Spatial Simulation Modeling

Senseless Crime Modeling :Gangnam-gu, Seoul

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Spatial Simulation Modeling

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01. Introduction

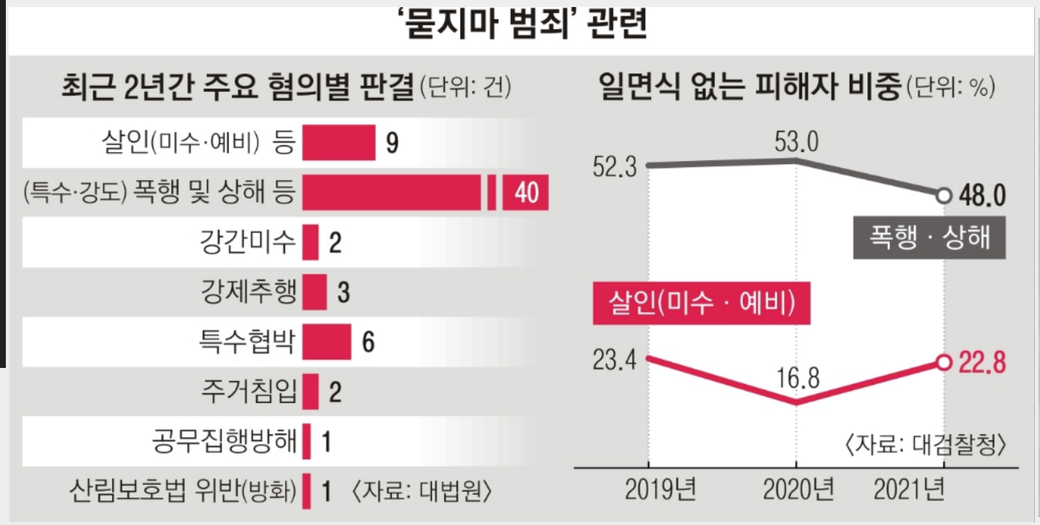
Background of study

Numerous recent senseless crimes in Korea

->2023.07.21 Stabbing rampage at Sillim station

->2023.08.03 Unprovoked aggression at Seohyeon station AK plaza

Series of copycat crimes against an unspecified number of people suddenly increased



01. Introduction

Background of study

Features of the 'senseless crime'

->Randomness of choosing victims

->The possibility of expanding the extent of the damage region and the number of victims

->Normally related to social situations (e.g. the economic depression , high unemployment rate)

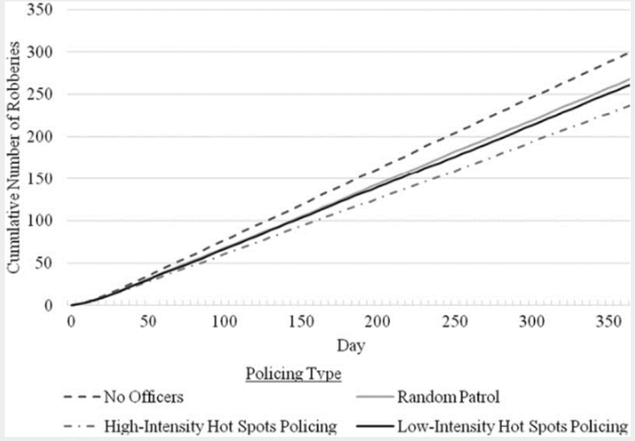
01. Introduction | Literature Review

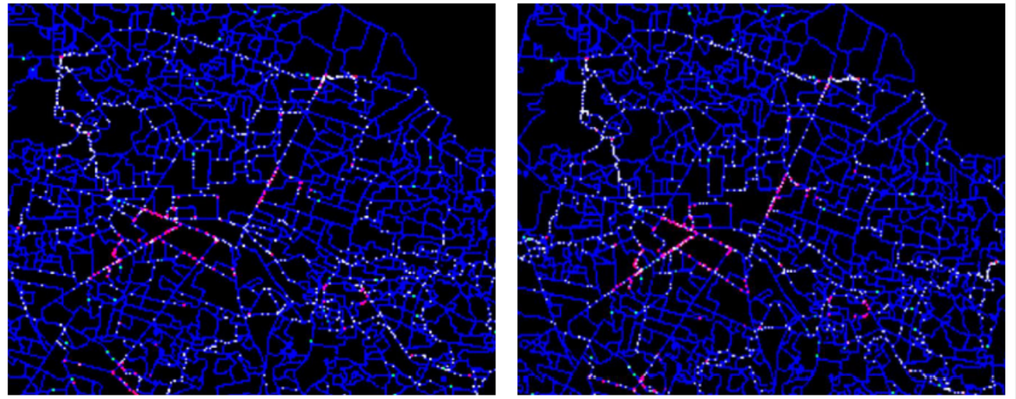
_Recently, due to the ability to simulate spatial and temporal aspects of criminal activities, ABM based crime researches are largely increased.

