

Micro-module B: Mobile Sensing Applications

B2- Geolocation Tracking Applications

In this micro-module we will introduce the use of mobile sensing applications with geo-location tags to record people's routes or the location where crowd gathering and import the data into QGIS for visual illustration. This can be used to record the gathering of people in the research area, the extent to which people prefer existing spaces.

The first part will introduce how to use the JAS location tracker to record routes or mark locations, and the export of geographic data.

The second part will explain how to import data recorded by mobile phones into QGIS, how to process data, and how to visualise the data to analyse problems.

1. Record route and placemark using the application – JAS Location Tracker

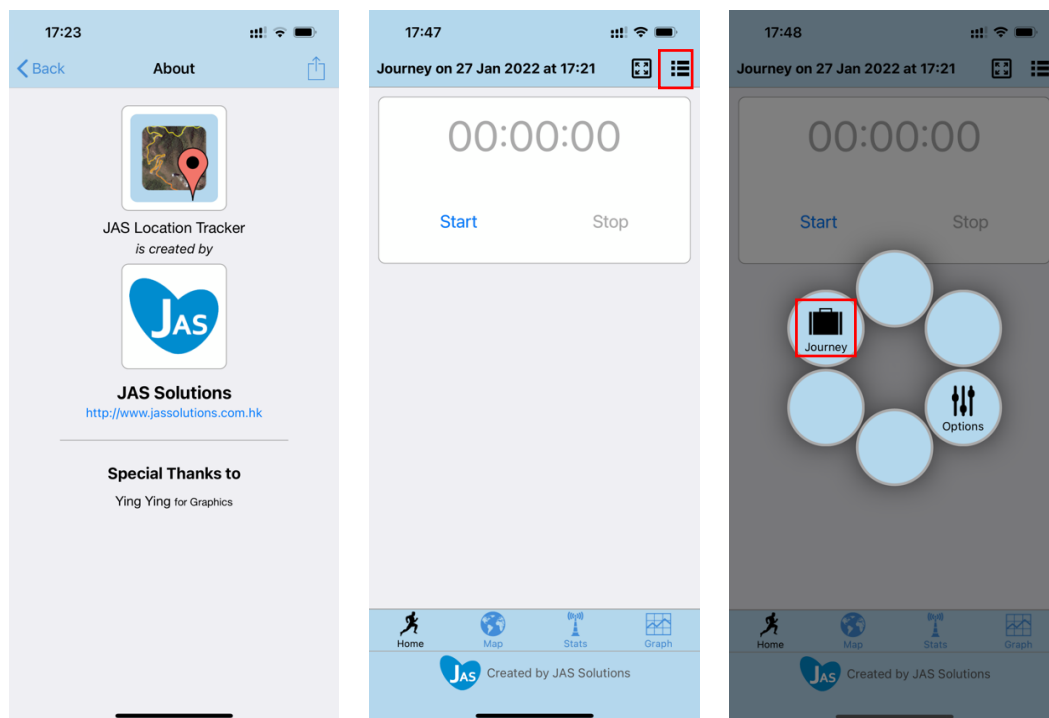
1.1 Download the application

There are many mobile phone applications with location tracking function that can record the location and path of a person, in this guide we will use JAS location tracker as an example.

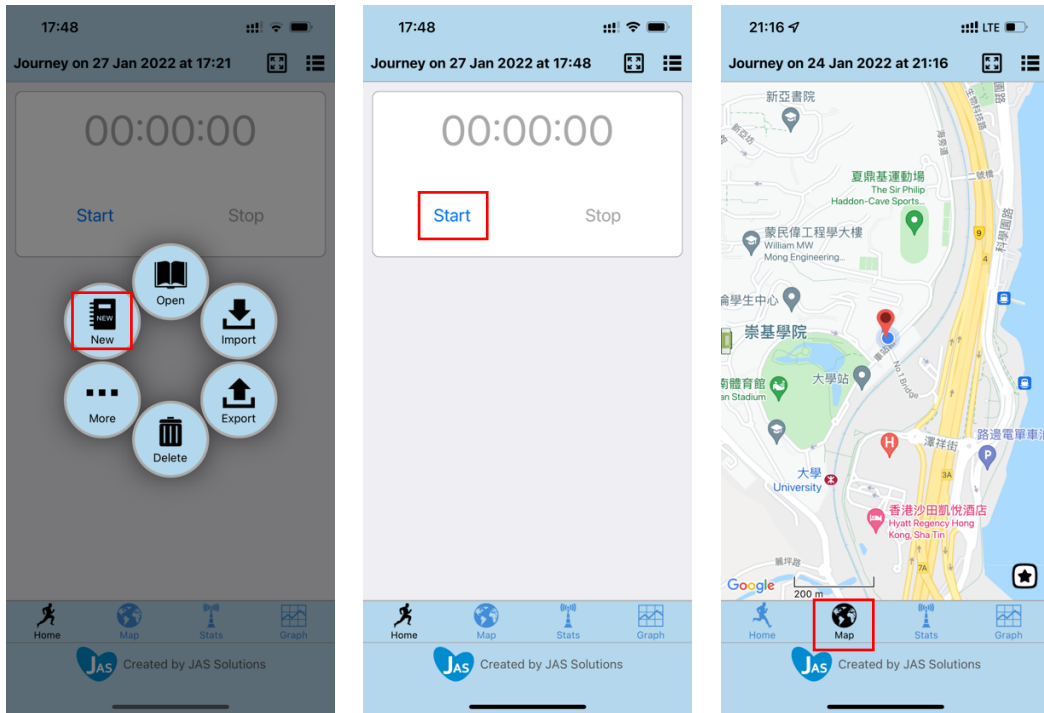
The JAS location tracker is only available for IOS, for Android phone users can use Geo-Tracker-GPS tracker. These two applications have similar functions and can export same type of data.



