DSA 506 2.0 Artificial Intelligence: Planning Assignment 1

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Planner: HyperTensioN

HyperTensioN is a hierarchical task network (HTN) planner. HTN planning is a type of planning that decomposes complex tasks into smaller, simpler tasks. HyperTensioN is designed to be flexible and extensible. It supports multiple domain description languages and uses domain transformation techniques to improve planning speed. This makes it suitable for a wide range of planning problems.

Here is a brief overview of the HyperTensioN ***working principle***:

1. The HyperTensioN compiler takes a domain description and a planning problem as input and produces a planning graph as output. The planning graph is a representation of all possible solutions to the planning problem.
2. The HyperTensioN planner then searches the planning graph for a solution. The planner uses a variety of heuristics to guide its search.
3. Once a solution is found, the HyperTensioN planner generates a plan. The plan is a sequence of actions that can be executed to achieve the desired goal.

HyperTensioN has been used to solve a variety of planning problems, including robotic planning, scheduling, and logistics.

Technology used for HyperTensioN:

- Three-stage compiler
- Supports optimizations in multiple domain description languages
- Improves the performance of HTN planners
- Stack: Ruby, JSHOP, and Pyhop

Source Code

- https://gitlab.anu.edu.au/u1092535/ipc2020-competitor-4
- https://github.com/Maumagnaguagno/HyperTensioN

Selected Problem Domains

- **Robot domain:** This domain involves tasks such as navigating, collecting information, and sending it to a lander.
  Link:https://github.com/panda-planner-dev/ipc2020-domains/tree/master/total-order/Robot
- **Snake domain:** This domain involves tasks such as moving to clear locations or striking nearby mice.
  Link:https://github.com/panda-planner-dev/ipc2020-domains/tree/master/total-order/Snake

1st step: I install Ruby
The next steps are outlined below.

Problem Domain - Robot

1.1) pfile_01_001

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Robot/pfile_01_001.hddl

ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_01_001.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_01_001.hddl rb
Total time: 0.0026807785034179688s
```

ruby examples/Robot/pfile_01_001.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Robot/pfile_01_001.hddl.rb
----------------------Tasks-----------------------
0: achieve_goals()
1: invisible_goal()
--------------------Planning--------------------
Time: 0.0058815479278564445s
----------------------Plan-----------------------
0: open(c r1 d01)
1: move(c r1 d01)
2: move(r1 c d01)
3: move(c r1 d01)
4: move(r1 c d01)
5: move(c r1 d01)
6: move(r1 c d01)
7: move(c r1 d01)
8: move(r1 c d01)
9: move(c r1 d01)
10: move(r1 c d01)
11: move(c r1 d01)
12: move(r1 c d01)
13: move(c r1 d01)
14: move(r1 c d01)
15: move(c r1 d01)
16: move(r1 c d01)
17: move(c r1 d01)
18: move(r1 c d01)
19: move(c r1 d01)
```

1.2) pfile_02_002

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Robot/pfile_02_002.hddl

ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_02_002.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_02_002.hddl rb
Total time: 0.010803937911987305s

C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>
```

ruby examples/Robot/pfile_02_002.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Robot/pfile_02_002.hddl.rb
----------------------Tasks-----------------------
0: achieve_goals()
1: invisible_goal()
---------------------Planning---------------------
Time: 0.010484695434570312s
-----------------------Plan-----------------------
0: open(c r2 d02)
1: move(c r2 d02)
2: move(r2 c d02)
3: move(c r2 d02)
4: move(r2 c d02)
5: move(c r2 d02)
6: move(r2 c d02)
7: move(c r2 d02)
8: move(r2 c d02)
9: move(c r2 d02)
10: move(r2 c d02)
11: move(c r2 d02)
12: move(r2 c d02)
13: move(c r2 d02)
14: move(r2 c d02)
15: move(c r2 d02)
16: move(r2 c d02)
17: move(c r2 d02)
18: move(r2 c d02)
```

