

Traffic simulation on HPC platform

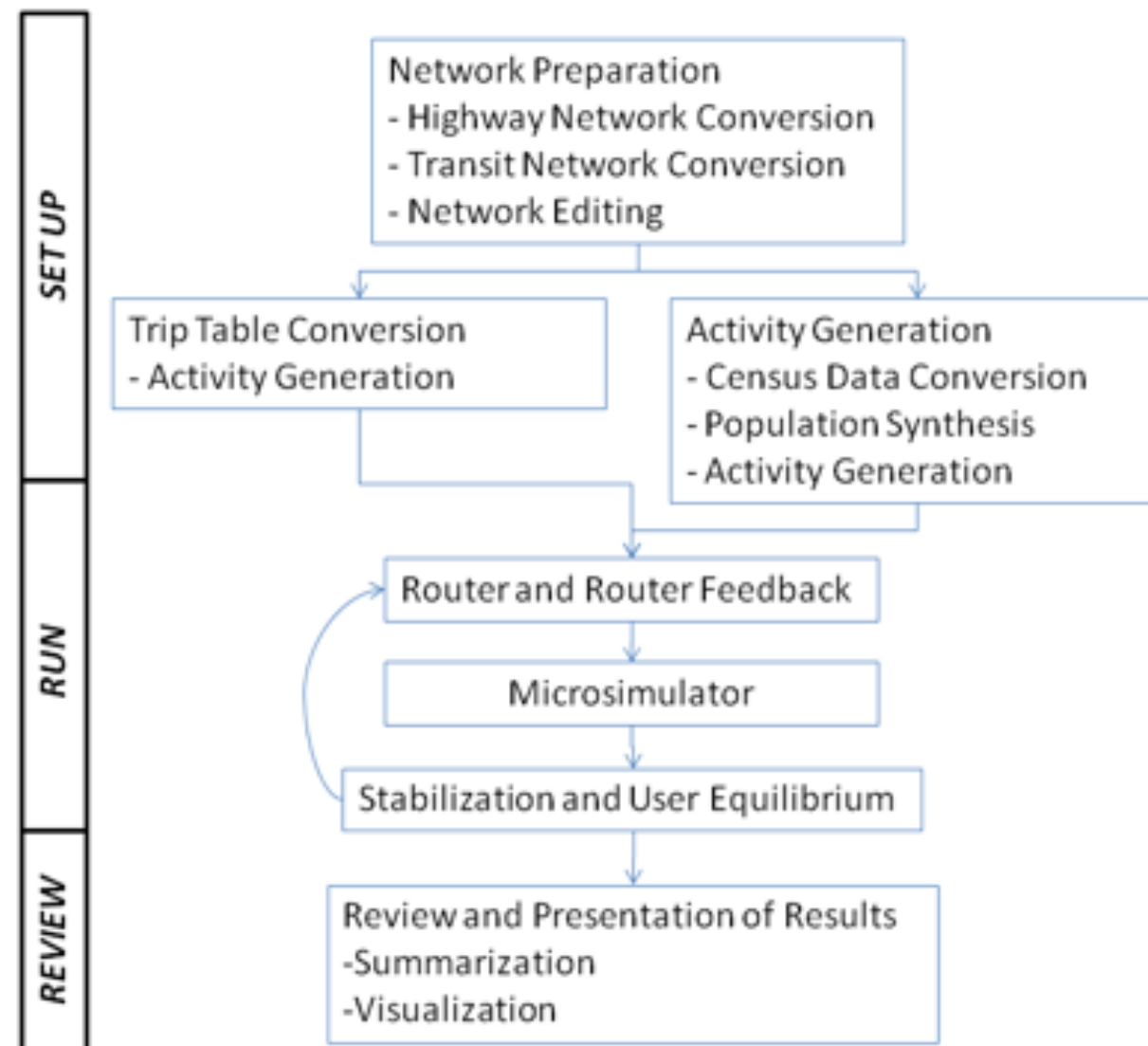
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