



## 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

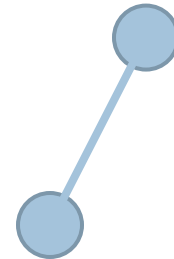
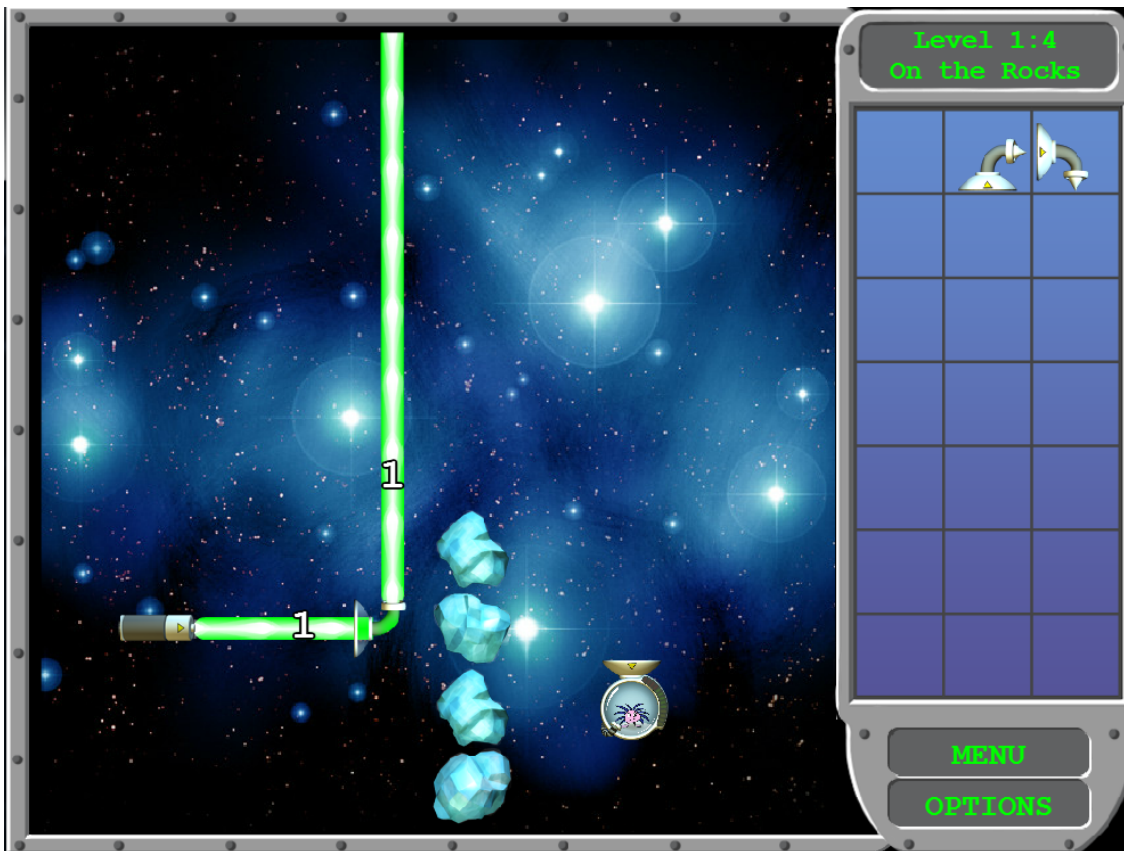
- <http://play.centerforgamescience.org/refraction/site/>
- Martin, T., Aghababyahm A., Pfaffman, J., Olsen, J., Baker, S., Janisiewicz, P., Phillips, R., Smith, C.P. (2012) Nanogenetic Learning Analytics: Illuminating Student Learning Pathways in an Online Fraction Game. *Proceedings of the 3<sup>rd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



