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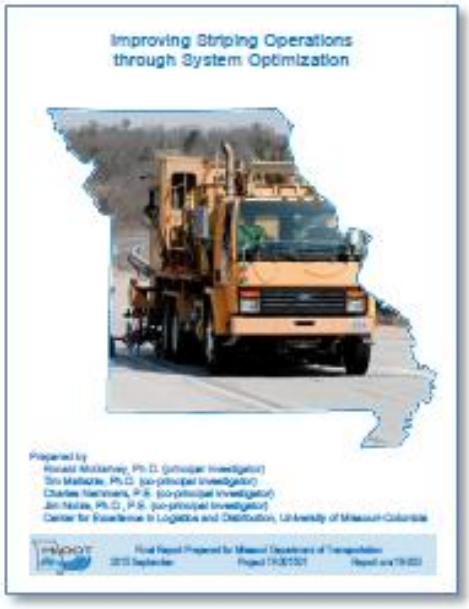
Research Summary

Improving Striping Operations through System Optimization



Road line striping operations generate a significant workload for MoDOT. Operational inefficiencies are created when a road striping crew has to travel out of its way in order to replenish its stock of paint and other consumable items from a bulk storage facility or to reach the roads that require striping. These so-called "deadhead miles" characterize mileage that road striping crew vehicles must travel while not actively applying pavement markings.

The research detailed in this report provides an optimization-based approach to determining a striping schedule that minimizes these deadhead miles. A computer program was developed for scheduling and routing road striping operations. This report contains details on the theoretical foundations of this optimization model, along with a user's guide that details the preparation of input data necessary to utilize this computer program and step-by-step instructions on the use of the model.

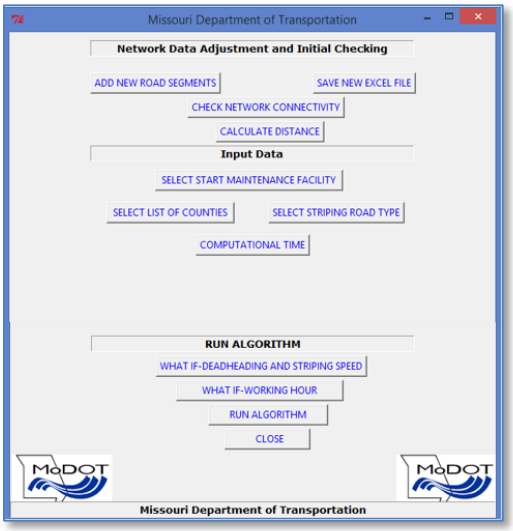
An optimization-based decision support tool was developed, implementing Genetic Algorithm techniques, to identify a minimum-distance striping schedule that satisfies the requirements of MoDOT striping operations. Despite the fact that some factors remain unrepresented in the model (e.g. highway ramps requiring striping), the current results of our model can be used to help MoDOT more quickly calculate a striping schedule and dynamically respond to unexpected conditions such as schedule disruptions which may occur due to chip seal operations not completing on the scheduled date.

The advantage of the Genetic Algorithm is that it alleviates the time and effort dedicated to manually developing a striping schedule. The manual calculation would represent an exceedingly lengthy and laborious task. As such, this model provides an ability to significantly reduce the effort necessary to produce said striping schedule as well as test what-if scenarios examining the impact of changing resource levels, policies, etc.

The inefficiencies due to deadhead miles are manifested not only in additional, unnecessary miles traveled by road striping crews, but also in the required capacity for road striping crews and equipment. If a more-efficient utilization of road striping equipment were possible, MoDOT could potentially reduce costs by reducing its inventory of road striping assets, without reducing the frequency with which it reapplies pavement markings to Missouri highways.

Our model can be used to help MoDOT more quickly calculate a striping schedule and dynamically respond to unexpected conditions such as schedule disruptions.

In this regard, the what-if capabilities of our model could be useful beyond solely the creation of striping operations schedules.



Screenshot of User Program Interface

Project Information

PROJECT NAME: Improving Striping Operations through System Optimization

PROJECT START/END DATE: June 2014 through July 2015

PROJECT COST: $60,000

LEAD CONTRACTOR: University of Missouri-Columbia

PRINCIPAL INVESTIGATORS: Dr. Ron McGarvey

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