RISK AWARE PATH PLANNING

ZIPLINE
PERCEPTION AND AUTONOMY INTERN CANDIDATE
KAUSHAL SORTE

Augmented A Star Search

- Basic A Star search doesn't take into account costs or risks associated with the environment.
- In this work, I have implemented a simple extension of A Star search that calculates path cost as the number of pixels.
- However, a pixel is counted with higher weight if it lies in the risk zone. Thus, the cost is not an integer.

Heuristic calculation

- Heuristic for the A-star search is calculated by planning a straight line path from the current position to the site and adding up the pixels.
- As mentioned before, high risk pixels are given more weight. This can be tuned. A weight of 1.5 gave me the best results.
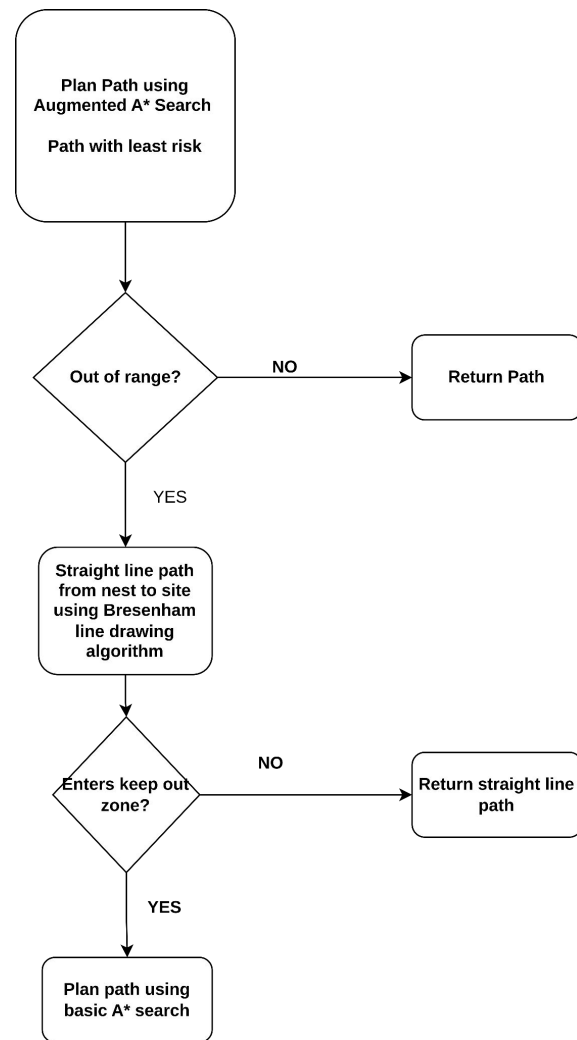- Straight line path planned using the Bresenham algorithm.

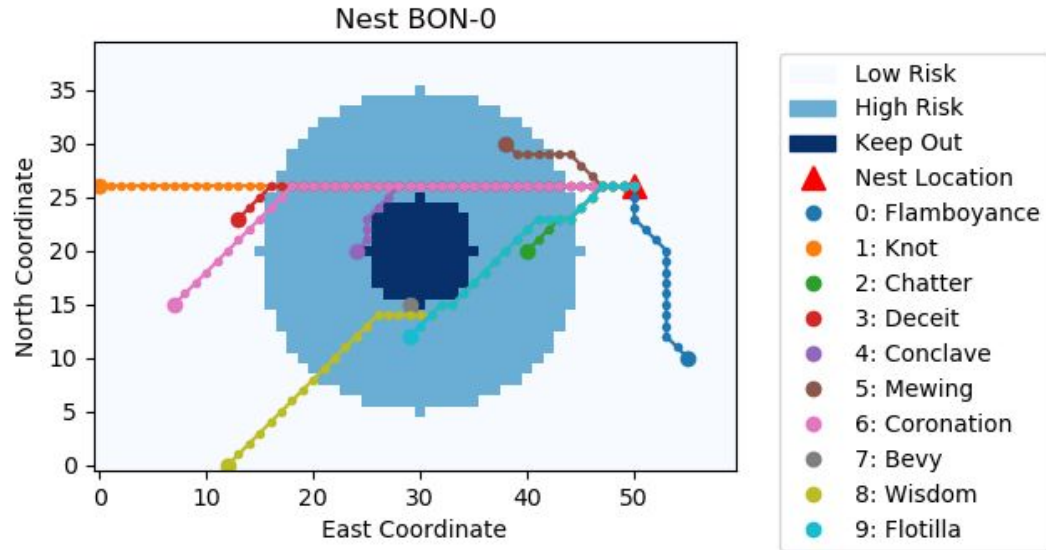Reference :

Path Planning Logic

A combination of risk aware A-star, basic A-star and simple straight line planning is employed to take into the account range limitations.

