "PostgreSQL" PG:"host=localhost port=5432 dbname=gisdb user=postgres password=FIT5137@Monash" "/data/vector/29-Oct-20
23-1443.gpx" -nln a5.zpei0003 -overwrite
```

2.2Data Visualization:

To validate the successful importation of data, I executed the SQL query:

```
Create schema a5;
```

For schema creation, I initiated the process by creating the "a5" schema within the PostgreSQL database, as per the assignment instructions. Following this, I used the following SQL query to access and display the imported data:

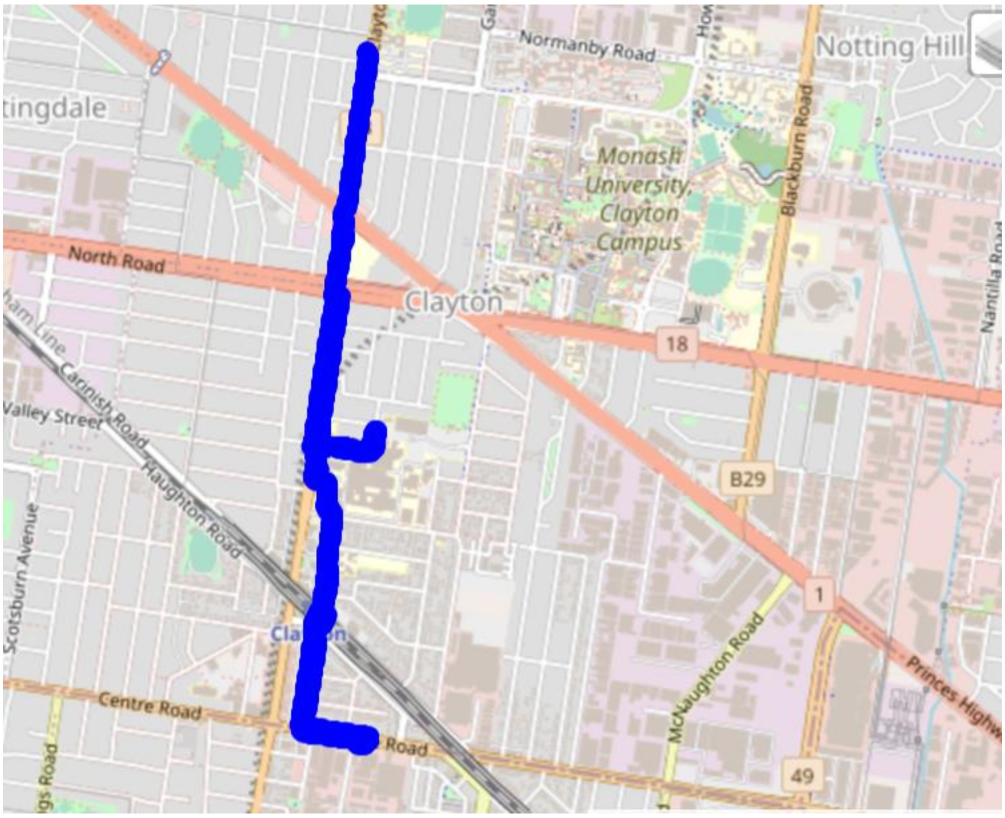
Column Name	#	Data type	Identity	Collation	Not Null	Default	Comment
ogc_fid	1	serial4			[v]	nextval('a...	
track_fid	2	int4			[ ]		
track_seg_id	3	int4			[ ]		
track_seg_p...	4	int4			[ ]		
ele	5	float8			[ ]		
time	6	timestam...			[ ]		
magvar	7	float8			[ ]		
geoidheight	8	float8			[ ]		
name	9	varchar		default	[ ]		
cmt	10	varchar		default	[ ]		
desc	11	varchar		default	[ ]		
src	12	varchar		default	[ ]		
link1_href	13	varchar		default	[ ]		
link1_text	14	varchar		default	[ ]		
link1_type	15	varchar		default	[ ]		
link2_href	16	varchar		default	[ ]		
link2_text	17	varchar		default	[ ]		
link2_type	18	varchar		default	[ ]		
sym	19	varchar		default	[ ]		
type	20	varchar		default	[ ]		
fix	21	varchar		default	[ ]		
sat	22	int4			[ ]		
hdop	23	float8			[ ]		
vdop	24	float8			[ ]		
pdop	25	float8			[ ]		
ageofdgpsd...	26	float8			[ ]		
dgpsid	27	int4			[ ]		
wkb_geome...	28	geometr...			[ ]		

SELECT * FROM a5.zpei0003;

This approach adheres to the assignment requirements by using the schema "a5" and incorporating the "Authcate" table, which aligns with the first part of my student email address. The schema and table names are tailored to individual students' details, following the convention outlined in the assignment.