First download the application to your mobile device.



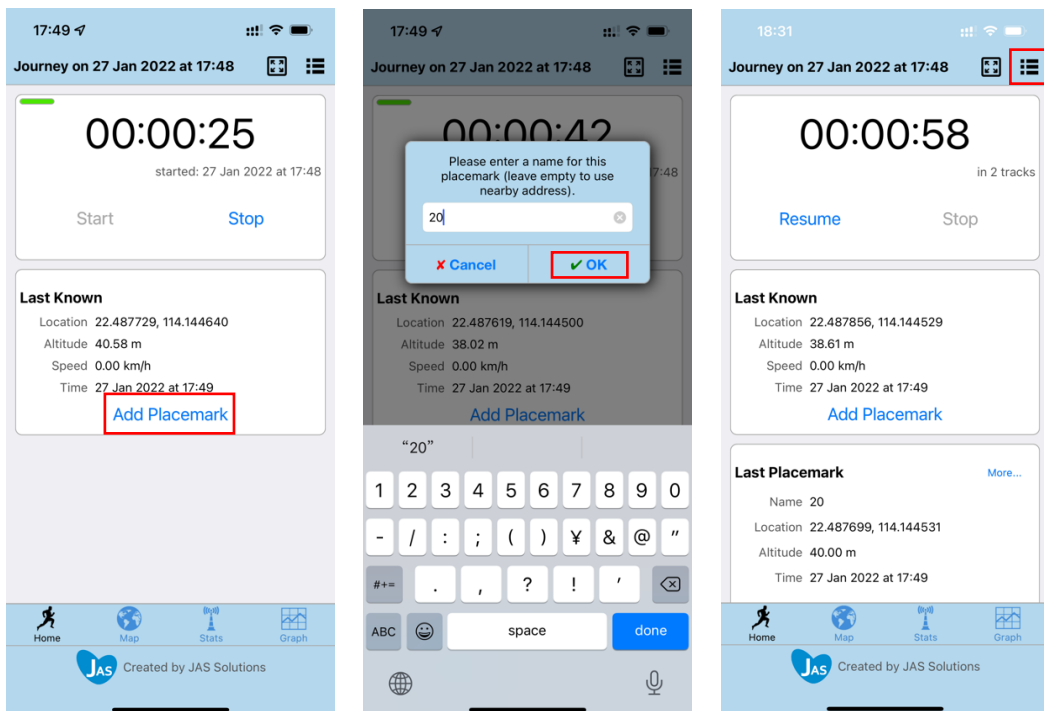
- Tap the three short lines in the upper right corner and then chose 'Journey'.



1.2 Start a new journey and export

- Chose 'New' to open a new journey.
- Tap Start and the phone will start to track your location and you can also check your location at Map in JAS location tracker.

In this guide we will take the example of marking the flow of people on the Chinese University of Hong Kong campus from University Station to Yasumoto International Academic Park and the School of Architecture.



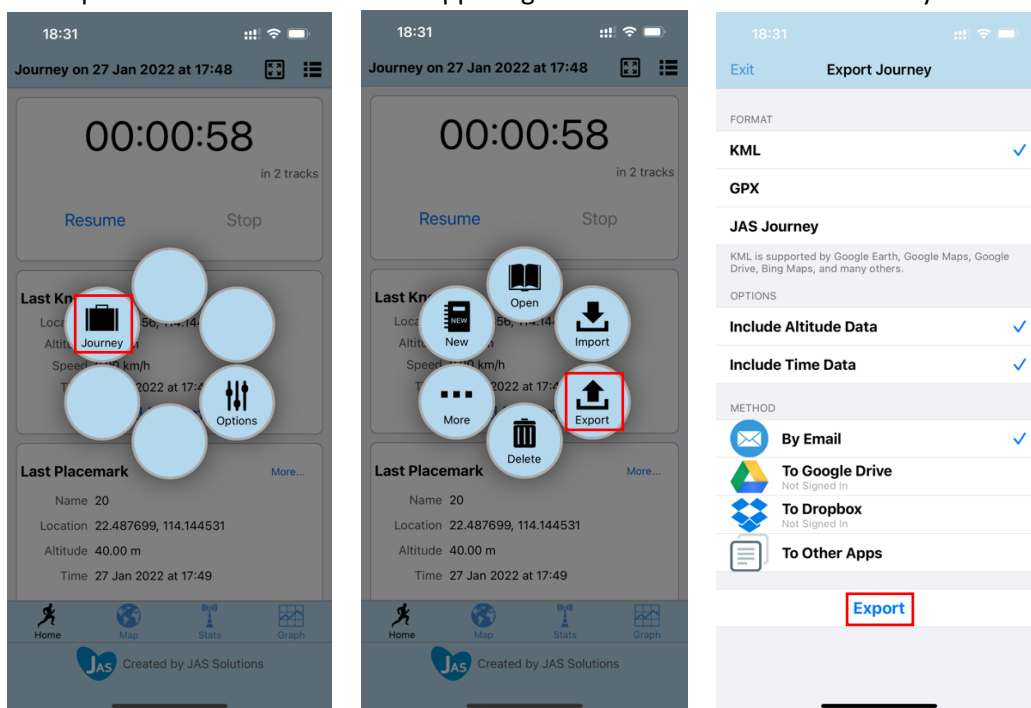
When you start to record the population flow in an area, go to some typical points and