Basic A-star employs Euclidean distance as heuristic and ignores risk values.

NOTE : The function that calculates heuristic using a rasterized straight line from a position to the site is also used to plan a straight path in case A-star doesn't yield good results.

Plan Path using Augmented A* Search

Path with least risk

Out of range? — NO → **Return Path**

YES

Straight line path from nest to site using Bresenham line drawing algorithm

Enters keep out zone? — NO → **Return straight line path**

YES

Plan path using basic A* search

Results : Basic A Star Search

Nest BON-0

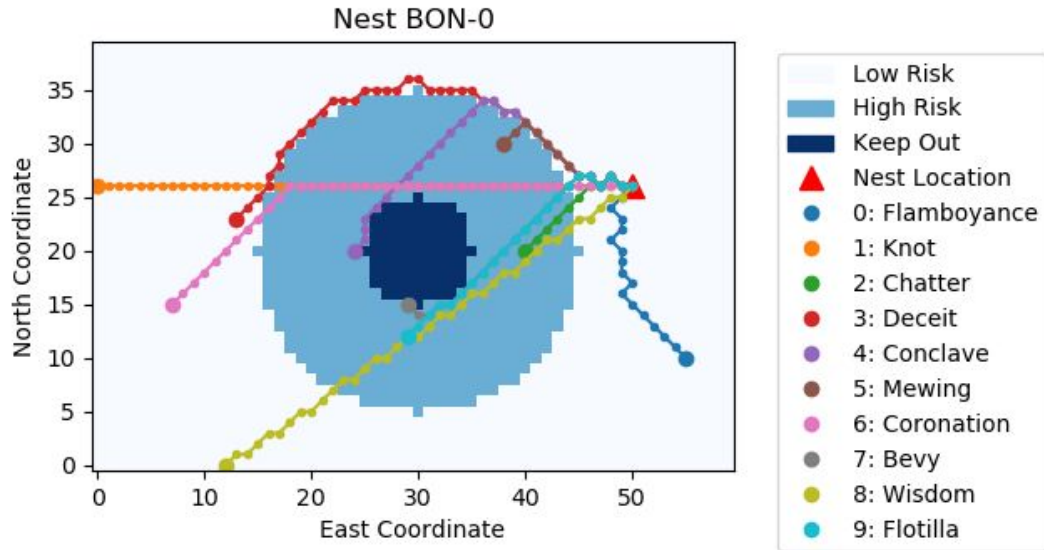Total Risk : 170
All Paths valid.

Augmented A-Star Search without consideration for range

Nest BON-0
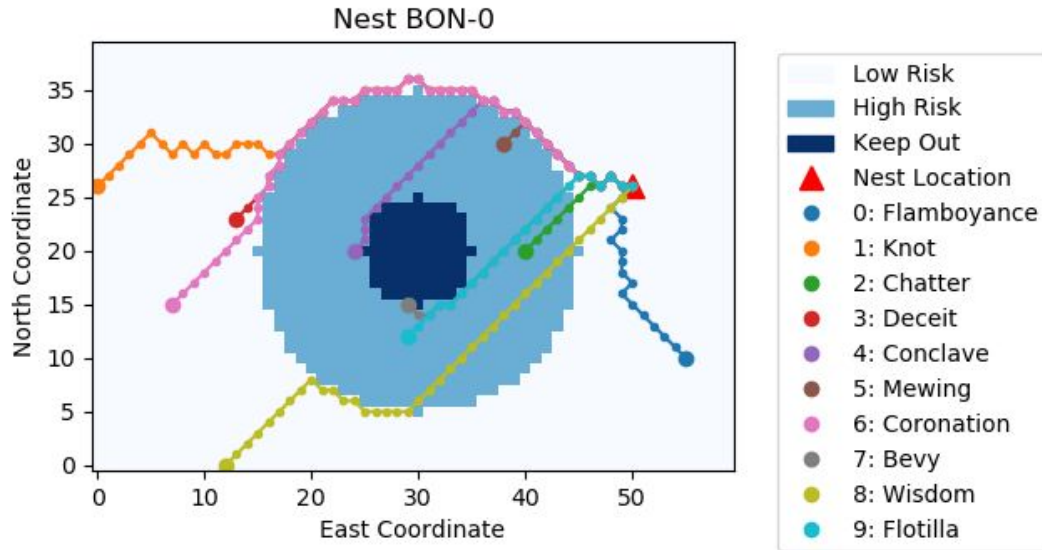
Risk : 66
7/10 valid paths. Range violated in 3 paths.

Augmented A-Star with range consideration [Refer slide 4]

Nest BON-0

Risk : 128
All Paths valid and within range.

THANK YOU FOR YOUR TIME!