Evolutionary artificial intelligence and robotics

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Abstract

Evolutionary artificial intelligence used to solve search and optimization problems, based on genetic processes of biological organisms. In this report, we have focused in some important algorithms to solve some real problems.

1 GitHub Repository

https://github.com/Harithelamin/ACIT4610-24H-G13

2 Traffic Management Optimization Using Multi-Objective Evolutionary Algorithms

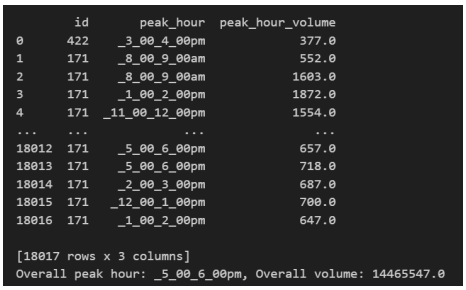
In this task, we have applyed a Multi-Objective Evolutionary Algorithm (MOEA) to optimize traffic management strategies for selected New York City (NYC) areas, in order to minimize conflicting objectives, Total Travel Time (TTT) and Fuel Consumption (FC), using real-world traffic data from NYC Open Data. The traffic management strategy has involved controlling traffic signal timings (green, yellow, and red light durations), and setting speed limits on these segments. We have developed an MOEA that optimized these parameters to achieve the best trade-off between minimizing TTT and FC.

2.1 The Dataset, and Preprocessing

In addition, we hvae used two datasets from the NYC Open Data portal, 1. NYC Traffic Volume Counts. 2. Traffic Speed Data. We have focused on optimizing traffic management for the three road segments in New York City; 1. 5th Ave between 42nd St and 47th St (Manhattan) 2. Atlantic Ave between Flatbush Ave and Bedford Ave (Brooklyn) 3. Queens Blvd between Union Tpke and Yellowstone Blvd (Queens)

We have Identified and preprocess relevant data points, such as peak-hour traffic volumes, average speeds, and any available environmental indicators.

Calculate the peak-hour traffic



```
        id       peak_hour  peak_hour_volume
0      422    _3_00_4_00pm             377.0
1      171    _8_00_9_00am             552.0
2      171    _8_00_9_00am            1603.0
3      171    _1_00_2_00pm            1872.0
4      171  _11_00_12_00pm            1554.0
...    ...             ...               ...
18012  171    _5_00_6_00pm             657.0
18013  171    _5_00_6_00pm             718.0
18014  171    _2_00_3_00pm             687.0
18015  171   _12_00_1_00pm             700.0
18016  171    _1_00_2_00pm             647.0

[18017 rows x 3 columns]
Overall peak hour: _5_00_6_00pm, Overall volume: 14465547.0
```

Figure 1: The peak-hour traffic

3 Task 2

This is the introduction of the document. Here we will cite some references, for example, [1].

4 Task 4

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References

[1] Donald E. Knuth. *The TeXbook*. Addison-Wesley, 1984.