Software Overview

Roundabout Traffic Operations Analysis
Short Course
Software Overview

- Description of each program
- Empirical vs analytical models
- Overview of British model
- Picking the appropriate modeling tool
Objectives

- Understand role of software packages
- Understand differences between applications
- Key assumptions and outputs of software packages
- Understand the role of deterministic models and microsimulation applications
Software Fundamentals

- Benefits and disbenefits of software
- General overview of software types
- Overview of RODEL
- Overview of SIDRA
Benefits of Software

- Use complex, iterative models
- Allows efficient performance of repetitive calculations
- Allows “what-if” testing
- Allows reproducibility between analysts or between consultants and agencies
- Allows you to “look official” with your results
  - Spreadsheets and hand calculations not as polished
Disbenefits of Software

- Sometimes requires more time to input
- May generate more detail than necessary for problem at hand
- A simple back-of-envelope or spreadsheet might be more cost effective in some applications
  - Use of graphs for planning-level estimates
  - Use of spreadsheets for less critical sites (e.g., sites well below capacity)
Types of Roundabout Analysis Software

- Deterministic
  - Analytical models
  - Regression models
- Stochastic
  - Simulation
Analytical vs. Regression-Based Models

Geometry, traffic volumes

Field

Empirical Regression Method

Capacity

Traffic flow theory

Analytical Method

Aggregate gap acceptance behavior

Traffic flow theory

Performance Measures

Simulation

Field

Traffic flow theory
British Empirical Method (used in ARCADY/RODEL)

Capacity is a function of six geometric parameters:

- Entry radius, r
- Approach half width, v
- Entry width, e
- Inscribed circle diameter, D
- Effective flare length, l’
- Entry angle, 2Φ
British Method: Geometric Sensitivity

**Major effects:**
- Approach width, $v$
- Entry width, $e$
- Effective flare length, $l'$

**Minor effects:**
- Diameter, $D$
- Entry radius, $r$
- Entry angle, $\phi$

Source: Barry Crown
Analytical- and Regression-Based Software

- HCS (and others) - USA
- SIDRA - Australia
- ARCADY - UK
- RODEL - UK
- GIRABASE - France
- KREISEL - Germany

*Historically, most used in U.S. for roundabout analysis*
Simulation Software

- AIMSUN – Spain
- CORSIM – USA
- Integration – USA/Canada
- Paramics – UK
- SimTraffic – USA
- VISSIM – Germany
How to Select a Software Package?

- Each package has its own strengths and weaknesses
- No one software package (nor its underlying theory) is perfect for every situation
- Be wary of hype touting one package over another
Some Questions to Ask When Comparing Software

- What is the software’s model basis?
- How well does the model fit data from its country of origin?
- How does the model compare to US field data?
- To which parameters is the model sensitive?
- What degree of precision/accuracy is needed for the task at hand?
- Do you need comparisons with other intersection types or forms of control?
- Do you need more than printed output (e.g., animation)?
What Does Software NOT Do?

- Software by itself does NOT necessarily produce a safe design
  - High capacity may mean low safety
- Software by itself does NOT necessarily produce an efficient design
  - Upstream, downstream effects
  - Lane configurations not accommodated within model
- Software may appear “precise” but may not be “accurate”
Modeling versus Reality

- All these factors affect the accuracy of capacity models under a variety of flow conditions.
- No existing model perfectly captures all of these effects – each is either an approximation or simplification.
- Recognize the approximate nature of all roundabout capacity models.
Operational Analysis

- Basics of roundabout operations
- Measures of effectiveness
- Modeling techniques
- Picking the appropriate modeling tool
Match the tool to the potential application

- Many potential needs for operational analysis
  - Planning-level sizing
  - Typical one- and two-lane roundabouts
  - More complex roundabout layouts
  - System analysis
  - Public involvement

- Match the tool to the application
Alternative Tools

- HCM 2010 explicitly recognizes that HCM procedures are not the only way to analyze problems
- Applicability to roundabouts
  - Geometric configurations not included in model
  - Oversaturated conditions requiring multiple-period analysis
  - Interaction effects with other intersections