1.3) pfile_03_001

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Robot/pfile_03_001.hddl

ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_03_001.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_03_001.hddl rb
Total time: 0.03211855888366699s
```

ruby examples/Robot/pfile_03_001.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Robot/pfile_03_001.hddl.rb
----------------------Tasks-----------------------
0: achieve_goals()
1: invisible_goal()
--------------------Planning--------------------
Time: 0.02412700653076172s
----------------------Plan------------------------
0: move(c r1 d01)
1: move(r1 c d01)
2: move(c r1 d01)
3: move(r1 c d01)
4: move(c r1 d01)
5: move(r1 c d01)
6: move(c r1 d01)
7: move(r1 c d01)
8: move(c r1 d01)
9: move(r1 c d01)
10: move(c r1 d01)
11: move(r1 c d01)
12: move(c r1 d01)
13: move(r1 c d01)
14: move(c r1 d01)
15: move(r1 c d01)
16: move(c r1 d01)
17: move(r1 c d01)
18: move(c r1 d01)
19: move(r1 c d01)
20: move(c r1 d01)
21: move(r1 c d01)
22: move(c r1 d01)
23: move(r1 c d01)
```

1.4) pfile_50_100

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Robot/pfile_50_100.hddl

ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_50_100.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_50_100.hddl rb
Total time: 0.01765131950378418s

C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>
```

ruby examples/Robot/pfile_50_100.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Robot/pfile_50_100.hddl.rb
----------------------Tasks-----------------------
0: achieve_goals()
1: invisible_goal()
--------------------Planning--------------------
```

1.5) pfile_35_070

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Robot/pfile_35_070.hddl

ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_35_070.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_35_070.hddl rb
Total time: 0.03231549263000488s

C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>
```

ruby examples/Robot/pfile_35_070.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Robot/pfile_35_070.hddl.rb
----------------------Tasks-----------------------
0: achieve_goals()
1: invisible_goal()
---------------------Planning---------------------
```

1.6) pfile_03_005

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Robot/pfile_03_005.hddl

ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_03_005.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_03_005.hddl rb
Total time: 0.009461164474487305s

C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>
```

ruby examples/Robot/pfile_03_005.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Robot/pfile_03_005.hddl.rb
----------------------Tasks-----------------------
0: achieve_goals()
1: invisible_goal()
---------------------Planning---------------------
Time: 5.586264610290527s
----------------------Plan-----------------------
0: open(c r1 d01)
1: move(c r1 d01)
2: move(r1 c d01)
3: move(c r1 d01)
4: move(r1 c d01)
5: move(c r1 d01)
6: move(r1 c d01)
7: move(c r1 d01)
8: move(r1 c d01)
9: move(c r1 d01)
10: move(r1 c d01)
11: move(c r1 d01)
12: move(r1 c d01)
13: move(c r1 d01)
14: move(r1 c d01)
15: move(c r1 d01)
16: move(r1 c d01)
17: move(c r1 d01)
18: move(r1 c d01)
19: move(c r1 d01)
20: move(r1 c d01)
21: move(c r1 d01)
22: move(r1 c d01)
23: move(c r1 d01)
24: move(r1 c d01)
25: move(c r1 d01)
26: move(r1 c d01)
27: move(c r1 d01)
28: move(r1 c d01)
```

1.7) pfile_04_003

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Robot/pfile_04_003.hddl

ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_04_003.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_04_003.hddl rb
Total time: 0.009741067886352539s

C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>
```

ruby examples/Robot/pfile_04_003.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Robot/pfile_04_003.hddl.rb
----------------------Tasks-----------------------
0: achieve_goals()
1: invisible_goal()
---------------------Planning---------------------
Time: 0.4572761058807373s
----------------------Plan------------------------
0: move(c r2 d02)
1: move(r2 c d02)
2: move(c r2 d02)
3: move(r2 c d02)
4: move(c r2 d02)
5: move(r2 c d02)
6: move(c r2 d02)
7: move(r2 c d02)
8: move(c r2 d02)
9: move(r2 c d02)
10: move(c r2 d02)
11: move(r2 c d02)
12: move(c r2 d02)
13: move(r2 c d02)
14: move(c r2 d02)
15: move(r2 c d02)
16: move(c r2 d02)
17: move(r2 c d02)
18: move(c r2 d02)
19: move(r2 c d02)
```

1.8) pfile_05_005

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Robot/pfile_05_005.hddl

ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_05_005.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_05_005.hddl rb
Total time: 0.014643907546997070s

C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>
```

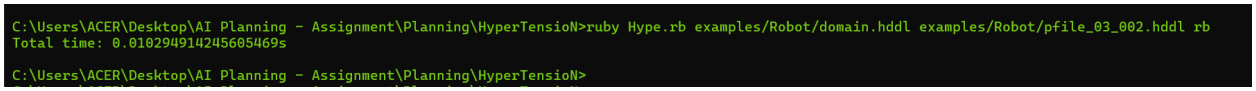
ruby examples/Robot/pfile_05_005.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Robot/pfile_05_005.hddl.rb
----------------------Tasks-----------------------
0: achieve_goals()
1: invisible_goal()
---------------------Planning---------------------
```

