

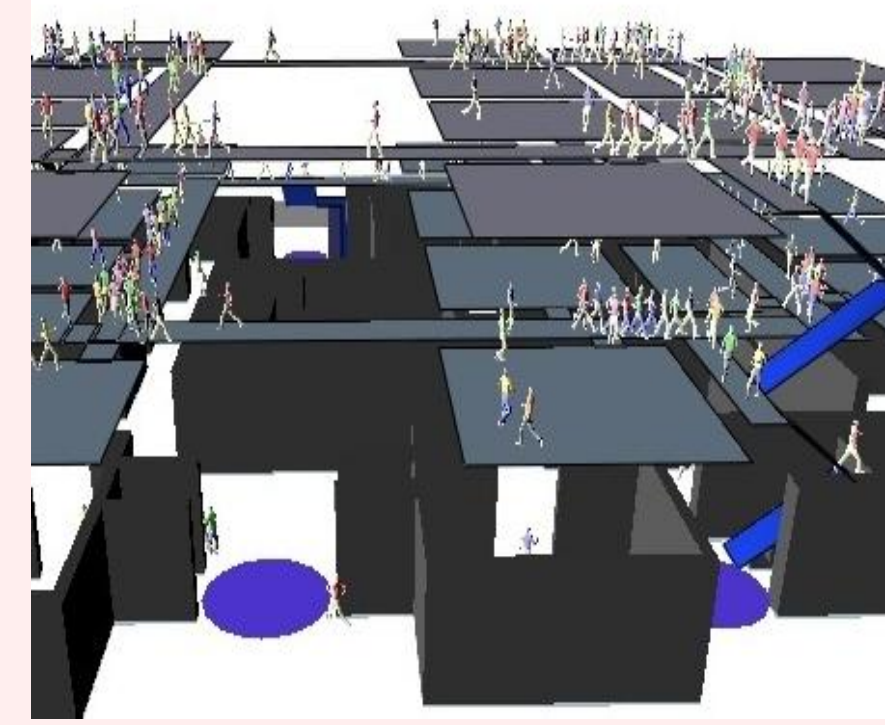
Motivation



In robotics, multiple robots frequently collaborate together in order to accomplish a common goal.

Applications

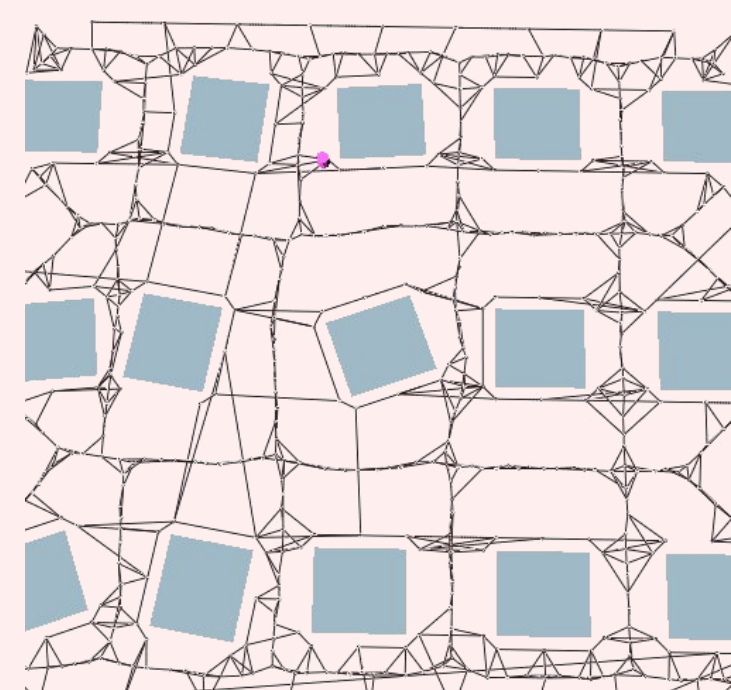
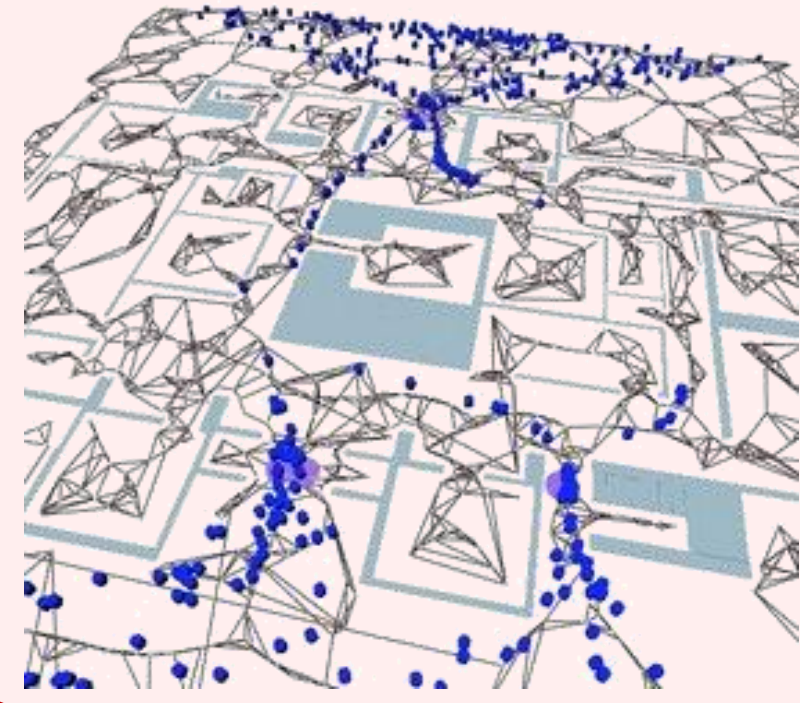
- Robotics • Building Design • Games



