Hyper Efficient City of Unceasing Vehicles

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PRESENTED AT

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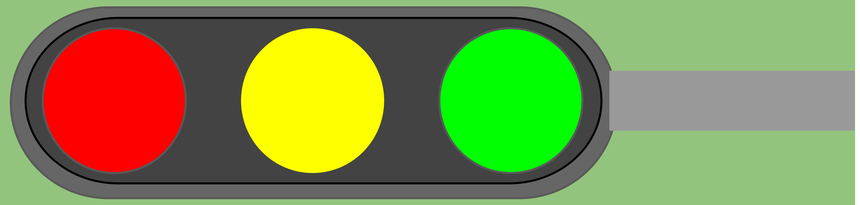
Using distributed reinforcement learning for the decentralized control of traffic lights



Introduction

Traffic lights have their own unique system which gives the city law and order. However, it also is the biggest factor that contributes to the carbon waste of vehicles in larger cities through **traffic**. Especially big cities like San Francisco as shown in Figure 1 gives the best example of this phenomenon during rush hours. Even in a research article published by the University of California Transportation Center in 2008, it was found that simply improving traffic congestion with few modifications alone reduced the CO2 emission by almost 20% in Southern California. This gives a rough idea how much carbon waste could be reduced if traffic light systems could be changed with much higher efficiency in urban cities.

Figure 1. Traffic in San Francisco

Methods

To solve this issue of traffic light systems in big cities, the methods of distributed **reinforcement learning** can be used from Machine Learning as shown in Figure 2. This reinforcement learning is different from the traditional supervised learning in that we the people regulating the algorithm aren't as much involved during the process of trial but instead the agent of what we have programmed will by itself find the best solution that brings out the best reward. This method was chosen over other methods due to the reason that reinforcement learning has been used in a lot of examples related to complicated sets of interactions happening, that could well predict the future in the long run where it fits our purpose. Diving deeper, distributed reinforcement learning could be more appropriately used in places where multiple agencies are involved in this trial process and works together to bring the optimal solution through increased rate of learning.

Results and Conclusion

There are largely four benefits possible due to this new implementation.

1. Low cost generation from the local government only needing the initial research and development cost to implement this new change.

2. People using the transportation whether it's the bike, bus, or their own vehicle wouldn't notice the change being made, since no physical changes would be made to the city itself but only algorithm changes electronically.

3. The whole process from start to finish will be carbon neutral since no extra pollution would be generated and emissions also start to decrease with less traffic.

4. It would be considered smart and innovative since minimum human interaction would be required after initial planning through the reinforcement learning methodology.

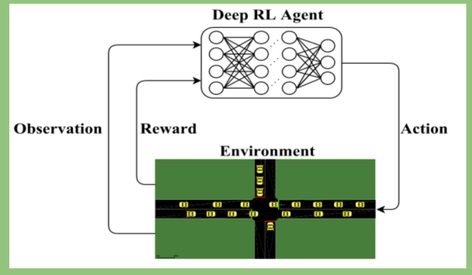


Figure 2. Example of using deep reinforcement learning in traffic lights