

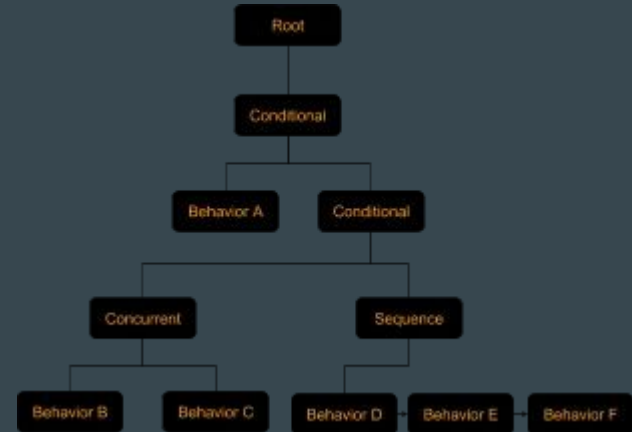
Behavior Tree AI



Alex Wood & Cormac MacKinnon

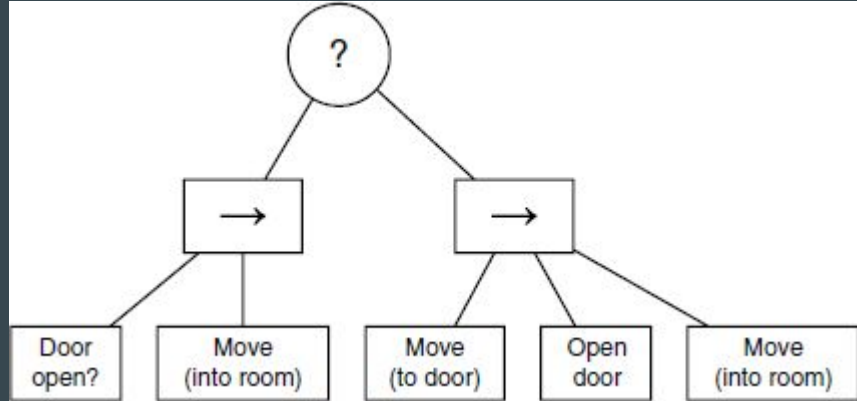
What are Behavior Trees?

- Synthesis of various techniques: Hierarchical State Machines, Scheduling, Planning, Action Execution
- Made up of “Tasks” that are then broken down into sub-trees that have more specific actions
- Tasks return a success, a failure, or a running status
- Tasks can be made up of other tasks to create more complex functionality



Key Concepts of Behaviour Trees

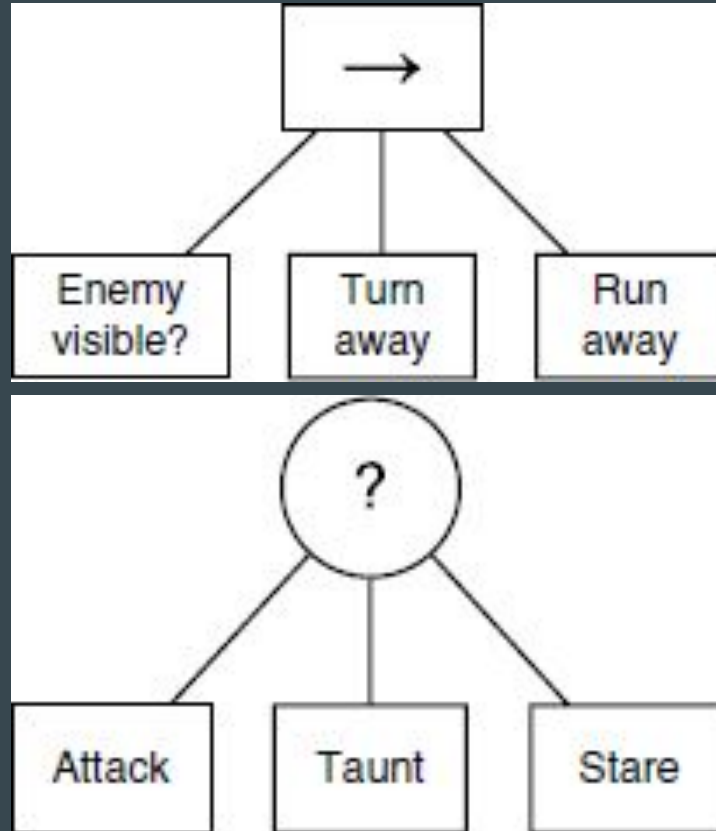
- Tasks
 - Success
 - Failure
 - Running
- Conditions
- Actions
- Composites

