AutoBot

- 2D space shooter game where **Fuzzy Logic** is implemented for Enemy bot to play defensively or offensively based on Bot's health, Bot's ammo and Player's offensive or defensive position.
- Membership functions and Fuzzy rules are defined in **Mamdani System** and then converted to **Takage-Sugeno System** for calculating the Output of the Fuzzy system.

- For convenience in checking Fuzzy rules auto fire on Bot is not implemented.
  Controls: Arrow keys to control the player, 'Space' to fire from Player Ship, 'B' to fire from Bot Ship
  Note: In Visual Studio, set Windows SDK Version to latest in project settings.
- Fuzzy Logic code is implement in '**GameState_Asteroids.c**' file as '**getFuzzyOutputY()**' function. Memberships functions are defined as float array and are used to calculate firing levels in '**Triangle()**' function.
- If player ship position is close to the centre then the player is considered playing **offensive** while the position of the player ship is far from the centre then the player is making **defensive** move.
- The '**getFuzzyOutputY()**' function takes **antecedents** of the Fuzzy system as parameters and returns the **consequence** i.e. position of the Bot ship based on the antecedents – Bot current HP, Bot current Ammo, Player ship position.
- Player and Bot start with **100 Health Points(HP)** and **5 bullets**. A bullet from either ship does **8 damage**. Each Heart symbol on the ship represent **25 HP**. 5 bullets can be fired continuously and are **reloaded after 2.5 seconds** of delay. Bullets are displayed beside the ships.

Variables:

BHP – Bot Health Points
BAM – Bot Ammo
PBH – Player Behaviour
BBH – Bot Behaviour

Antecedents:

BHP
- Low (LO)
- Medium (MD)
- High (HI)

BAM
- Low (LO)
- High (HI)

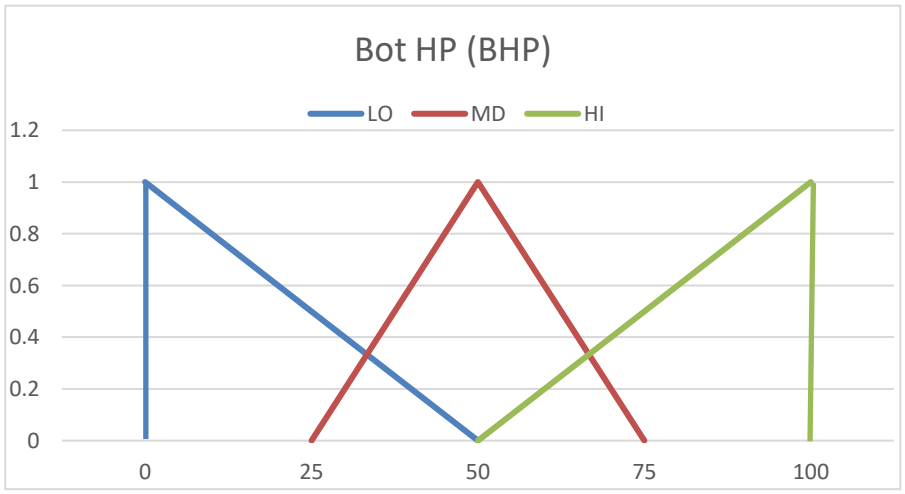
PBH
- Offensive (OF)
- Normal (NM)
- Defensive (DF)

Consequences:

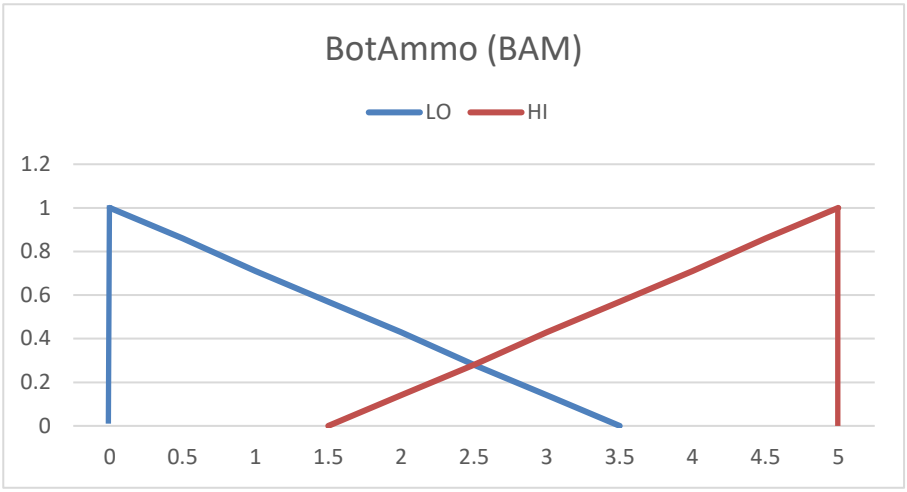
BBH
- Offensive (OF)
- Normal (NM)
- Defensive (DF)