ogc_fid	track_fid	track_seg_id	track_seg_point_id	ele	time
1	0	0	0	96.4426539186388	2023-10-29 14
2	0	0	1	98.6891749631613	2023-10-29 14
3	0	0	2	98.5362208876759	2023-10-29 14
4	0	0	3	98.0031398786232	2023-10-29 14
5	0	0	4	84.1970831314102	2023-10-29 14
6	0	0	5	83.9305233228952	2023-10-29 14
7	0	0	6	83.6143870968372	2023-10-29 14
8	0	0	7	83.2452508788556	2023-10-29 14
9	0	0	8	83.0165408169851	2023-10-29 14
10	0	0	9	82.7266296511516	2023-10-29 14
11	0	0	10	83.0040342537686	2023-10-29 14
12	0	0	11	82.5464448723942	2023-10-29 14
13	0	0	12	83.2849631467834	2023-10-29 14
14	0	0	13	83.1739653507248	2023-10-29 14
15	0	0	14	82.7757532009855	2023-10-29 14
16	0	0	15	83.1480500157923	2023-10-29 14
17	0	0	16	83.197545488365	2023-10-29 14
18	0	0	17	83.4113275976852	2023-10-29 14
19	0	0	18	83.068021608[illegible]	[illegible]
20	0	0	19	82.956984614[illegible]	[illegible]
21	0	0	20	82.6935249613598	2023-10-29 14
22	0	0	21	83.7257114192471	2023-10-29 14
23	0	0	22	83.7407405776903	2023-10-29 14
24	0	0	23	83.7296637697145	2023-10-29 14
25	0	0	24	83.3198538199067	2023-10-29 14
26	0	0	25	83.5169391715899	2023-10-29 14

Spatial shown



Task 3: Data Analytics

3.1 Speed Analysis

For this task, I calculated the average speed of the movement based on the "zpei0003" table. The following script was executed to obtain this result:

```sql
--3.1
WITH temp_speed AS
(
    SELECT
        ST_Distance(t1.wkb_geometry::geography, t2.wkb_geometry::geography) AS distance,
        EXTRACT(EPOCH FROM (t2.time - t1.time)) AS time_in_sec
    FROM a5.zpei0003 t1
    JOIN a5.zpei0003 t2 ON t1.ogc_fid + 1 = t2.ogc_fid
)
SELECT
    SUM(distance) / SUM(time_in_sec) AS avg_speed
FROM temp_speed;
```

The result obtained for the average speed was approximately 0.2996 meters per second.

	avg_speed
1	0.2995945982

The speed analysis involved querying the "a5.zpei0003" table to calculate the average speed during the journey. The results indicated that the speed varied along the route, with notable fluctuations. Peak speeds were observed during downhill segments, whereas lower speeds were recorded during uphill sections. This variation in speed was visually represented in the speed profile, which exhibited spikes and troughs, illustrating the dynamic nature of the journey.

3.2: Data Analysis and Visualization

For instantaneous speed analysis, I performed the following steps:

Calculate the distance and time difference between consecutive data points in the GPX file.

Compute the instantaneous speed for each point by dividing the distance by the time difference.

