Prepared for:

Prepared by:

EVALUATION OF CAMERA-BASED SYSTEMS TO REDUCE TRANSIT BUS SIDE COLLISIONS

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INTRODUCTION

- Transit buses experience side collisions when changing lanes, merging or turning
- One of the factors contributing to side collisions is the side blind zone due to the limited field of view of the mirrors
- Many studies have been conducted, offering sensor systems as countermeasures. They are not however reliable and do not work 100% of the time

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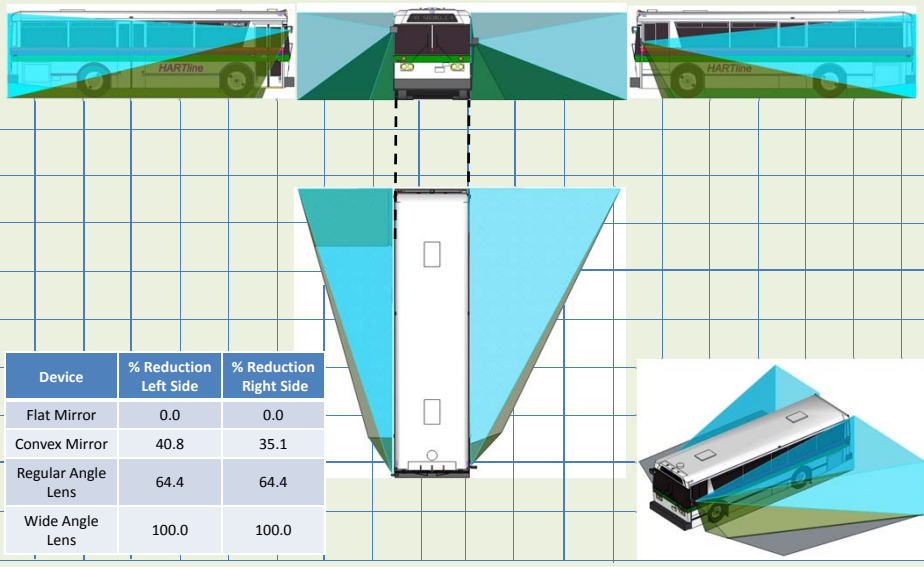
PROJECT METHODOLOGY

- Conduct literature review to compare existing mirror-, sensor-, camera-based systems
- Perform volumetric measurements and comparison of the Field of View (FOV) of mirrors and camera system
- Design and perform controlled driving test to evaluate camera-based systems

LITERATURE REVIEW

- Previous studies and prototypes have shown:
  - mirrors leave a blind zones around the vehicle
  - sensor systems have too many false alarms, can be distracting to the driver and do not work 100% of the time
  - camera systems have been used only for machine vision, and not for enhancing the view of the driver

VIDEO SYSTEM FOV and SIDE BLIND ZONE REDUCTION



Device	% Reduction Left Side	% Reduction Right Side
Flat Mirror	0.0	0.0
Convex Mirror	40.8	35.1
Regular Angle Lens	64.4	64.4
Wide Angle Lens	100.0	100.0

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CONTROLLED DRIVING TEST

Objectives:

1. Test if drivers can perceive distance similarly with mirrors and cameras (maneuver 1)
2. Test if drivers can identify side blind zone and use system to eliminate (maneuver 2)
3. Examine distance perception in static conditions
4. Collect feedback from drivers on enhancements for the camera system

Note: 28 participating bus drivers

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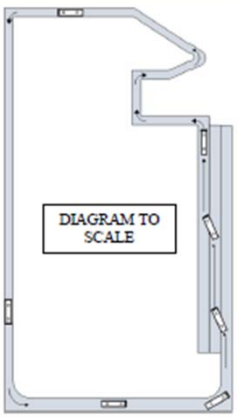
CONTROLLED DRIVING TEST

- 28 Drivers recruited from USF transit system
- Mix of ages (under 25 to 50+)
- Mix of driving experience (0.5-52 years)
- Two types of buses used: cutaway and low floor
- Eleven drivers had previous experience with rearview video system

