Clean your city efficiently with limited resource you have

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Motivation


- Most third world country's city like Dhaka produce 4600 – 5110 tons waste/ day.
- For the lack of resources ,only 40% waste can be managed properly.

Our Contribution

- We have performed analytical modeling and simulation of our proposed algorithm.
- We have proposed a better algorithm for WCVR and optimizing its performance.

Primary Constraints


- Lack of budget.
- Less number of waste collector.
- Lack of time.

System Model

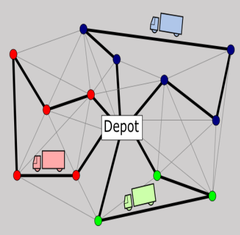

Empty dustbin


Full dustbin


Sending participators Data


Server


Hosting full Depot positions on Map



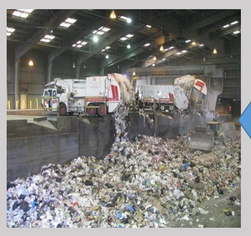
Plan/ Route/ Schedule

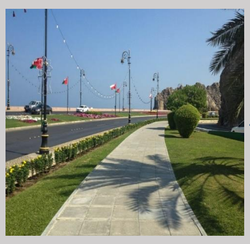

Optimization using ruin and recreate principle


Optimized route with respect to cost, paths and capacity.


Garbage Collector


Collecting garbage


Going to dump station when vehicle is full.


Clean city

Objective

This problem is an optimization problem. Where we have to traverse a Directed Multigraph, G(BUDUS,E)

B = Set of bins,

D = set of depots

S = set of disposal sites,

N = Number of vehicle { 0,1,2….K}.

Objective function of cost which will be minimized:

$f = \sum_{i,j,k=0}^{N} (\phi_k y_k + Bk \sum\sum \Pi_{ij} x_{ij} + {}^{\theta}{}_k (\sum S_{jk} - S_{ik}))$.

$\phi_k y_k$=The fixed cost of vehicle 'k'

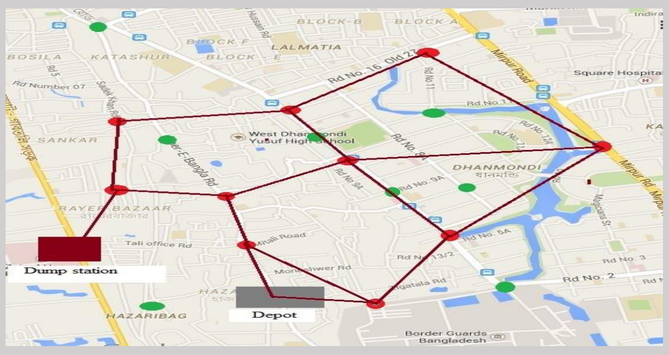
B_k= Hourly driver wage rate.

${}^{\theta}k$ = Hourly driver wage rate.

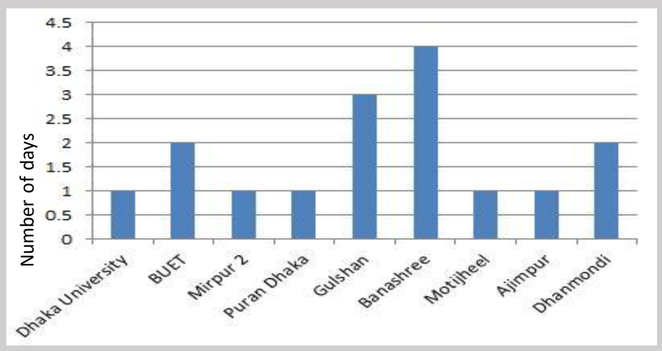
${}^{\theta}{}_k (\sum S_{jk} - S_{ik})$= Wage rate * service time.

Experimental Outcome

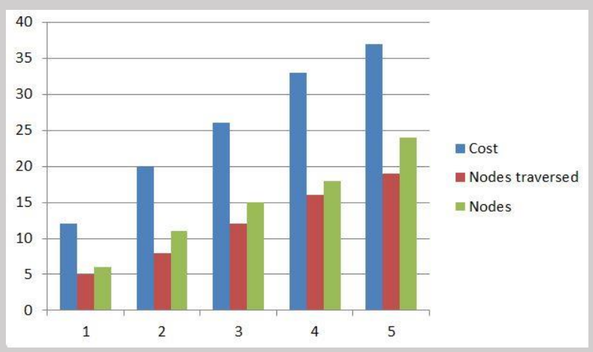
❖ Outcome with real-time data

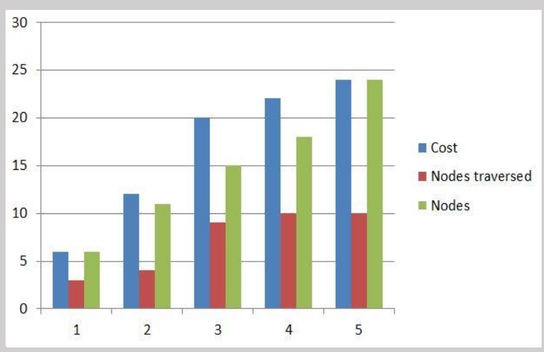


❖ Number of days are needed to fill a bin in different areas.



❖ Comparison between ruin and repair method optimization algorithm with respect to cost and number of bins traversed for small number of nodes.





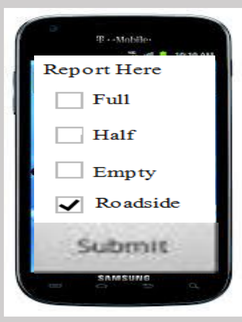
Scalability and Uncertainty Issues

- Our algorithm must be scalable for handling highly congested cities.
- More generalization over existing VRP algorithms.
- In cities like Dhaka there is probable stage to face that uncertain waste appearance.









- This uncertainty, handled by participatory sensing application of our system which will handle the crowd-source part.

References

1. Imran Maqsood & Guo H. Huang (2003)" A Two-Stage Interval-Stochastic Programming Model for Waste Management under Uncertainty", Journal of the Air & Waste Management Association, 53:5, 540-552.
2. "Success Stories in the Waste Management," http://www.ccap.org/ .
3. Gerhard Schrimpf, Johannes Schneider, Hermann Stamm-Wilbrandt and Gunter Dueck (2000) "Record Breaking Optimization Results Using the Ruin and Recreate Principle", Journal of Computational Physics 159, 139–171.

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