count the number of people around that point.

- Tap Add Placemark to add points.
- Enter the number of people as the name of the placemark and then tap OK. You can also leave the name as empty, so the application will use the nearby address as the name.

After you have finish add all the placemark that you want then you need to export the data.

- Tap the three short lines in the upper right corner and then chose Journey.



- Tap Export.
- Chose format as KML and include altitude data and time data and chose the method that you want, then tap Export.

Then you will get a KML file named “journey.kml”, and you can add that into QGIS to do analysis.

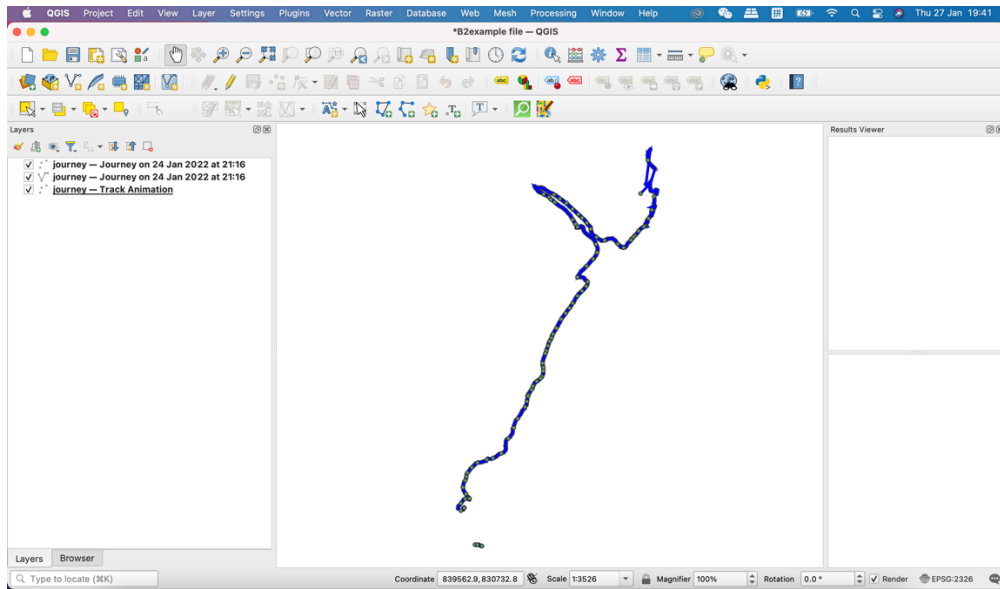
The application will track the route between start and stop point and also the location once a second during the journey automatically.

2. Process analysis map in QGIS

2.1 Import mobile device data to QGIS

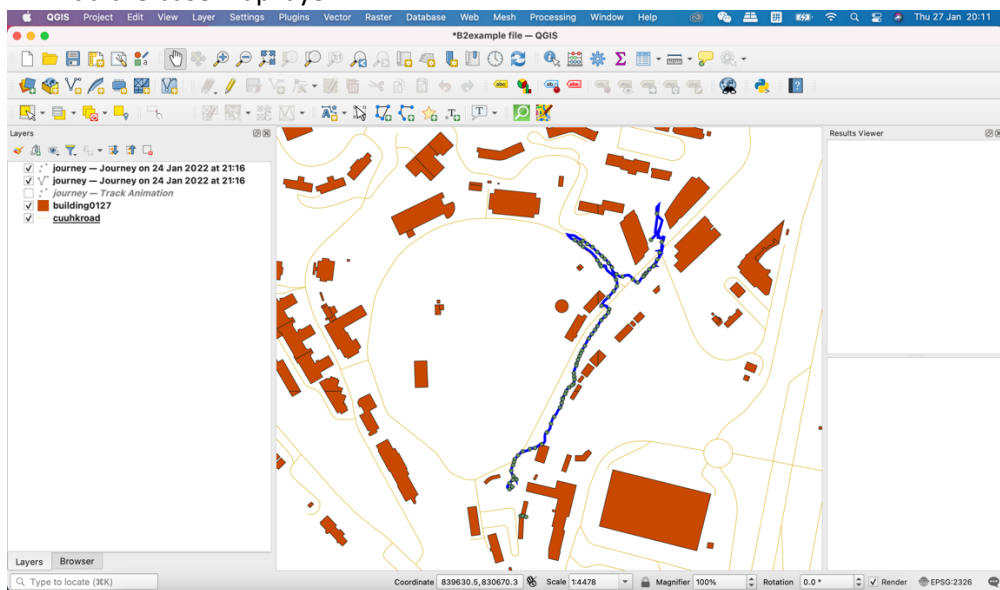
- Start QGIS and open a new project.
- Drag the KML file into QGIS.

