

Week 6 Video 4

Visualization

State Space Networks

State Space Diagrams

- Visualizations of all the states that the learning system can have during a problem
 - ▣ State = complete characterization of the situation
- Also referred to as student learning pathways or interaction networks

State Space Diagrams in Refraction

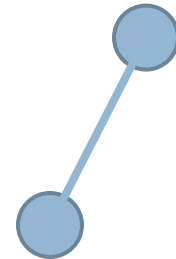
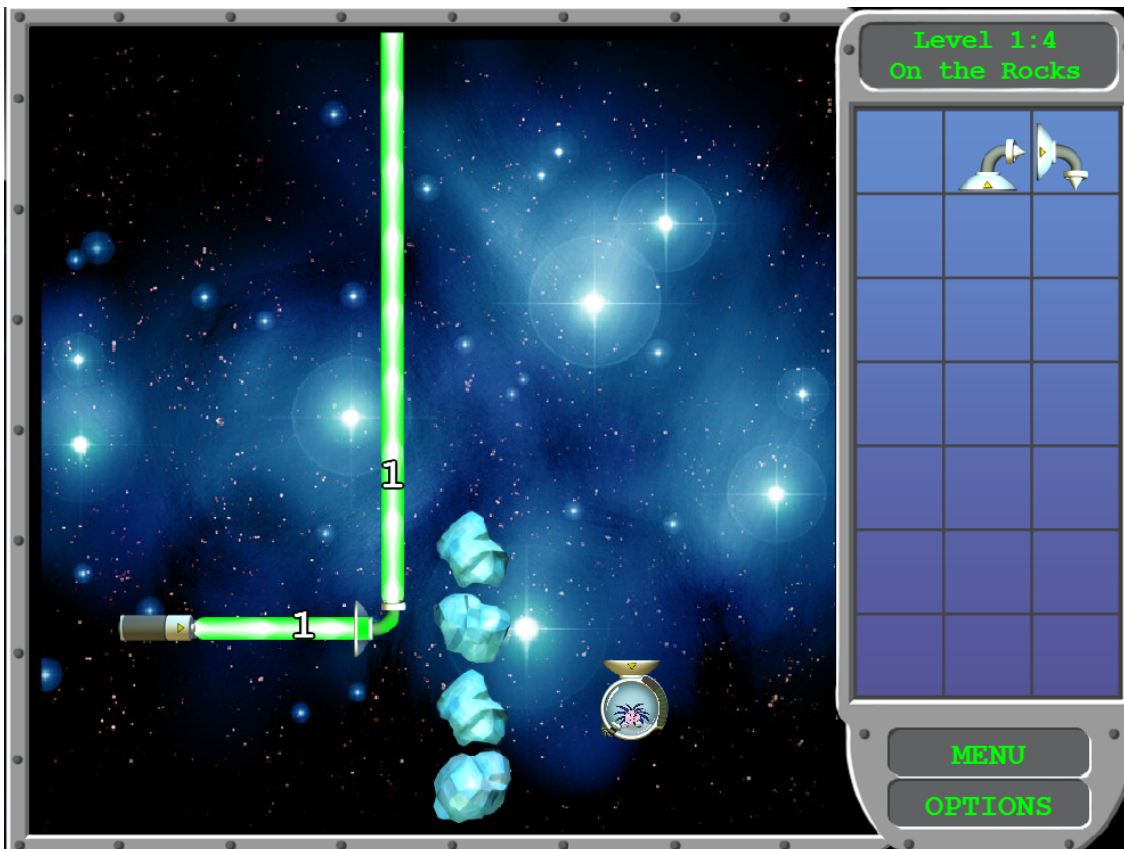
- <http://play.centerforgamescience.org/refraction/site/>
- Martin, T., Aghababayahm A., Pfaffman, J., Olsen, J., Baker, S., Janisiewicz, P., Phillips, R., Smith, C.P. (2012) Nanogenetic Learning Analytics: Illuminating Student Learning Pathways in an Online Fraction Game. *Proceedings of the 3rd International Conference on Learning Analytics and Knowledge*, 165-169.