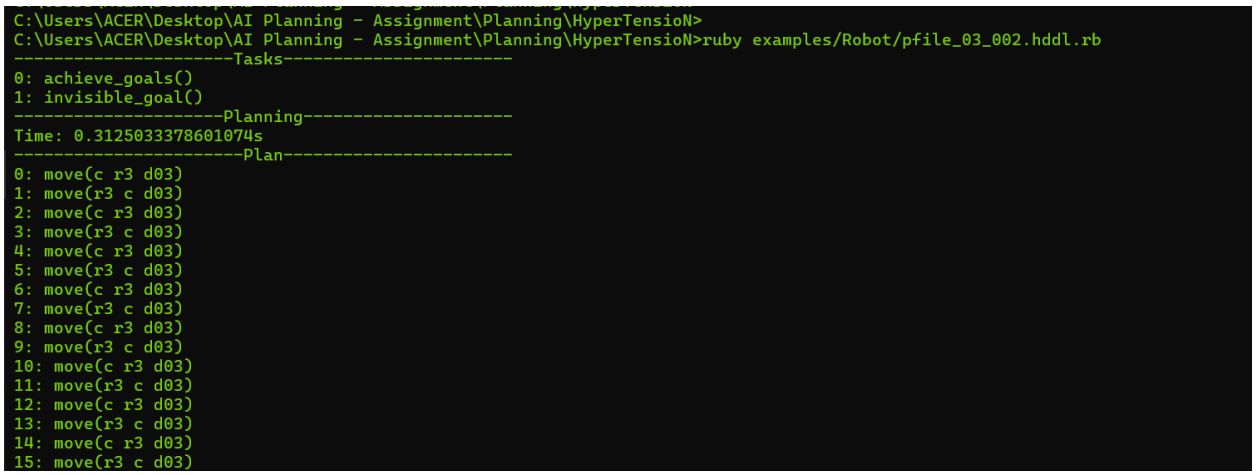
1.9) pfile_03_002

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Robot/pfile_03_002.hddl

ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_03_002.hddl rb



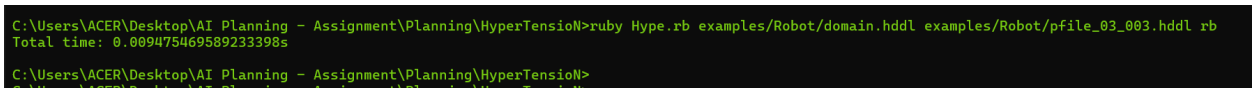
ruby examples/Robot/pfile_03_002.hddl.rb