There are three layers in the file, one is the route line of your journey, one is the location point of each second during the journey and last one is the point of placemark that you have added.



To make it more clear of the site of your survey, it's better to add the base map of the site. You can use the method in our micro-module A-A2 to obtain the base map.

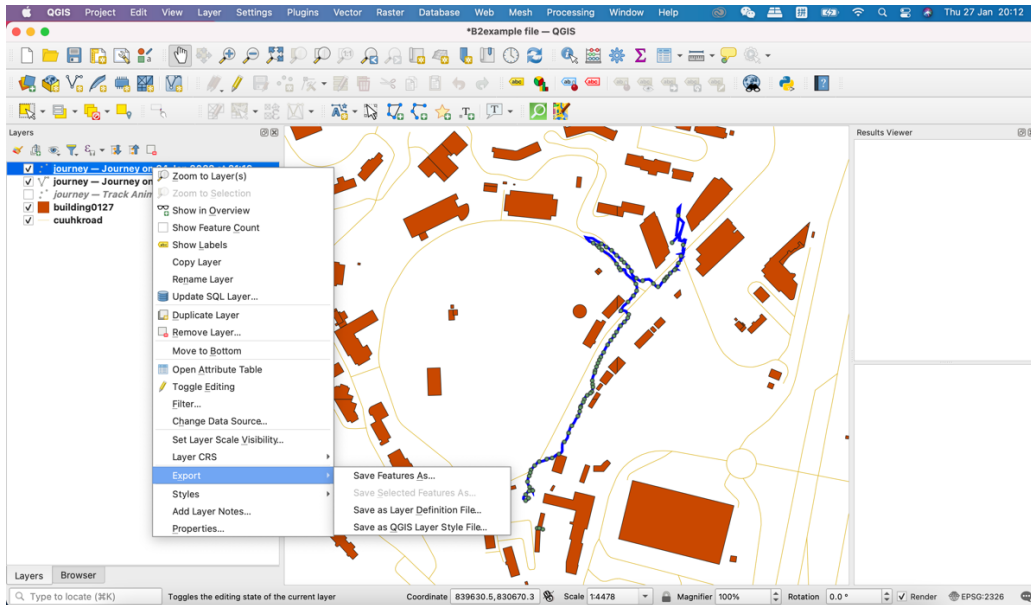
- Add the base map layer.