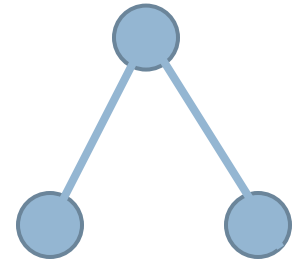
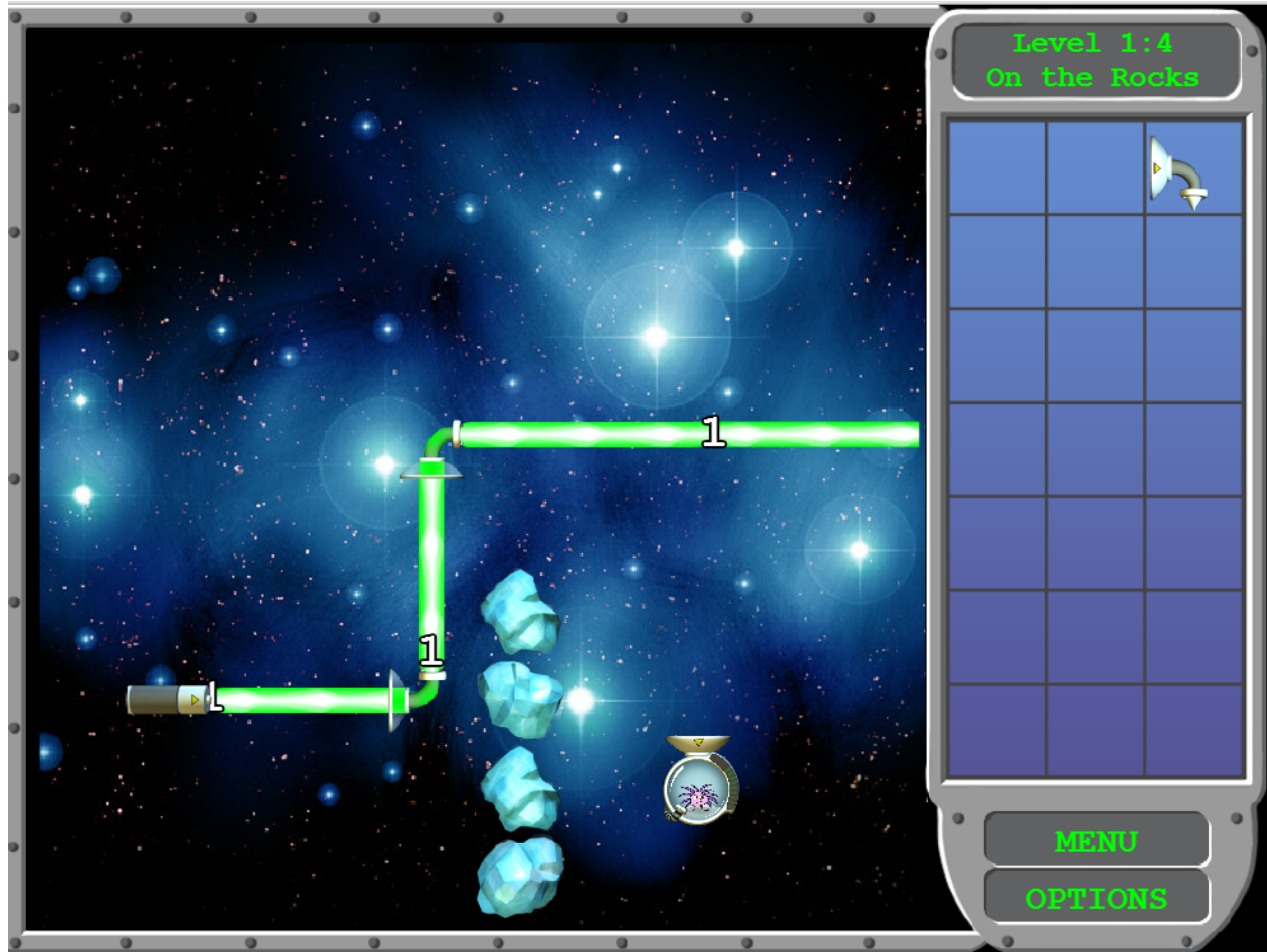
State 1 (Refraction)