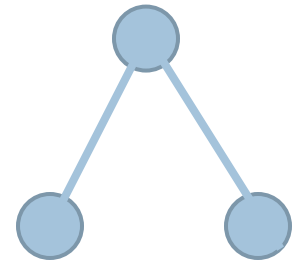
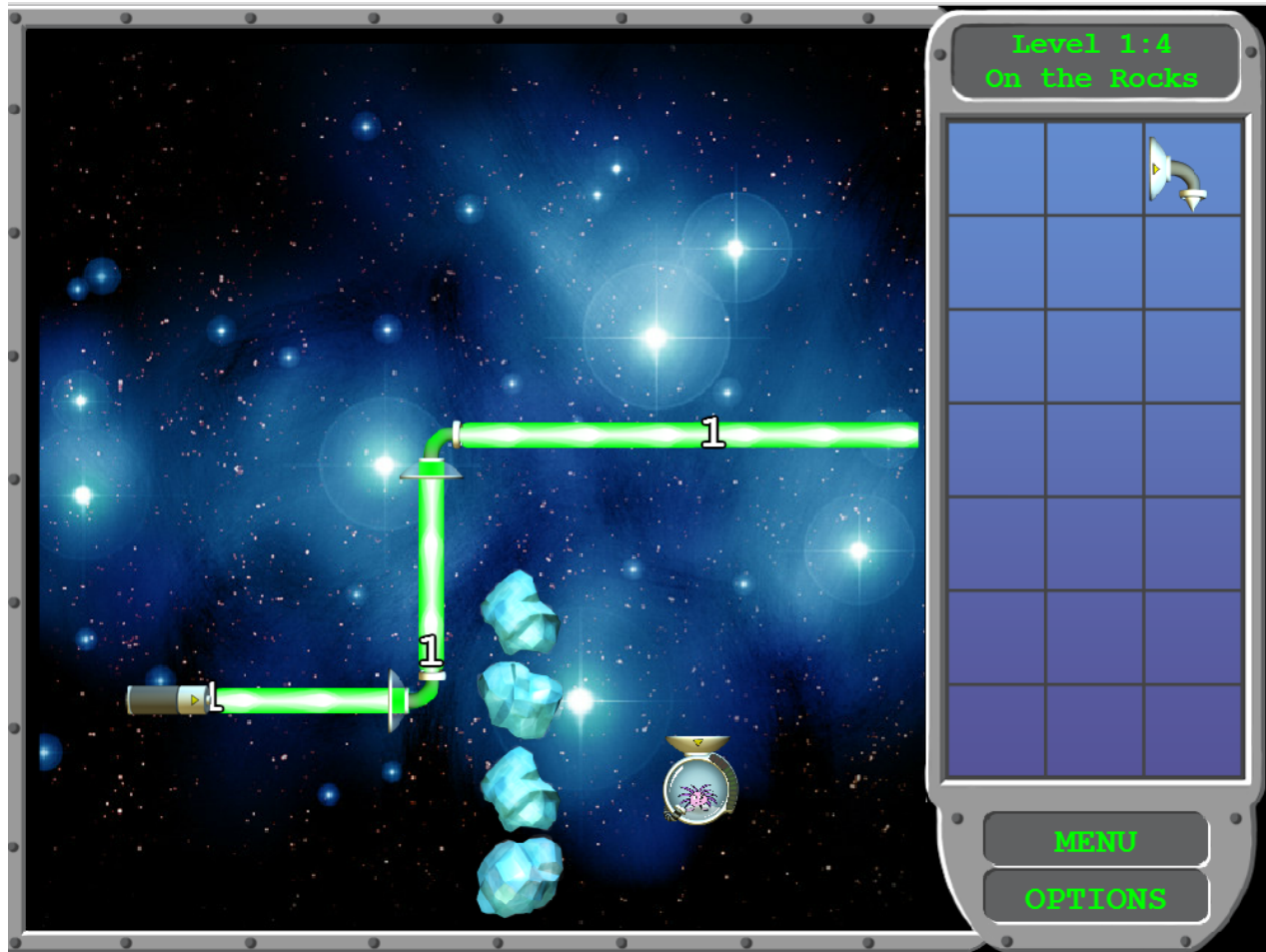
# State 1 (Refraction)