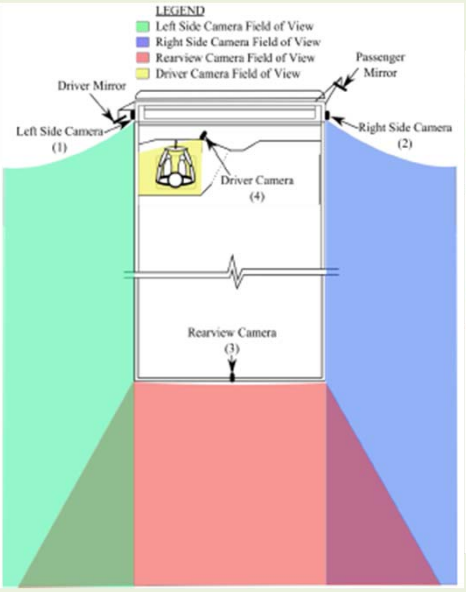
CONTROLLED DRIVING TEST

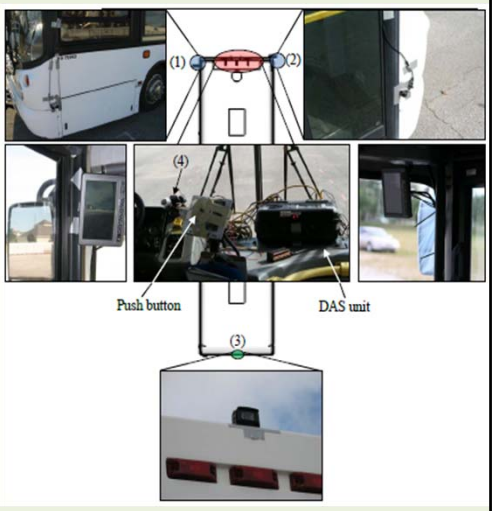
- Closed course

1. Drive around course twice
2. Perform driving maneuvers
3. Perform static perception test



DATA COLLECTION DURING TEST





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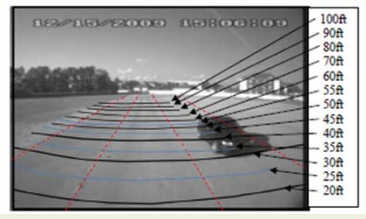
CAMERA VIEWS AND VIRTUAL SCALE



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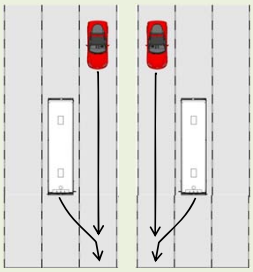
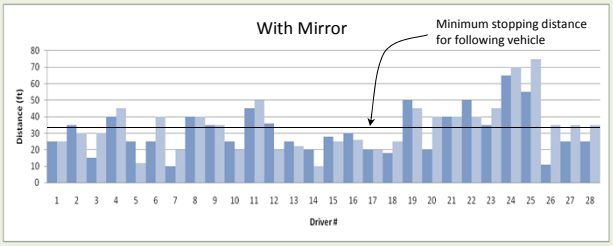
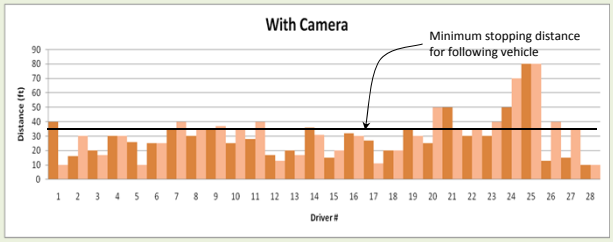
RESULTS OF FIRST MANEUVER

Distance perception in dynamic conditions

Maneuver 1







RESULTS OF SECOND MANEUVER

Maneuver 2

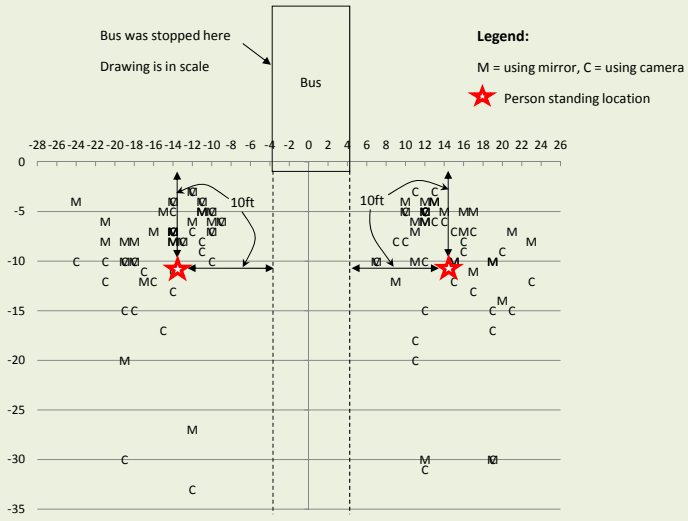
Mirror FOV

RESULTS OF SECOND MANEUVER

Vehicle not visible in mirror

Vehicle visible in camera

STATIC DISTANCE PERCEPTION



RESULTS OF DRIVER SURVEY

- The system reduces or eliminates the side blind zone compared to the mirrors
- The system can help drivers reduce side crashes by providing a better view
- In general the system can improve bus safety
- With the system they can observe late arriving passengers
- Drivers would like to have this system on the bus they drive everyday
- Felt comfortable performing a lane change maneuver with the system
- The system can help reduce crashes during lane change maneuvers

OTHER SYSTEM BENEFITS

At nighttime

OTHER SYSTEM BENEFITS

During Rain

OTHER SYSTEM BENEFITS

Avoid hitting pedestrians

Thank You!

Comments and Questions