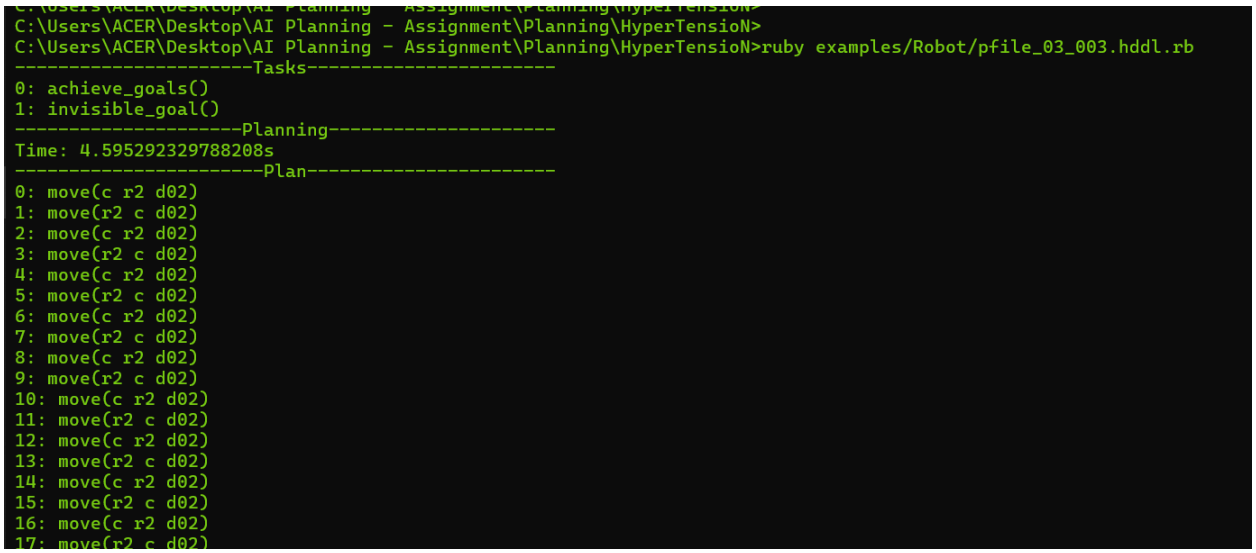
1.10) pfile_03_003

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Robot/pfile_03_003.hddl

ruby Hype.rb examples/Robot/domain.hddl examples/Robot/pfile_03_003.hddl rb



ruby examples/Robot/pfile_03_003.hddl.rb



Problem Domain - Snake

2.1) pb01.snake

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Snake/pb01.snake.hddl

ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb01.snake.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb01.snake.hddl rb
Total time: 0.041351318359375s
```

ruby examples/Snake/pb01.snake.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Snake/pb01.snake.hddl.rb
----------------------Tasks-----------------------
0: hunt()
--------------------Planning--------------------
Time: 0.014612674713134766s
----------------------Plan------------------------
0: move_short(viper px1y2 px2y2)
1: move_short(viper px0y2 px1y2)
2: move_short(viper px1y2 px0y2)
3: move_short(viper px0y2 px1y2)
4: move_short(viper px1y2 px0y2)
5: move_short(viper px0y2 px1y2)
6: move_short(viper px1y2 px0y2)
7: move_short(viper px0y2 px1y2)
8: move_short(viper px1y2 px0y2)
9: move_short(viper px0y2 px1y2)
10: move_short(viper px1y2 px0y2)
11: move_short(viper px0y2 px1y2)
12: move_short(viper px1y2 px0y2)
13: move_short(viper px0y2 px1y2)
14: move_short(viper px1y2 px0y2)
15: move_short(viper px0y2 px1y2)
16: move_short(viper px1y2 px0y2)
17: move_short(viper px0y2 px1y2)
18: move_short(viper px1y2 px0y2)
19: move_short(viper px0y2 px1y2)
20: move_short(viper px1y2 px0y2)
21: move_short(viper px0y2 px1y2)
22: move_short(viper px1y2 px0y2)
23: move_short(viper px0y2 px1y2)
24: move_short(viper px1y2 px0y2)
25: move_short(viper px0y2 px1y2)
26: move_short(viper px1y2 px0y2)
27: move_short(viper px0y2 px1y2)
28: move_short(viper px1y2 px0y2)
29: move_short(viper px0y2 px1y2)
30: move_short(viper px1y2 px0y2)
```

2.2) pb02.snake

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Snake/pb02.snake.hddl

ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb02.snake.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb02.snake.hddl rb
Total time: 0.010147809982299805s
```

ruby examples/Snake/pb02.snake.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Snake/pb02.snake.hddl.rb
----------------------Tasks-----------------------
0: hunt()
--------------------Planning--------------------
Time: 0.0002505779266357422s
-----------------------Plan-----------------------
0: move_long(viper px1y2 px2y2 px2y2 px2y1)
1: move_long(viper px0y2 px1y2 px1y2 px2y2)
2: move_long(viper px0y1 px0y2 px0y2 px1y2)
3: move_long(viper px1y1 px0y1 px0y1 px0y2)
4: move_long(viper px2y1 px1y1 px1y1 px0y1)
5: move_long(viper px2y0 px2y1 px2y1 px1y1)
6: move_long(viper px1y0 px2y0 px2y0 px2y1)
7: strike(viper px1y0 px0y0)
```