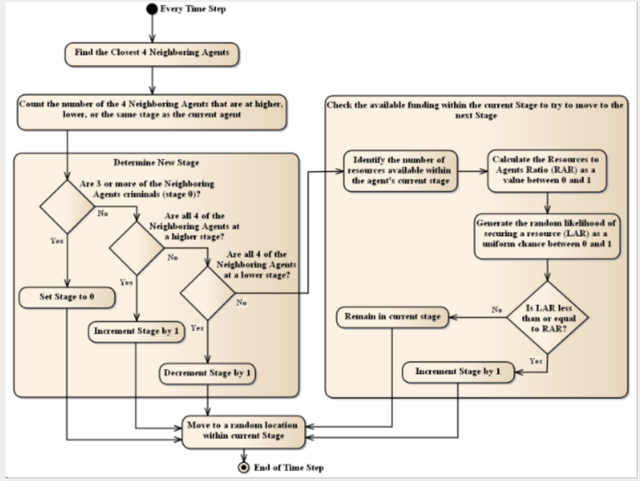
*Malleson, N., Heppenstall, A., & See, L. (2010). Crime reduction through simulation: An agent-based model of burglary. Computers, environment and urban systems, 34(3), 236-250.

*Cornelius, C. V., Lynch, C. J., & Gore, R. (2017, April). Aging out of crime: Exploring the relationship between age and crime with agent based modeling. In Proceedings of the agent-directed simulation symposium (pp. 1-12).

*Escobar, H., Cuevas, E., Toski, M., Ceron, F., & Perez-Cisneros, M. (2023). An agent-based model for public security strategies by predicting crime patterns. IEEE Access.