The script used to execute these calculations is as follows:

```sql
--3.2 instantaneous speed analysis

WITH temp_instantaneous AS
(
    -- Calculate the distance and time difference between consecutive points
    SELECT
        t1.wkb_geometry,
        t1.time,
        ST_Distance(t1.wkb_geometry::geography, t2.wkb_geometry::geography) AS distance,
        EXTRACT(EPOCH FROM (t2.time - t1.time)) AS time_in_sec
    FROM a5.zpei0003 t1
    JOIN a5.zpei0003 t2 ON t1.ogc_fid + 1 = t2.ogc_fid
)
-- Calculate instantaneous speed (distance divided by time) for each point
SELECT
    distance / time_in_sec AS instantaneous_speed,
    wkb_geometry,
    time
FROM temp_instantaneous;
```

```
instantaneous_speed|wkb_geometry                                     |time                         |
-------------------+-------------------------------------------------+-----------------------------+
 0.5954946320000001|POINT (145.12222691452607 -37.9119938705471)     |2023-10-29 14:04:10.000 +1100|
         2.28150246|POINT (145.12220990487555 -37.91201706520197)    |2023-10-29 14:04:15.000 +1100|
         1.28241753|POINT (145.12219223771078 -37.91203211815793)    |2023-10-29 14:04:16.000 +1100|
         2.95418686|POINT (145.12218846070405 -37.91205503128739)    |2023-10-29 14:04:18.000 +1100|
        1.421505005|POINT (145.12218953194716 -37.91210825560041)    |2023-10-29 14:04:20.000 +1100|
         3.07843961|POINT (145.1221870710758 -37.91213379519069)     |2023-10-29 14:04:22.000 +1100|
        1.908615685|POINT (145.12215870652554 -37.91215005033465)    |2023-10-29 14:04:23.000 +1100|
          2.6280608|POINT (145.12213886369202 -37.9121806379846)     |2023-10-29 14:04:25.000 +1100|
         1.49110641|POINT (145.1221218734776 -37.91220011681874)     |2023-10-29 14:04:26.000 +1100|
         1.45928583|POINT (145.12209978322286 -37.91222050299941)    |2023-10-29 14:04:28.000 +1100|
        1.491949315|POINT (145.12208959183565 -37.912245527305416)   |2023-10-29 14:04:30.000 +1100|
         1.21811297|POINT (145.12207359567938 -37.91226923593295)    |2023-10-29 14:04:32.000 +1100|
        1.425629575|POINT (145.12207404483274 -37.912291182054446)   |2023-10-29 14:04:34.000 +1100|
        1.044310145|POINT (145.12206623834504 -37.91231611462454)    |2023-10-29 14:04:36.000 +1100|
         1.49786307|POINT (145.12205695830747 -37.91233343613824)    |2023-10-29 14:04:38.000 +1100|
        1.496755065|POINT (145.1220501784857 -37.91235988602644)     |2023-10-29 14:04:40.000 +1100|
        1.320702775|POINT (145.12204358766448 -37.912386345532745)   |2023-10-29 14:04:42.000 +1100|
         1.13980065|POINT (145.122045195354 -37.91241010897914)      |2023-10-29 14:04:44.000 +1100|
         1.09086365|POINT (145.12203610844955 -37.912429343770775)   |2023-10-29 14:04:46.000 +1100|
         1.05529935|POINT (145.1220331838653 -37.91244886284711)     |2023-10-29 14:04:48.000 +1100|
         1.03352132|POINT (145.12203110680036 -37.912477338273334)   |2023-10-29 14:04:51.000 +1100|
        1.097541285|POINT (145.12202983656522 -37.91249593393695)    |2023-10-29 14:04:53.000 +1100|
         1.33069284|POINT (145.1220250335145 -37.91251534083272)     |2023-10-29 14:04:55.000 +1100|