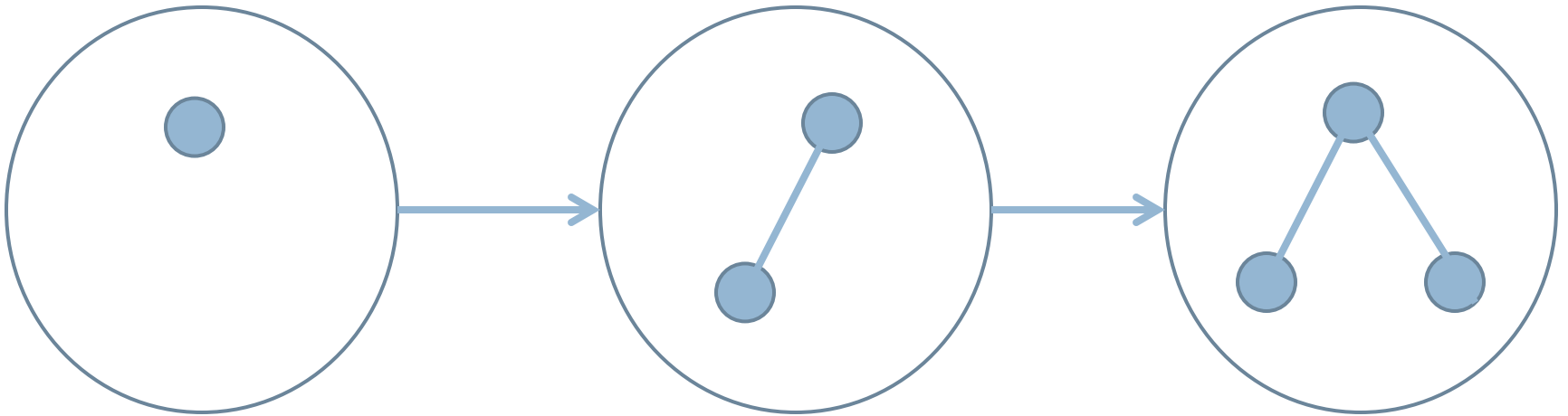
State 2 (Refraction)



State 3 (Refraction)



