

# Characteristic AI's Fighting Decision Based on Bayesian Network

Xiangqing Ding, Zifan Nan, Wenxuan Zhu

## **Problem Statement**

In many current ACT or RPG games, hostile behaviors of AIs are almost in the same way: after spotting enemies, they rush to the them and keep attacking until the either enemies or themselves are killed.

Fighting to death sounds honorable, but obviously is not intelligent and realistic.

In a more realistic situation, one (creatures with thinking ability. Zombies? No.) is expected to determine whether they can beat their enemy, and choose whether to fight or run for lives based on current situation and its own characters. The elements (external) that may influence one's decision include the enemy's strength and quantity and so on. At the same time, one's character (internal), like brevity or cowardice, may also change its behaviors. Furthermore, if they choose to fight back, they should fight intelligently, like hitting and running. Otherwise, they should choose a best way to escape.

## **Techniques Involved**

For the most basic and important, the AI should own the ability of dynamically evaluating the chance of beating the enemies by using Bayesian Network.

Finite state machine should be used to allow AI translating from different states based on its decisions. In addition, some fighting skills may include a series behaviors and can be achieved by behavior trees.

Finding a way to escape could include common path-finding algorithms like A\*, but other algorithms with less cost and same efficiency should also be compared and considered.

## **Evaluation Method**

This project is designed to be implemented on ACT or RPG games. One of the most important evaluation metric of this project is the AI's reactions to enemies. The AI is expected to behave different towards different enemies and different characters compared with ordinary AI. We could assign enemies with different attributes to AI with different characters and see the AI's behaviors. Or we could set two AI teams fighting each other and see the result.

The project could also be evaluated by the survival rate (times of survival/times of encountering enemies) and winning rate (times of beating enemies/times of fighting with enemies) of AI. Both reflect the success of decision making, and the second one specifically presents how smart the AI fighting skills are.

## **Importance**

For the most significant, this project allows game AI to make reasonable choice and actions, which looks more intelligent and characteristic. In addition, AI with different characters and decisions provides player and the game with more possibilities.

In the BN (Bayesian Network) model, in addition to the original probabilities we input (e.g. Armed Enemies-Win 60%: Lost 40%), the player's behaviors and results may also be added to the statistics and influence the rate. This presents AI with the ability of learning and evolving.

People may think random behaviors also work and cost lost. But decision making cannot be replaced because decision making is based on the external environments and internal characters. After all, no one is expected to escape in a fight that you cannot lose.