

ABM in NetLogo

CS 704: Social Simulation Seminar

Session II

April 9, 2020

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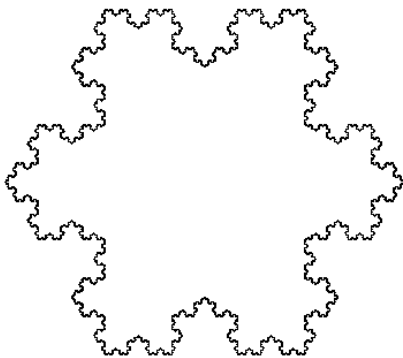
Recap: Session 1

- The whole is more than the sum of its parts
 - e.g. “intolerance can lead to diversity” (please don’t take this literally!)
 - @holism, @emergence
- Dependence on initial conditions
 - Single runs depend highly on parameters (d, s) and randomness
- Invariant distribution of equilibria
 - Repeated runs lead to converging distributions of outcomes
- Phase transitions
 - Be aware of modelling assumptions
 - @tipping point

NetLogo

Logo

- Dynamic programming language for educational purposes
- Developed in 1967
 - by Daniel G. Gobrow, Wally Feuerzeig, Seymour Papert, and Cynthia Solomon
- Turtle graphic
 - agents = “turtles”
 - especially suited for 2-dim geometrical figures & fractal curves



Example: Koch snowflake

NetLogo

- Multi-agent programmable modeling environment
- Developed in 1999 by Uri Wilensky
- Will be used in this course
- Download & install Netlogo 6.1.1
 - <https://ccl.northwestern.edu/netlogo/download.shtml>
 - Make sure to select the right OS

NetLogo Documentation

- NetLogo docs (all links below, this & other tutorials)
 - <https://ccl.northwestern.edu/netlogo/docs/>
- Programming guide
 - <https://ccl.northwestern.edu/netlogo/docs/programming.html>
- NetLogo dictionary
 - <https://ccl.northwestern.edu/netlogo/docs/dictionary.html>

NetLogo Tutorial

- Based on tutorial #3 in the NetLogo docu
 - How to implement procedures
 - How to make monitors, sliders, and plots
- Agents in NetLogo are divided into
 - Patches (stationary, arranged in a grid)
 - Turtles (move over grid)
 - Links (connect two turtles)
 - Overseer (does whatever the other agents can't do)
- Agents can run *procedures* (series of NetLogo commands)
 - e.g. move, eat, reproduce, die

Paper Presentations

Evaluation criteria

- Summarize a paper of your choice and give a *brief* overview over the related work
 - Send **3 priorities** to Kilian until next week **Thursday (April 16) 12:00**
- Presentations should be 15min + 5min for Q&A
- **50% of the course grade**
- Date: Thursday, May 7, 12:00

Papers for Presentations (1/3)

- Baeza, A., & Janssen, M. A. (2018). **Modeling the Decline of Labor-Sharing in the Semi-Desert Region of Chile.** *Regional Environmental Change*, 18(4), 1161-1172. [[PDF](#)]
- Birks, D., & Davies, T. (2017). **Street Network Structure and Crime Risk: An Agent-Based Investigation of the Encounter and Enclosure Hypotheses.** *Criminology*, 55(4), 900-937. [[PDF](#)]
- El Hachami, K., & Tkiouat, M. (2018, April). **An Approach for Modeling the Economy as a Complex System Using Agent-Based Theory.** In *Intelligent Systems and Computer Vision (ISCV), 2018 International Conference on* (pp. 1-6). IEEE. [[PDF](#)]
- García-Magariño, I., Lombas, A. S., Plaza, I., & Medrano, C. (2017). **ABS-SOCI: An Agent-Based Simulator of Student Sociograms.** *Applied Sciences*, 7(11), 1126. [[PDF](#)]
- Hébert, G. A., Perez, L., & Harati, S. (2018). **An Agent-Based Model to Identify Migration Pathways of Refugees: The Case of Syria.** In *Agent-Based Models and Complexity Science in the Age of Geospatial Big Data* (pp. 45-58). Springer, Cham. [[PDF](#)]

Papers for Presentations (2/3)

- Kowalska-Pyzalska, A. (2017). **Willingness to Pay for Green Energy: An Agent-Based Model in NetLogo Platform.** 2017 14th International Conference on the European Energy Market (EEM). [[HTML](#)]
- Lemos, C. M. (2018). **ABM of Civil Violence: ODD Description.** In Agent-Based Modeling of Social Conflict (pp. 51-63). Springer, Cham. [[HTML](#)]
- Malik, A., & Abdalla, R. (2017). **Agent-Based Modelling for Urban Sprawl in the Region of Waterloo, Ontario, Canada.** Modeling Earth Systems and Environment, 3(1), 7. [[PDF](#)]
- Muhammad, A., Kashif, Z., & Saini, D. (2018). **Agent-Based Simulation of Socially-Inspired Model of Resistance Against Unpopular Norms** Proceedings of the 10th International Conference on Agents and Artificial Intelligence (ICAART 2018) - Volume 1, pages 133-139. [[PDF](#)]
- Ponziani, F., Tinaburri, A., & Ricci, V. (2018). **A Multi Agent Approach to Analyse Shift in People Behaviour Under Critical Conditions.** International Journal of Safety and Security Engineering, 8(1), 1-9. [[PDF](#)]

