Part Ⅲ. Run Vehicle in The Road Network

1. Generating random traffic in road network

ls ../sumo-0.21.0/tools/trip

./randomTrips.py --help

```
kwoncesc@kwoncesc-VirtualBox:~/sumo-0.22.0/tools/trip$ ls
generateTripsXml.py  removeGeometryInTrips.pl        route2trips.py          trips.trips.xml
randomTrips.py       removeTripsIfNotInInterval.pl  splitTripsByHours.pl
kwoncesc@kwoncesc-VirtualBox:~/sumo-0.22.0/tools/trip$ ./radomTrips.py --help
bash: ./radomTrips.py: No such file or directory
kwoncesc@kwoncesc-VirtualBox:~/sumo-0.22.0/tools/trip$ ./randomTrips.py --help
Usage: randomTrips.py [options]

Options:
  -h, --help            show this help message and exit
  -n NETFILE, --net-file=NETFILE
                        define the net file (mandatory)
  -a ADDITIONAL, --additional-files=ADDITIONAL
                        define additional files to be loaded by the router
  -o TRIPFILE, --output-trip-file=TRIPFILE
                        define the output trip filename
  -r ROUTEFILE, --route-file=ROUTEFILE
                        generates route file with duarouter
  --weights-prefix=WEIGHTSPREFIX
                        loads probabilities for being source, destination and
                        via-edge from the files named <prefix>.src.xml,
                        <prefix>.sink.xml and <prefix>.via.xml
  --weights-output-prefix=WEIGHTS_OUTPREFIX
                        generates weights files for visualisation
  --pedestrians         create a person file with pedestrian trips instead of
                        vehicle trips
  --prefix=TRIPPREFIX   prefix for the trip ids
  -t TRIPATTRS, --trip-attributes=TRIPATTRS
                        additional trip attributes
  -b BEGIN, --begin=BEGIN
                        begin time
  -e END, --end=END     end time (default 3600)
  -p PERIOD, --period=PERIOD
                        repetition period (default 1)
  -s SEED, --seed=SEED  random seed
  -l, --length          weight edge probability by length
  -L, --lanes           weight edge probability by number of lanes
  --speed-exponent=SPEED_EXPONENT
                        weight edge probability by speed^<FLOAT> (default 0)
  --fringe-factor=FRINGE_FACTOR
                        multiply weight of fringe edges by <FLOAT> (default 1
  --fringe-threshold=FRINGE_THRESHOLD
                        only consider edges with speed above <FLOAT> as fringe
                        edges (default 0)
  --min-distance=MIN_DISTANCE
                        require start and end edges for each trip to be at
                        least <FLOAT> m appart
  --max-distance=MAX_DISTANCE
                        require start and end edges for each trip to be at
```

Please check the detail explanation for this tool:

http://sumo.dlr.de/wiki/Tools/Trip

Usage:

Input the net.xml file we generated before.

Run:

./randomTrips.py -n *.net.xml -e 7200 -p 0.5

```
kwoncesc@kwoncesc-VirtualBox:~/sumo-0.22.0/tools/trip$ ./randomTrips.py -n /home/kwoncesc/california.
net.xml -e 7200 -p 0.5 -o california.trips.xml
```

```
kwoncesc@kwoncesc-VirtualBox:~/sumo-0.22.0/tools/trip$ ls
california.trips.xml  randomTrips.py            removeTripsIfNotInInterval.pl  splitTripsByHours.pl
generateTripsXml.py   removeGeometryInTrips.pl  route2trips.py                trips.trips.xml
```

Several important parameters:

-e END,   end time (default 3600)

-p PERIOD, repetition period (default 1) // the default means every 1 second inject 1 vehicle

-o TRIPFILE, define the output trip filename // if not specify, the default name is trips.trips.xml

Then you can get trips file, you can directly use this file as a route file working with net file.

The contents of trip file:

```
─<!--
    generated on 2017-08-16 15:14:00.690674 by $Id: randomTrips.py 17235 2014-11-03 10:53:02Z behrisch $
    options: -n /home/kwoncesc/california.net.xml -e 7200 -p 0.5 -o california.trips.xml
-->
─<trips>
    <trip id="0" depart="0.00" from="464448045#1" to="499707721#0"/>
    <trip id="1" depart="0.50" from="32936886" to="464448014"/>
    <trip id="2" depart="1.00" from="-405341708" to="-405318783"/>
    <trip id="3" depart="1.50" from="13303869#1" to="-405367735"/>
    <trip id="4" depart="2.00" from="32893017#0" to="-352357246#0"/>
    <trip id="5" depart="2.50" from="-13454718#1" to="500508196#1"/>
    <trip id="6" depart="3.00" from="181708019#5" to="-13400236#1"/>
    <trip id="7" depart="3.50" from="489944934#1" to="405367747"/>
    <trip id="8" depart="4.00" from="-405341706" to="-405365446#3"/>
    <trip id="9" depart="4.50" from="-405367802#0" to="32880630#0"/>
    <trip id="10" depart="5.00" from="-13463319" to="32276640#1"/>
    <trip id="11" depart="5.50" from="181708019#0" to="-405367737"/>
    <trip id="12" depart="6.00" from="405360896#0" to="512415226#0"/>
    <trip id="13" depart="6.50" from="405328998" to="-405360926"/>
    <trip id="14" depart="7.00" from="405341710#1" to="405358494#2"/>
    <trip id="15" depart="7.50" from="405367802#0" to="32892927#2"/>
    <trip id="16" depart="8.00" from="405341705" to="405349836#2"/>
    <trip id="17" depart="8.50" from="500508226" to="32905834#3"/>
    <trip id="18" depart="9.00" from="-500787789" to="500508222"/>
    <trip id="19" depart="9.50" from="-405367743#0" to="489944932"/>
    <trip id="20" depart="10.00" from="489944920" to="13454693#4"/>
    <trip id="21" depart="10.50" from="-500787788" to="500506594#1"/>
    <trip id="22" depart="11.00" from="499710955" to="-512415217#0"/>
    <trip id="23" depart="11.50" from="-489944927" to="-32936790#0"/>
    <trip id="24" depart="12.00" from="-418120483" to="-405318811"/>
    <trip id="25" depart="12.50" from="-405363012" to="177240635#3"/>
    <trip id="26" depart="13.00" from="32952052#0" to="-464448015#0"/>
    <trip id="27" depart="13.50" from="182939312#1" to="508456292#1"/>
    <trip id="28" depart="14.00" from="13281632#3" to="499707721#1"/>
    <trip id="29" depart="14.50" from="405363001#0" to="405367735"/>
    <trip id="30" depart="15.00" from="-489944929#0" to="32892912"/>
    <trip id="31" depart="15.50" from="13454693#5" to="-379696722#2"/>
    <trip id="32" depart="16.00" from="13351800#3" to="-13400236#2"/>
    <trip id="33" depart="16.50" from="13303869#6" to="32893280#0"/>
```

