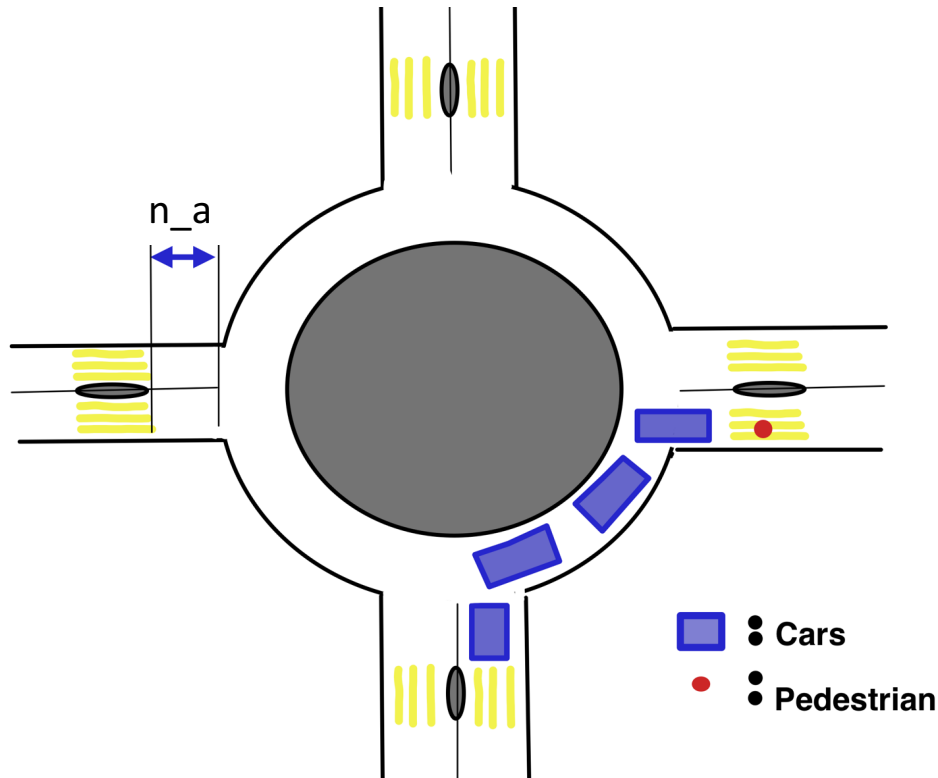# The impact of pedestrians on roundabout's entry

A simulation in the context of the lecture, Modelling and Simulating Social Systems with MATLAB

Introduction

Research Question:

Is a reasonably small increase of the storage space between the yield line and the crosswalk "n_a " has a significant positive impact on the entry capacity "Cs" ?
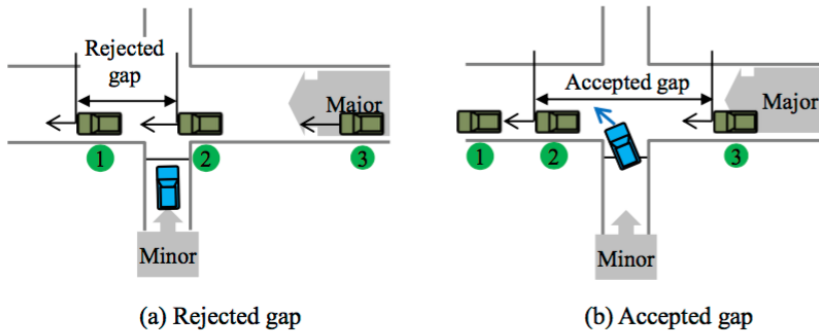
Gap acceptance theory

Fig. 1

- Entry-capacity Cs: How many vehicles can enter one accepted gap and how accepted gaps are provided

- Minorflow: Vehicles intending to merge into the roundabout

- Majorflows: Pedestrians crossing and circulating vehicles

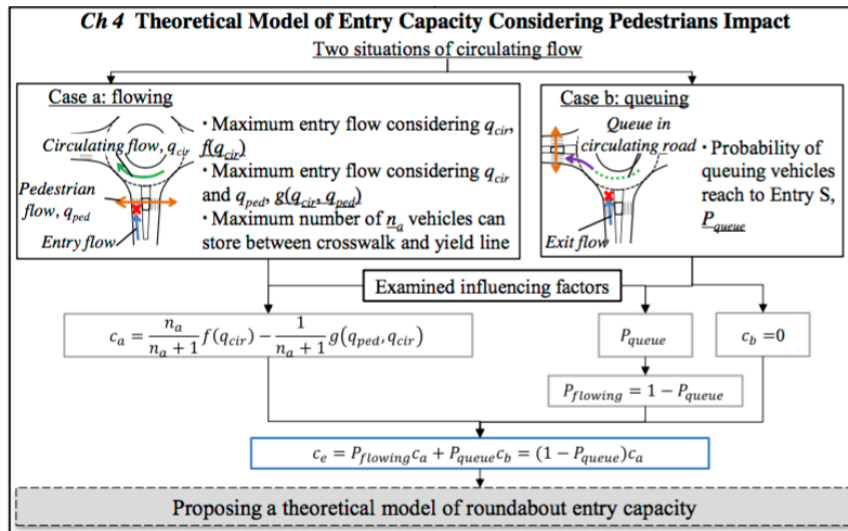- Roundabout ⇔ two unsignalized intersections to cross and merge into.