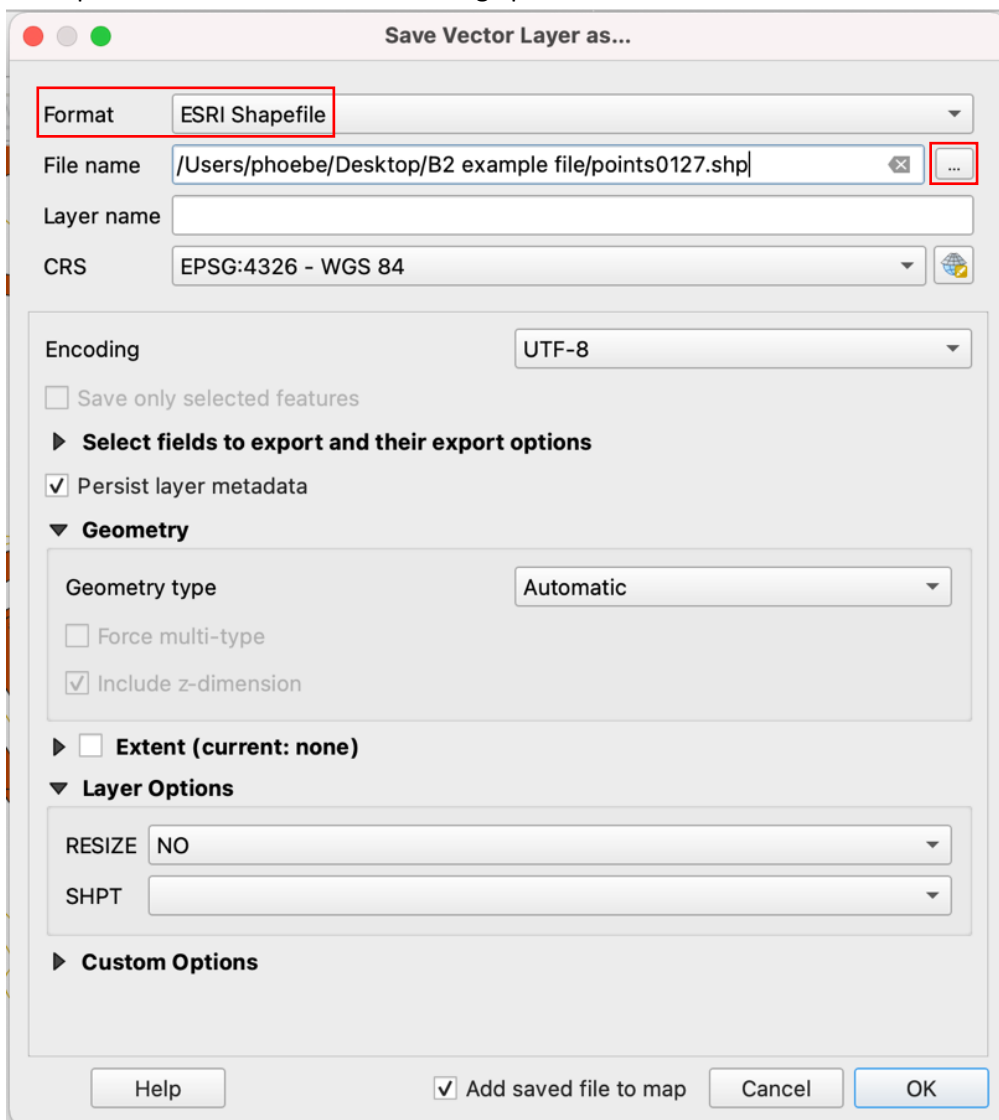
2.2 Preprocessing data

Before we conduct analysis method in the placemark layer we need to save the layer as shape file, which is convenient for edit.

- Right click the name of the placemark layer, chose 'Export- Save Features As'.

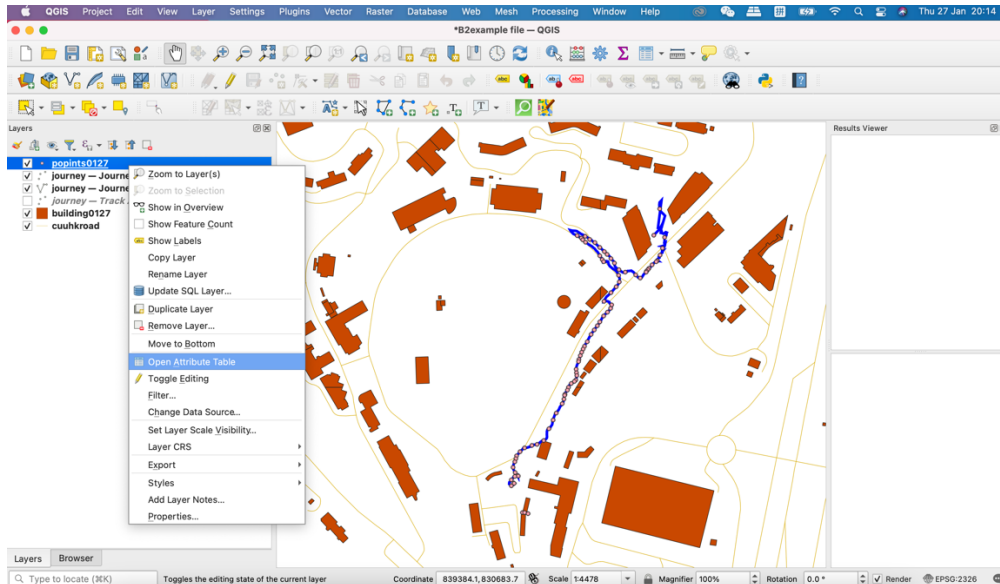


- Chose 'Format' as 'ESRI Shapefile'.
- Input the file name and chose storage path.



Because we have set the name of the points as the number of people, but the type of name is not number, so under this case we can not define the size of the point. So we need to create a new field which type is number and copy the values of name into the new field.

- Right click the name of the shapefile point layer and open 'Attribute Table'.

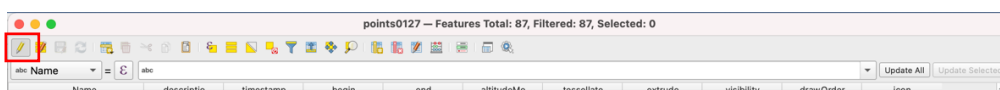


We can see under the field 'Name', it have 'Start', 'End', numbers and the address of the points.

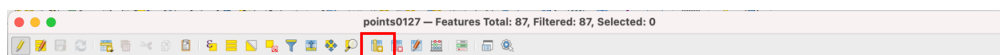
The screenshot shows the 'Attribute Table' for the 'points0127' layer. The table has 11 columns: Name, descriptio, timestamp, begin, end, altitudeMo, tessellate, extrude, visibility, drawOrder, and icon. The 'Name' column contains various entries including 'Start', 'End', and numbers (20, 25, 15, 15, 1, 5, 6, 7, 3). The 'descriptio' column contains dates like '24 Jan 2022 ...'. The 'timestamp', 'begin', and 'end' columns are mostly NULL. The 'altitudeMo' column contains the word 'absolute'. The 'tessellate', 'extrude', and 'visibility' columns contain -1, 0, and -1 respectively. The 'drawOrder' and 'icon' columns are NULL.

| Name | descriptio | timestamp | begin | end | altitudeMo | tessellate | extrude | visibility | drawOrder | icon |
|-----------------|-----------------|-----------|-------|------|------------|------------|---------|------------|-----------|------|
| 1 Start | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 2 End | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 3 Start | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 4 End | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 5 20 | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 6 25 | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 7 15 | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 8 15 | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 9 香港馬料水車站路綜... | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 10 香港馬料水車站路綜... | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 11 香港沙田康本國際學... | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 12 香港沙田康本國際學... | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 13 香港沙田康本國際學... | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 14 香港沙田康本國際學... | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 15 1 | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 16 5 | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 17 6 | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 18 7 | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |
| 19 3 | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL |

- Click 'Toggle Editing' and enter editing mode.



