

REP Report

1. Project Title: The Real-Time Vehicle Routing Problem with Stochastic Demands (VRPSD)

2. Name of PI, Co-PI's

PI: First name Clara Last name Novoa

3. PI Email address cn17@txstate.edu

4. Department Engineering and Technology

5. 250 Word Project Summary

The vehicle routing problem with stochastic demands (VRPSD) is to design minimum cost routes from a depot to a customer set in such a way that all vehicles start and end their route at the depot and customer demands are satisfied. Route length is the main component for computing route cost.

Customer demands follow known probability distributions but actual demands are only revealed when the vehicle arrives at each customer. Consequently, a route may fail if a customer demand exceeds the current vehicle capacity and a recourse action, such as sending the vehicle back to the depot and forth to the customer, must be taken at extra cost. Most previous research designs routes before demands become known and they are unchanged during real-time execution. Novoa (2005) and Secomandi (2001) use a more flexible approach called dynamic that construct routes as demand is revealed. These works are only for single-vehicle.

This REP research solved a multiple VRPSD using a dynamic algorithm. It required development of computer models coded in C++ to represent the general

problem, and generation of 140 instances to resemble real-life situations. Instances varied number and capacity for the vehicles, and number, location and demand distribution for the customers. Routes resulted 1%-2% shorter than those from static models were and its generation took less than 2 CPU seconds. This research tested also the benefits from a distributed computing cluster acquired by our department and provided one further research idea. A paper to the Transportation Science Journal is in-progress.

6. Citation of accepted in-press publications

A manuscript titled "The Multiple Vehicle Routing Problem with Stochastic Demands" is being prepared and will be submitted to Transportation Science, a publication of the Institute for the Operations Research and Management Science (INFORMS)

7. Citation of presentations

Novoa, C. (2006). The Multiple Vehicle Routing Problem with Stochastic Demands (VRPSD) under a Dynamic Approach. Institute for the Operations Research and Management Science (INFORMS) Annual Conference, Pittsburgh, PA, November 5-8.

Novoa, C (2007) A Real-time Stochastic Integer Programming Model for the Stochastic Vehicle Routing Problem. Institute for the Operations Research and Management Science (INFORMS) Annual Conference, Seattle, WA, November 4-7. This is a further-research idea generated from the work funded by this REP.

8. N/A

9. 0

10 0.

11. 1