11. 重型卡車的油耗節約運作

Energy-efficient Operation of Heavy-duty Truck

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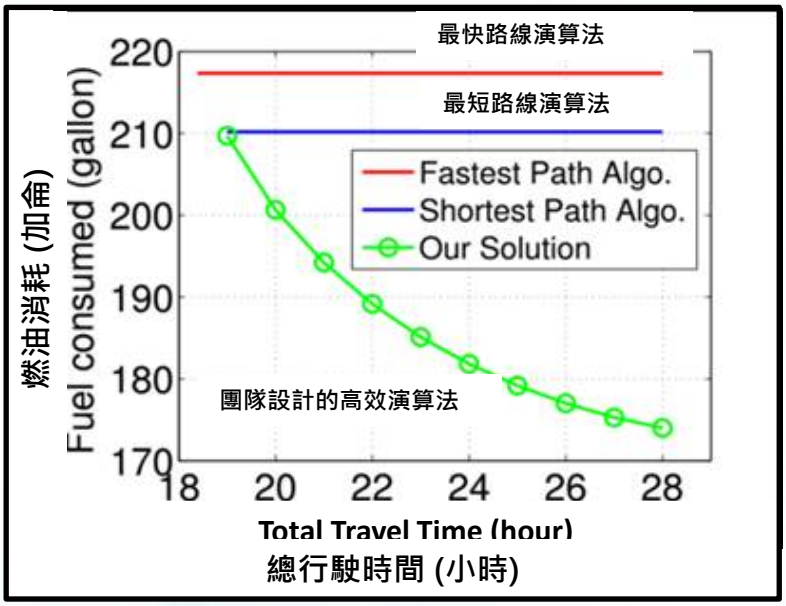
針對問題 Problem to be Solved

中重型卡車數目僅佔美國公路車輛的 5%，但卻佔了交通領域排放總量的 20%，是交通領域中溫室氣體的第二大排放源。因此，節省中重型卡車的燃油用量對保護環境具有重要意義。Medium and heavy-duty trucks only consist 5% of total vehicle number in USA, but consume 20 % total transportation fuel use. Hence, improving fuel efficiency of these trucks would bring substantial social and economic benefits.

對大部份運輸車輛來說，把貨物（如新鮮食品或有儲存期限的貨品）在特定的運輸期限前準時送到目的地，是十分關鍵的。可是，目前市面上為車輛建議最佳路線的應用軟件，通常只考慮路線長短或時間，並未考慮能源耗用的情況。
Delivering goods to the required destinations within a stringent time constraint is important for most transportation vehicles, especially for fresh foods or goods with limited storage time. Nevertheless, the currently available application software in the market only take distance or time into considerations, without considering energy consumption of vehicles.

特長 Advantages

團隊設計的高效演算法，能為需要在兩個目的地間運輸的車輛設計出效能最優的行車車速及路線。團隊採用的方案，透過控制車速 [在上坡（即最浪費燃油時）以較慢車速行駛，在下坡時則較快] 及考慮了風速、路面質素、車輛型號及負重等因素，以達致節省能源的目的。結果表明，相比常用的最短或最快路線演算法，**此算法能為重型卡車節省高達 17% 油耗，同時滿足運輸期限的要求**。
The highly-efficient solution invented by the team is able to deploy an optimized route with speed plan for trucks that have to travel between two designated locations. The approach provides an optimized solution to save energy consumption through the deployment of a lower speed during going up slopes (which is more fuel-consuming) and a higher speed during going down slope, and at the same time considering other factors such as wind speed, surface quality of roads, vehicle model and loading. Results showed that **the solution can reduce the truck's fuel consumption by up to 17% as compared to the common shortest/fastest path algorithm, while meeting the deadline constraint.**



相對常用的最短或最快路線演算法，團隊設計的高效能演算法能為重型卡車節省高達 17% 油耗。
Our solution is able to bring up to 17% fuel consumption saving as compared to traditional approaches.

應用 Applications

任何以燃油或是電力供應能源的車輛，此演算法都能應用。當中，若車輛屬於耗能特別大的重型種類，而且經常行走於交通順暢的高速公路上而較少受交通燈號或擠塞影響，成效更為顯著。此算法亦能安裝於智能手機、平板或手提電腦上應用。
Both oil- or electricity-powered vehicles are suitable for applying our solution. For those types that are heavy duty (with higher energy consumption) and have frequent travels in highways (less restriction by traffic congestion), the energy saving would be more substantial. The algorithm can be installed in smartphone, tablet or laptop computers.

相關文獻 Related Paper:

Lei Deng, Mohammad H. Hajiesmaili, Minghua Chen* and Haibo Zeng. Energy-efficient timely transportation of long-haul heavy-duty trucks. *IEEE Transactions on Intelligent Transportation Systems*, Vol 19, Issue 7, July 2018. [Link]

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Available Patent

Energy-efficient Operation of Heavy-duty Truck
(Patent US 15/622,742)

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