**Integrated modeling**

4-Steps Small and Medium-Sized City Planning

Tools Implementation guide

1. **Subarea Analysis**
2. Select link analysis

* Tool used (methods): NEXTA, TransCAD, Cube, DTALite

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Input | Method | Output/input | Method | Output |
| Subarea boundary | TransCAD NEXTA | Subarea cut  Node.csv  Link.csv | DTALite | link\_performance.csv |
| OD demand from the entire network |  | subarea od demand file |  | route\_assignment.csv for subarea od based travel time statistics |
|  |  |  |  | Trajectory.csv |

Error: external station can not be reported

Use OSM2GMNS (Python package)

* Network files preparation

You requested too many nodes (limit is 50000). Either request a smaller area, or use planet.osm

Graphical user interface, text, application

Description automatically generated

1. Creating GMNS format network and specify POIs (High Definitions)

* Methods used: OSM2GMNS
* Visualization tool QGIS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Step** | **Process** | **Input file** | **Method** | **Output** |
| 1 | Network files preparation | map.osm (from OpenStreetMap) | OSM2GMNS (Python package) | link.csv |
|  |  |  |  | node.csv |
|  |  |  |  | poi.csv |

- Error: Point of interest issue reported to Jeiwie:

Text

Description automatically generated

1. **Trip Generation**

* Estimate the number of trips entering and leaving each zone

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Steps** | **Process** | **Input file** | Method | **Output** |
| 1 | - Zone generation.  - Partition network into grid cells | poi.csv  link.csv  node.csv | Grid2demand (Python package) | Zone.csv |
| 2 | - production/attraction rates of each land use (optional) | poi.csv, trip purpose set as 1 | Grid2demand | poi\_trip\_rate.csv |
| 3 | - Production/Attraction value of each node according to POI type | poi.csv  or  poi\_trip\_rate.csv | Grid2demand | *Updated:* node.csv  *Which contains # of production and attraction trips* |
| 4 | - zone-to-zone accessibility matrix.  - Change the latitude of the area of interest (optional). Default value assigned | Zone.csv  *Updated:* node.csv | Grid2demand | accessibility.csv (optional, however, it is needed if you preceding to next step, trip Distribution) |

**Trip generation excel base model**

1. Trip production

|  |  |  |
| --- | --- | --- |
| **Input file** | Method | **Output** |
| HD Zone Characteristic (Census data, # of HH, HH Income, Auto Ownership, Employmen) | Excel based model (ITE) | # Of production trips for each trip purpose (HBW, HBO, and NHB)>> person trips for all day |
| Trip production Coefficient Table |  |  |

1. Trip attraction

|  |  |  |
| --- | --- | --- |
| **Input file** | **Method** | **Output** |
| HD Zone Characteristic (Census data, # of HH, HH Income, Auto Ownership, Employmen) | Excel based model (ITE) | # Of attraction trips for each trip purpose (HBW, HBO, and NHB) >> person trips for all day all day |
| Trip Attraction Coefficient Table |  |  |

1. **Trip Distribution**

* Estimate the number of trips made between each zone
* Trip distribution classification is considered.
  + Classification of trip distribution
    - external > external (bypassing and traversing).
    - external > internal
    - internal > internal
    - internal > external

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Step** | **Process** | **Input file** | **Method** | **Output** |
| 1 | Apply gravity model to perform trip distribution | zone.csv  od\_accessibility.csv | Grid2demand (Python package) | demend.csv |
| 2 | Generate agent-based demand | demend.csv | Grid2demand | input\_agent.csv |

Table

Description automatically generated zone.csv set up

|  |  |  |  |
| --- | --- | --- | --- |
| Trip distribution classification | Zones (External or Internal) | Production P | Attraction A |
| external > external (manually from selected link) | E | E-E P | E-E A |
| external > internal | E | total P – E-E P | 0 |
| I | 0 | normal A |
| internal > internal  internal > external | E | 0 | total A – E-E A |
| I | normal P | normal A |

- zone.csv

Graphical user interface, application, table, Excel

Description automatically generated

1. **Traffic Assignment**
2. **Path4gmns**

Path4GMNS supports, in short,

- finding (static) shortest path between two nodes,

- constructing shortest paths for all individual agents,

- performing path-based User-Equilibrium (UE) traffic assignment,

- evaluating multimodal accessibility and equity,

- synthesizing zones and Origin-Destination (OD) demand for a given network.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Steps** | **Process** | **Input file** | Method | **Output** |
| 1 | - Finding (static) shortest path between two nodes.  - Constructing shortest paths for all individual agents, | node.csv  link.csv  demand.csv  settings.yml (for multimodal analyses) | Path4gmns (Python package) | agent.csv |
| 2 | - Performing path-based User-Equilibrium (UE) traffic assignment, | node.csv  link.csv  demand.csv  settings.csv (for DTALite) | DTALite (C++ package) | link\_performence.csv  (volume, v/c, speed, travel time)  route\_assignment.csv |
| 3 | - Synthesizing zones and Origin-Destination (OD) demand for a given network. | node.csv  link.csv  demand.csv  settings.csv (with ODME iterations)  measurement.csv | DTALite (C++ package) | link\_performence.csv  (with ODME deviation) route\_assignment.csv  (Volume before and after ODME) |

1. **DTALite**

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| --- | --- | --- |
| **Input file** | **Method** | **Output** |
| node.csv | DTALite | link\_performence.csv |
| link.csv |  | route\_assignment.csv |
| demand.csv or od demand matrix |  |  |
| settings.csv |  |  |
| Traffic Time Function/Volume Delay Function |  |  |

1. **ODME**

* **DTALite**

|  |  |  |
| --- | --- | --- |
| **Input file** | **Method** | **Output** |
| node.csv | DTALite (C++ package) | link\_performence.csv  with ODME deviation |
| link.csv |  | route\_assignment.csv  (Volume before and after ODME, volume difference) |
| demand.csv or od demand matrix |  | od\_accessibility.csv |
| settings.csv  with ODME iterations |  |  |
| measurement.csv |  |  |
|  |  |  |

- measurement.csv

Graphical user interface, application, table, Excel

Description automatically generated

- setting.csv or configuration file

Graphical user interface, application, table, Excel

Description automatically generated

**- New OD matrix** in od\_accessibility.csv

Graphical user interface, application, table, Excel

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