User guide for space-time-diagram_gmns

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The program "space-time diagram.py" written in Python 3.7 first read the data from the files **node.csv, road_link.csv and agent.csv** of NeXTA-GMNS (the Github repository of NeXTA-GMNS is available at https://github.com/xzhou99/NeXTA-GMNS), and the space-time trajectories of the vehicles on a path (i.e., a set of sequentially connected road links) are displayed in a figure using the Python matplotlib library.

The fields of data in the three .csv files that are necessary are listed as follows:

1. node.csv

Field Name	Description	Sample Value
name	Optional for visualization only	Main street @ Highland Dr.
node_id	Node identification number	1001
x_coord	Longitude or horizontal coordinate in any arbitrary geographic coordinate system.	100
y_coord	Latitude or vertical coordinate horizontal coordinate in any arbitrary geographic coordinate system	200

2. road_link.csv

Field Name	Description	Sample Values
name	Optional for visualization purposes	Main Street
road_link_id	Link identification number of the road	101
from_node_id	Upstream node number of the link, must already defined in input_node.csv	2

to_node_id	Downstream node number of the link, must already defined in input_node.csv	3
length	The length of the link (between end nodes), measured in units of mile, km or other units.	1.0
display_sequence	The order of the road link in the path with a given direction. Note that the value of "display_sequence" starts from 0, and the link is not included if the value of "display_sequence" equals to -1	1

3. agent.csv

Field Name	**Description**	**Sample Value**
agent_id	Node identification number	1
o_node_id	Origin node id of the agent	1
d_node_id	Destination node id of the agent	20
agent_type	Optional text label for visualization purpose	high-speed
node_sequence	The number of nodes through which agents pass in turn	0;1;2;3;4;
time_sequence	The time stamps on the set of nodes through which agents pass in turn, and each time stamp is denoted by the format "HHMM:SS"	0700:00;0701:00;0702:00;0703:00;0704:00;

Fig. 1 shows an illustrative example for the display of space-time diagram, and there are 6 nodes and 6 road links in the artificial road network. In Fig. 1, the node numbers and names are depicted beside the nodes. Moreover, the numbers in a bracket beside a road link show the link number and link travel time. For instance, (0, 10) denote the link 0 with the travel time of 10 min. Moreover, there are two paths in Fig. 1, the set of noes {1, 2, 3, 101, 202} for path 1 and {1, 2, 3, 320, 400} for path 2.

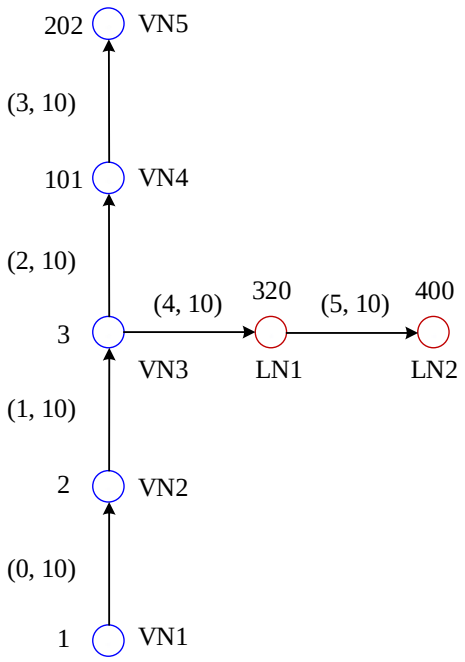

Fig. 1. Layout of the artificial road network

Figs. 2-4 shows the values of the related data for the **node.csv, road_link.csv and agent.csv** files. There are 2 agents traveling on path 1 from node 1 to node 4 and 2 agents traveling on path 2 from node 0 to node 6. Fig. 5-6 shows the space-time diagram of the four agents on path 1 and path 2, respectively.

name	node_id	x_corrd	y_coord
VN1	1	0	0
VN2	2	0	10
VN3	3	0	20
VN4	101	0	30
VN5	202	0	40
LN6	320	10	20
LN7	400	20	20

Fig. 2. Input data for the node.csv file

name	road_link_id	from_node_id	to_node_id	length	lanes	display_sequence
Redwood Rd	2	1	2	10	7	0
9000 South	5	2	3	10	7	1
300 West	12	3	101	10	7	-1
700 West	14	101	202	10	7	-1
1300 West	20	3	320	10	7	2
9800 South	23	320	400	10	7	3

Fig. 3. Input data for the road_link.csv file

agent_id	o_node_id	d_node_id	node_sequence	time_sequence
0	1	101	1;2;2;3;101;202;	0700:00;0701:00;0702:00;0703:00;0704:00;0705:00;
1	1	101	1;2;2;3;101;202;	0703:00;0704:00;0705:00;0706:00;0707:00;0708:00;
2	1	400	1;2;2;3;320;400;	0706:00;0707:00;0708:00;0709:00;0710:00;0711:00;
3	1	400	1;2;2;3;320;400;	0709:00;0710:00;0711:00;0712:00;0713:00;0714:00;