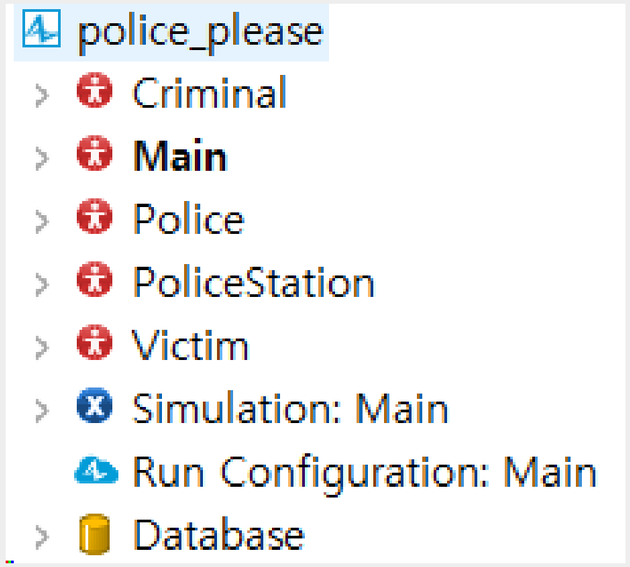


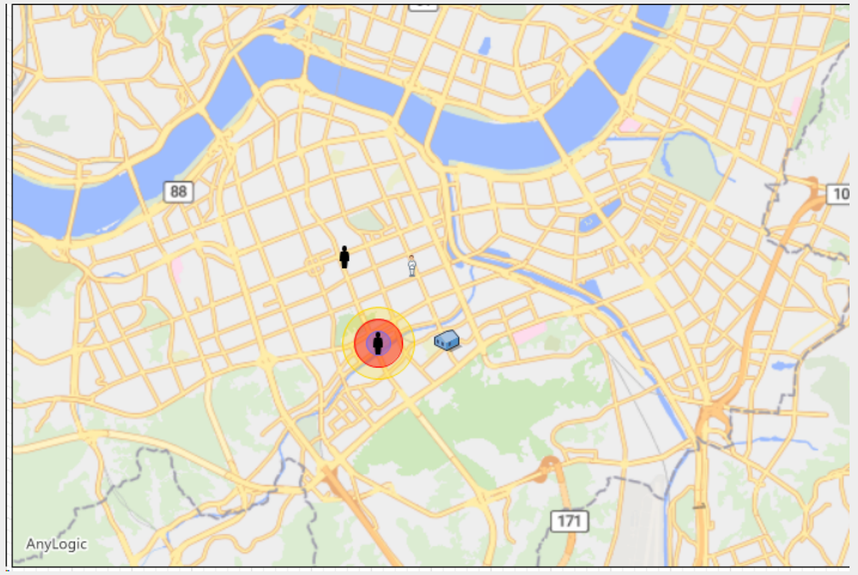
02. Model

Method framework

_Research area ; Gangnam-gu

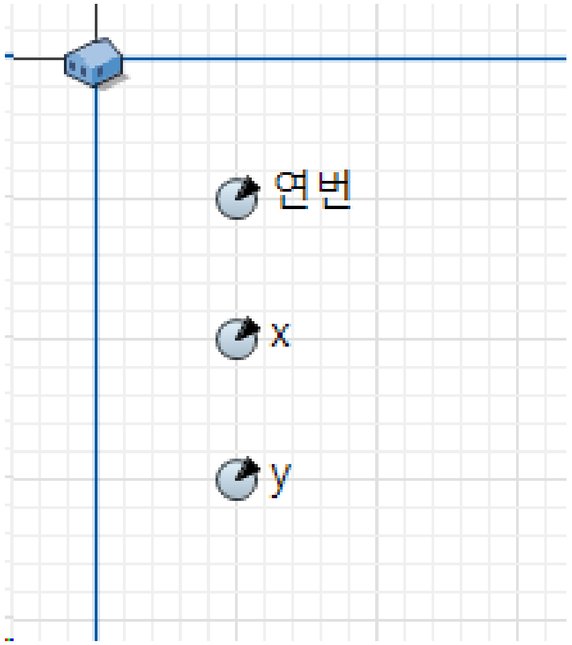
->Areas with high pedestrian traffic
->Numerous locations with large-scale entertainment districts and a high incidence of crime
->Recent frequent occurrences of senseless crimes
->Areas where significant damage is anticipated





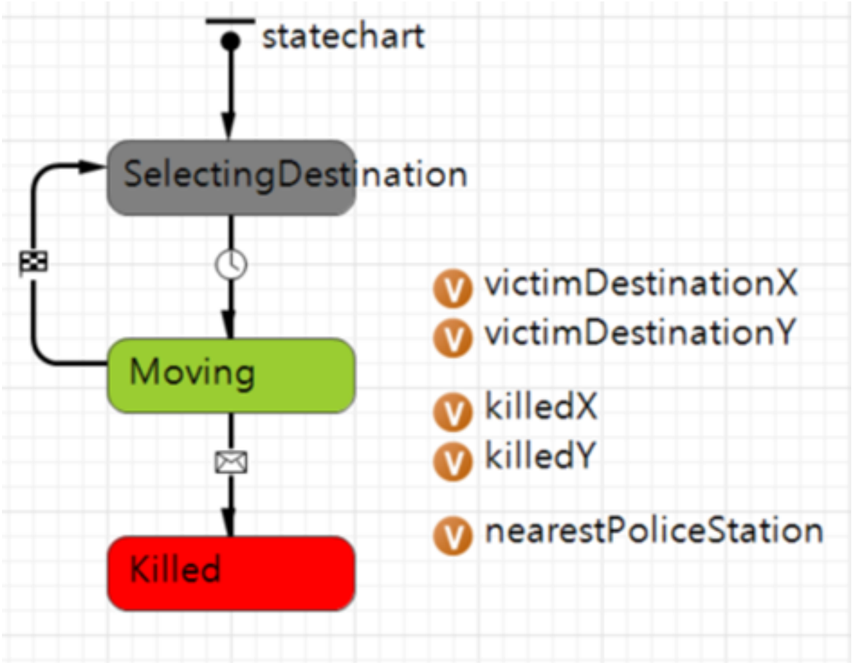
02. Model | Statechart

Police station



	연번	x	y
1	139	127.041	37.508
2	140	127.029	37.514
3	141	127.034	37.515
4	142	127.061	37.515
5	143	127.043	37.512
6	144	127.053	37.521
7	145	127.024	37.518
8	146	127.036	37.529
9	238	127.044	37.501
10	239	127.063	37.495
11	240	127.105	37.489
12	241	127.107	37.465
13	242	127.083	37.492
14	243	127.051	37.48

