ANAORHYTHM

Nao Challenge 2021

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The Algorithm

Initialize a basic Feasible Solution:

[I M1 M2 M3 M4 M5 M6 F]

I = Initial Move

F = Final Move

Mn = Mandatory moves*

*Mandatory Moves are actually shuffled since there’s no constraint on their order.

The Algorithm

Create new Random Feasible Solutions starting from the Initial one:

Pick a Random Mandatory Move Mn.

Add a non mandatory Move before Mn while also checking Standing Preconditions.

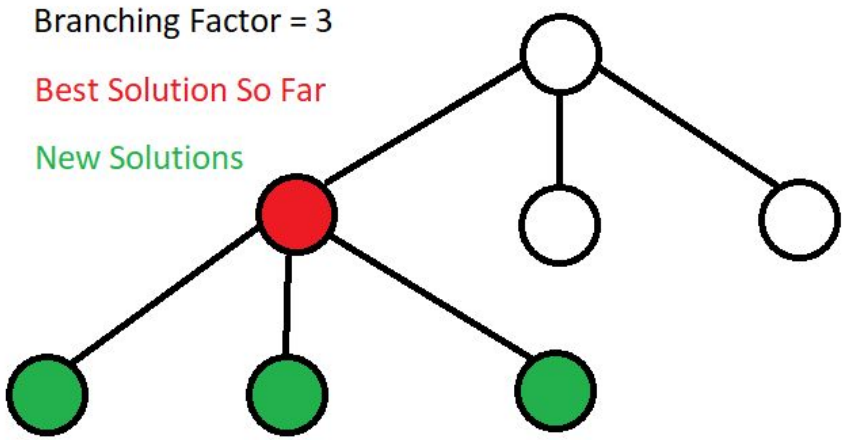
E.g.

Mn = M4

New Solution= [I M1 M2 M3 (Non Mandatory Move) ← M4 M5 M6 F]

The Algorithm

Expand the best solution Node [BRANCHING FACTOR] times.



The Heuristic

The Best Solution is chosen through a Heuristic:

$$h(n) = \alpha*ST + \beta*BM$$

- **β** = 1 - α
- **ST**: Normalized Solution Time:
  - ST = Total time / 180
- **BM**: Beat matches:
  - BM: Number Of Moves that start on a beat / Total Number of Moves

Beat matching

- Since *Daft Punk - Around The World* is **121 beats per minute**, a **4/4 beat** lasts about **2 seconds**.
- A move is considered a “**Beat Matching Move**” if it starts at a time which is **multiple of 2 seconds**.
- The developed algorithm is able to achieve a Final solution with **30-35% of matching moves**.
- **Fine tuning of the parameters might improve the percentage of Beat matching Moves.**

The Algorithm

Nodes **closer to a total time of 180 seconds** and with the best number of beat matches **are expanded each time**.

If the Tree gets too large the **epoch is considered failed** and **the algorithm starts again** trying to create new solutions from scratch.

Video Demo

Thanks For Listening!

Github Repo