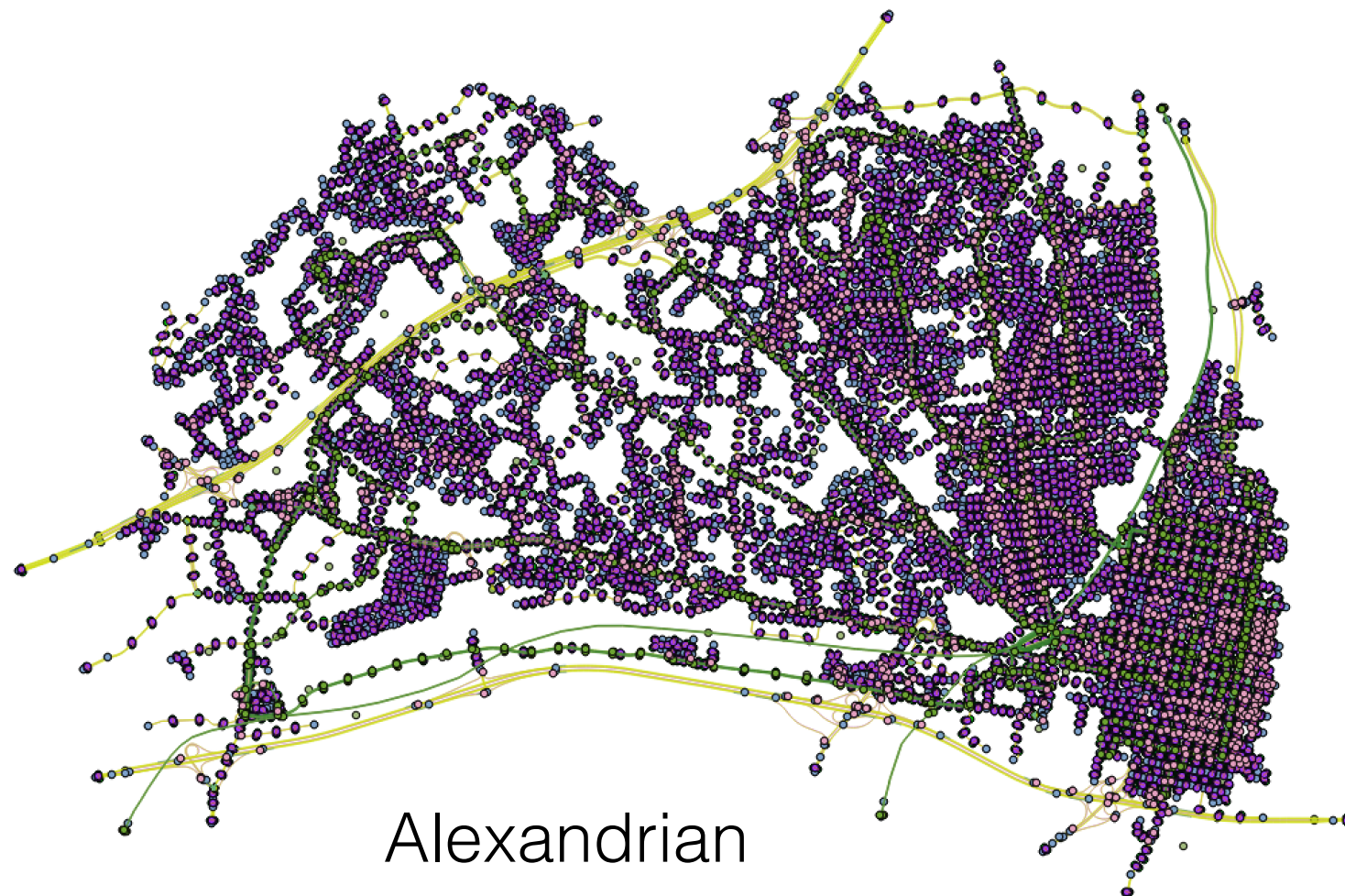
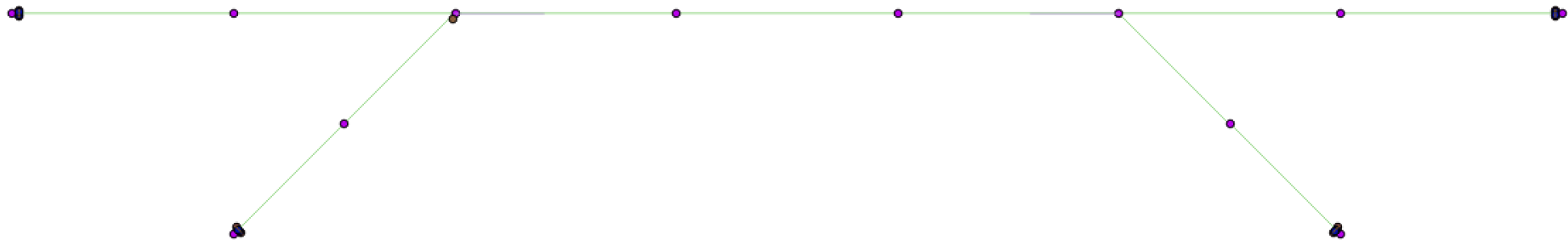
TRANSIMS