2.3) pb03.snake

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Snake/pb03.snake.hddl

ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb03.snake.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb03.snake.hddl rb
Total time: 0.010347843170166016s
```

ruby examples/Snake/pb03.snake.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Snake/pb03.snake.hddl.rb
----------------------Tasks-----------------------
0: hunt()
--------------------Planning--------------------
Time: 0.7952942848205566s
-----------------------Plan-----------------------
0: move_short(viper px1y2 px2y2)
1: move_short(viper px0y2 px1y2)
2: move_short(viper px1y2 px0y2)
3: move_short(viper px0y2 px1y2)
4: move_short(viper px1y2 px0y2)
5: move_short(viper px0y2 px1y2)
6: move_short(viper px1y2 px0y2)
7: move_short(viper px0y2 px1y2)
8: move_short(viper px1y2 px0y2)
9: move_short(viper px0y2 px1y2)
10: move_short(viper px1y2 px0y2)
11: move_short(viper px0y2 px1y2)
12: move_short(viper px1y2 px0y2)
13: move_short(viper px0y2 px1y2)
14: move_short(viper px1y2 px0y2)
15: move_short(viper px0y2 px1y2)
16: move_short(viper px1y2 px0y2)
17: move_short(viper px0y2 px1y2)
18: move_short(viper px1y2 px0y2)
19: move_short(viper px0y2 px1y2)
20: move_short(viper px1y2 px0y2)
21: move_short(viper px0y2 px1y2)
22: move_short(viper px1y2 px0y2)
23: move_short(viper px0y2 px1y2)
24: move_short(viper px1y2 px0y2)
25: move_short(viper px0y2 px1y2)
26: move_short(viper px1y2 px0y2)
27: move_short(viper px0y2 px1y2)
28: move_short(viper px1y2 px0y2)
29: move_short(viper px0y2 px1y2)
30: move_short(viper px1y2 px0y2)
31: move_short(viper px0y2 px1y2)
```

2.4) pb04.snake

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Snake/pb04.snake.hddl

ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb04.snake.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb04.snake.hddl rb
Total time: 0.013335943222045898s
```

ruby examples/Snake/pb04.snake.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Snake/pb04.snake.hddl.rb
----------Tasks----------
0: hunt()
----------Planning----------
Time: 0.0005505084991455078s
----------Plan----------
0: move_long(viper px0y1 px1y1 px1y2 px1y3)
1: move_long(viper px0y0 px0y1 px1y1 px1y2)
2: move_long(viper px1y0 px0y0 px0y1 px1y1)
3: move_long(viper px2y0 px1y0 px0y0 px0y1)
4: move_long(viper px3y0 px2y0 px1y0 px0y0)
5: move_long(viper px4y0 px3y0 px2y0 px1y0)
6: move_long(viper px4y1 px4y0 px3y0 px2y0)
7: move_long(viper px4y2 px4y1 px4y0 px3y0)
8: move_long(viper px3y2 px4y2 px4y1 px4y0)
9: move_long(viper px2y2 px3y2 px4y2 px4y1)
10: move_long(viper px1y2 px2y2 px3y2 px4y2)
11: move_long(viper px0y2 px1y2 px2y2 px3y2)
12: move_long(viper px0y1 px0y2 px1y2 px2y2)
13: move_long(viper px1y1 px0y1 px0y2 px1y2)
14: move_long(viper px2y1 px1y1 px0y1 px0y2)
15: strike(viper px2y1 px3y1)
```

2.5) pb05.snake

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Snake/pb05.snake.hddl

ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb05.snake.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb05.snake.hddl rb
Total time: 0.010486841201782227s
```

ruby examples/Snake/pb05.snake.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Snake/pb05.snake.hddl.rb
----------Tasks----------
0: hunt()
----------Planning----------
Time: 0.0006036758422851562s
----------Plan----------
0: move_long(viper px1y0 px2y0 px2y2 px3y2)
1: strike(viper px1y0 px0y0)
2: move_long(viper px0y1 px0y0 px2y1 px2y2)
3: move_long(viper px1y1 px0y1 px2y0 px2y1)
4: move_long(viper px2y1 px1y1 px1y0 px2y0)
5: move_long(viper px3y1 px2y1 px0y0 px1y0)
6: move_long(viper px3y0 px3y1 px0y1 px0y0)
7: strike(viper px3y0 px4y0)
8: move_long(viper px4y1 px4y0 px1y1 px0y1)
9: strike(viper px4y1 px4y2)
10: move_long(viper px3y2 px4y2 px2y1 px1y1)
11: move_long(viper px2y2 px3y2 px3y1 px2y1)
12: move_long(viper px1y2 px2y2 px3y0 px3y1)
13: strike(viper px1y2 px0y2)
```