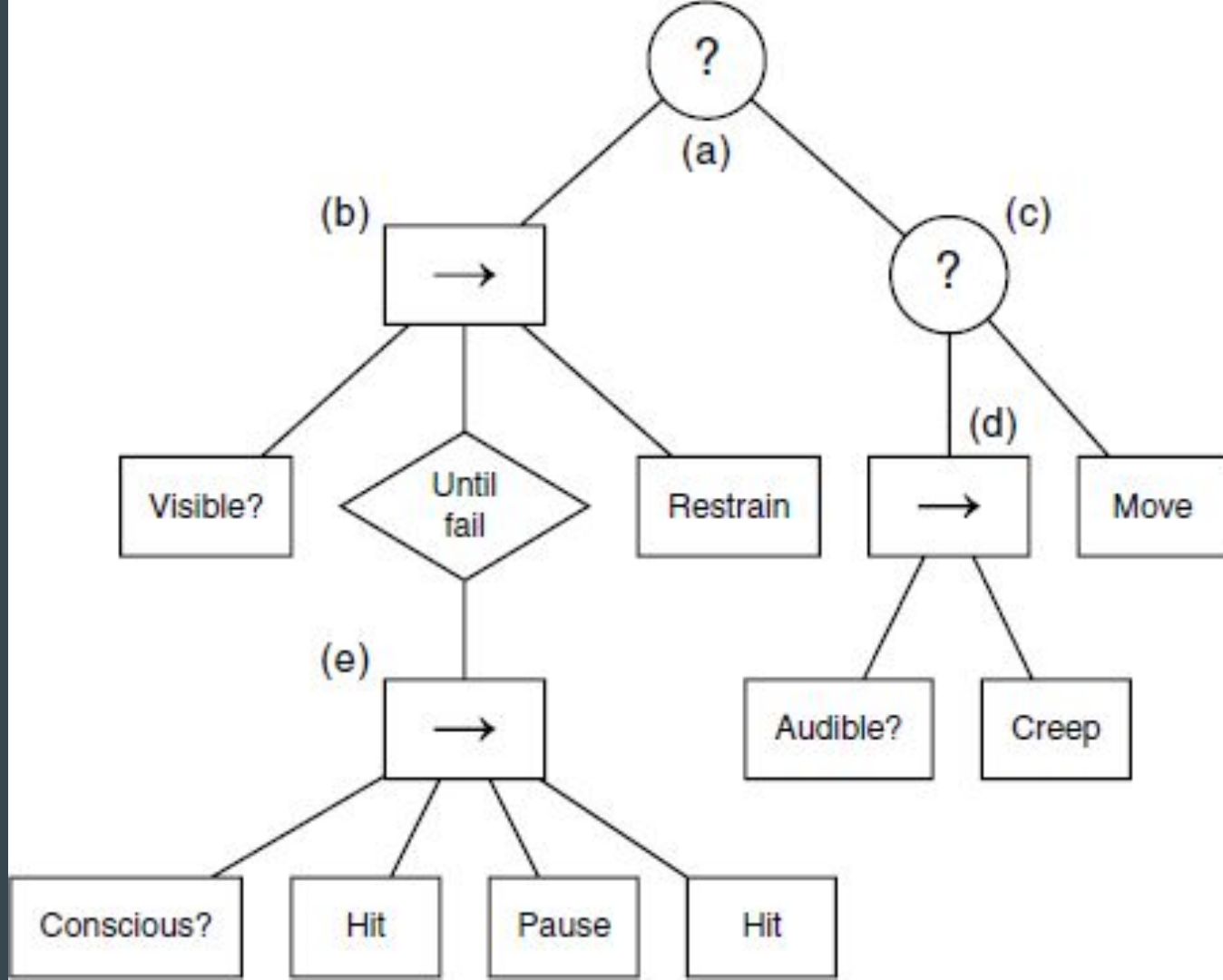


```
switch(mNode.Evaluate())
{
    case NodeState.RUNNING:
        mNodeState = NodeState.RUNNING;
        break;
    case NodeState.SUCCESS:
        mNodeState = NodeState.FAILURE;
        break;
    case NodeState.FAILURE:
        mNodeState = NodeState.SUCCESS;
        break;
    default:
        break;
}
return mNodeState;
```

Key Concepts of Behaviour Trees cont.

