NEW ENGLAND TRANSPORTATION CONSORTIUM

RESEARCH PROBLEM STATEMENT FORMAT

Due to netc@ctcandassociates.com by January 24, 2020

I. PROBLEM TITLE

Leveraging Emerging Sensing Data for Horizontal Curve Safety Improvement

II. RESEARCH PROBLEM STATEMENT

Horizontal curves are one of the most over-represented locations for high-frequency, high-severity crashes. According to the Federal Highway Administration (FHWA), more than 25% of fatal crashes in the United States occur on horizontal curves that account for 5% of roadways. Transportation agencies make substantial investment and effort to mitigate the crashes by performance different safety improvement countermeasures. However, critical curve information is usually lacking although it places an indispensable role in supporting the decisions on where and how to improve horizontal curve safety. In recent years, emerging sensing data, such as a global positioning system (GPS), an inertial navigation system (INS), light detection and ranging (LiDAR), video-log imagery, etc., have become widely available, affordable and with desired density and accuracy. While the traditional survey-based (e.g., chord-offset curve measurement) and driving-based (e.g., ball bank indicator (BBI)) methods may be still widely used by public transportation agencies, the time-consuming and subjective natures of these methods often limit their applications on a project level and hinder them from the large network-level application. On the contrary side, the emerging sensing data, with high accuracy, resolution, a more frequent data collection cycle, have created an unprecedented opportunity for public transportation agencies to implement their systemic safety improvement plans. However, there lacks a streamlined processing pipeline and practical implementation guideline on harnessing the promises of these emerging sensing data.

III. RESEARCH OBJECTIVES

This proposed study is aimed at developing a streamlined data processing pipeline for the emerging sensing data and formulating a practical guideline for supporting horizontal safety improvement implementations. The detailed anticipated objectives include:

1. *To develop a streamlined data processing pipeline that includes automated sensing data processing algorithms (e.g., automated horizontal curve geometry measurement, curve signage and marking inventory, roadway surface friction, etc.), and geospatial data integration procedures (e.g., integrating horizontal curve traffic control devices with run-off-road crash history).*
2. *To conduct case studies to substantiate the developed data processing pipeline. The case studies will focus on some of the particular interests of New England, e.g., advisory curve speed limit signage, high friction surface treatment (HFST), etc. The corresponding guidelines on how to implement the proposed data processing pipeline for the cases of interest will also be formulated.*

IV. COST ESTIMATE

$200,000

V. RESEARCH PERIOD

24 Month

VI. URGENCY AND PAYOFF POTENTIAL

If proved feasible, the emerging sensing data processing pipeline will become a cost-effective and efficient means for supporting systemic horizontal curve safety improvement. The form of the research implementation is successful case studies that tailor the proposed pipeline towards several critical applications in horizontal curve safety improvement, including curve speed advisory signage, HFST, etc. While the immediate implementation of the proposed pipeline will facilitate the urgent needs from state transportation agencies for fulfilling their pressing need in compliance of federal and state mandates for horizontal curve safety, more importantly, the implementation of the proposed pipeline will lay a strong foundation for state transportation agencies in New England in terms of capacities for data analytics and emerging technology adoption.

VII. IMPLEMENTATION POTENTIAL

- ***The intended DOT audience(s) for using the research products.***
  - *The intended DOT audiences will include traffic safety, roadway design, and GIS data.*
- ***Type of implementation anticipated as a result of the project.***
  - *The anticipated implementation of this project will include the successful deployment of the proposed pipeline in case studies. For example, for the HFST, the proposed pipeline will be substantiated through 1) implementation of automated algorithms for curve geometry extraction and road surface condition evaluation, 2) analysis of run-off-road crashes and their potential causations with respect to horizontal curve geometry and roadway surface condition, and 3) identification of feasible HFST application curves that maximize the effectiveness of the treatment and minimize the overall cost.*
- ***Activities to facilitate implementation to help create awareness and facilitate the implementation of the research results.***
  - *The activities to facilitate implementation will be carried out via training workshops and the deployment of the proposed pipeline in selected case studies.*
- ***Anticipated barriers or constraints to implementation and ways to overcome them.***
  - *One of the anticipated barriers to implementation would be the adoption of the data processing pipeline in different state departments of transportation in New England, which may demand extensive technical support, and technical personnel. Such a barrier can be mitigated through effective communication, training process, and technical supports.*
- ***Methods of tracking and measuring the impacts of implementation.***
  - *The impacts of implementation can be measured based on the successful practices of utilizing the proposed data processing pipeline on the implementation of horizontal curve safety improvement strategies in different state departments of transportations in New England.*

TWO DOT STAFF ENDORSEMENTS ARE REQUIRED (To be signed by separate individuals.)

1. *The Problem Statement follows the required format.*
2. *The Problem Statement addresses a transportation issue of relevance to NETC and does not duplicate another Problem Statement being submitted at this time.*

Nicholas Zavolas — Name

MA DOT, OTP - Research — DOT

Signature

1/24/2020 — Date

ENDORSEMENT BY THE SPONSORING DOT PROBLEM STATEMENT AUTHOR/SUBMITTER

By signing the endorsement, the DOT Problem Statement author/submitter is certifying that:

1. *I have technical knowledge of the project topic and will be committed to the research outcome.*
2. *I agree to serve as Chair of the project's Technical Committee if this Research Problem Statement is selected for funding by NETC.*

Neil E. Boudreau — Name

Mass DOT — DOT

Signature*

1/23/2020 — Date

*Attached email/correspondence may substitute signature

NOTE: To expedite the processing of Research Problem Statements, NETC requires submittal by e-mail from signing Advisory Committee member to (netc@ctcandassociates.com) by January 24, 2020.