In a disconnected network scenario, regular vehicles can be used for data transportation instead of actual network links. These vehicles, called message ferries, emulate the communication medium between two disconnected network sections whose connection cannot be established easily with typical wired or wireless links. Previous research work mostly considered data rate, data buffer in a message ferry, or delay time in data transportation. None of them concern about reliability of data transportation in situations where message ferries may fail to operate. This research, therefore, proposes a method to determine message ferry routes that minimizes operational cost in terms of energy consumption, while guaranteeing a minimum service level at each disconnected station.

The research problem is analyzed and mathematically modeled using graph theory with two different objective functions, minimizing total routing tours and minimizing maximum-length tour. Then, two methods are proposed: (1) the brute force method that aims to compute the optimal solutions, and (2) the grouping method which attempts to reduce computing time while giving comparable tour lengths. Both methods are implemented in a computer simulation program for experiments. Computing time and distance of routing tours are used as performance metrics.

Simulation results show that the maximum brute force's computing time is 5 hours but use only 0.039 seconds for grouping method's computing in the same scenario, 7 stations and 6 message ferries. Most results from the grouping method yield the same cost as those from the brute force method.  While some results are of greater costs, the cost difference is at most 27%.

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Student's signature                    Thesis Advisor's signature