Network Assignment Module V1.0

Documentation

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# Introduction

## Scope and objectives

The Network assignemnt module is a static traffic assignment developed to assign trip matrices generated from parcel and shipment scheduling modules to the road networks.the result of this model is the intensities on road networks where the number of truck passing each link can be validated with actual truck counts.

# Requirements.

## Software requirements

The simulators have been built using Python version 3.8.8.

The following Python libraries need to be installed:

1. pandas==1.3.4
2. pyshp==2.1.3
3. tk==0.1.0
4. numpy==1.19.1
5. scipy==1.5.0
6. shapely==1.7.0
7. numba==0.53.0

## Input/Outputs

### Inputs

The inputs of the Shipment simulator are described in Table 1.

Table 1 Network assignment module– Inputs files

|  |  |
| --- | --- |
| Inputs | Description |
| skimTijd\_new\_REF.mtx | Travel time matrix |
| skimAfstand\_new\_REF.mtx | Distance matrix |
| links\_v5.shp | Road networks in the study area |
| nodes\_v5.shp | Shapefile of the Logistics nodes |
| Zones\_v6.shp | Shapefile of the traffic analysis zones |
| SEGS2020.csv | Sociodemographics of each zone |
| SupCoordinatesID.csv | External zones |
| Cost\_VehType\_2016.csv | Cost of transport per vehicle types |
| Cost\_Sourcing\_2016.csv | Cost of outsourcing |
| CarryingCapacity.csv | Capacity of the vehicles |
| EmissieFactoren\_BUITENWEG\_LEEG.csv | Emission factors for roads outside the cities when they are empty |
| EmissieFactoren\_BUITENWEG\_VOL.csv | Emission factors for roads outside the cities when they are full |
| EmissieFactoren\_SNELWEG\_LEEG.csv | Emission factors for motorways when they are empty |
| EmissieFactoren\_SNELWEG\_VOL.csv | Emission factors for motorways when they are full |
| EmissieFactoren\_STAD\_LEEG.csv | Emission factors for roads inside cities when they are empty |
| EmissieFactoren\_STAD\_VOL.csv | Emission factors for roads inside cities when they are full |
| emission\_type.txt | Types of emission |
| logistic\_segment.txt | Logistics segments |
| ParcelSchedule\_REF.csv | Parcel schedule generated by parcel scheduler |
| Shipments\_AfterScheduling\_REF.csv | Shipment schedules generated by shipment scheduler |
| Tours\_REF.csv | Tours generated bu tour module |
| tripmatrix\_parcels\_REF.txt | Trip matrix for parcels |
| tripmatrix\_parcels\_REF\_TOD0.txt | Trip matrix for parcels at 0:00 |
| tripmatrix\_parcels\_REF\_TOD1.txt | Trip matrix for parcels at 1:00 |
| tripmatrix\_parcels\_REF\_TOD2.txt | Trip matrix for parcels at 2:00 |
| tripmatrix\_parcels\_REF\_TOD3.txt | Trip matrix for parcels at 3:00 |
| tripmatrix\_parcels\_REF\_TOD4.txt | Trip matrix for parcels at 4:00 |
| tripmatrix\_parcels\_REF\_TOD5.txt | Trip matrix for parcels at 5:00 |
| tripmatrix\_parcels\_REF\_TOD6.txt | Trip matrix for parcels at 6:00 |
| tripmatrix\_parcels\_REF\_TOD7.txt | Trip matrix for parcels at 7:00 |
| tripmatrix\_parcels\_REF\_TOD8.txt | Trip matrix for parcels at 8:00 |
| tripmatrix\_parcels\_REF\_TOD9.txt | Trip matrix for parcels at 9:00 |
| tripmatrix\_parcels\_REF\_TOD10.txt | Trip matrix for parcels at 10:00 |
| tripmatrix\_parcels\_REF\_TOD11.txt | Trip matrix for parcels at 11:00 |
| tripmatrix\_parcels\_REF\_TOD12.txt | Trip matrix for parcels at 12:00 |
| tripmatrix\_parcels\_REF\_TOD13.txt | Trip matrix for parcels at 13:00 |
| tripmatrix\_parcels\_REF\_TOD14.txt | Trip matrix for parcels at 14:00 |
| tripmatrix\_parcels\_REF\_TOD15.txt | Trip matrix for parcels at 15:00 |
| tripmatrix\_parcels\_REF\_TOD16.txt | Trip matrix for parcels at 16:00 |
| tripmatrix\_parcels\_REF\_TOD17.txt | Trip matrix for parcels at 17:00 |
| tripmatrix\_parcels\_REF\_TOD18.txt | Trip matrix for parcels at 18:00 |
| tripmatrix\_parcels\_REF\_TOD19.txt | Trip matrix for parcels at 19:00 |
| tripmatrix\_parcels\_REF\_TOD20.txt | Trip matrix for parcels at 20:00 |
| tripmatrix\_parcels\_REF\_TOD21.txt | Trip matrix for parcels at 21:00 |
| tripmatrix\_parcels\_REF\_TOD22.txt | Trip matrix for parcels at 22:00 |
| tripmatrix\_parcels\_REF\_TOD23.txt | Trip matrix for parcels at 23:00 |
| tripmatrix\_REF.txt | Trip matrix for Shipments |
| tripmatrix\_REF\_TOD0.txt | Trip matrix for Shipments at 0:00 |
| tripmatrix\_REF\_TOD1.txt | Trip matrix for Shipments at 1:00 |
| tripmatrix\_REF\_TOD2.txt | Trip matrix for Shipments at 2:00 |
| tripmatrix\_REF\_TOD3.txt | Trip matrix for Shipments at 3:00 |
| tripmatrix\_REF\_TOD4.txt | Trip matrix for Shipments at 4:00 |
| tripmatrix\_REF\_TOD5.txt | Trip matrix for Shipments at 5:00 |
| tripmatrix\_REF\_TOD6.txt | Trip matrix for Shipments at 6:00 |
| tripmatrix\_REF\_TOD7.txt | Trip matrix for Shipments at 7:00 |
| tripmatrix\_REF\_TOD8.txt | Trip matrix for Shipments at 8:00 |
| tripmatrix\_REF\_TOD9.txt | Trip matrix for Shipments at 9:00 |
| tripmatrix\_REF\_TOD10.txt | Trip matrix for Shipments at 10:00 |
| tripmatrix\_REF\_TOD11.txt | Trip matrix for Shipments at 11:00 |
| tripmatrix\_REF\_TOD12.txt | Trip matrix for Shipments at 12:00 |
| tripmatrix\_REF\_TOD13.txt | Trip matrix for Shipments at 13:00 |
| tripmatrix\_REF\_TOD14.txt | Trip matrix for Shipments at 14:00 |
| tripmatrix\_REF\_TOD15.txt | Trip matrix for Shipments at 15:00 |
| tripmatrix\_REF\_TOD16.txt | Trip matrix for Shipments at 16:00 |
| tripmatrix\_REF\_TOD17.txt | Trip matrix for Shipments at 17:00 |
| tripmatrix\_REF\_TOD18.txt | Trip matrix for Shipments at 18:00 |
| tripmatrix\_REF\_TOD19.txt | Trip matrix for Shipments at 19:00 |
| tripmatrix\_REF\_TOD20.txt | Trip matrix for Shipments at 20:00 |
| tripmatrix\_REF\_TOD21.txt | Trip matrix for Shipments at 21:00 |
| tripmatrix\_REF\_TOD22.txt | Trip matrix for Shipments at 22:00 |
| tripmatrix\_REF\_TOD23.txt | Trip matrix for Shipments at 23:00 |
| TripsVanConstruction.mtx | Trips of vans for construction industries |
| TripsVanService.mtx | Service trips made by Vans |
| vehicle\_type.txt | Vehicle types |

