In recent years, traffic agencies have begun to place emphasis on the importance of pedestrian safety. In the United States, nearly 70,000 pedestrians were reported injured in 2015. Although the number only account for 3% of all the people injured in traffic crashes, the number of pedestrian fatalities is still around 15% of total traffic fatalities. Furthermore, the state of Florida has consistently ranked as one of the worst states in terms of pedestrian crashes, injuries and fatalities. Therefore, it is befitting to focus on the pedestrian safety. This dissertation mainly focused on pedestrian safety at both midblock crossings and intersections by using micro-simulation and driving simulator.

First, this study examines if the micro-simulation model (VISSIM and SSAM) could estimate pedestrian-vehicle conflicts at signalized intersections. A total of 42 video-hours were recorded at seven signalized intersections for field data collection. The observed conflicts from the field were used to calibrate VISSIM and replicate the conflicts. The calibrated and validated VISSIM model generated the pedestrian-vehicle conflicts from SSAM software using the vehicle trajectory data in VISSIM. The mean absolute percent error (MAPE) was used to determine the optimum TTC and PET thresholds for pedestrian-vehicle conflicts and linear regression analysis was used to study the correlation between the observed and simulated conflicts at the established thresholds. The results indicated the highest correlation between the simulated and observed conflicts when the TTC parameter was set at 2.7 and the PET was set at 8.

Second, the driving simulator experiment was designed to assess pedestrian safety under different potential risk factors at both midblock crossings and intersections. Four potential risk factors were selected and 67 drivers participated in this experiment. In order to analyze pedestrian safety, the surrogate safety measures were examined to evaluate these pedestrian-vehicle conflicts.

Third, by using the driving simulator data from the midblock crossing scenario, typical examples of drivers' deceleration rate and the distance to crosswalk were summarized, which exhibited a clear drivers' avoidance pattern during the vehicle pedestrian conflicts. This pattern was summarized into four stages, including the brake response stage, the deceleration adjustment stage, the maximum deceleration stage, and the brake release stage. In addition, the pedestrian-vehicle conflict prediction model was built to predict the minimum distance between vehicle and pedestrian.

Finally, this study summarized the three different kinds of data that were to evaluate the pedestrian safety, including field data, simulation data, and driving simulator data. The framework of combination of field data, simulation data, and simulator data was proposed. This framework presented how to evaluate the pedestrian safety by combining three kinds of data.
Approved for distribution by Essam Radwan, Committee Chair, on April 24, 2017.

The public is welcome to attend.