- Click 'New field' to add a new field.



- Name the new field and set 'Type' as 'Whole number'

| | Name | descriptio | timestamp | begin | end | altitudeMo | tessellate | extrude | visibility | drawOrder | icon | number | |
|----|------------|------------|-----------------|-------|------|------------|------------|---------|------------|-----------|------|--------|------|
| 1 | Start | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 2 | End | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 3 | Start | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 4 | End | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 5 | 20 | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 6 | 25 | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 7 | 15 | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 8 | 15 | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 9 | 香港馬料水車站... | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 10 | 香港馬料水車站... | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 11 | 香港沙田康本園... | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 12 | 香港沙田康本園... | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 13 | 香港沙田康本園... | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 14 | 香港沙田康本園... | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 15 | 1 | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 16 | 5 | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 17 | 6 | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |
| 18 | 7 | | 24 Jan 2022 ... | NULL | NULL | NULL | absolute | -1 | 0 | -1 | NULL | NULL | NULL |

Before copy the values under name to the new field, you need to delete the values that are not number under 'Name'.

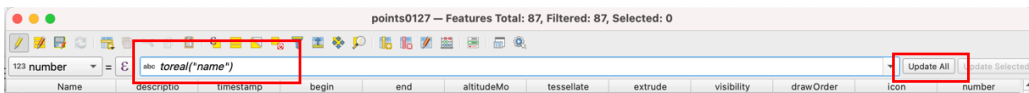
- Double click the value and delete and it will show 'NULL'.

Then you can copy the values to the new field.

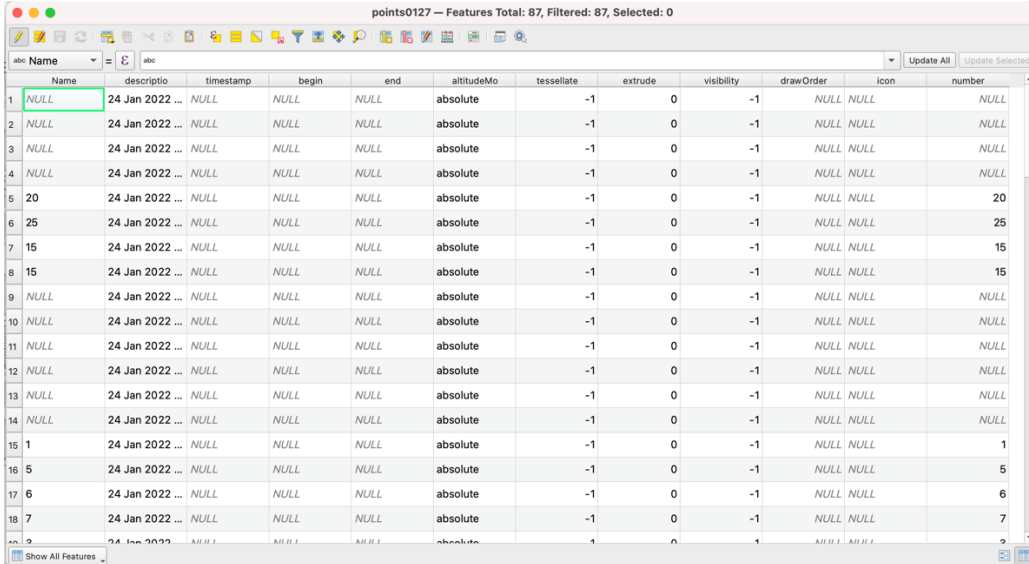
| abc | Name | |
|-----|------------|------------|
| abc | descriptio | descript |
| abc | timestamp | 24 Jan 20: |
| abc | begin | 24 Jan 20: |
| abc | end | 24 Jan 20: |
| abc | altitudeMo | 24 Jan 20: |
| 123 | tessellate | 24 Jan 20: |
| 123 | extrude | 24 Jan 20: |
| 123 | visibility | 24 Jan 20: |
| 123 | drawOrder | 24 Jan 20: |
| abc | icon | 24 Jan 20: |
| 123 | number | 24 Jan 20: |

- Click Name and chose number, which is the new field that you have add just before.

- Enter 'toreal("name")' and click 'Update All'.