Related Work

Roadmap-based Motion Planning

A concept from robotics that represents the environment, where the agent is and where it can go.



Two example roadmaps in different environments: spanning a simple two dimensional environment with square obstacles.

Flocking

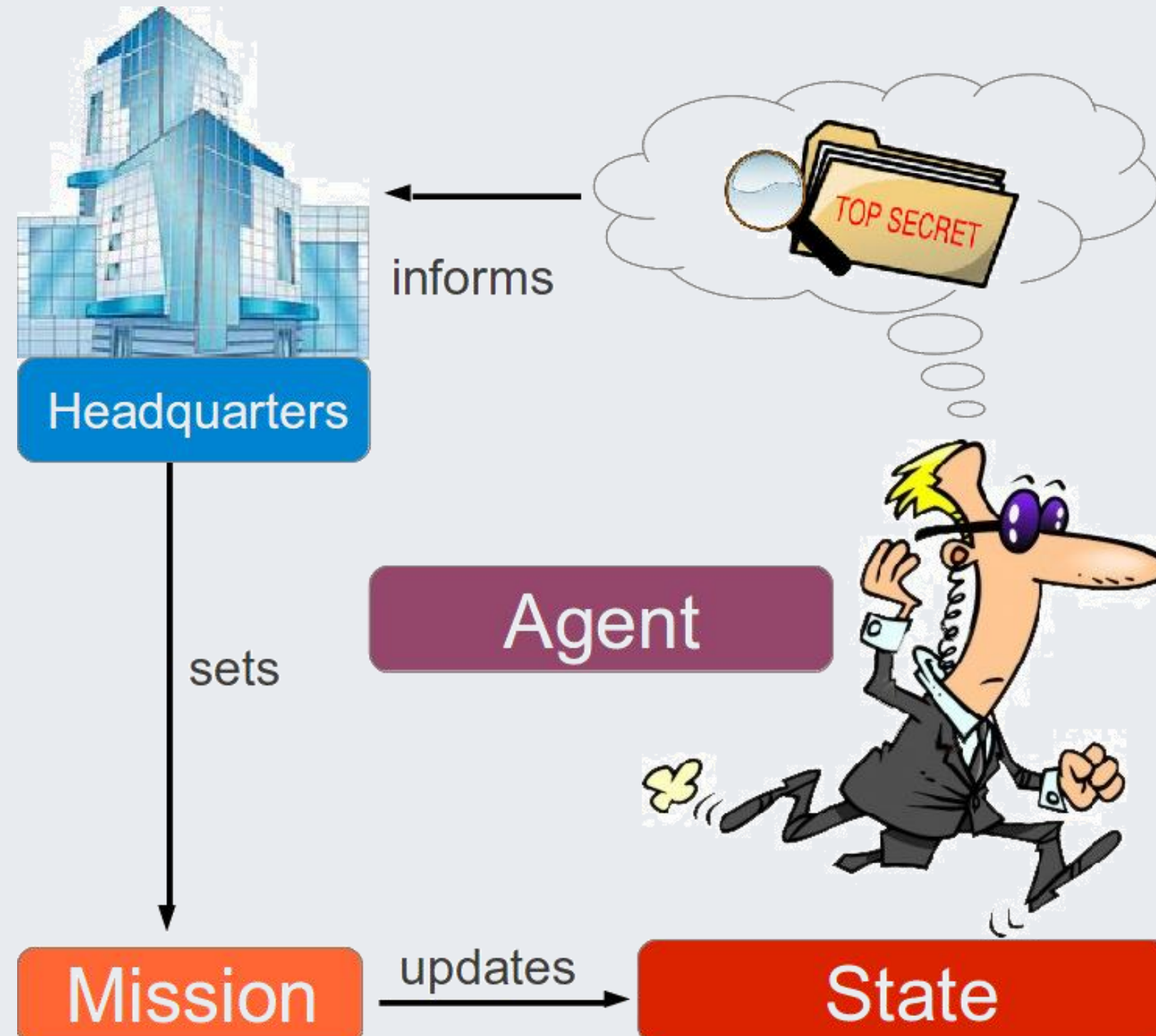
Used in graphics to model groups of agents individually while still interacting with each other through forces.