2. Specifying route

Or by the following tool some shortest path can be generated as a route file based on the trip file made above:

duarouter

```
kwoncesc@kwoncesc-VirtualBox:~/sumo-0.22.0/tools/trip$ duarouter
SUMO duarouter Version 0.22.0
 Copyright (C) 2001-2014 DLR and contributors; http://sumo.dlr.de
 License GPLv3+: GNU GPL Version 3 or later <http://gnu.org/licenses/gpl.html>
 Use --help to get the list of options.
```

For a complete information of this tool, please check the following page:

http://sumo.dlr.de/wiki/DUAROUTER

Several important parameters:

-t, --trip-files FILE   // Read trip-definitions from FILE(s), which is generated from generateTrips.py

-n, --net-file FILE   // Use FILE as SUMO-network to route on, specify the net file

-o, FILE   // specify output file name

```
kwoncesc@kwoncesc-VirtualBox:~/sumo-0.22.0/tools/trip$ duarouter -t california.trips.xml -n /home/kwo
ncesc/california.net.xml -o california.route.xml
```

The generated file looks like following:

```xml
<!--
    generated on Wed Aug 16 15:18:33 2017 by SUMO duarouter Version 0.22.0
    <?xml version="1.0" encoding="UTF-8"?>

    <configuration xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="http://sumo.dlr.de/xsd/duar

        <input>
            <net-file value="/home/kwoncesc/california.net.xml"/>
            <trip-files value="california.trips.xml"/>
        </input>

        <output>
            <output-file value="california.route.xml"/>
        </output>

    </configuration>
-->
<routes xsi:noNamespaceSchemaLocation="http://sumo.dlr.de/xsd/routes_file.xsd">
  <vehicle id="0" depart="0.00">
    <route edges="464448045#1 464448043#2 -32892927#0 -508405422#1 -508405422#0 405363013#3
     405363014#0 405363014#1 405363014#2 405363014#3 405362996 405363003 405363002 405369815
     405369813 405369819 405369817 32893017#0 32893017#1 32893017#2 500502111 500502108#1
     405365436#0 405365436#1 405365438 -499707721#0 499707721#0"/>
  </vehicle>
  <vehicle id="1" depart="0.50">
    <route edges="32936886 -32936886 405349836#2 405349836#3 405341711#1 405341712#0
     405341712#1 405341699 405341698 405341705 405341708 405341706 405341707 405341710#0
     405341710#1 405318804 405318797 13454693#0 13454693#1 464448014"/>
  </vehicle>
  <vehicle id="2" depart="1.00">
    <route edges="-405341708 405341708 405341706 405341707 405341710#0 405341710#1 405318804
     405318797 405318792 405318803 405318789 405318795 405318783 32892927#0 -32892927#0
     -405318783"/>
  </vehicle>
  <vehicle id="3" depart="1.50">
    <route edges="13303869#1 -13303869#1 -13303869#0 -405360998#1 -405360998#0 -405360954
     -405360926 -405367747 -405367740 -405367735"/>
  </vehicle>
  <vehicle id="5" depart="2.50">
    <route edges="-13454718#1 -13454718#0 13448414 -512415215#2 -13281632#5 -13281632#4
     -13281632#3 -13281632#2 -13281632#1 -13281632#0 -405365419 -405365410 -405365425 -32928674
     406477548 500502107#0 32893290#0 32893290#1 500508196#1"/>
```

3. Running in SUMO-GUI

2 ways: command line and in-gui

a. command line:

sumo-gui -n *.net.xml -r *.route.xml

// read net file and route file, for more information, please see the sumo-gui --help

b. in-gui:

1. make configuration file:

file name shall be *.sumocfg

```
<configuration>
    <input>
        <net-file value="*.net.xml"/>
        <route-files value="*.rou.xml"/>
        <additional-files value="*.add.xml"/>
    </input>
</configuration>
```

2. open sumo-gui, and load the configuration file (or directly use command line mode)

File->Open Simulation->load configuration file

Then run the simulation, you will see vehicles running in the road network.

SUMO 0.22.0

File   Edit   Settings   Locate   Simulation   Windows   Help

Time: Delay (ms):   0

standard

0m   1000m

Loading net-file from '/home/kwoncesc/california.net.xml'... done (512ms).
Loading done.

Opens a menu which lets you edit the viewport.   x:-2978.86, y:5300.15   lat:34.261903, lon:-118.5057