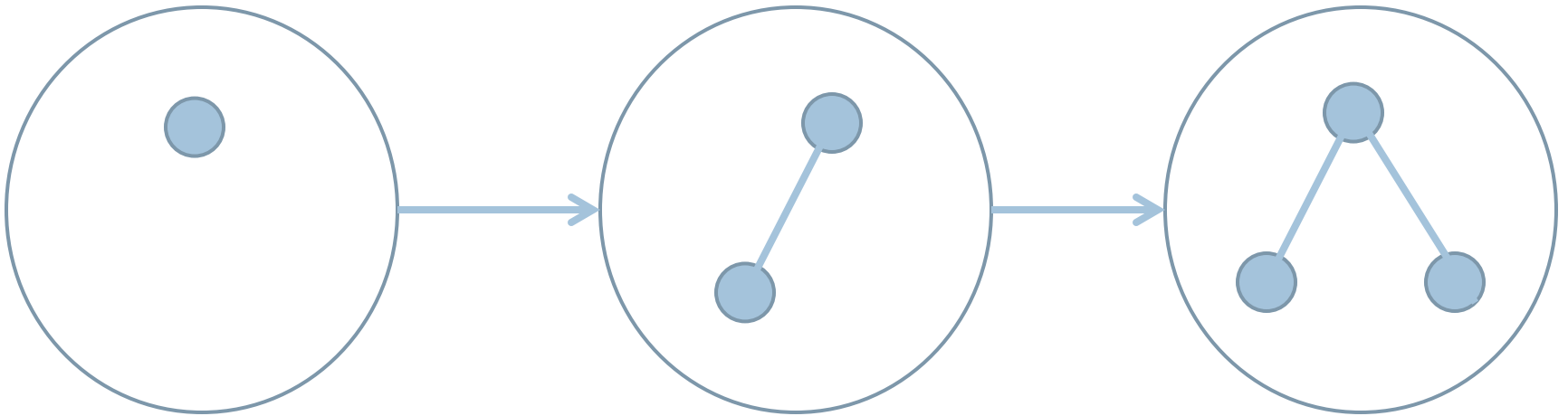
# State 2 (Refraction)