### Outputs

The outputs of the Traffic module are described in Table 2.

Table 2 Network assignment module– Outputs description

|  |  |
| --- | --- |
| Outputs | Description |
| links\_loaded\_REF\_intensities.csv | Links loaded with truck intensities |
| ParcelSchedule\_REF\_Emission.csv | Parcel schedules with emissions |
| Shipments\_AfterScheduling\_REF\_Emission.csv | Shipment schedules with emissions |
| Tours\_REF\_Emission.csv | Tours with emission |
| links\_loaded\_REF.shp | Shape file of the loaded link with truck intensities |
| Logfile\_TrafficAssignment.log | Log file of the simulation for network assignment |

## Paths structure

The directory where the model is located has the following structure:

── Root

├── Input Folder

│

└── Output folder

# Model Description

This section describes the different files and scripts present in the model

|  |  |  |
| --- | --- | --- |
| File name | Location | Description |
| \_\_module\_TRAF\_\_.py | Root | Main script |
| \_\_functions\_\_.py | Root | External functions |
| requirements.txt | Root | Python packages required |
| Instruction.txt | Root | Instruction to run code from console |

# Instructions to run the model

## Command line execution of the model

### Instructions and commands

The instruction to install the packages needed:

* pip install -r requirements.txt

The instruction to run the model

python3 \_\_module\_TRAF\_\_.py Label Input Output skimTijd\_new\_REF.mtx skimAfstand\_new\_REF.mtx nodes\_v5.shp Zones\_v6.shp SocioeconomicData.csv links\_v5.shp SupCoordinatesID.csv Cost\_VehType\_2016.csv Cost\_Sourcing\_2016.csv CarryingCapacity.csv EmissieFactoren\_BUITENWEG\_LEEG.csv EmissieFactoren\_BUITENWEG\_VOL.csv EmissieFactoren\_SNELWEG\_LEEG.csv EmissieFactoren\_SNELWEG\_VOL.csv EmissieFactoren\_STAD\_LEEG.csv missieFactoren\_STAD\_VOL.csv

### Arguments

The arguments in the instructions to run the model are as follows. Please note that the inputs files that are needed in the arguments are those which are not generated by any other models. The network assignment requires a lot more inputs as expressed in the Table 1 which are generated by shipment, tour and parcel modules.

