



# GLOBAL POSITIONING SYSTEM DATA INTEGRATION AND DEVELOPMENT OF A THREE-DIMENSIONAL SPATIAL MODEL OF THE KANSAS HIGHWAY NETWORK

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By

Dr. Shang I. Chang, Kansas State University

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## Introduction

Currently, KDOT collects and maintains spatial data on the Kansas highway system from the yearly road condition survey and video log survey. These surveys utilize differentially corrected Global Positioning Systems (GPS) systems cross-referenced to the traditional KDOT linear reference system (LRS) derived from distance measuring instruments (DMI) on board the vehicles. Preliminary development of a spatial model has been performed internally to KDOT resulting in a 2D model (latitude and longitude, but not altitude) for approximately 75% of the state highway system.

## Project Objective

Develop a 3D model that shall serve as a cross referencing system between project stationing, project numbers, LRS, and other methods of defining physical locations. It will also serve to enable spatial analysis of the system for such items as sub-standard stopping sight distance, sub-standard horizontal curves, and the correlation of accidents with highway geometry.

## Project Description

Extend the current 2D model used by KDOT into a 3D model by including altitude GPS coordinates using a B-spline fitting model. Control points – 3D data coordinates for B-spline fitting were generated and stored in a database. The proposed 3D models are validated by comparing the altitudes of the 3D models with those obtained from original highway designs.

## Project Results

This report summarizes technical achievements of this project in two parts. Part 1 describes the data cleaning, curving fitting algorithms and geometric modeling using B-spline techniques. The proposed algorithm is capable of modeling over 90% of Kansas highway with high accuracy. Part 2 outlines the procedures of generating sub-standard stopping sight distance. The entire procedure was automated, right from the importing of the data from the control point database to transferring the results into the two tables of the result database.

## Report Information

For technical information on this report, please contact: Dr. Shang I. Chang, Associate Professor, College of Engineering, Kansas State University; 228 Durland, 228 Durland, Manhattan, KS 66506-5101; Phone: 785-532-5606; Fax: 785-532-7810; e-mail: [chang@ksu.edu](mailto:chang@ksu.edu).

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