2.6) pb06.snake

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Snake/pb06.snake.hddl

ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb06.snake.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb06.snake.hddl rb
Total time: 0.012050628662109375s
```

ruby examples/Snake/pb06.snake.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Snake/pb06.snake.hddl.rb
----------------------Tasks-----------------------
0: hunt()
--------------------Planning--------------------
Time: 0.027619838714599615s
----------------------Plan------------------------
0: move_long(viper px6y1 px6y0 px1y0 px0y0)
1: move_long(viper px6y2 px6y1 px1y1 px1y0)
2: move_long(viper px5y2 px6y2 px1y2 px1y1)
3: move_long(viper px5y1 px5y2 px2y2 px1y2)
4: move_long(viper px4y1 px5y1 px3y2 px2y2)
5: move_long(viper px4y2 px4y1 px3y1 px3y2)
6: move_long(viper px3y2 px4y2 px3y0 px3y1)
7: move_long(viper px2y2 px3y2 px4y0 px3y0)
8: move_long(viper px1y2 px2y2 px5y0 px4y0)
9: move_long(viper px1y1 px1y2 px6y0 px5y0)
10: strike(viper px1y1 px0y1)
11: move_long(viper px0y0 px0y1 px6y1 px6y0)
12: move_long(viper px1y0 px0y0 px6y2 px6y1)
13: move_long(viper px2y0 px1y0 px5y2 px6y2)
14: move_long(viper px3y0 px2y0 px5y1 px5y2)
15: move_long(viper px4y0 px3y0 px4y1 px5y1)
16: move_long(viper px5y0 px4y0 px4y2 px4y1)
17: move_long(viper px6y0 px5y0 px3y2 px4y2)
18: move_long(viper px6y1 px6y0 px2y2 px3y2)
19: move_long(viper px5y1 px6y1 px1y2 px2y2)
20: move_long(viper px4y1 px5y1 px1y1 px1y2)
21: move_long(viper px3y1 px4y1 px0y1 px1y1)
22: move_long(viper px2y1 px3y1 px0y0 px0y1)
23: move_long(viper px1y1 px2y1 px1y0 px0y0)
24: move_long(viper px0y1 px1y1 px2y0 px1y0)
25: move_long(viper px0y0 px0y1 px3y0 px2y0)
26: move_long(viper px1y0 px0y0 px4y0 px3y0)
27: move_long(viper px2y0 px1y0 px5y0 px4y0)
28: move_long(viper px3y0 px2y0 px6y0 px5y0)
29: move_long(viper px4y0 px3y0 px6y1 px6y0)
30: move_long(viper px5y0 px4y0 px5y1 px6y1)
31: move_long(viper px6y0 px5y0 px4y1 px5y1)
```

2.7) pb07.snake

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Snake/pb07.snake.hddl

ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb07.snake.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb07.snake.hddl rb
Total time: 0.011469364166259766s
```

ruby examples/Snake/pb07.snake.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Snake/pb07.snake.hddl.rb
----------------------Tasks-----------------------
0: hunt()
--------------------Planning--------------------
Time: 0.09635353088378906s
-----------------------Plan-----------------------
0: move_long(viper px4y3 px4y4 px1y0 px0y0)
1: move_long(viper px4y2 px4y3 px2y0 px1y0)
2: move_long(viper px4y1 px4y2 px2y1 px2y0)
3: move_long(viper px4y0 px4y1 px2y2 px2y1)
4: move_long(viper px3y0 px4y0 px2y3 px2y2)
5: move_long(viper px2y0 px3y0 px2y4 px2y3)
6: move_long(viper px1y0 px2y0 px3y4 px2y4)
7: move_long(viper px0y0 px1y0 px4y4 px3y4)
8: move_long(viper px0y1 px0y0 px4y3 px4y4)
9: strike(viper px0y1 px1y1)
10: move_long(viper px2y1 px1y1 px4y2 px4y3)
11: strike(viper px2y1 px3y1)
12: strike(viper px3y1 px3y2)
13: move_long(viper px2y2 px3y2 px4y1 px4y2)
14: move_long(viper px2y3 px2y2 px4y0 px4y1)
15: move_long(viper px2y4 px2y3 px3y0 px4y0)
16: move_long(viper px3y4 px2y4 px2y0 px3y0)
17: move_long(viper px4y4 px3y4 px1y0 px2y0)
18: move_long(viper px4y3 px4y4 px0y0 px1y0)
19: move_long(viper px4y2 px4y3 px0y1 px0y0)
20: move_long(viper px4y1 px4y2 px1y1 px0y1)
21: move_long(viper px4y0 px4y1 px2y1 px1y1)
22: move_long(viper px3y0 px4y0 px3y1 px2y1)
23: move_long(viper px2y0 px3y0 px3y2 px3y1)
24: move_long(viper px1y0 px2y0 px2y2 px3y2)
25: move_long(viper px0y0 px1y0 px2y3 px2y2)
26: move_long(viper px0y1 px0y0 px2y4 px2y3)
27: move_long(viper px1y1 px0y1 px3y4 px2y4)
28: move_long(viper px2y1 px1y1 px4y4 px3y4)
29: move_long(viper px3y1 px2y1 px4y3 px4y4)
```