- Developed by Argonne National Laboratory
- Famous software in 2010
- NO update now
- Serial software code
- Agent-based simulation

Structure of TRANSIMS



created by manual, for analysis



- Node
- entry/exit point
- signal nodes
- Link

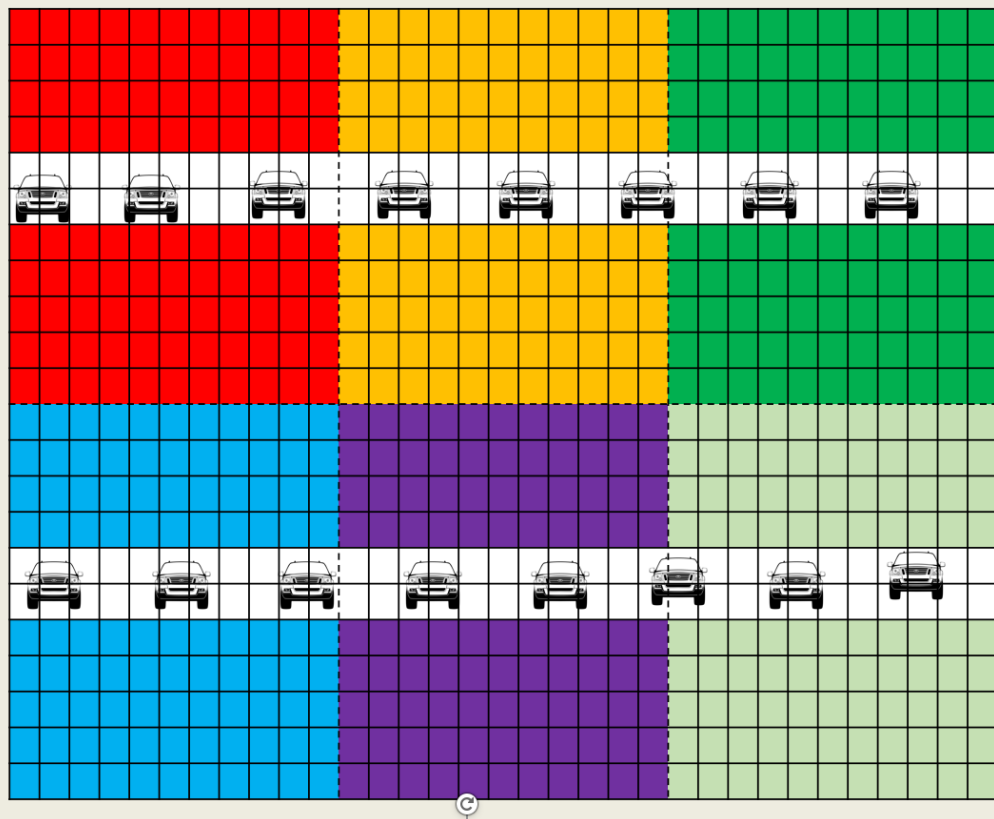
Output data

- Delay, for feedback
- Table, including position and time
 - Can be converted to animation
 - <http://tums.ornl.gov/tums/index.html>

RepastHPC

- Argonne National Laboratory
- Agent-based simulation platform
- only need to design the model
- No need for control sending/receiving message

Idea



- Each process control one area.
- Buffer area
- Each vehicle is a individual agent, move from left to right

Agent

- Each agent is a kind of vehicle
- Each has a unique ID
- Each agent has its own max speed, 2, 4, 6,
- Each agent has its own safety distance, 1, 2, 3
- Each agent know its neighbours

Algorithm

1.init

- 1.read prop/config
- 2.create Grid
- 3.initial some agents

2.Play

- 1.decide next position
- 2.remove the agent outsides.
- 3.after all agents decide next position, move
- 4.add new agent
5. synchronise between processes

