Evaluating Continuous Flow Intersection and Virtual Reality

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Overview

1. Introduction
   - Background of Continuous Flow Intersection (CFI) and Virtual Reality Glasses
   - Objective

1. Literature Review
   - Past Studies

1. Methodology
   - Site Location
   - Design & Parameters
Background

- High demand for improvement to increase capacity, decrease congestion, and minimize cost.

- As congestion worsens drivers experience delays at intersections.

- Continuous Flow Intersection (CFI) is a design to accommodate these issues for signalized intersections.
What is a CFI?

- Unlike conventional intersections, the left turning pocket is moved hundreds of feet back.
- Left turning vehicles enter the CFI leg which empties into the cross street at the main signalized intersection.
- Right turning vehicles are not impacted and merge with traffic depending on the design.
- One controller cabinet per intersection controlling all signals.
- The design is meant for high volume of left turning vehicles and vehicles going through the intersection.
Virtual Reality

- Used to test without building.
  - Popularity increasing
  - Realistic settings
  - Cost effective
  - Safe
Objectives

1. Study Adaptability
2. Study Effects
3. Evaluate Safety
4. Evaluating Feedback
5. Evaluate intersection using VISSIM
6. Adding to Classroom
Types

Many Unconventional Intersections

- Median U-Turn
- Superstreet
- Reverse/Reverse Jughandle
Safety Performance

- There is little research conducted on safety.

- Unconventional CFI (2)
  - Crossing 12, Merging 8, Diverging 8, Total 28

- Conventional Intersection Conflict points (2)
  - Crossing 16, Merging 8, Diverging 8, Total 32

- There are concerns indicated for wrong movements and emergency vehicles.

Maryland Department of Transportation
The Operational Process, Performance, & Impact

- Studies show that CFI’s significantly reduce the overall delay and queue lengths by 64% and 61%, respectively. (3)

- Same studies showed that there is less stops made for CFI’s.

- CFI’s have better performance than any other unconventional and conventional intersections. (4)

- Other critical contributing factors remain an ongoing research issue.
Average delay of whole intersection
(traffic volume of arterial road = 2000 vph)

Average delay of whole intersection
(traffic volume of arterial road = 2500 vph)

(3) Esawy, M., and Sayed.: Comparison of Three Unconventional Arterial Intersection Designs: Continuous Flow Intersection, Parallel Flow Intersection, and Upstream Signalized Crossover
Methodology

- Select Site
- Gather Data
  - Hourly Volume
  - Peak Hour Factor
  - Level of Service (LOS)
- Generate Model Via PTV VISSIM
- Analyze data
Site Location

- W. Valley Blvd and Temple Ave
- 2 major Arterials in City
  - Connects City of Pomona and City of Walnut
  - Near 10, 57 and 71 interstate
- Existing LOS E/F according to the city of Pomona
- Near Campus
Temple Ave and W. Valley Blvd

- Westbound and Eastbound
  - 3 lanes each direction with a protected left turn.

- Southbound and Northbound
  - 2 lanes each direction with protected left and right turn.
Design

- Creating simulation in VISSIM with following properties and dimensions.
  - Arrange phases according
  - Gather Hourly Volume from intersection
Results

VISSIM (13 simulation runs)

- Conventional
  - LOS D (HCM)
    - Avg. Delay @ 50 Sec per Veh
    - Average Stops 39.8

- Unconventional
  - LOS C (HCM)
    - Avg. Delay @ 30 Sec per Veh
Conclusion

● Studies show CFI offer advantages compared to Conventional intersections.
  ○ Accommodates for future growth.
  ○ Has High-performance and is an economical alternative for congested intersection.
  ○ Design can be modified for better performances.

● Results from VISSIM show improvements for intersection near Cal Poly Pomona.
Future Work with Virtual Reality

- Use new software
  - Adaptable with virtual reality glasses
  - Ways to accommodate pedestrians, bicyclists and transit users (e.g. multimodal).
  - For classrooms use

- Applications with Virtual Reality
  - Pedestrian simulator
  - Human behavior in certain virtual environments
Questions?
Reference


(4) Performance of XDLT intersection.