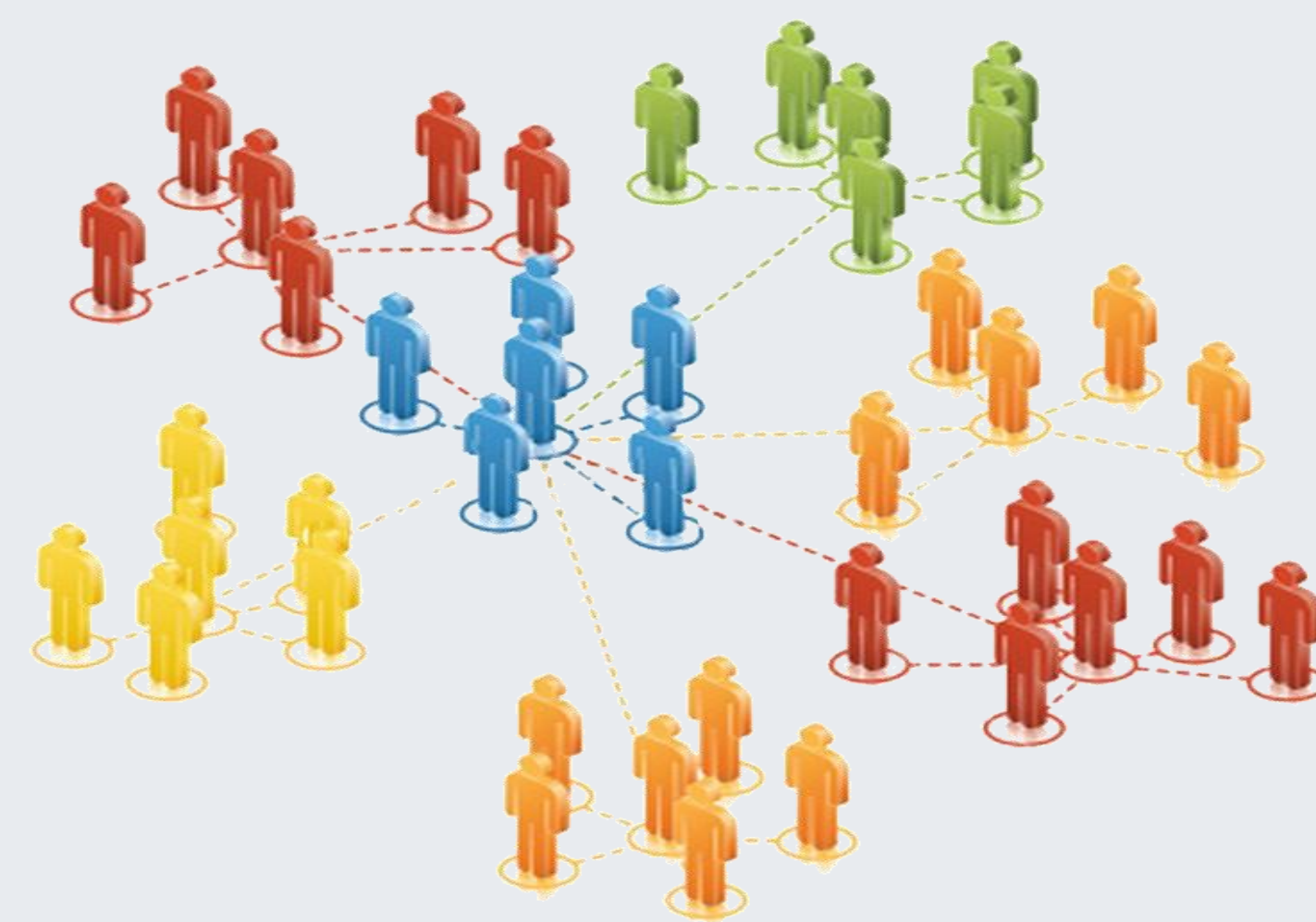
Agents-Based Systems

Agents

- *What is an agent?*
A human, a robot, an animal, etc.
- May have different knowledge
 - Different paths in the environment
 - Other agents to cooperate with