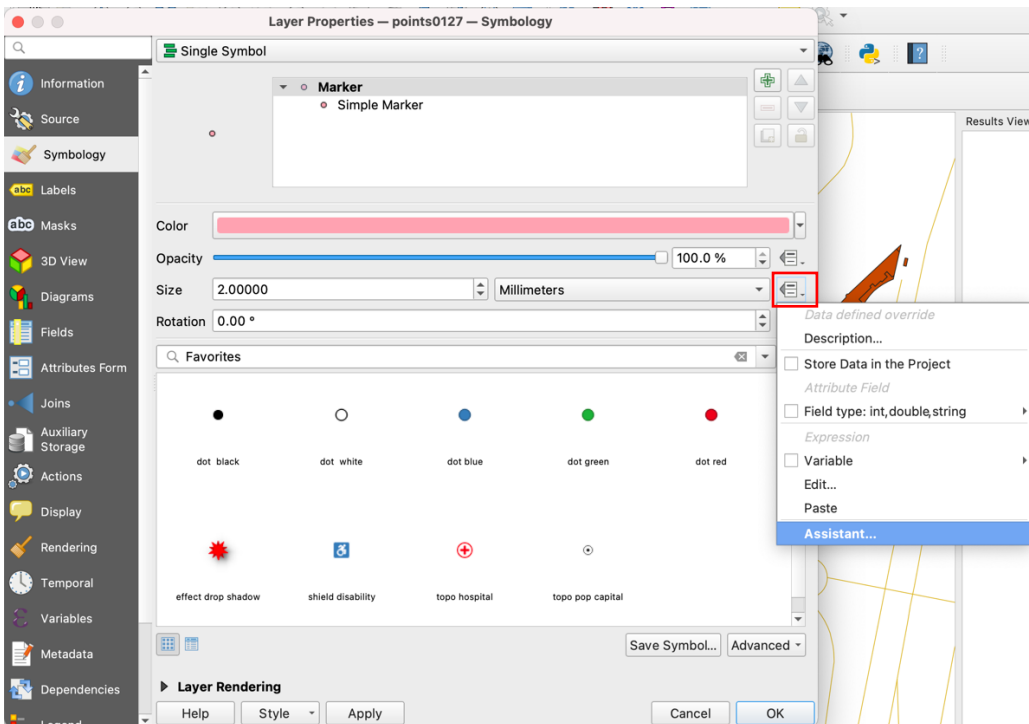
Then you will see the values under 'Name' has been copied to 'number'.



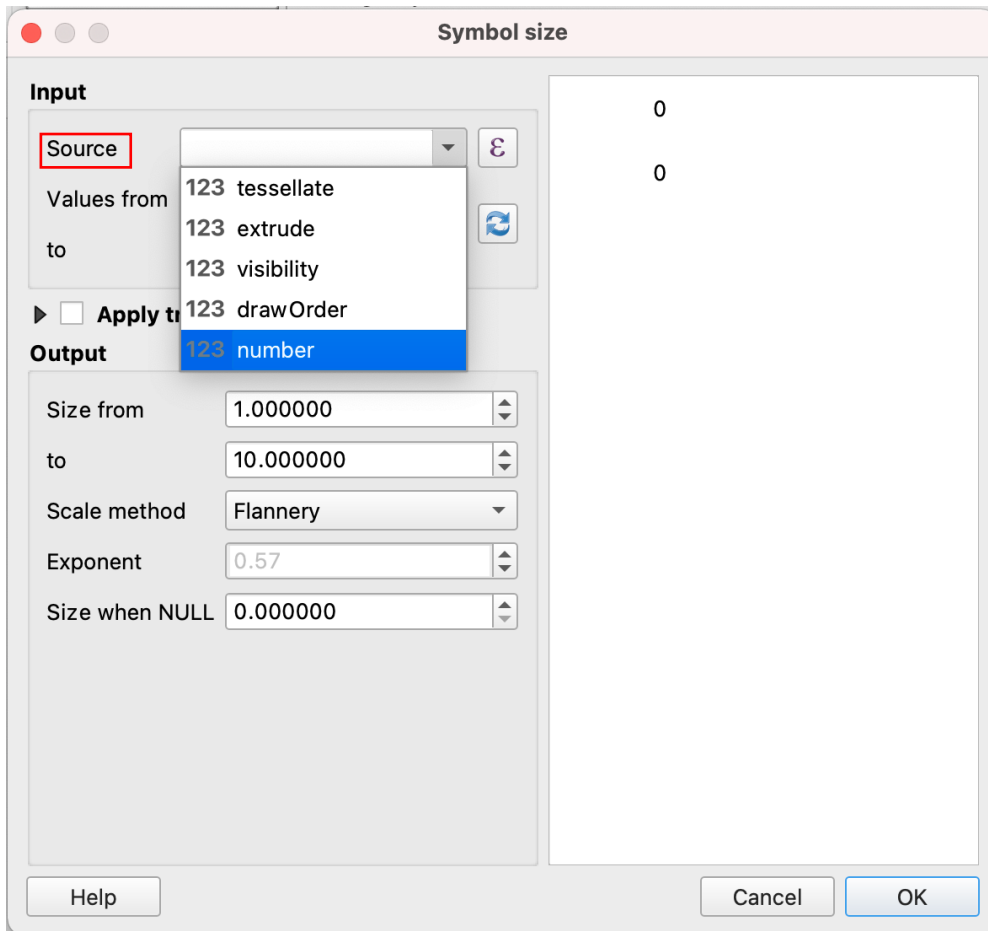
2.3 Size the placemark point

After we prepared the data we can define the size of the points.