2.8) pb08.snake

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Snake/pb08.snake.hddl

ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb08.snake.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb08.snake.hddl rb
Total time: 0.010941743850708008s

C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>
```

ruby examples/Snake/pb08.snake.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Snake/pb08.snake.hddl.rb
----------------------Tasks-----------------------
0: hunt()
--------------------Planning--------------------
Time: 0.030667066574096685
----------------------Plan------------------------
0: move_long(viper px1y0 px2y0 px4y2 px4y3)
1: strike(viper px1y0 px0y0)
2: move_long(viper px0y1 px0y0 px4y1 px4y2)
3: move_long(viper px1y1 px0y1 px3y1 px4y1)
4: move_long(viper px1y2 px1y1 px2y1 px3y1)
5: move_long(viper px2y2 px1y2 px2y0 px2y1)
6: move_long(viper px3y2 px2y2 px1y0 px2y0)
7: move_long(viper px4y2 px3y2 px0y0 px1y0)
8: move_long(viper px4y1 px4y2 px0y1 px0y0)
9: move_long(viper px3y1 px4y1 px1y1 px0y1)
10: move_long(viper px2y1 px3y1 px1y2 px1y1)
11: move_long(viper px1y1 px2y1 px2y2 px1y2)
12: move_long(viper px0y1 px1y1 px3y2 px2y2)
13: move_long(viper px0y0 px0y1 px4y2 px3y2)
14: move_long(viper px1y0 px0y0 px4y1 px4y2)
15: move_long(viper px2y0 px1y0 px3y1 px4y1)
16: move_long(viper px3y0 px2y0 px2y1 px3y1)
17: strike(viper px3y0 px4y0)
18: move_long(viper px4y1 px4y0 px1y1 px2y1)
19: move_long(viper px3y1 px4y1 px0y1 px1y1)
20: move_long(viper px2y1 px3y1 px0y0 px0y1)
21: move_long(viper px1y1 px2y1 px1y0 px0y0)
22: move_long(viper px0y1 px1y1 px2y0 px1y0)
23: move_long(viper px0y0 px0y1 px3y0 px2y0)
24: move_long(viper px1y0 px0y0 px4y0 px3y0)
25: move_long(viper px2y0 px1y0 px4y1 px4y0)
26: move_long(viper px3y0 px2y0 px3y1 px4y1)
27: move_long(viper px4y0 px3y0 px2y1 px3y1)
28: move_long(viper px4y1 px4y0 px1y1 px2y1)
29: move_long(viper px3y1 px4y1 px0y1 px1y1)
30: move_long(viper px2y1 px3y1 px0y0 px0y1)
31: move_long(viper px1y1 px2y1 px1y0 px0y0)
```

2.9) pb15.snake

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Snake/pb15.snake.hddl

ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb15.snake.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb15.snake.hddl rb
Total time: 0.014729738235473633s