Membership Functions:

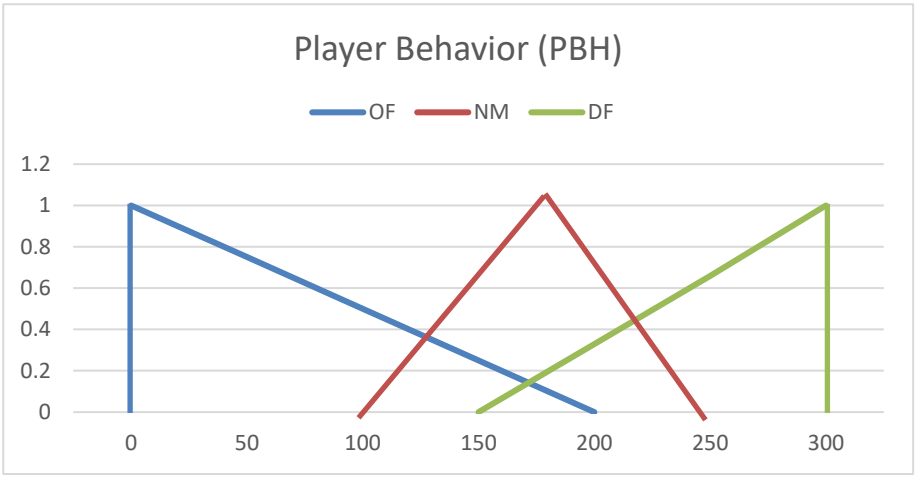
1. BHP



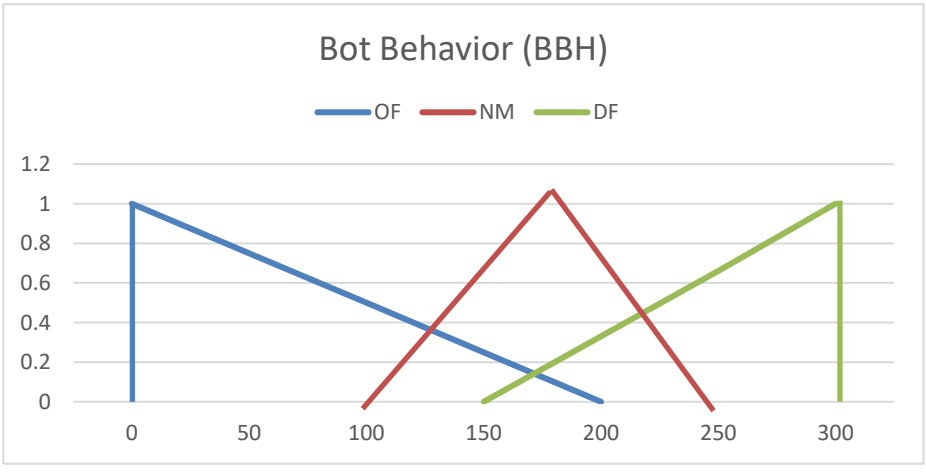
2. BAM



3. PBH



4. BBH



Fuzzy Rule base:

1. If BHP is LO and BAM is LO and PBH is OF then BBH is DF
2. If BHP is LO and BAM is LO and PBH is NM then BBH is NM
3. If BHP is LO and BAM is LO and PBH is DF then BBH is NM
4. If BHP is LO and BAM is HI and PBH is OF then BBH is DF
5. If BHP is LO and BAM is HI and PBH is NM then BBH is NM
6. If BHP is LO and BAM is HI and PBH is DF then BBH is NM
7. If BHP is MD and BAM is LO and PBH is OF then BBH is DF
8. If BHP is MD and BAM is LO and PBH is NM then BBH is DF
9. If BHP is MD and BAM is LO and PBH is DF then BBH is NM
10. If BHP is MD and BAM is HI and PBH is OF then BBH is NM
11. If BHP is MD and BAM is HI and PBH is NM then BBH is NM
12. If BHP is MD and BAM is HI and PBH is DF then BBH is OF
13. If BHP is HI and BAM is LO and PBH is OF then BBH is NM
14. If BHP is HI and BAM is LO and PBH is NM then BBH is NM
15. If BHP is HI and BAM is LO and PBH is DF then BBH is OF
16. If BHP is HI and BAM is HI and PBH is OF then BBH is OF
17. If BHP is HI and BAM is HI and PBH is NM then BBH is NM
18. If BHP is HI and BAM is HI and PBH is DF then BBH is OF