Edith Cowan University

CSG2341
Intelligent Systems

Assignment 1B

Saucers Part 2

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1 Introduction

This report examines fuzzy logic using Sugeno style inference, and its practical use in a video game called Saucers. Saucers is a multiplayer game where each player indirectly controls their flying saucer using a fuzzy logic controller. The saucers meet on a battle space, a rectangular xy plane, with the purpose of destroying each other. The walls of this space cannot be travelled through, and will cause the saucer to ricochet off the wall when hit.

Up to twelve saucers spawn at the start of the game, and each saucer begins with equal amounts of energy. This energy is consumed as they fly around, fire their auto aiming cannon mounted on a rotating turret, or use their shield to protect themselves from energy blasts. When a saucer is hit by an energy blast, energy is depleted. The amount of energy depletion depends on the amount of energy committed to firing, and how far away it was fired. Energy blasts lose energy the further they travel.

Saucers cannot stop flying and will always consume energy. However, the speed of a saucer can be controlled. The slowest speed consumes the least amount of energy, while the fastest speed consumes the most. The saucer's heading can also be controlled, and can turn left or right in any direction. There is however, a small energy penalty for turning.

Each saucer is equipped with multiple sensors to provide inputs for fuzzy logic. There is a sensor for all current enemy saucers, providing information about their distance, their direction in relation to the player, their current heading in relation to the player's heading, their current speed, their current energy level, and their ID number. Similarly, there is a sensor for power ups that randomly appear in the battle space, providing an energy boost to the first saucer that touches it, and a sensor for all energy blasts. These sensors provide the same information as the enemy saucer sensor. There is also a sensor providing information about the player's own energy level.

When a saucer loses all of its energy, it disappears from the battle space and loses. Each game round has a limited time, and if multiple saucers are still alive at the end of the round, it results in a tie for that spot in the ladder. The goal of this report is to design a fuzzy logic controller so that it's saucer will be the last saucer remaining during the end of a game round.

2 Idea

The main tactic for this controller is fly defensively in order to conserve energy and survive until there are a two enemies left. Turns for the most part will focus on the energy blast sensor, in order to dodge as many of them as possible. When there are only two enemy saucers left in the arena, turning will focus on the enemy saucer sensor, to track them down and shoot at them from a close distance.

However, when any power ups spawn nearby, the goal is to move straight to the power up, ignoring any energy blasts. If any close energy blasts close to the player while attempting to retrieve a power up, the player will raise the shield. The rate of fire will be kept to a minimum for most situations to conserve energy, unless a nearby power up spawns, or if there is only two remaining enemy saucers left. In these cases, the rate of fire will increase, to either deter enemy saucers from retrieving the power

up, or attempt to destroy them.

Speed will also be kept at the minimum for most situations, only increasing speed when necessary for dodging, or when a power up spawns nearby, to try and get to it first. Speed will also be increased when there are only two remaining enemy saucers left, attempting to destroy them before the timer runs out.

This controller attempts to implement these strategies with turning, speed, shields and firepower, with the primary goal of flying defensively by dodging energy blasts and retrieving nearby power ups. When there are only two enemies left, the saucer will begin to fly offensively, increasing speed and firepower, and attempt to destroy the enemies before the timer runs out.

3 Fuzzy variables

4 Learnings

5 Conclusion