**Introduction**

Protecting environment, reducing the pollution and developing the infrastructure of transport are the main topics of our modern society. Several studies of technique have already found the answer. By the same reason, implementation of informational structure, the communication of the electric network and the development of the electric vehicles lead us to a new era of technology.

However, there are some limits still exist, those limits are caused by the lever of technology, as a result, the range of the electric vehicle is relatively low, and the charging time of the battery is also a problem.

So we have studied the thesis < An efficient Itinerary Management Scheme for Electric Vehicles using ACO > written by Deepika Hooda and Neeraj Kumar form Thapar university, India, and tried to find out a better itinerary management which influenced by three arguments: the distance, the cost and finally the time. The algorithm which they have chosen is ACO (Ant Colony Optimization)

**Goals**

We will summarize their approach, and finally we will try to figure out their merit and demerit in this thesis

**Hypothesis and Limits**

Hypothesis:

- Only one type of vehicle (not difference between vehicles)

- The nodes are the charging points

- There is less than 100 charging stations between the starting point and the ending point

Limits

- The number of the charging station between S and D

- The type of the road (free or paid)

- The travailing time between two stations

- The charging price of a station

- The type of the battery used by EV

**Used approach**

This study uses the algorithm of ACO(Ant Colony Optimization),

The ants always follow the path which is most optimized for searching resources. The ants normally try several times for collecting resources. And for this algorithm, it will choose the most rapid path and then replaces the slower one. For 2 paths which have the same starting point and the same ending point, the ant on the shorter path will return earlier, so it will be more pheromone (2 times) in the this path than the longer path, because at the moment, the ant on the longer path hasn’t come back yet. As a conclusion, the following ant will have less chance to choose the longer path. The scientist has achieved to realize this method with mat, and then, they use this method in the application of the EV.

This function has several arguments: a number of stations, free or paid for each path, the price for passing the path, the traveling time on a path, the charging price of a station, the type of the battery used by EV and a function of probability.

By using function of probability with a node, we can know the probability of leaving from a node to a neighboring node. And the application will chose the path with higher ranger of the probability.

**Result**

**Merit and Demerit**

**Merit:**

**- D**eveloper-friendly, easy to understand

- Inspired by existing algorithm

**Demerit**

**- N**ot dynamic (the arguments and results are fixed)

- Over-calculate (the method doesn’t work with big data)

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disadvantages :

o non dynamique path :

The method proposed in the article is optimal only if the input values of parameters are fixed. In fact, all the probabilities are calculated before the departure and the path is unchangeable. As a result, not a single update will be made during the journey.

o the result is not ideal based on travel time :

ACO is a long process which requires a lot of time to find the most efficient path. In order to limit the processing time, the authors modified the algorithm. They finally decided to determine the most efficient way by looking for the optimal path for each node to next node rather than from the beginning to the destination. As a result, the path obtained is not guaranteed to be optimal

In this thesis, some errors can cause problems of the application.

- In the equation [2] and [3] , they didn’t explain the difference between the value and , which can cause the problem of comprehension.

- The equation [4] is not correct, after our research, we find out the is the right one. (The equation in Wikipedia page ACO)

- Some input errors present in the table

- The example of the pathway is an idealization, who doesn’t work in all actual circumstance.

**Conclusion**

As a conclusion, the algorithm of ACO is one of the methods which can solve the problem of itinerary management optimization. By using the ACO, the users will have the competence to find the best optimization of efficacy between two stations. Developer-friendly and simplicity of implement are the advantages of this method which you can’t negligee. Nonetheless, some important disadvantages still exist, like the static stat of the function, calculate limited by the algorithm and neglect the influence of the time. Which make this solution become useless for our project.