Systems

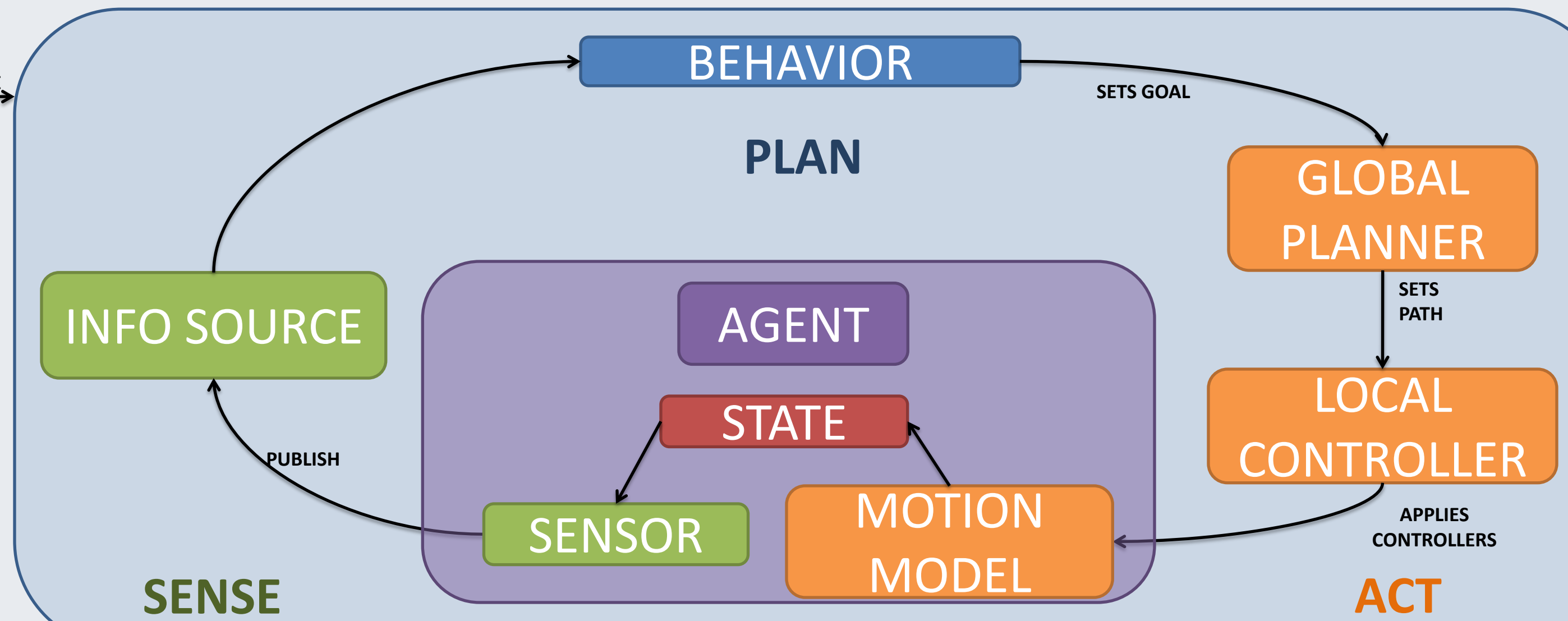


- An agent-based system is a group of agents acting under the influence of one or more behaviors
- *What is a behavior?*
 - A set of rules that govern what the agent should do next given its current knowledge