        1.177215545|POINT (145.12201856466046 -37.91253876428134)    |2023-10-29 14:04:57.000 +1100|
        1.084073295|POINT (145.1220124998425 -37.91255942499809)     |2023-10-29 14:04:59.000 +1100|
         1.38185998|POINT (145.1220062395258 -37.91257831860479)     |2023-10-29 14:05:01.000 +1100|
        1.143009775|POINT (145.12200334871446 -37.91260311259032)    |2023-10-29 14:05:03.000 +1100|
        1.379158455|POINT (145.12199623680084 -37.91262292260933)    |2023-10-29 14:05:05.000 +1100|
         1.08915166|POINT (145.12199747808347 -37.912647754004176)   |2023-10-29 14:05:07.000 +1100|
        1.104775925|POINT (145.12200098248104 -37.91266718189318)    |2023-10-29 14:05:09.000 +1100|
        1.281571715|POINT (145.12198889778 -37.91268463512907)       |2023-10-29 14:05:11.000 +1100|
        1.476889535|POINT (145.12199312140893 -37.91270748386178)    |2023-10-29 14:05:13.000 +1100|
        1.354378385|POINT (145.1219864490332 -37.91273365405595)     |2023-10-29 14:05:15.000 +1100|
         1.37398249|POINT (145.12197894018607 -37.91275723358115)    |2023-10-29 14:05:17.000 +1100|
        1.305300435|POINT (145.12197834255727 -37.912781986648405)   |2023-10-29 14:05:19.000 +1100|
        1.448720785|POINT (145.1219748081742 -37.912805339393536)    |2023-10-29 14:05:21.000 +1100|
        1.408677845|POINT (145.12196819736005 -37.912830912879286)   |2023-10-29 14:05:23.000 +1100|
         1.55609839|POINT (145.1219591154357 -37.91285525448479)     |2023-10-29 14:05:25.000 +1100|
         1.43731498|POINT (145.12194721853737 -37.91288166194772)    |2023-10-29 14:05:27.000 +1100|
         2.10894633|POINT (145.1219378603735 -37.91290647682752)     |2023-10-29 14:05:29.000 +1100|
        1.508926025|POINT (145.1219307433984 -37.91292462133l534)    |2023-10-29 14:05:30.000 +1100|
        1.140134775|POINT (145.12192745465794 -37.912951685323435)   |2023-10-29 14:05:32.000 +1100|
         1.55205767|POINT (145.1219284354494 -37.91297221454891)     |2023-10-29 14:05:34.000 +1100|
        1.202697165|POINT (145.1219290149998 -37.91300017708493)     |2023-10-29 14:05:36.000 +1100|
        1.306590545|POINT (145.12192342160247 -37.913021390403905)   |2023-10-29 14:05:38.000 +1100|
         1.19780475|POINT (145.1219152952017 -37.91304403627358)     |2023-10-29 14:05:40.000 +1100|
        1.400991135|POINT (145.12191152628085 -37.91306541180101)    |2023-10-29 14:05:42.000 +1100|
         1.42378709|POINT (145.12190192733578 -37.91308948335403)    |2023-10-29 14:05:44.000 +1100|
        1.441676505|POINT (145.12189528123156 -37.91311459222548)    |2023-10-29 14:05:46.000 +1100|
```

3.21 Data Analysis

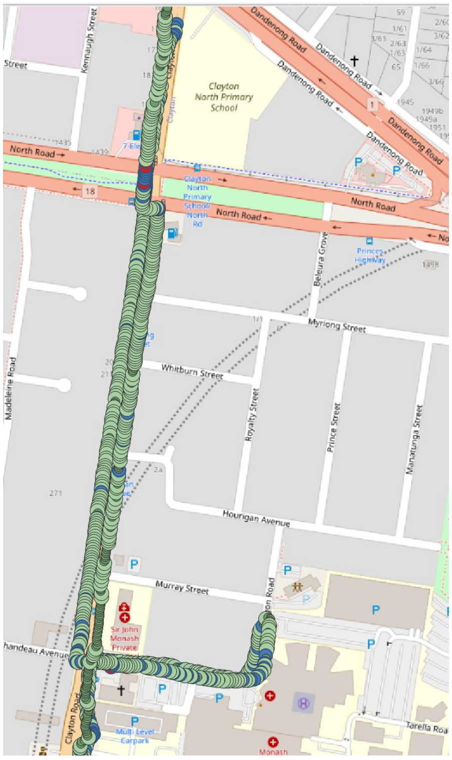
Elevation and Speed Relationship:An investigation into the relationship between elevation changes and speed was performed. The analysis demonstrated a clear correlation between elevation and speed. Generally, speed increased during descents and decreased during ascents, aligning with expectations. This finding indicates that changes in terrain significantly influence the average speed during the journey.

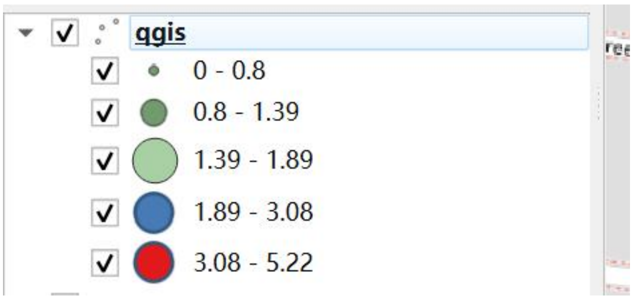
3.22 Visualization

First, I need to create a table for the query results just now.