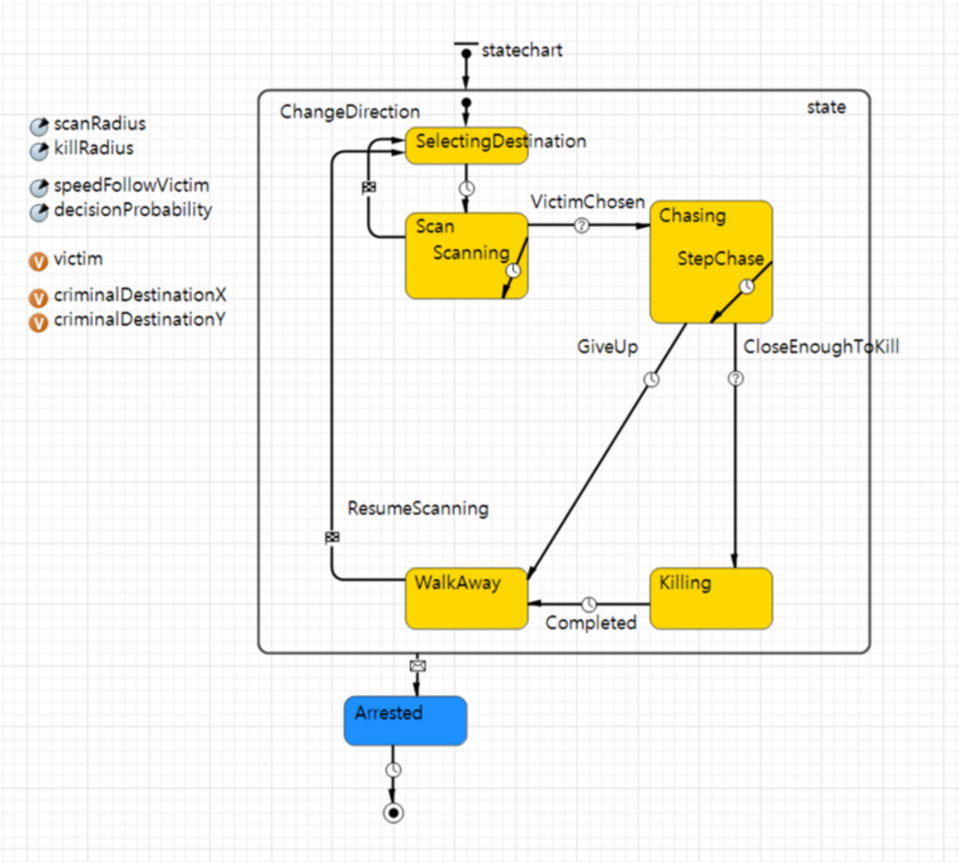
Victim

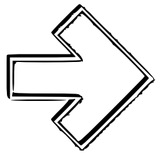


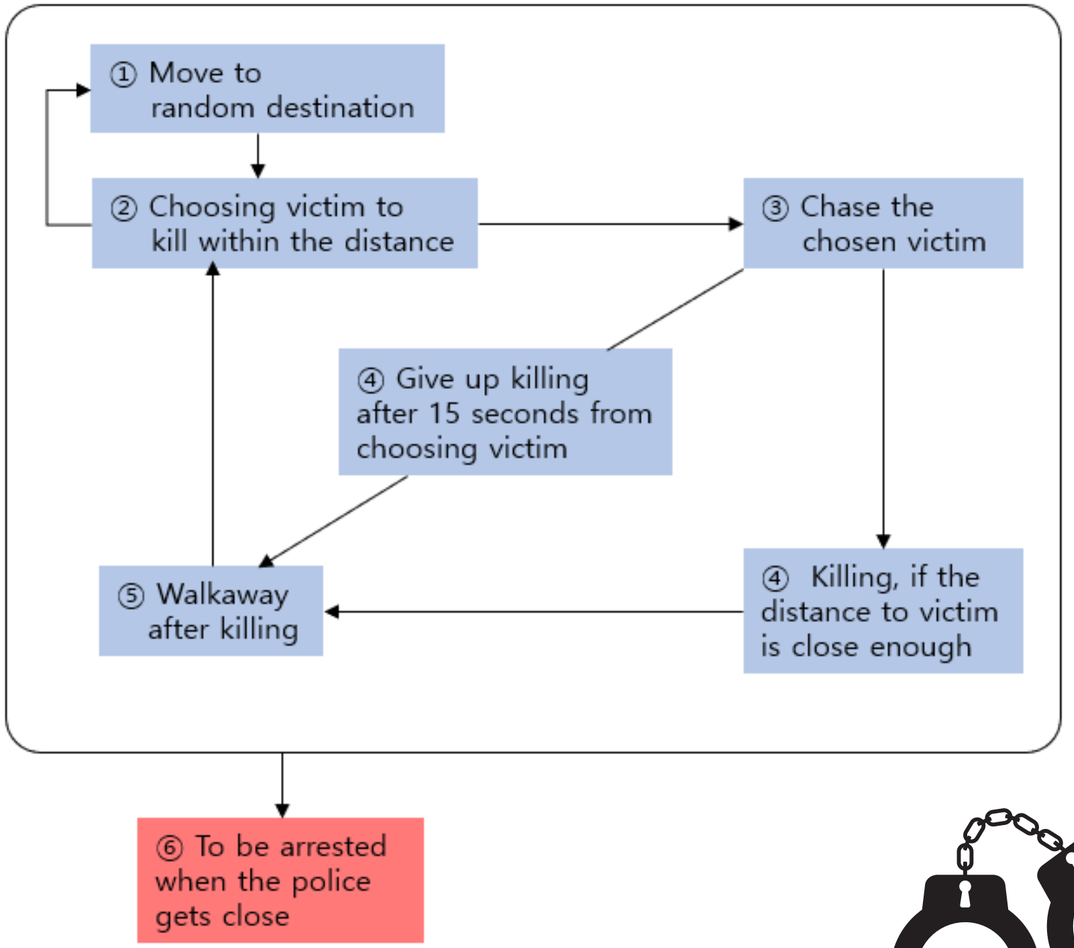
① Movint toward random destination → ② Killed → ③ The killed location is traced