The model

Fig. 2

- Circulation flow divided in flowing traffic (Ca) queuing traffic (Pq)
- Ca(n_a) is adjusted with f and g
- f = maximum entry flow without considering pedestrians (simple case)
- g = maximum entry flow considering pedestrians but without storage space (calculated using Queue theory)
- Pq is estimated using queuing theory

The implementation
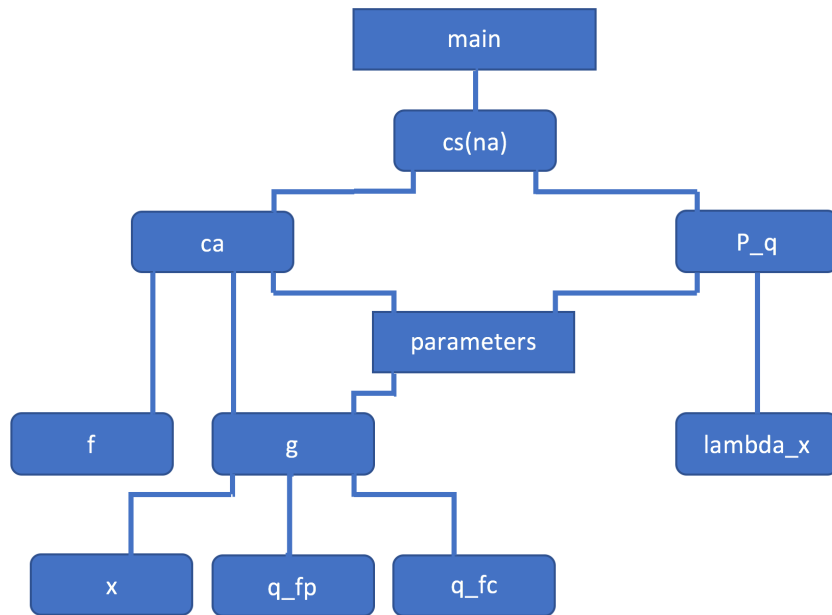
- Two different Implementation
- First shows the impact of a growing n_a
- Second shows the difference between n_a =1 and n_a =2 over a day.
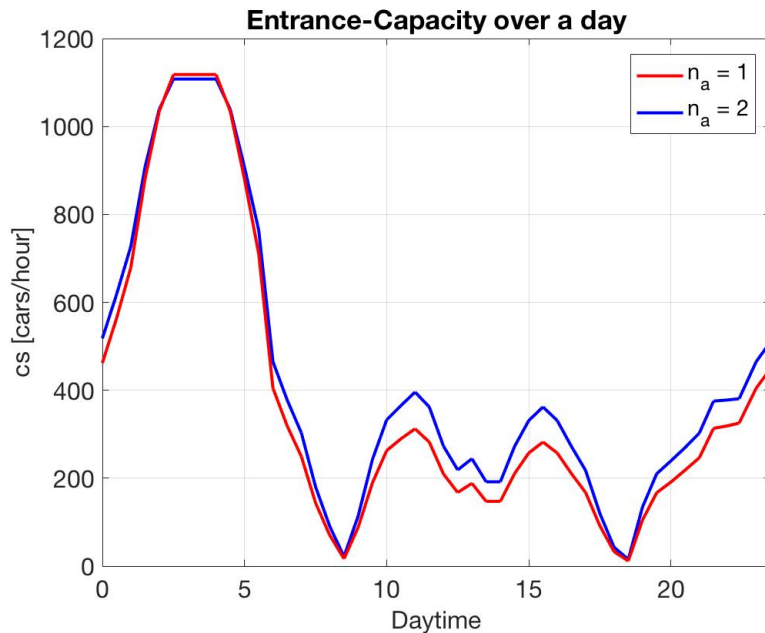
Results and Discussion
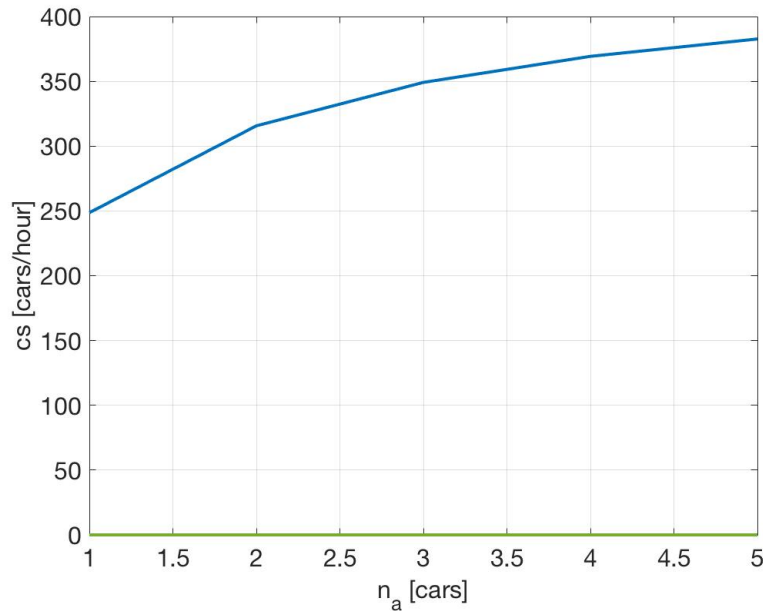
- Fitting parameters because of the simplified model