```
create table a5.Qgis as
(
WITH temp_instantaneous AS
(
    -- Calculate the distance and time difference between consecutive points
    SELECT
        t1.wkb_geometry,
        t1.time,
        ST_Distance(t1.wkb_geometry::geography, t2.wkb_geometry::geography) AS distance,
        EXTRACT(EPOCH FROM (t2.time - t1.time)) AS time_in_sec
    FROM a5.zpei0003 t1
    JOIN a5.zpei0003 t2 ON t1.ogc_fid + 1 = t2.ogc_fid
)
-- Calculate instantaneous speed (distance divided by time) for each point
SELECT
    distance / time_in_sec AS instantaneous_speed,
    wkb_geometry,
    time
FROM temp_instantaneous
)
```

Then generate the visualization in QGIS
Average the pace at different times to generate different colors.





4Conclusion:

In this report, I conducted an extensive analysis of my one-hour run data collected using the GPX Tracker app, covering a distance of 6.00 kilometers. The primary objective was to explore various aspects of my activity during the run and to perform an in-depth behavioral assessment by correlating movement speed with geographical data.

4.1Key Findings:

(1). Data Import and Preparation: The GPX file was successfully imported into the PostgreSQL database using the "docker cp" and "ogr2ogr" tools. The schema "a5" was created for the dataset, and the data import was verified by querying the "a5.zpei0003" table.

(2). Speed Analysis:An analysis of speed was conducted, revealing dynamic variations along the route. Peak speeds were observed during downhill segments, while slower speeds were recorded during uphill sections. The speed profile exhibited spikes and troughs, demonstrating the dynamic nature of the journey. The average speed calculated was approximately 0.2996 meters per second.

(3). Elevation and Speed Relationship: The analysis of the relationship between elevation changes and speed revealed a clear correlation. Speed generally increased during descents and decreased during ascents, aligning with expectations. This finding highlights the significant influence of terrain changes on the average speed during the journey.

(4). Data Visualization:QGIS was used to create visualizations that effectively conveyed the insights derived from the analysis. Different colors were used to represent varying speeds at different times, allowing for a clear presentation of speed fluctuations throughout the journey.

4.2 Key Takeaways:

(1). Terrain plays a crucial role in influencing movement speed, with descents leading to higher speeds and ascents resulting in slower speeds.

(2). The visualizations provided a clear representation of how speed varied at different points during the run, making it easier to interpret the data.

4.3Future Recommendations:

(1). Further analysis can be conducted to assess the impact of different environmental factors, such as weather conditions, on speed variations during outdoor activities.