- May share knowledge globally
 - Most agents will share a roadmap
 - This can model inter agent communication.

Framework

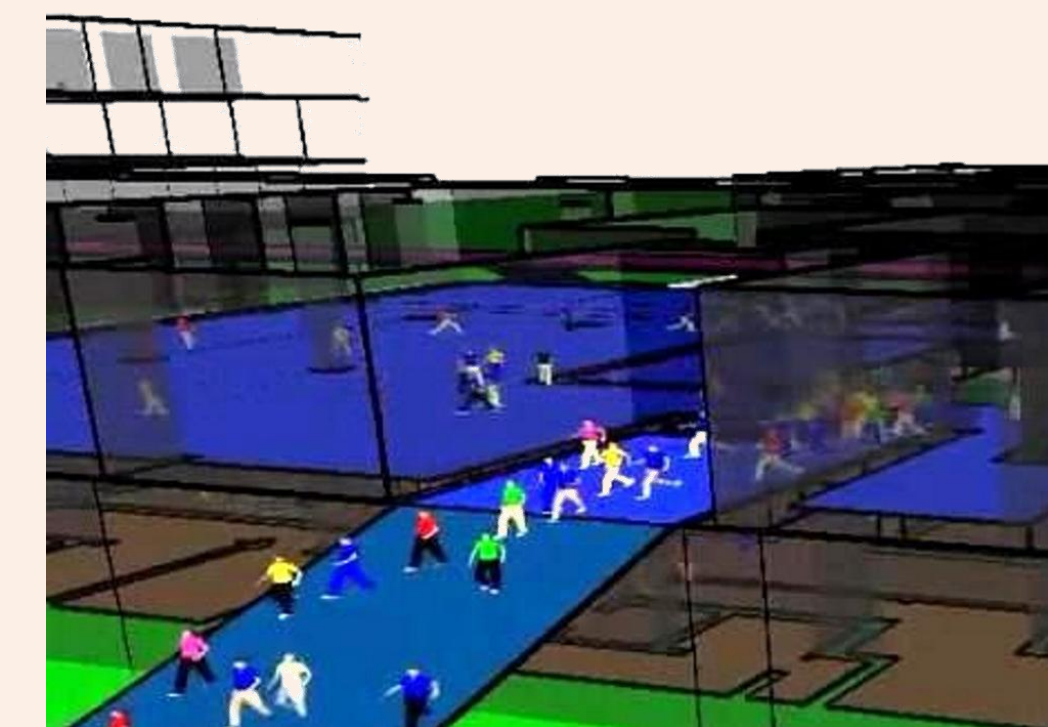
SIMULATOR UPDATE

Here is a simple example of the standard sense-plan-act loop in our framework.



