Behavior Trees vs. Decision Trees

Behavior trees are generally used when you want more complex and complete control over an AI's behavior. They are implemented as a simple form of planning, also known as reactive planning that allows behaviors to change without manual transitions. Decision trees are much more simple and easier to implement, which allows the AI to run through all possible outcomes and decide on which outcome to choose based simply on whether or not the conditions have been satisfied.

Three States and a Plan: The AI of F.E.A.R.

The main approach discussed in this paper is the method of trading multiple states and simplifying the finite state machine's states in order to utilizing planning. Planning, as defined in the paper, is a "formalized process of searching for sequence of actions to satisfy a goal". The approach uses plan formulation to implement smarter AI, which yields many benefits over the traditional state machine approach such as dynamic problem solving, layered behaviors, and decoupled goals and actions. Planning allows the AI to "re-plan" which yields multiple different behaviors that are dependent on player and environment interactions, at the cost of very little manual transitions for states. Planning also creates more depth for the AI, as there can be many layers and priorities built in that can mimic complex tactical behavior without ever having to manually specify a transition for all the interdependent behaviors. Finally, decoupling goals and actions allows different characters to have only the necessary behavior unique to them, and also decoupled systems allow goals and actions to share information between each other to create a more clean interaction between objects in the environment. A simple scenario example: Let's say that Kevin wants to get an A on his final project in his Interactive Entertainment Engineering class. If he has team members who know how to model 3D characters, he can make an FPS game to get an A. If he likes puzzle games, he can make a puzzle game to get an A. If he's programmed card games before, he can make a card game to get an A. If he doesn't really care about getting an A, he doesn't have to make a game at all. The AI will need to assess what his personality is like, what resources he has, and what experiences he has in order to achieve his goal.

Steering Behaviors for Autonomous Characters

In the paper, the author delves into the three main layers of an autonomous character, or AI in a game, and speaks particularly on steering. Steering is the concept of decomposing the higher and overreaching goal into manageable sub-goals in order to accomplish it. Another analogy to complement his analogy of reining in a stray cow from the herd is trying to learn how to shoot a 3 pointer in basketball. The goal is to be able to shoot a three pointer, and that is considered the action selection. There is a need to shoot a 3 pointer, and there is going to be a plan to reach that need. The best way to do that (or at least, a way to accomplish it) is to first learn how to hold a basketball properly, then shoot free throws, and then finally practice shooting 3 pointers. That is the steering mechanism. Finally, it comes to actually spending time everyday at the gym, to practice shooting the ball. Your mind instructs your body on the actual locomotion, and your body takes the mind's control signals as input, and does (or at least attempts) to do what it says. There are a few types of steering behaviors, namely seeking, fleeing, pursuing, wandering, arriving, collision avoiding, offset pursuing, wall following, containing, separating, aligning, path following, and leader following. Combining these different behaviors together in various mixes allows the autonomous character or "vehicle" to be more fully autonomous, and allow the character to have much more complex patterns of behaviors. These behaviors could be layered within themselves, giving priority to more important steering behaviors over less important ones. For example, the wandering steering behavior is often much less important than the need to flee, or the need to pursue. Given a situation where there is the ability to do both, good steering behavior should select the fleeing or pursuing behavior.