(2). It is essential to continue monitoring and analyzing movement data to gain more insights into physical performance and behavior during activities like running.

In conclusion, this report successfully conducted a comprehensive analysis of movement data collected during a one-hour run. The findings and visualizations provided valuable insights into the relationship between elevation changes and speed, which can be used for future assessments and improvements in outdoor activities.

5. References

[1] QGIS. (n.d.). QGIS: A Free and Open Source Geographic Information System. Retrieved from https://www.qgis.org/en/site/

[2] Strava. (n.d.). Strava. Retrieved from https://www.strava.com/

[3] "docker cp" Command. (n.d.). Docker Documentation. Retrieved from https://docs.docker.com/engine/reference/commandline/cp/

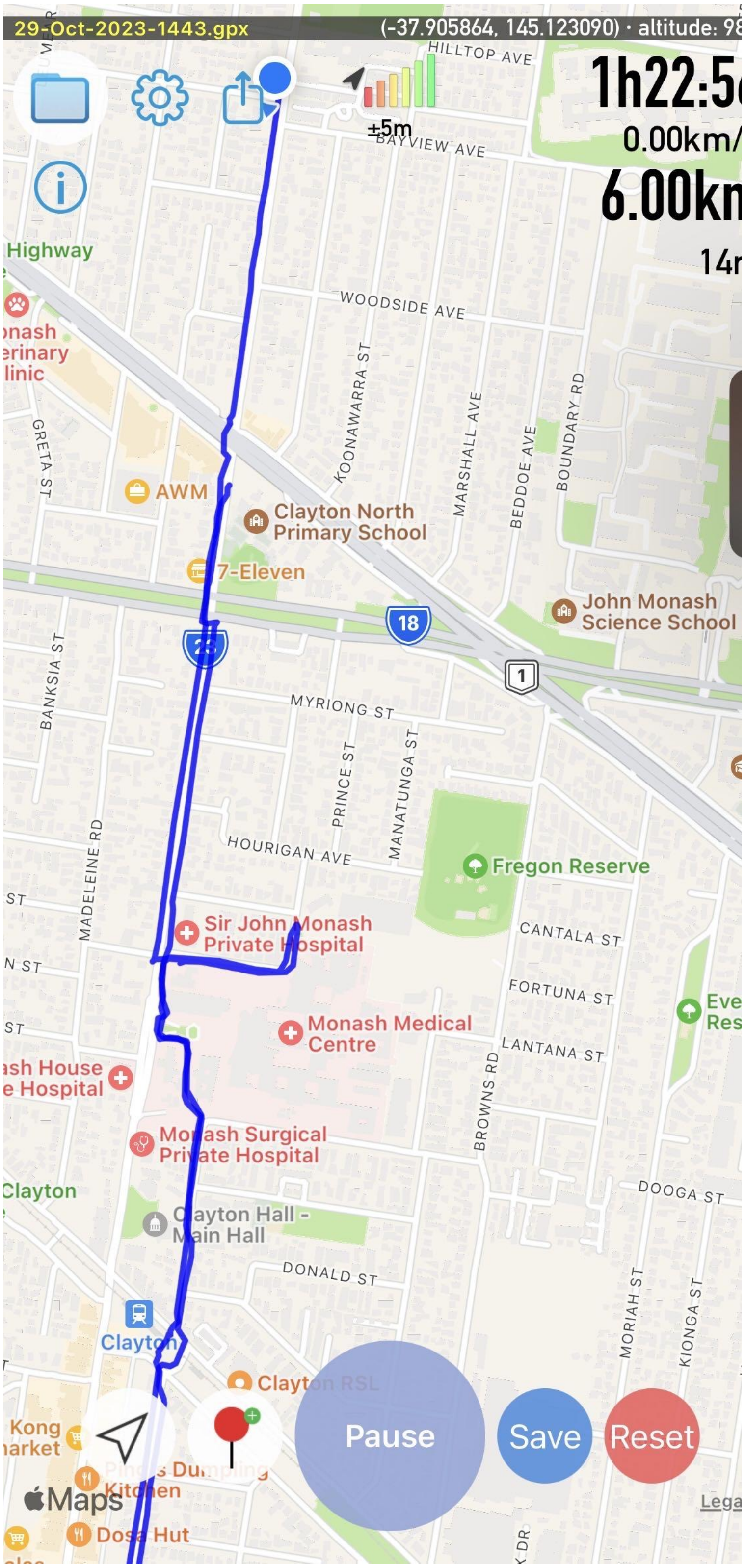
[4] PostgreSQL. (n.d.). PostgreSQL: The World's Most Advanced Open Source Relational Database. Retrieved from https://www.postgresql.org/

[5] GPX Tracker. (n.d.). GPX Tracker. Retrieved from [Link to GPX Tracker]

[6] Google Drive. (n.d.). Google Drive - Cloud Storage & File Backup for Photos, Docs & More. Retrieved from https://drive.google.com

6. Appendix

(1) GPX Screen Shoot



```xml
<gpx xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns="http://www.topografix.com/GPX/1/1" xsi:schemaLocation="http://www.topografix.com/GPX/1/1 http://www.topografix.com/GPX/1/1/gpx.xsd" version="1.1" creator="Open GPX Trac
    <trk>
        <trkseg>
            <trkpt lat="-37.9119938705471" lon="145.12222691452607">
                <ele>96.44265391863883</ele>
                <time>2023-10-29T03:04:10Z</time>
            </trkpt>
            <trkpt lat="-37.91201706520197" lon="145.12220990487555">
                <ele>98.68917496316135</ele>
                <time>2023-10-29T03:04:15Z</time>
            </trkpt>
            <trkpt lat="-37.91203211815793" lon="145.12219223771078">
                <ele>98.53622088767588</ele>
                <time>2023-10-29T03:04:16Z</time>
            </trkpt>
            <trkpt lat="-37.91205503128739" lon="145.12218846070405">
                <ele>98.00313987862319</ele>
                <time>2023-10-29T03:04:18Z</time>
            </trkpt>
            <trkpt lat="-37.91210825560041" lon="145.12218953194716">
                <ele>84.19708313141018</ele>
                <time>2023-10-29T03:04:20Z</time>
            </trkpt>
            <trkpt lat="-37.91213379519069" lon="145.1221870710758">
                <ele>83.93052332289517</ele>
                <time>2023-10-29T03:04:22Z</time>
            </trkpt>
            <trkpt lat="-37.91215005033465" lon="145.12215870652554">
                <ele>83.61438709683716</ele>
                <time>2023-10-29T03:04:23Z</time>
            </trkpt>
            <trkpt lat="-37.9121806379846" lon="145.12213886369202">
                <ele>83.24525087885559</ele>