02. Model | Statechart

Criminal

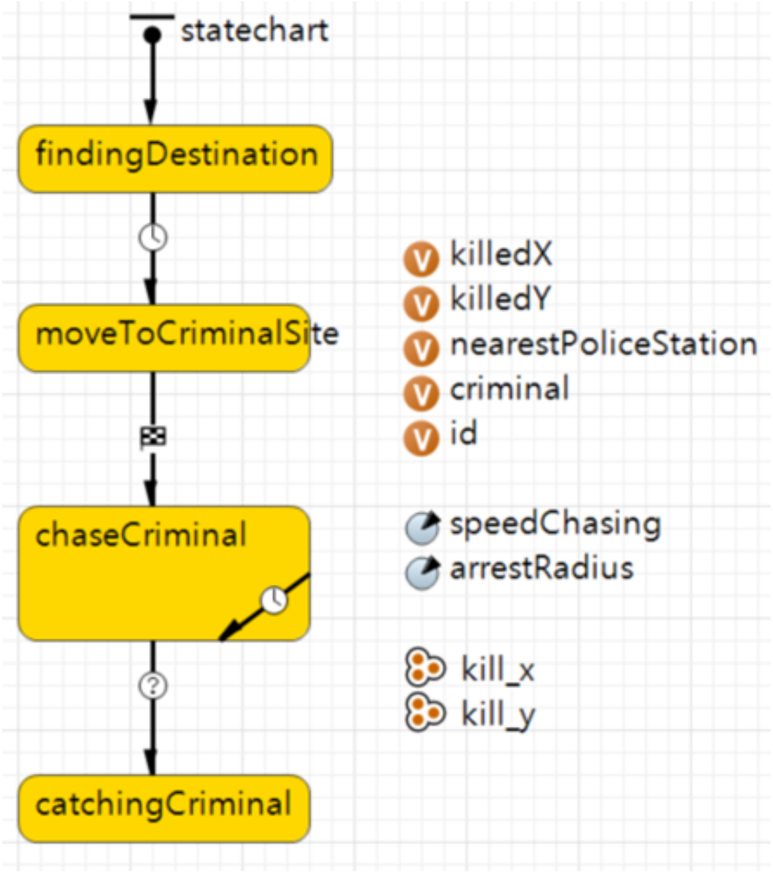






02. Model | Statechart

Police



① Alerting the nearest police station when the victim is killed

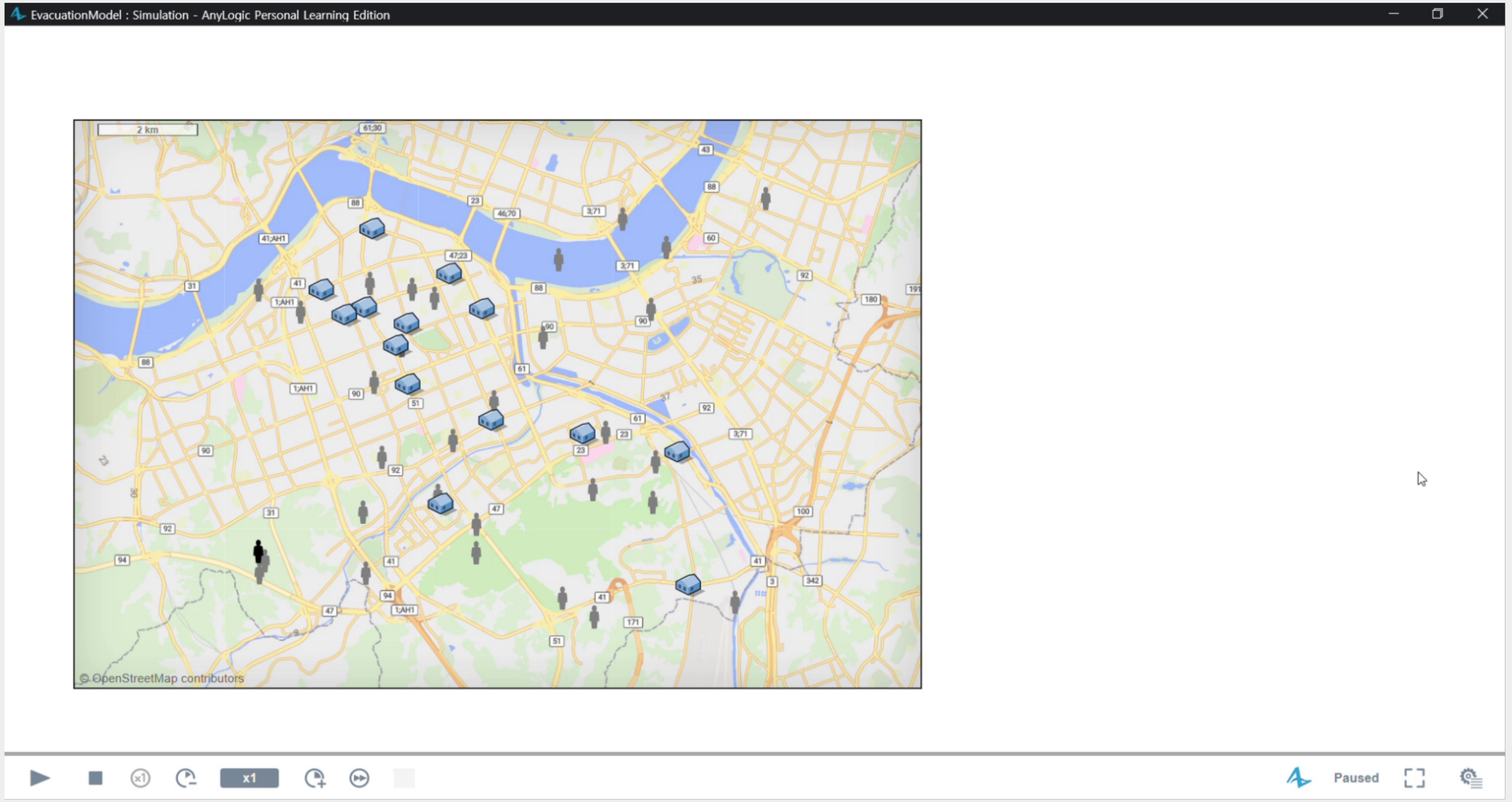
② Move to criminal site

③ Chasing the criminal

④ Sending a message to criminal if the distance is close enough

⑤ Stop

03. Result : Running the model



04. Conclusion

- Implication
- Research limit

_Implication

->Micro-Level Understanding

->Emergent Patterns and Trends

->Scenario Testing for Policy Evaluation

->Spatial and Temporal Dynamics

->Adaptability and Flexibility

_Research limit

->Data Requirements

->Sensitivity to Parameterization

->Validation and Calibration Complexity

Thank you