Fig. 4. Input data for the agent.csv file

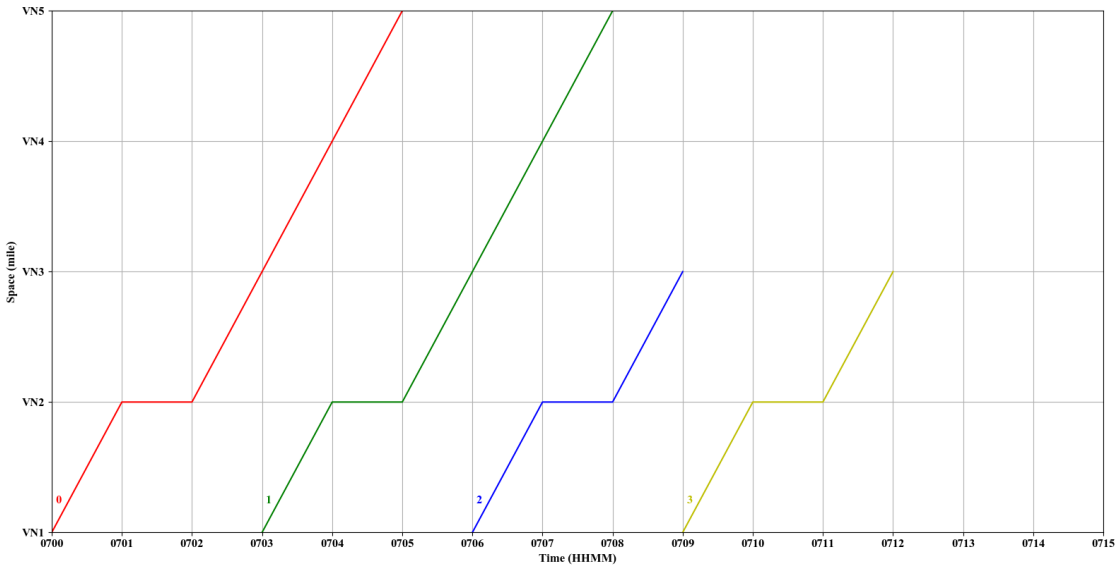

Fig. 5. Space-time diagram of the 4 agents on path 1

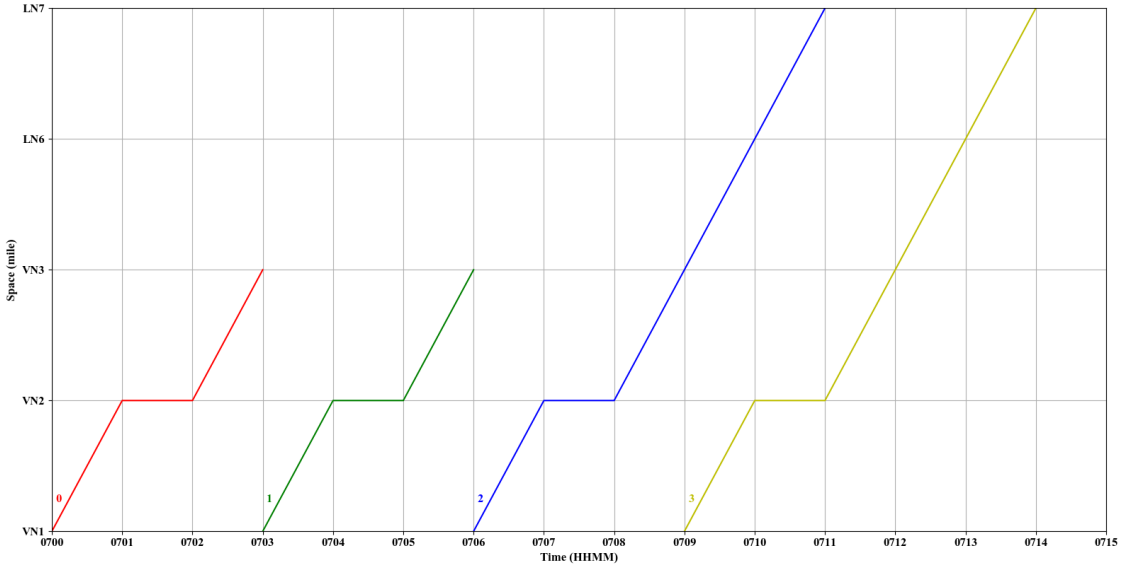

Fig. 6. Space-time diagram of the 4 agents on path 2