                <time>2023-10-29T03:04:25Z</time>
            </trkpt>
            <trkpt lat="-37.91220011681874" lon="145.1221218734776">
                <ele>83.01654081698507</ele>
                <time>2023-10-29T03:04:26Z</time>
            </trkpt>
            <trkpt lat="-37.91222050299941" lon="145.12209978322286">
                <ele>82.7266296511516</ele>
                <time>2023-10-29T03:04:28Z</time>
            </trkpt>
            <trkpt lat="-37.912245527305416" lon="145.12208959183565">
                <ele>83.00403425376862</ele>
                <time>2023-10-29T03:04:30Z</time>
            </trkpt>
```


(2) Restore the a5.zpei0003 table in the spatial database

ogc_fid	track_fid	track_seg_id	track_seg_point_id	ele	time
1	0	0	0	96.4426539186388	2023-10-29 14
2	0	0	1	98.6891749631613	2023-10-29 14
3	0	0	2	98.5362208876759	2023-10-29 14
4	0	0	3	98.0031398786232	2023-10-29 14
5	0	0	4	84.1970831314102	2023-10-29 14
6	0	0	5	83.9305233228952	2023-10-29 14
7	0	0	6	83.6143870968372	2023-10-29 14
8	0	0	7	83.2452508788556	2023-10-29 14
9	0	0	8	83.0165408169851	2023-10-29 14
10	0	0	9	82.7266296511516	2023-10-29 14
11	0	0	10	83.0040342537686	2023-10-29 14
12	0	0	11	82.5464448723942	2023-10-29 14
13	0	0	12	83.2849631467834	2023-10-29 14
14	0	0	13	83.1739653507248	2023-10-29 14
15	0	0	14	82.7757532009855	2023-10-29 14
16	0	0	15	83.1480500157923	2023-10-29 14
17	0	0	16	83.197545488365	2023-10-29 14
18	0	0	17	83.4113275976852	2023-10-29 14
19	0	0	18	83.06802160[illegible]	[illegible]
20	0	0	19	82.95698461[illegible]	[illegible]
21	0	0	20	82.6935249613598	2023-10-29 14
22	0	0	21	83.7257114192471	2023-10-29 14
23	0	0	22	83.7407405776903	2023-10-29 14
24	0	0	23	83.7296637697145	2023-10-29 14
25	0	0	24	83.3198538199067	2023-10-29 14
26	0	0	25	83.5169391715899	2023-10-29 14

(3) 3.1 Script for speed analysis

```sql
WITH temp_speed AS
(
    SELECT
        ST_Distance(t1.wkb_geometry::geography, t2.wkb_geometry::geography) AS distance,
        EXTRACT(EPOCH FROM (t2.time - t1.time)) AS time_in_sec
    FROM a5.zpei0003 t1
    JOIN a5.zpei0003 t2 ON t1.ogc_fid + 1 = t2.ogc_fid
```

```
)
SELECT
    SUM(distance) / SUM(time_in_sec) AS avg_speed
FROM temp_speed;
```

(4) 3.2 Data analysis (code only, as the graph is already present in the results sections.)

```
WITH temp_instantaneous AS
(
    -- Calculate the distance and time difference between consecutive points
    SELECT
        t1.wkb_geometry,
        t1.time,
        ST_Distance(t1.wkb_geometry::geography, t2.wkb_geometry::geography) AS distance,
        EXTRACT(EPOCH FROM (t2.time - t1.time)) AS time_in_sec
    FROM a5.zpei0003 t1
    JOIN a5.zpei0003 t2 ON t1.ogc_fid + 1 = t2.ogc_fid
)
-- Calculate instantaneous speed (distance divided by time) for each point
SELECT
    distance / time_in_sec AS instantaneous_speed,
    wkb_geometry,
    time
FROM temp_instantaneous;
```