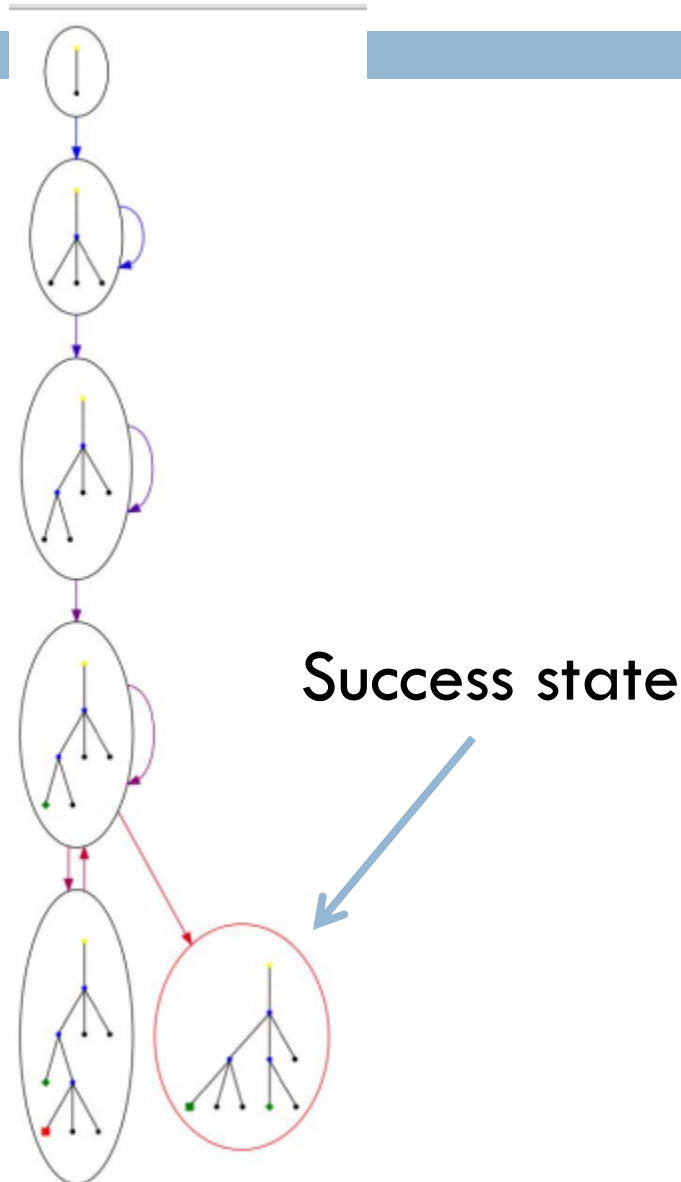
Transitions between states



Can show single student trajectories

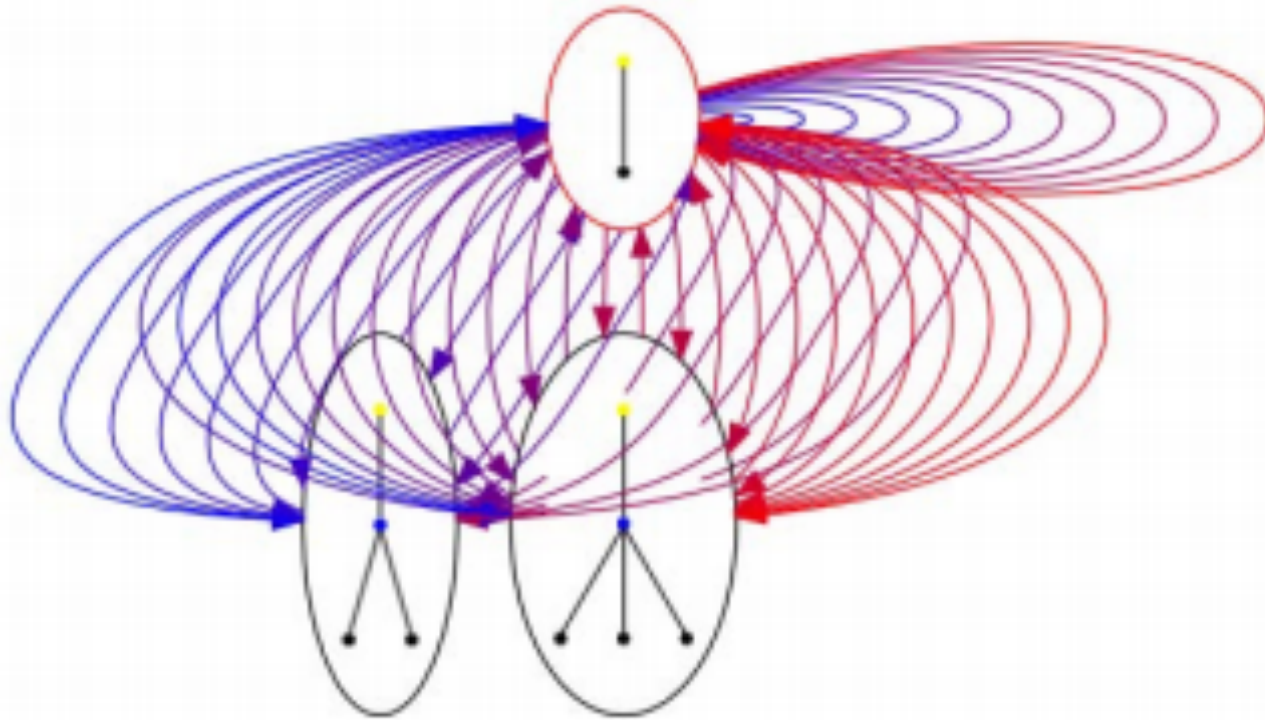


Successful student (Martin et al., 2012)



Unsuccessful student (Martin et al., 2012)

- Student goes back and forth endlessly between a small number of states...



