# Soft Computing (7168)

Assignment 1 S2 2012

# Fuzzy Harrier Lander Report

Ravel Ford u3049516

**Problems**

1. The first problem I had was with the way the height was calculated relative to the deck of the ship. In easy, medium and hard the jet is at an height of 23 when it is at the height of the deck so I change the height value by offesetting it by 23; Line 114: height = harrier.Y – 23. And for Very Hard I offset it by 5. Then in my Height sets, I had a landing height set where its centre was 0.
2. The 2nd problem I had was moving the jet across to the safe landing area. To do this I had a Distance sets, with 7 sets in it which determined how far away from the safe landing area the jet was and adjusted the thrust vector enough to move the jet towards the safe landing area as needed.

**Fuzzy Rules**

Throttle Rules: Hard And VeryHard

Y Velocity Height Rules:

if Y vel is up then throttle is no

if height is high and Y vel is high then throttle is medium

if height is high and Y vel is moderate then throttle is medium

if height is high and Y vel is low then throttle is low

if height is high and Y vel is safe then throttle is low

if height is medium and Y vel is high then throttle is high

if height is medium and Y vel is moderate then throttle is high

if height is medium and Y vel is low then throttle is medium

if height is medium and Y vel is safe then throttle is low

if height is low and Y vel is high then throttle is high

if height is low and Y vel is moderate then throttle is medium

if height is low and Y vel is low then throttle is medium

if height is low and Y vel is safe then throttle is low

if height is landing and Y vel is high then throttle is high

if height is landing and Y vel is moderate then throttle is high

if height is landing and Y vel is low then throttle is medium

if height is landing and Y vel is safe then throttle is low

if height is below deck height height then throttle is high

if height is medium and Y vel is up then throttle is no

if height is low and Y vel is up then throttle is no

if height is landing and Y vel is up then throttle is no

Throttle Rules: Easy And Medium

Y Velocity Height Rules:

if Y vel is up then throttle is no

if height is high and Y vel is high then throttle is medium

if height is high and Y vel is moderate then throttle is medium

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if height is medium and Y vel is low then throttle is medium

if height is medium and Y vel is safe then throttle is low

if height is low and Y vel is high then throttle is high

if height is low and Y vel is moderate then throttle is medium

if height is low and Y vel is low then throttle is medium

if height is low and Y vel is safe then throttle is low

if height is landing and Y vel is high then throttle is high

if height is landing and Y vel is moderate then throttle is high

if height is landing and Y vel is low then throttle is medium

if height is landing and Y vel is safe then throttle is low

if height is below deck height height then throttle is high

if height is medium and Y vel is up then throttle is no

if height is low and Y vel is up then throttle is no

if height is landing and Y vel is up then throttle is no

Thrust Vector Rules: Hard and VeryHard

X Velocity Left Dangerzone Rules

if distance is left high dangerzone then thrust vector is forward high thrust

if distance is left moderate dangerzone and X vel is high left then thrust vector is forward high thrust

if distance is left moderate dangerzone and X vel is moderate left then thrust vector is forward moderate thrust

if distance is left moderate dangerzone and X vel is low left then thrust vector is forward moderate thrust

if distance is left moderate dangerzone and X vel is neutral then thrust vector is forward moderate thrust

if distance is left low dangerzone and X vel is high left then thrust vector is forward moderate thrust

if distance is left low dangerzone and X vel is moderate left then thrust vector is forward moderate thrust

if distance is left low dangerzone and X vel is low left then thrust vector is forward moderate thrust

if distance is left low dangerzone and X vel is high left then thrust vector is forward moderate thrust

X Velocity Safezone Rules

if distance is safe zone and X vel is high left then thrust vector is forward moderate thrust

if distance is safe zone and X vel is moderate left then thrust vector is forward moderate thrust

if distance is safe zone and X vel is low left then thrust vector is forward low thrust

if distance is safe zone and X vel is neutral then thrust vector is neutral thrust

if distance is safe zone and X vel is low right then thrust vector is backward low thrust

if distance is safe zone and X vel is moderate right then thrust vector is backward moderate thrust

if distance is safe zone and X vel is high right then thrust vector is backward moderate thrust

if distance is safe zone and X vel is moderate right then thrust vector is backward moderate thrust

