Effective Evaluation of MicroStation and UNR Methods for Curve Data Measurement

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Presentation Overview

- Background
- Data Collection Sites
- Methodology
- Data Processing
- Summary
- Future Research Topics
Research Background

• Horizontal curve data are important for design, operation and performance evaluation of highway facilities; and it is especially significant for highway safety.

• Curve data management is of significant importance to highway design and operation.
Curve Measurement Sites

State Route 318 (SR 318)
Established in the 1930s
Renumbered to SR 318 in 1976.
Length: 110 miles
Existed: 1976-present
Curve Measurement Data Collection Sites

U.S. Route 50 (US 50)

Length: 3008 miles
Existed: 1926-present
Methods Introduction

- **MicroStation Method**
  - Capturing Google Earth’s Image
  - Drawing along the Centerline
  - Data Extracting with InRoads
Capturing Google Earth’s Image

- Define a Geographic Coordinate System in MicroStation (e.g., NAD83-WF, Nevada State Planes Western Zone)
- Set the coordinate system to the active view in the Auxiliary Coordinates menu. Tools—coordinate--systems—ACS
- Double click the NV83—WF to make sure it is active.
Methods Introduction

- Set the Running Coordinates to ACS Position
- Running coordinate system:
  ![Running coordinate system image]
- Left click to choose ACS position and change it.
- Select follow google earth’s view: 
  ![Follow google earth’s view]
- Make sure the rolling terrain is unchecked.
- Click the Capture Google Earth Image button
- Then you will see some grids:
Methods Introduction

• For this kind of circumstance, you need to change display style from wireframe to smooth. After that you can see the image showing on the screen.
Methods Introduction

Drawing along the Centerline

- Adjust transparency to 30% and use the level default
- Tools—manipulate—modify—fillet—open as a tool box.
- Choose construct circular fillet and form the curves by entering the estimate radius.
- If the estimate radius is not fit the situation (along the centerline), you need to estimate for the second time until it fit the situation.
- Then we use complex chain tools: tools—group—open as a tool box.
- Follow the instructions of Microstation to use the complex chain: select the road segment and confirm.
Methods Introduction

Data Extracting with InRoads

- Close the MicroStation and open the inroads.
- From—file—new-geometry tab, create a new geometry project.
- From—file—import form graphics, create a horizontal alignment from the view. (Select the line that had draw from view)
- Review the created horizontal alignment and save it as a txt file.
Methods Introduction

**UNR Tool Method**

- Install the `scipy`. The UNR Curvature Tool needs to install the `scipy` Python library which is for regression analysis of the curves data.

  ![Image of file names](image)

- Right click in the ArcToolbox of ArcMap, and select “Add Toolbox …”
Methods Introduction

b. Select the “UNR_CURVATURE.tbx”
c. Right click the “Curve Extraction” tool and select “properties”
Methods Introduction

d. Select “Source” tab, and change the script file as the file “automaticCurveExtraction.py” in the package.
Select the HPMS Route Layer, the Route ID information and the Output Workspace (the folder path to output the final curve layers and excel files).
Methods Introduction

- The process takes 20 seconds to minutes, decided by GIS layers and computers. When it’s done, the window shows “completed” and the total number of identified curves is shown.
- The results can be found in the Output.gdb folder. The data layer of the extracted curves is named as “originalLayerName_Route_Curves”
Methods Introduction

- FLDOT Tool method
Curve Length Data Processing

SR 318 Tool Evaluation

UNR_Length Error (P) vs Microstation_Length Error (P)
Radius Data Processing

SR 318 Tool Evaluation

Microstation_Radius Error (P)  Microstation_Length Error (P)
Curve Length Data Processing

US 50 Tool Accuracy Evaluation

- UNR_Length Error (P)
- Microstation_Length Error (P)
Radius Data Processing

UNR Tool Accuracy Evaluation

UNR_Radius Error (P)  UNR_Length Error (P)
Curve Length Data Processing

Length Accuracy Evaluation Based on US50 and SR 318

- UNR_Length Error
- Microstation_Length Error

Percentage of Identified Curves vs. Percentage of Error
Radius Data Processing

![Graph showing Radius Accuracy Evaluation Based on US50 and SR 318]

- **UNR_Radius Error**
- **Microstation_Radius Error**

The graph illustrates the percentage of identified curves against the percentage of error, comparing UNR Radius Error and Microstation Radius Error for US50 and SR 318.
The MicroStation method provides more accurate radius data extraction.

The UNR method is more suitable for length data extraction, particularly for continuous curves.

FLDOT Tool can be used as targeted one or two curves, but requires accurate milepost.
Future Study

- Spiral curve identification.
- MicroStation method for continuous curve identification.
Questions and Discussions

Thank you!