3.Save data to file

4.Done, record

How to decide (straight)

- In each step, it will query and know its neighbours.
- It will know which car is in front and the distance
- It will move to the position
 - Keep safety distance
 - as much as it can

Decide (straight)

Assume A's speed is 4

A(t1)		A		B(t1)

A(t1)	A		B(t1)	

Keep safety distance
Go faster as much as it can

How to decide (line changing)

- After it query and know its neighbours, it will know
- Any car is in left/right front and the distance
- Any car is in left/right position
- It will move to the position
 - Keep safety distance
 - as much as it can

Decide(lane changing)

$$B(t2) = B(t1) + B's \text{ speed}$$

B(t1)	B(t2)			
		A(t1)	X	
			X	

A can change
line

B(t1)			B(t2)	
		A(t1)	X	
			X	

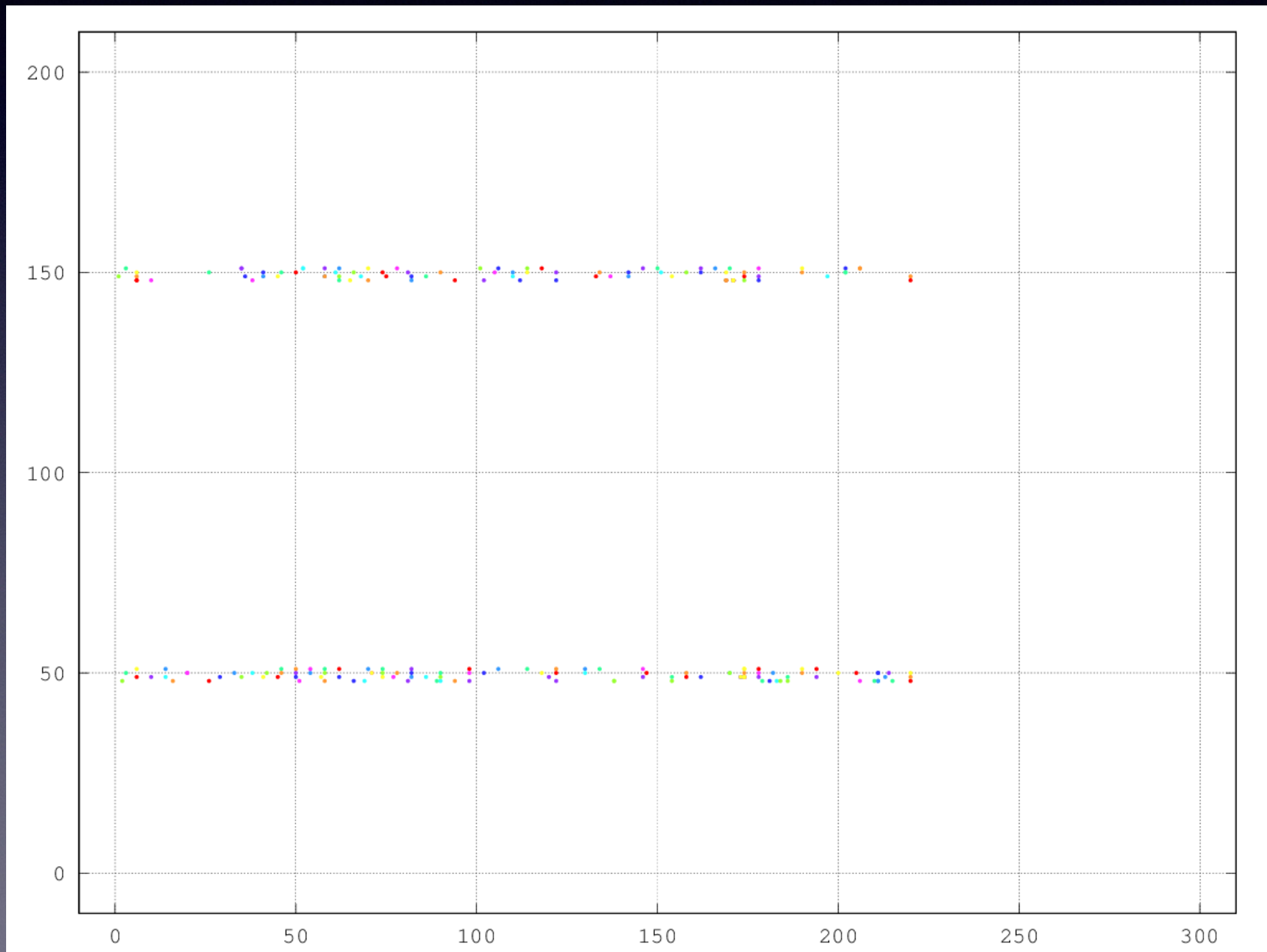
A cannot
change line

Output data

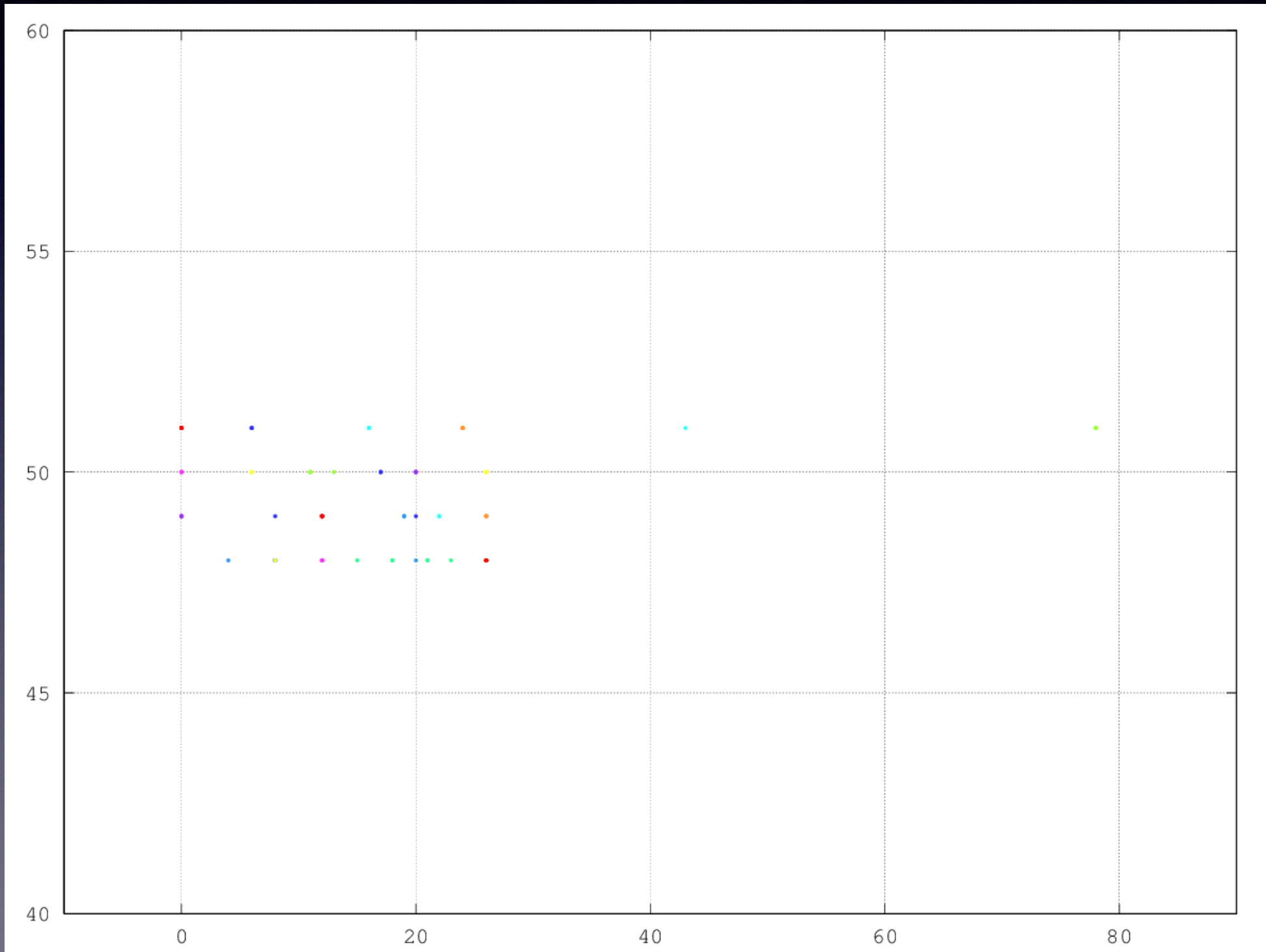
- txt file, from t0001.txt to t3000.txt
- Each file describe the position of the agent at that time

```
id AgentId(2, 0, 0, 0) AT Point[0, 50]
id AgentId(0, 3, 1, 3) AT Point[0, 148]
id AgentId(1, 3, 0, 3) AT Point[0, 149]
id AgentId(1, 0, 1, 0) AT Point[0, 49]
id AgentId(3, 3, 2, 3) AT Point[0, 151]
id AgentId(3, 0, 3, 0) AT Point[0, 51]
id AgentId(2, 3, 3, 3) AT Point[0, 150]
id AgentId(0, 0, 1, 0) AT Point[0, 48]
```