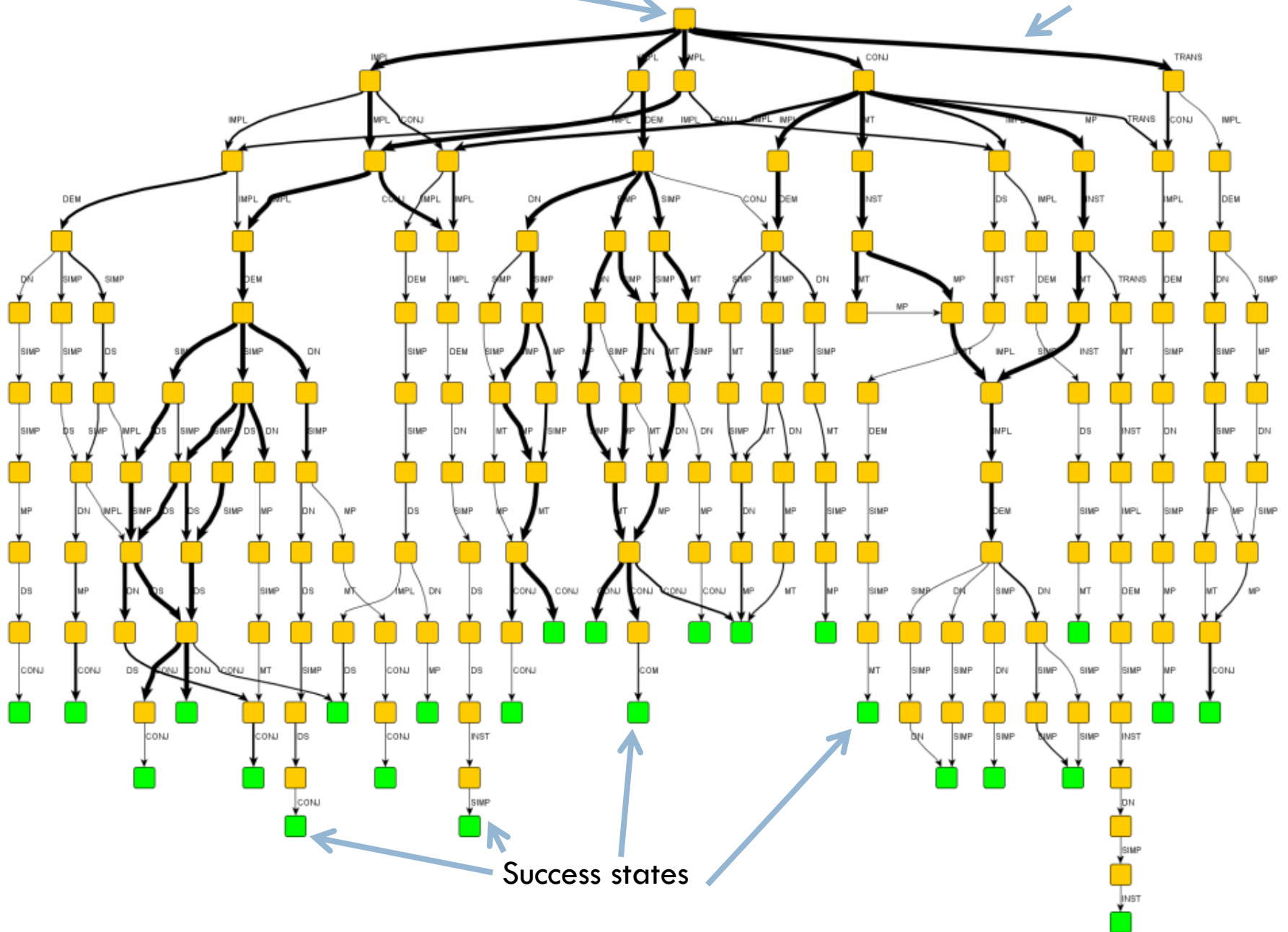
Can be used to show all paths, and for more complex systems...

Johnson, M., Eagle, M., Stamper, J., Barnes, T. (2013)
An Algorithm for Reducing the Complexity of
Interaction Networks. *Proceedings of the 6th
International Conference on Educational Data Mining*,
248-251.



Start state

Thicker lines = more students



Uses



- Study specific student trajectories
- See which paths end up being productive
- See which paths are rare (despite being productive)
- Make recommendations (hints) to students based on their path (Barnes, Stamper, & Lehmann, 2008)

Next lecture



- Other visualizations of educational data