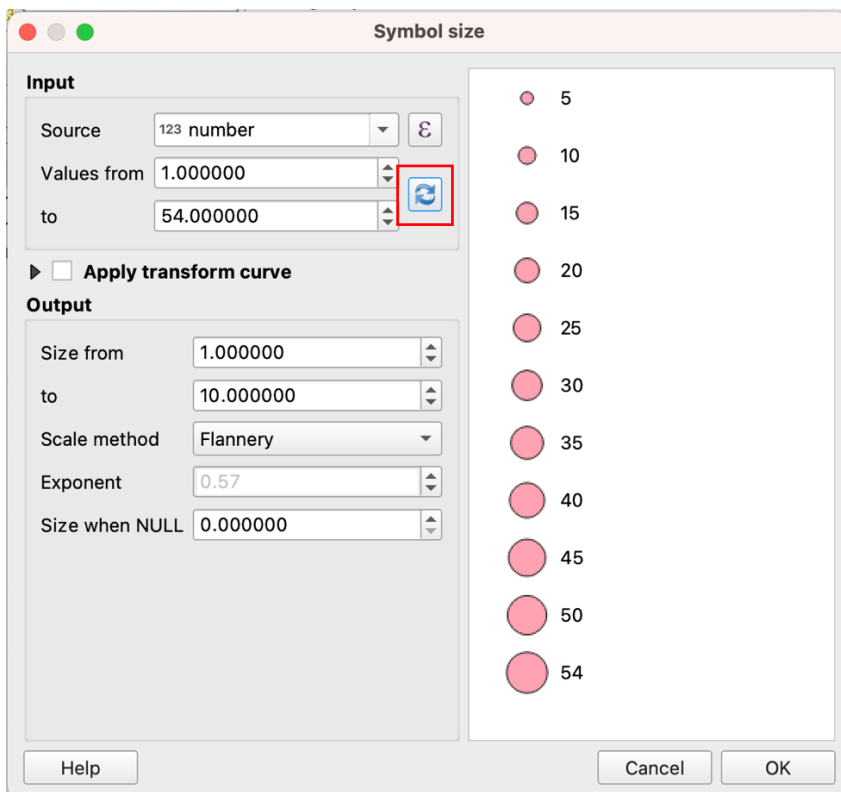
- Right click the name of the layer and go to 'Symbology' label.



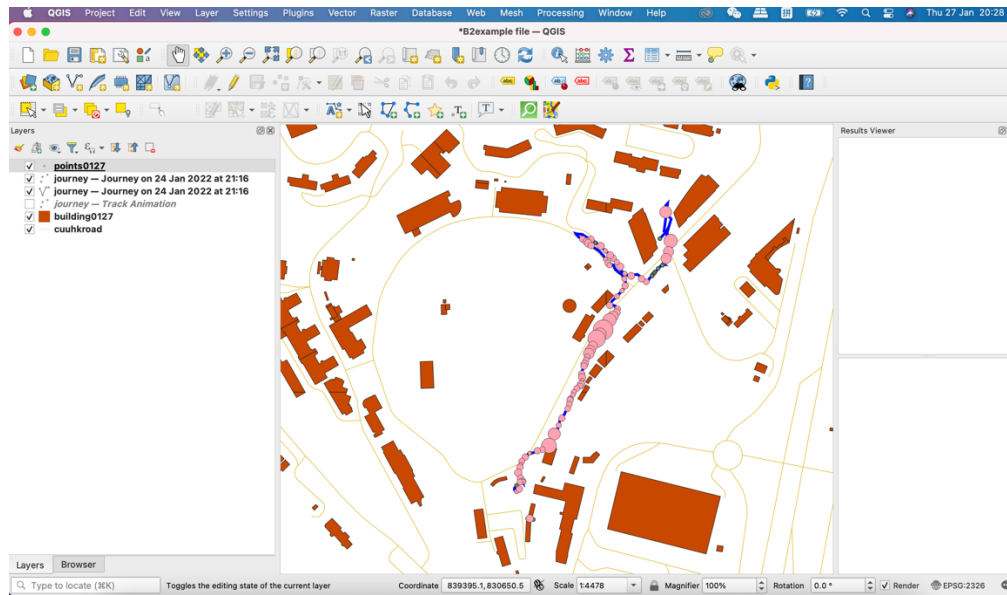
- Click the button at right of the size unit.
- Chose 'Assistant'.



- Chose 'Source' as number which is the field we have add just before.
- Click 'Fetch range from layer', you will see different size of point appear at right side.



Then you can get a map of the distribution of where people gathered. Combine with the situation of the space you can apply that in the analysis of urban issues.



For now you have gone through all the steps of using geolocation tracking application and processing data.

You can also use this kind of applications to track people's daily route. For example find a large amount of volunteers and ask them to download the application in their mobile devices to track their path in a period of time. Gather all the route data to see the access frequency of different destinations and does the space alongside the path that people pass by most frequently need to be improved.