Table 3 Network assignment– Inputs for command line

|  |  |
| --- | --- |
| Arg[0] | Script name |
| Arg[1] | Lable(Name of the Scenario) |
| Arg[2] | Input folder name |
| Arg[3] | Output folder name |
| Arg[4] | Time skim matrix |
| Arg[5] | Distance skim matrix |
| Arg[6] | logistics nodes |
| Arg[7] | study area |
| Arg[8] | Socioeconomic Data |
| Arg[9] | Network links |
| Arg[10] | External Zones |
| Arg[11] | Cost per vehicle type |
| Arg[12] | Cost of our-sourcing |
| Arg[13] | Carrying capacity |
| Arg[14] | Emission factors for roads outside the cities when they are empty |
| Arg[15] | Emission factors for roads outside the cities when they are full |
| Arg[16] | Emission factors for motorways when they are empty |
| Arg[17] | Emission factors for motorways when they are full |
| Arg[18] | Emission factors for roads inside cities when they are empty |
| Arg[19] | Emission factors for roads inside cities when they are full |

## Requirements

### Testing requirements

pip install -r requirements.txt

### Input folder (Arg[2])

Folder 1( e.g. Input)

Table 4 Network assignment– Inputs description

|  |  |  |
| --- | --- | --- |
| Inputs | Type | Description |
| skimTijd\_new\_REF.mtx | mtx | Id of areas ordered increasingly |
| skimAfstand\_new\_REF.mtx | mtx | Id of areas ordered increasingly |
| links\_v5.shp | shp |  |
| nodes\_v5.shp | shp | Logistics node shapefile |
| Zones\_v6.shp | shp | Zones of the study area |
| SEGS2020.csv | csv | Required cols:  “zone”;  "1: woningen";  "9: arbeidspl\_totaal" |
| SupCoordinatesID.csv | csv | Required cols:  “COROP”;  " Xcoor ";  “Ycoor”;  " AREANR "; |
| Cost\_VehType\_2016.csv | csv | cost per vehicle types  "columns":[{  "CostPerKm":"float",  "CostPerH": "float"  }] |
| Cost\_Sourcing\_2016.csv | csv | cost of out sourcing  "columns":[{  "CostPerKm":"float",  "CostPerH": "float"  }] |
| CarryingCapacity.csv | csv | carrying capacity  "columns":[{  "Vehicle Type":"str",  "Tonnes": "float"  }] |
| EmissieFactoren\_BUITENWEG\_LEEG.csv | csv | Emission Factors  "columns":[{  " Voertuigtype":"str",  " CO2 (gram/km)": "float"  " SO2 (mg/km)":"float",  "PMv (mg/km)": "float"  "NOx (g/km) ":"float",  "PMslijtage (mg/km) ": "float"  }] |
| EmissieFactoren\_BUITENWEG\_VOL.csv | csv | Emission Factors  "columns":[{  " Voertuigtype":"str",  " CO2 (gram/km)": "float"  " SO2 (mg/km)":"float",  "PMv (mg/km)": "float"  "NOx (g/km) ":"float",  "PMslijtage (mg/km) ": "float"  }] |
| EmissieFactoren\_SNELWEG\_LEEG.csv | csv | Emission Factors  "columns":[{  " Voertuigtype":"str",  " CO2 (gram/km)": "float"  " SO2 (mg/km)":"float",  "PMv (mg/km)": "float"  "NOx (g/km) ":"float",  "PMslijtage (mg/km) ": "float"  }] |
| EmissieFactoren\_SNELWEG\_VOL.csv | csv | Emission Factors  "columns":[{  " Voertuigtype":"str",  " CO2 (gram/km)": "float"  " SO2 (mg/km)":"float",  "PMv (mg/km)": "float"  "NOx (g/km) ":"float",  "PMslijtage (mg/km) ": "float"  }] |
| EmissieFactoren\_STAD\_LEEG.csv | csv | Emission Factors  "columns":[{  " Voertuigtype":"str",  " CO2 (gram/km)": "float"  " SO2 (mg/km)":"float",  "PMv (mg/km)": "float"  "NOx (g/km) ":"float",  "PMslijtage (mg/km) ": "float"  }] |
| EmissieFactoren\_STAD\_VOL.csv | csv | Emission Factors  "columns":[{  " Voertuigtype":"str",  " CO2 (gram/km)": "float"  " SO2 (mg/km)":"float",  "PMv (mg/km)": "float"  "NOx (g/km) ":"float",  "PMslijtage (mg/km) ": "float"  }] |
| emission\_type.txt | txt | Emission type  "columns":[{  "ID":"Int",  "comment": "str"  }] |
| logistic\_segment.txt | txt | Logistic segment  "columns":[{  "ID":"Int",  "comment": "str"  }] |
| TripsVanConstruction.mtx | mtx | Service trips matrix for construction |
| TripsVanService.mtx | mtx | Service Trip matrix |
| vehicle\_type.txt | txt | Vehicle type  "columns":[{  "ID":"Int",  "IsRefTypeFreight": "boolean",  "IsAvailableInParcelModule":" boolean",  " Comment ":"str",  }] |