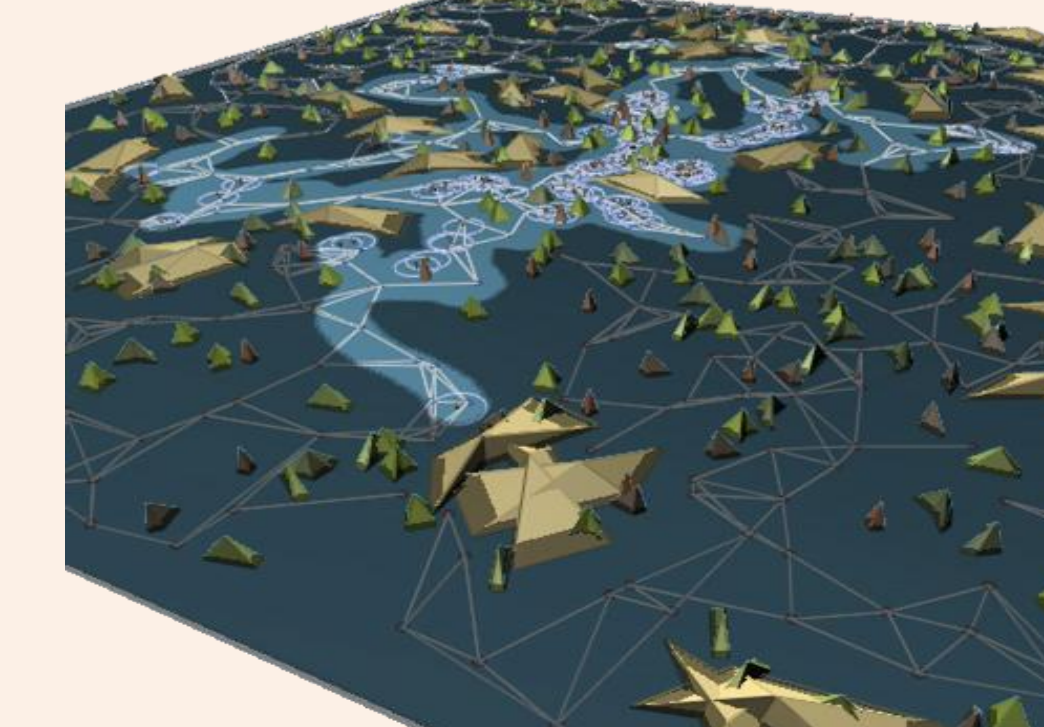
Example Behaviors

Ingress/Egress



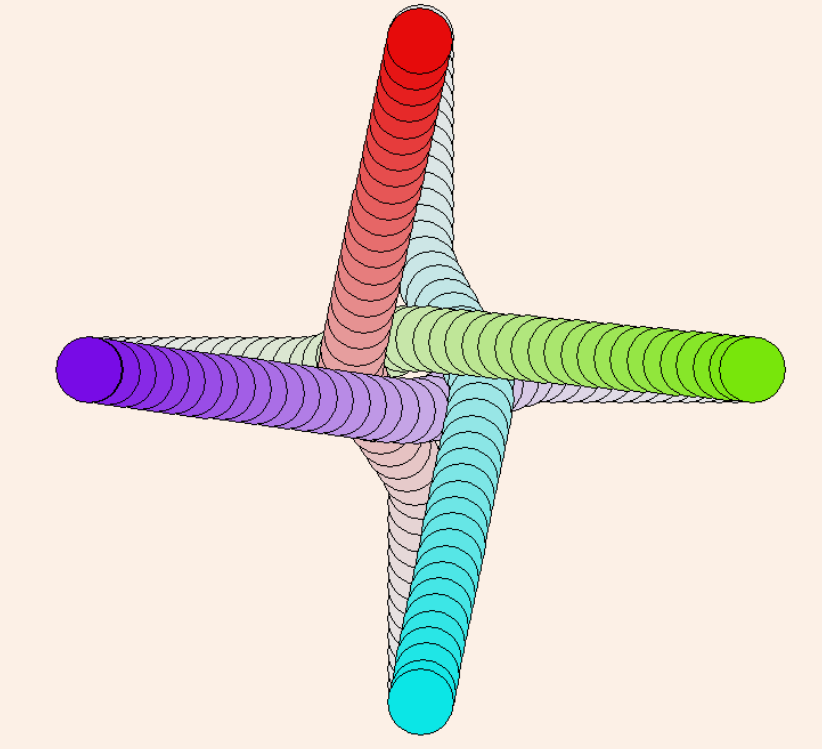
Simulates the flow of agents entering and exiting an environment and has applications in building design.