X Velocity Right Dangerzone Rules

if distance is right high dangerzone then thrust vector is backward high thrust

if distance is right moderate dangerzone and X vel is high right then thrust vector is backward high thrust

if distance is right moderate dangerzone and X vel is moderate right then thrust vector is backward moderate thrust

if distance is right moderate dangerzone and X vel is low right then thrust vector is backward moderate thrust

if distance is right moderate dangerzone and X vel is neutral then thrust vector is backward moderate thrust

if distance is right low dangerzone and X vel is high right then thrust vector is backward moderate thrust

if distance is right low dangerzone and X vel is moderate right then thrust vector is backward moderate thrust

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Thrust Vector Rules: Easy And Medium

X Velocity Left Dangerzone Rules

if distance is left high dangerzone then thrust vector is forward high thrust

if distance is left moderate dangerzone and X vel is high left then thrust vector is forward high thrust

if distance is left moderate dangerzone and X vel is moderate left then thrust vector is forward moderate thrust

if distance is left moderate dangerzone and X vel is low left then thrust vector is forward moderate thrust

if distance is left moderate dangerzone and X vel is neutral then thrust vector is forward moderate thrust

if distance is left low dangerzone and X vel is high left then thrust vector is forward moderate thrust

if distance is left low dangerzone and X vel is moderate left then thrust vector is forward moderate thrust

if distance is left low dangerzone and X vel is low left then thrust vector is forward moderate thrust

if distance is left low dangerzone and X vel is high left then thrust vector is forward moderate thrust

X Velocity Safezone Rules

Easy

if distance is safe zone and X vel is high left then thrust vector is forward moderate thrust

if distance is safe zone and X vel is moderate left then thrust vector is forward moderate thrust

if distance is safe zone and X vel is low left then thrust vector is forward low thrust

if distance is safe zone and X vel is neutral then thrust vector is neutral thrust

if distance is safe zone and X vel is low right then thrust vector is backward low thrust

if distance is safe zone and X vel is moderate right then thrust vector is backward moderate thrust

if distance is safe zone and X vel is high right then thrust vector is backward moderate thrust

if distance is safe zone and X vel is moderate right then thrust vector is backward moderate thrust

Medium

if distance is safe zone and X vel is high left then thrust vector is forward moderate thrust

if distance is safe zone and X vel is moderate left then thrust vector is forward moderate thrust

if distance is safe zone and X vel is low left then thrust vector is forward low thrust

if distance is safe zone and X vel is neutral then thrust vector is neutral thrust

if distance is safe zone and X vel is low right then thrust vector is backward low thrust

if distance is safe zone and X vel is moderate right then thrust vector is backward moderate thrust

if distance is safe zone and X vel is high right then thrust vector is backward moderate thrust

if distance is safe zone and X vel is moderate right then thrust vector is backward moderate thrust

X Velocity Right Dangerzone Rules

if distance is right high dangerzone then thrust vector is backward high thrust

if distance is right moderate dangerzone and X vel is high right then thrust vector is backward high thrust

if distance is right moderate dangerzone and X vel is moderate right then thrust vector is backward moderate thrust

if distance is right moderate dangerzone and X vel is low right then thrust vector is backward moderate thrust

if distance is right moderate dangerzone and X vel is neutral then thrust vector is backward moderate thrust

if distance is right low dangerzone and X vel is high right then thrust vector is backward moderate thrust

if distance is right low dangerzone and X vel is moderate right then thrust vector is backward moderate thrust

if distance is right low dangerzone and X vel is low right then thrust vector is backward moderate thrust

if distance is right low dangerzone and X vel is high right then thrust vector is backward moderate thrust

**Logic of the Fuzzy System**

Basically my Fuzzy system check to see whether the Harrier is in 1 of 7 zones, high left dangerzone, medium left dangerzone, low left dangerzone, safezone and the high right dangerzone, medium right dangerzone and low right dangerzone. This is based on the harrer.X variable, if it is in one of these zones the thrust vector is adjusted accordingly to push the Harrier towards the safezone. When above the safezone the harrier will try and neutralize all X velocity and land safely. My system also checks the height of the Harrier, the height is divided into 5 which include high, medium, low, landing and below deck height. Using the Harrier.Y variable I can determine how much throttle to use to make the Harrier come down at a safe speed to land. Also used two velocity sets ( X and Y) to determine how much Thrust vector or throttle I needed.

**Fuzzy Sets**