C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>
```

ruby examples/Snake/pb15.snake.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Snake/pb15.snake.hddl.rb
----------------------Tasks-----------------------
0: hunt()
--------------------Planning--------------------
Time: 37.71139907836914s
----------------------Plan------------------------
0: move_long(viper px6y2 px5y2 px1y8 px0y8)
1: move_long(viper px7y2 px6y2 px2y8 px1y8)
2: move_long(viper px7y1 px7y2 px3y8 px2y8)
3: move_long(viper px6y1 px7y1 px4y8 px3y8)
4: move_long(viper px5y1 px6y1 px5y8 px4y8)
5: move_long(viper px4y1 px5y1 px6y8 px5y8)
6: move_long(viper px3y1 px4y1 px7y8 px6y8)
7: move_long(viper px2y1 px3y1 px8y8 px7y8)
8: move_long(viper px1y1 px2y1 px8y7 px8y8)
9: move_long(viper px1y2 px1y1 px8y6 px8y7)
10: move_long(viper px1y3 px1y2 px7y6 px8y6)
11: move_long(viper px1y4 px1y3 px6y6 px7y6)
12: move_long(viper px1y5 px1y4 px5y6 px6y6)
13: move_long(viper px2y5 px1y5 px4y6 px5y6)
14: move_long(viper px3y5 px2y5 px3y6 px4y6)
15: move_long(viper px4y5 px3y5 px2y6 px3y6)
16: move_long(viper px5y5 px4y5 px1y6 px2y6)
17: move_long(viper px6y5 px5y5 px0y6 px1y6)
18: move_long(viper px7y5 px6y5 px0y5 px0y6)
19: move_long(viper px8y5 px7y5 px0y4 px0y5)
20: move_long(viper px8y6 px8y5 px0y3 px0y4)
21: move_long(viper px7y6 px8y6 px0y2 px0y3)
22: move_long(viper px6y6 px7y6 px0y1 px0y2)
23: move_long(viper px5y6 px6y6 px0y0 px0y1)
24: move_long(viper px4y6 px5y6 px1y0 px0y0)
25: move_long(viper px3y6 px4y6 px2y0 px1y0)
26: move_long(viper px2y6 px3y6 px3y0 px2y0)
27: move_long(viper px1y6 px2y6 px4y0 px3y0)
28: move_long(viper px0y6 px1y6 px5y0 px4y0)
29: move_long(viper px0y5 px0y6 px6y0 px5y0)
```

2.10) pb19.snake

https://github.com/panda-planner-dev/ipc2020-domains/blob/master/total-order/Snake/pb19.snake.hddl

ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb19.snake.hddl rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby Hype.rb examples/Snake/domain.hddl examples/Snake/pb19.snake.hddl rb
Total time: 0.0146021842956542975

C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>
```

ruby examples/Snake/pb19.snake.hddl.rb

```
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>
C:\Users\ACER\Desktop\AI Planning - Assignment\Planning\HyperTensioN>ruby examples/Snake/pb19.snake.hddl.rb
----------------------Tasks-----------------------
0: hunt()
--------------------Planning--------------------
Time: 0.1257777214050293s
----------------------Plan------------------------
0: move_long(viper px1y3 px2y3 px0y0 px1y0)
1: move_long(viper px1y2 px1y3 px0y1 px0y0)
2: move_long(viper px2y2 px1y2 px0y2 px0y1)
3: move_long(viper px2y1 px2y2 px0y3 px0y2)
4: move_long(viper px1y1 px2y1 px0y4 px0y3)
5: move_long(viper px0y1 px1y1 px1y4 px0y4)
6: move_long(viper px0y2 px0y1 px2y4 px1y4)
7: move_long(viper px0y3 px0y2 px2y3 px2y4)
8: move_long(viper px0y4 px0y3 px1y3 px2y3)
9: move_long(viper px1y4 px0y4 px1y2 px1y3)
10: move_long(viper px2y4 px1y4 px2y2 px1y2)
11: move_long(viper px2y3 px2y4 px2y1 px2y2)
12: move_long(viper px1y3 px2y3 px1y1 px2y1)
13: move_long(viper px1y2 px1y3 px0y1 px1y1)
14: move_long(viper px2y2 px1y2 px0y2 px0y1)
15: move_long(viper px2y1 px2y2 px0y3 px0y2)
16: move_long(viper px1y1 px2y1 px0y4 px0y3)
17: move_long(viper px0y1 px1y1 px1y4 px0y4)
18: move_long(viper px0y2 px0y1 px2y4 px1y4)
19: move_long(viper px0y3 px0y2 px2y3 px2y4)
20: move_long(viper px0y4 px0y3 px1y3 px2y3)
21: move_long(viper px1y4 px0y4 px1y2 px1y3)
22: move_long(viper px2y4 px1y4 px2y2 px1y2)
23: move_long(viper px2y3 px2y4 px2y1 px2y2)
24: move_long(viper px1y3 px2y3 px1y1 px2y1)
25: move_long(viper px1y2 px1y3 px0y1 px1y1)
26: move_long(viper px2y2 px1y2 px0y2 px0y1)
27: move_long(viper px2y1 px2y2 px0y3 px0y2)
28: move_long(viper px1y1 px2y1 px0y4 px0y3)
29: move_long(viper px0y1 px1y1 px1y4 px0y4)
30: move_long(viper px0y2 px0y1 px2y4 px1y4)
31: move_long(viper px0y3 px0y2 px2y3 px2y4)
```

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