Background and Objectives

Introduction
Critical and follow-up headways relevant impact on roundabouts’ operation and capacity analysis.
- Critical gap (Hc): Unobservable value, different for each driver, time and conditions.
- Depends on sampling criteria. Dispersion.
- Strong impact when conflicting flow (Qc) is high.
- Widely studied.
- Follow-up headway:
  - Less researched.
  - Strong impact when conflicting flow (Qc) is low.

Research motivation
There is a need to document headway acceptance on Spanish roundabouts:
- Large number of roundabouts in Spain (more than 38,000).
- Driver behavior: more used to roundabouts and/or aggressive.
- High demands.
- Not balanced demands.
- Lack of further studies on follow-up headway influence on capacity and its variation with demand.

Objectives
The aim of the research is to analyze the main parameters at roundabouts: critical and follow-up headway.
- To collect data of both parameters in one Spanish single-lane roundabout.
- To calculate the discrete value and/or distribution of the critical headway from the most widely used models.
- To validate and validate VISSIM for the observed scenarios.
- To study the follow-up headway variation for different critical headway values and increasing traffic demand conditions.
- To discuss the results with previous research.

State of the Art

Critical headway estimation

Field study

Methodology

Calibration parameters in VISSIM:
- Stop lines and conflict markers position.
- Reduced speed area length.
- Dynamic queue condition.
- Number of observed vehicles, from the Wiedemann car-following model.
- Look ahead distance, from the Wiedemann car-following model.

Microsimulation study (VISSIM)

Sample size

Accepted headways: 2702
Rejected headways: 205

Microsimulation study (VISSIM)

Calibration of HCM 2010 capacity equation

VISSIM capacity estimation (for LOS F HCM)

Follow-up headway distribution vs. conflicting flow

Conclusions

Critical headway estimation:
- Differences up to 2 s depending on method or sampling criteria.
- Methods based on congested conditions leads to higher values.
- For large Qc (>800 vph), critical gap affects capacity.
- For low Qc (<500 vph), critical gap effect is not decisive.

Follow-up headway:
- Major contributing parameter when Qc are low.
- Cannot be considered uniform at every Qc level – increases with Qc.

Microsimulation tools represent a useful method to avoid the absence of follow-up estimation procedures.