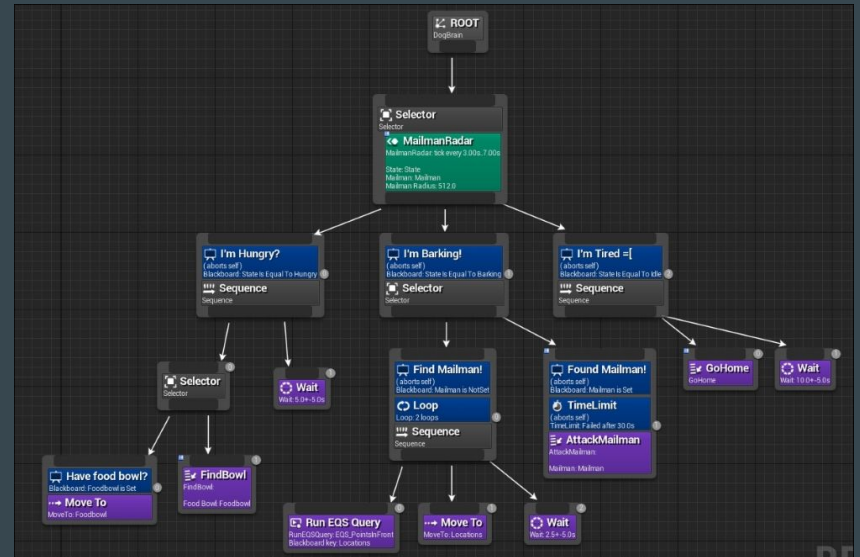
- Sequences
- Selectors
- Decorators
 - Inverters
 - filters





What are they good for?

- If it's set up correctly can be easily implemented by designers or other members of a team (can be set up like visual coding)
 - Unreal Engine 4 is set up to do this
- Easier to design and debug than Finite State Machines
- Provide more flexibility over design systems that came before

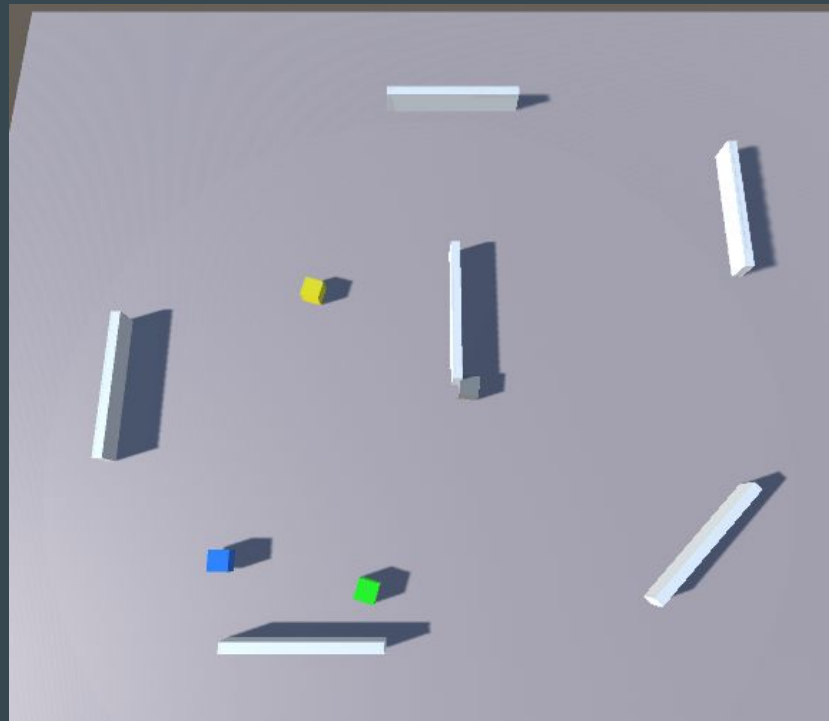


Limitation/Cons

- Becoming an older style design that is being replaced in more complex/modern games with more intense AI
 - Other styles of AI can more easily appear like human intelligence
- The cost of evaluating a large tree can be high
- Types of behaviors are limited by how the system works
- Decision making is locked to conditional nodes



Demo



Sources

Ai in Unity Tutorial. Behavior Trees. - Youtube. GameDevChef, 9 June 2020, <https://www.youtube.com/watch?v=F-3nxJ2ANXg>.

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