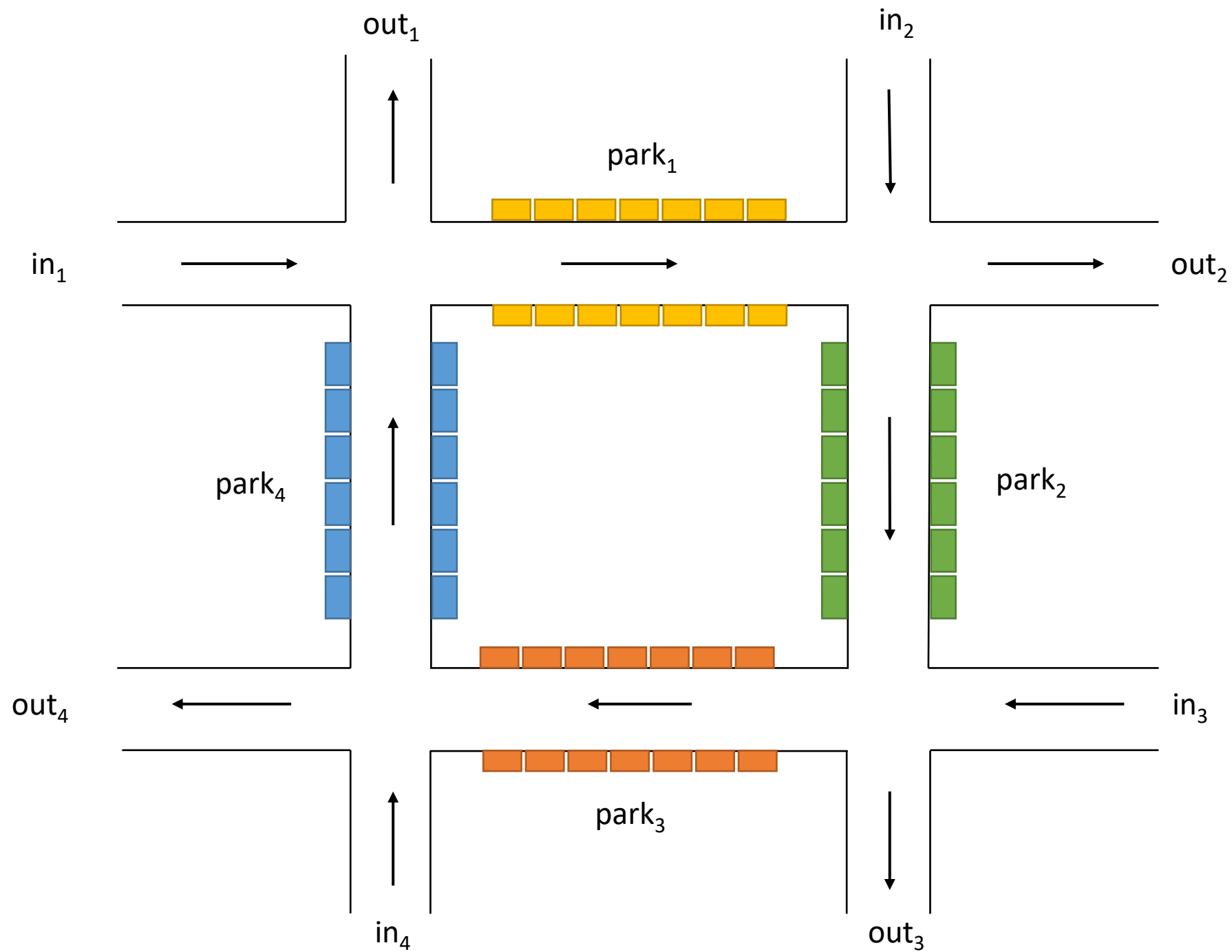
Papers for Presentations (3/3)

- Putra, H. C., Andrews, C. J., & Senick, J. A. (2017) **An Agent-Based Model of Building Occupant Behavior During Load Shedding**. In Building Simulation (pp. 1-15). Tsinghua University Press. [[PDF](#)]
- Rai, S., Carter, T., & Sharma, B. (2019). **Using NetLogo to Simulate Building Occupancy of a University Building**. ASEE 2019 Annual Conference. [[PDF](#)]
- Scott, N., Livingston, M., Hart, A., Wilson, J., Moore, D., & Dietze, P. (2016). **SimDrink: An Agent-Based NetLogo Model of Young, Heavy Drinkers for Conducting Alcohol Policy Experiments**. Journal of Artificial Societies and Social Simulation, 19(1). [[HTML](#)]
- Sturley, C., Newing, A., & Heppenstall, A. (2018). **Evaluating the Potential of Agent-Based Modelling to Capture Consumer Grocery Retail Store Choice Behaviours**. The International Review of Retail, Distribution and Consumer Research, 28(1), 27-46. [[HTML](#)]
- Thuy An Vo, T., van der Waerden, P. J. H. J., & Wets, G. (2016). **Micro-Simulation of Car Drivers' Movements at Parking Lots**. Procedia Engineering, 142, 100-107. [[HTML](#)]

Practical Group Project

Evaluation Criteria

- Form a group and implement your own ABM for parking facility management
- Deliverables
 - Group presentation (25min + 10min Q&A)
 - Code
 - Short report (10 pages) written in LaTeX
- Another **50% of the course grade**
- Deadline: tba



Context:

- in_i #
- Lots_i #

Policies:

- price_i €
- fine_i €
- control_i %

Outcomes:

- traffic_i
- utilization_i %
- costs €

Possible Starting Points

- NetLogo Model: “Traffic Grid”
 - <https://ccl.northwestern.edu/netlogo/models/TrafficGrid>
- Netlogo Community Model: “Parking”
 - <http://www.netlogoweb.org/launch#http://ccl.northwestern.edu/netlogo/community/parking.nlogo>