# State 3 (Refraction)



# Transitions between states

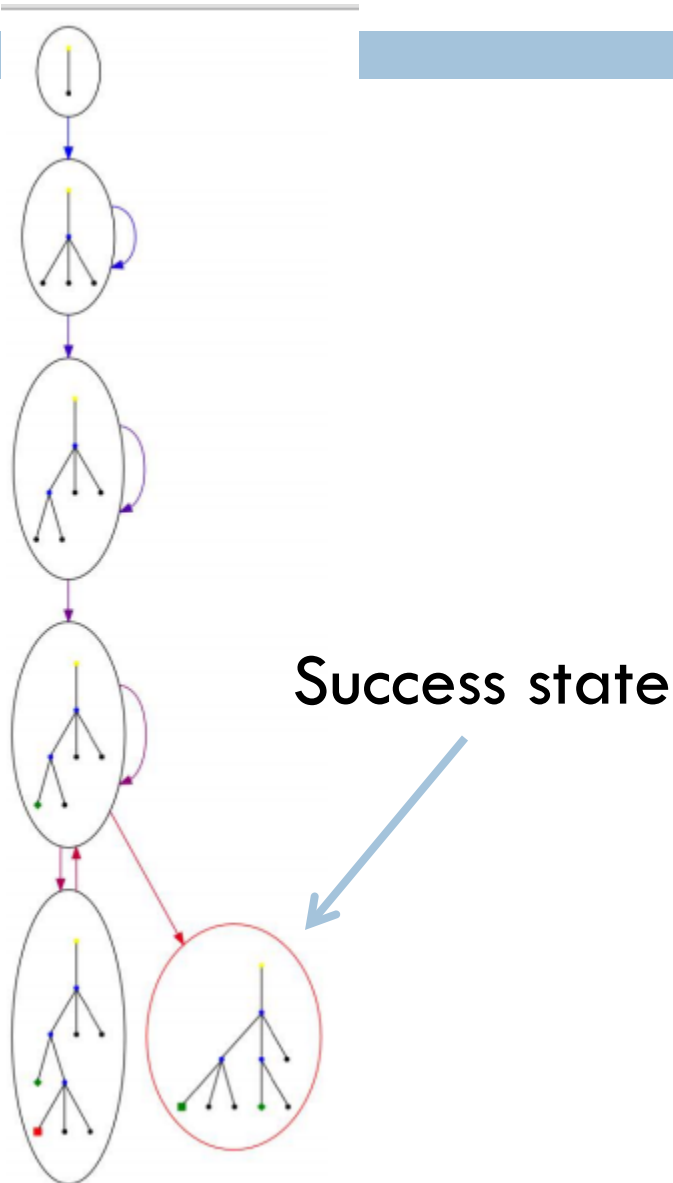


# Can show single student trajectories



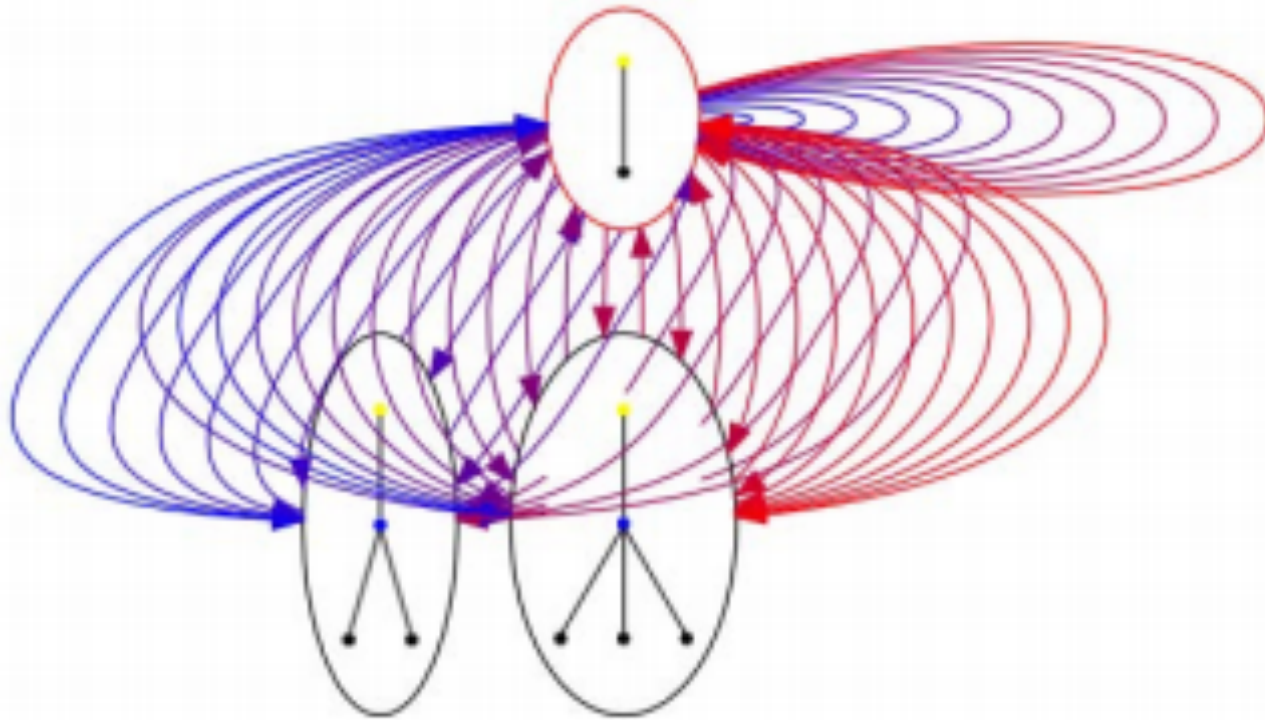


# Successful student (Martin et al., 2012)



# Unsuccessful student (Martin et al., 2012)

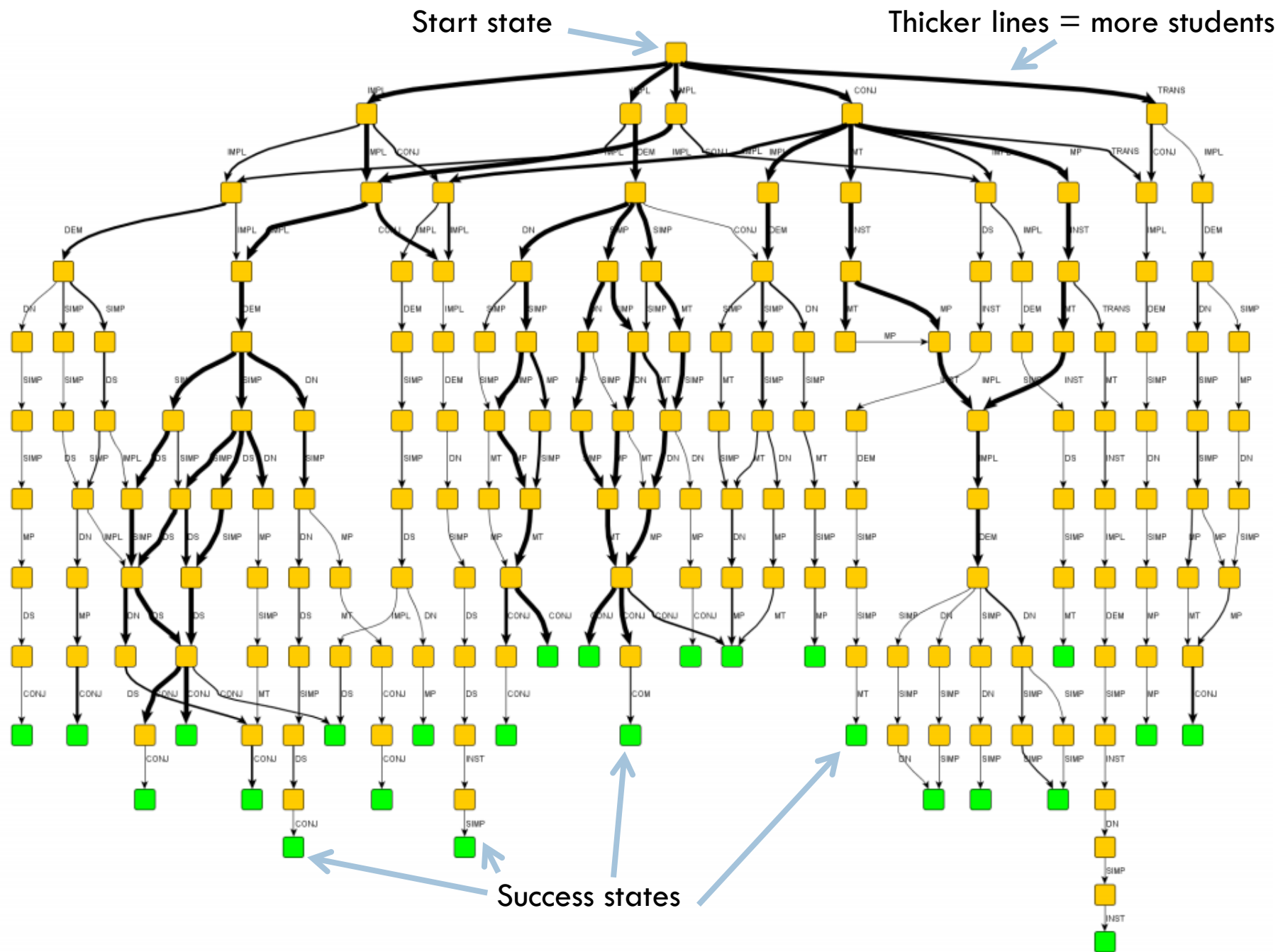
- Student goes back and forth endlessly between a small number of states...



# 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 6<sup>th</sup>  
International Conference on Educational Data Mining*,  
248-251.





# Uses

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- 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 (Stamper, Barnes, & Lehmann, 2008)

# Next lecture



- Other visualizations of educational data