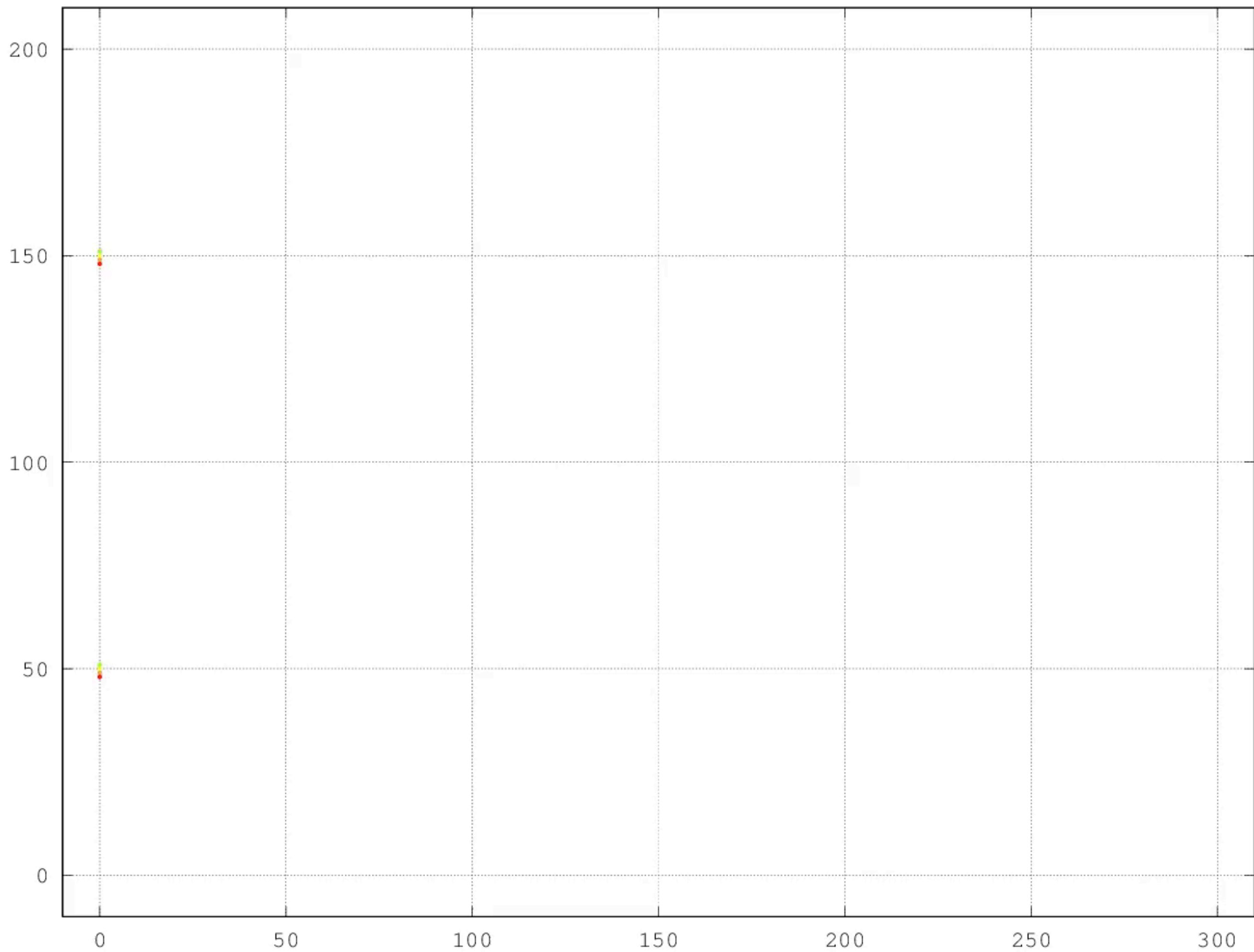

Output data

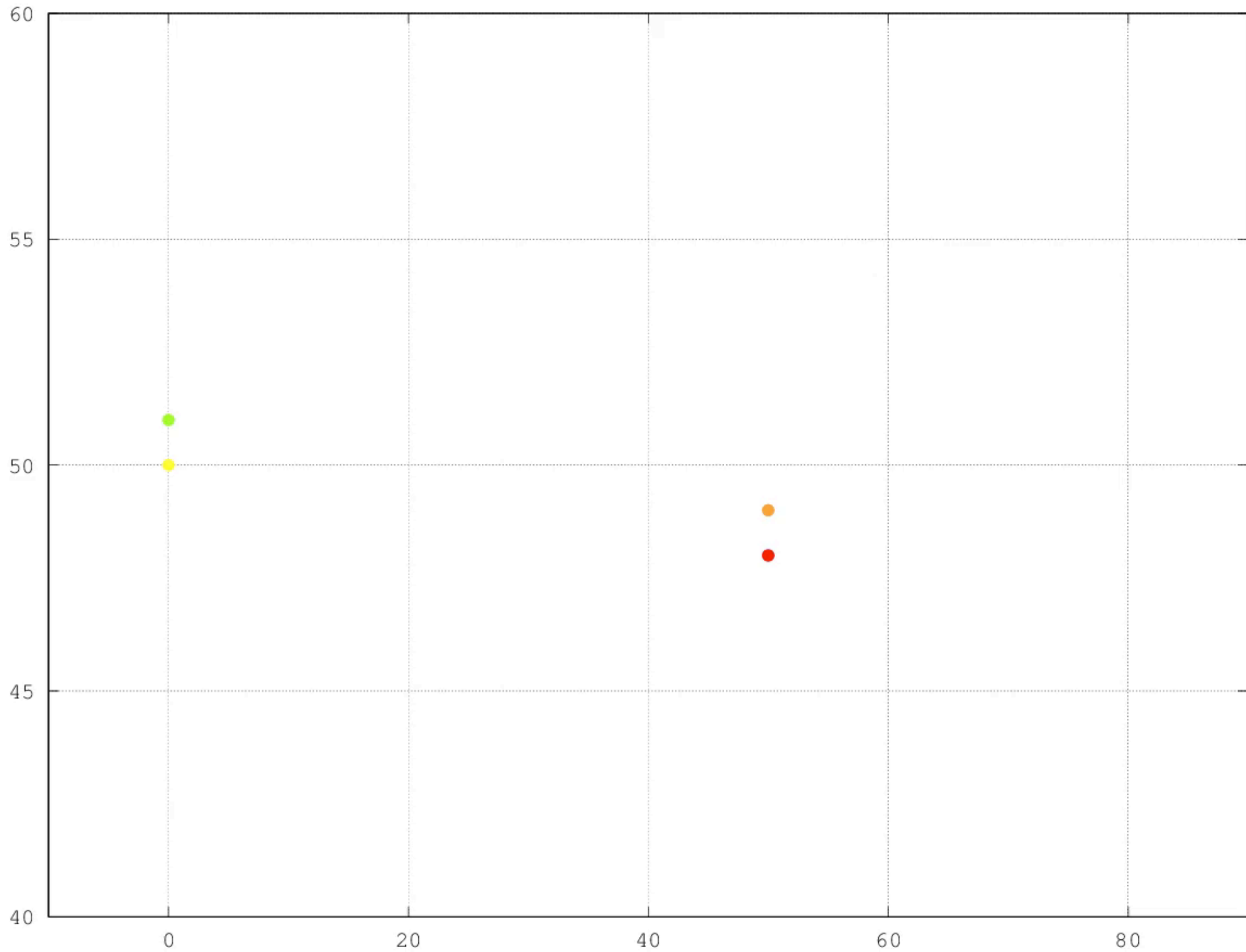


Output data



Video Demo





Future work

- 2 car move to one position
 - The agent only know others' position at this moment
- Road -> Agent also
- Traffic signal
- Flow intersection
- more complex algorithm

B(t1)				
		X		
A(t1)				

		X		
A(t1)	B(t1)			

Q&A