Searching



The frontier exploration behavior involves visiting unexplored areas of the environment using visibility information.

Reciprocal Velocity Obstacles



RVO is a Local Controller that applies a modified velocity as a control to avoid collisions.

Pursuit/Evasion

Vision sensors to simulate how environmental factors such as crowds and terrain can affect the chase.



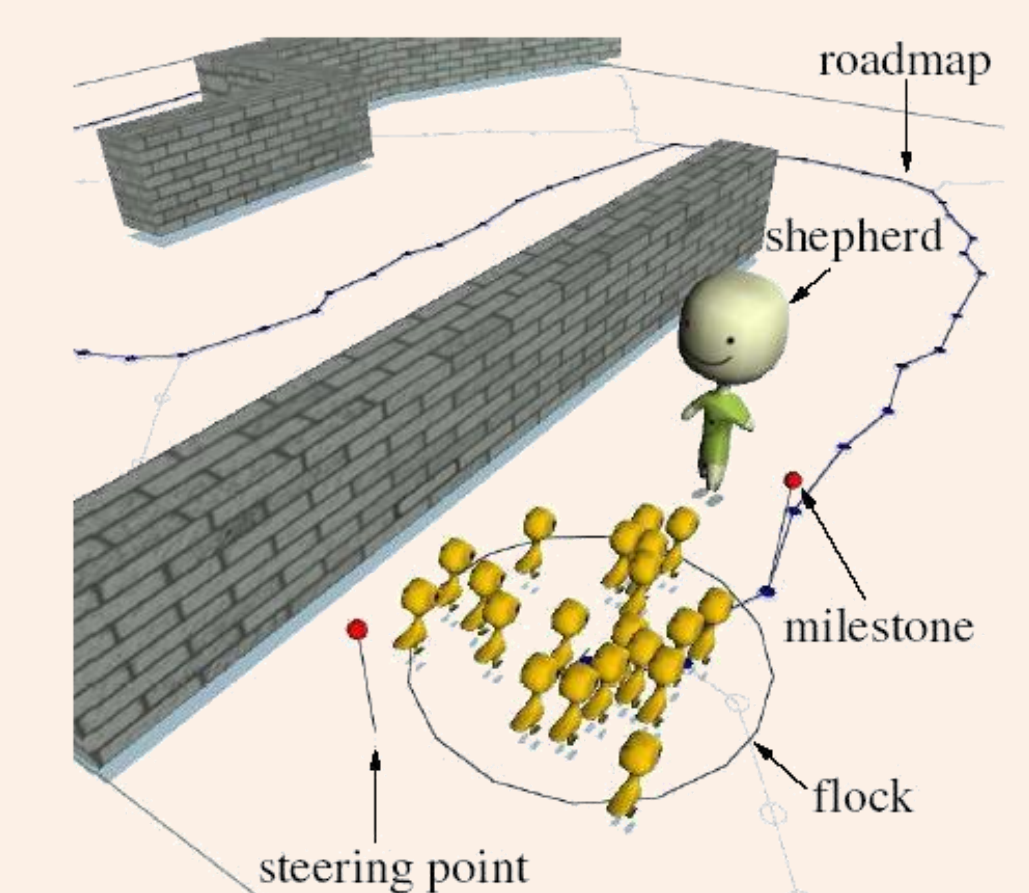
Caravanning

A group of agents that lack a complete roadmap may cooperate to traverse the environment.



Shepherding

One or more agents attempts to control a flock to perform tasks such as flock herding, covering, or patrolling.



Conclusions

We present a scalable roadmap-based framework for modeling group behaviors. In the future we plan to model more complicated agents restricted by their nature and more behaviors. We also plan to utilize a standalone physics library for collision resolution.

References

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- Utilizing Roadmaps in Evacuation Planning, Samuel Rodriguez, Nancy M. Amato, In Proc. of 24th Intern. Conf. on Computer Animation and Social Agents (CASA), 2011, in Intern. J. of Virtual Reality (IJVR), pp. 67-73, May 2011.
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