- Values in the same range as in the model from Dr. Eng. Nan Kang and Dr. Eng. Hideki Nakamura

- A big change of cs from n_a = 1 n_a= 2

Results and Discussion
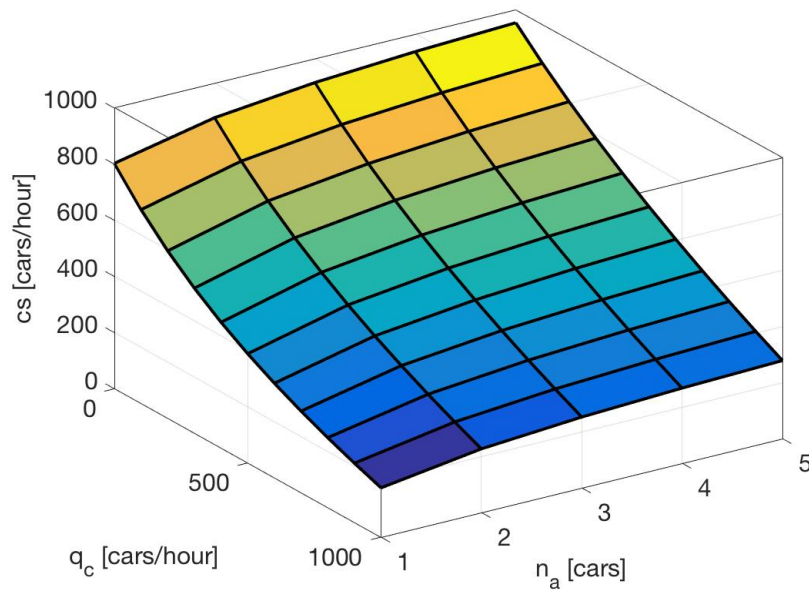
- Impact of n_a remains for changing q_c

- n_a = 2 is the most promising value

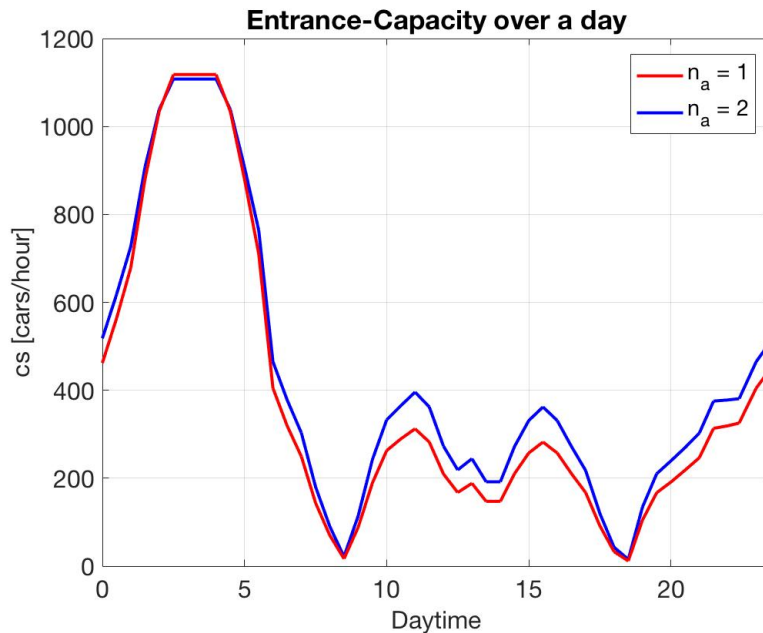# Results and Discussion

Entrance-Capacity over a day

- First implementation was not very accurate

- q_c, q_cprime, q_p and q_pprime variate over 24 hours

- Only an improvement of 11 percent over a day

- Big improvement between 10am and 5pm

Results and Discussion

Entrance-Capacity over a day

Legend: $n_a = 1$ (red), $n_a = 2$ (blue)

x-axis: Daytime
y-axis: cs [cars/hour]

- Behaves as expected and correlates
- Model is highly symplified but still gives consistent results
- n_a might have a big influence
- Next step real Data

Conclusion

Research Question:

Is a reasonably small increase of the storage space between the yield line and the crosswalk "n_a " has a significant positive impact on the entry capacity "Cs" ?

References

- Fig. 1:
  http://ir.nul.nagoya-u.ac.jp/jspui/bitstream/2237/20517/2/10680本文.pdf
- Fig. 2:
  http://ir.nul.nagoya-u.ac.jp/jspui/bitstream/2237/20517/2/10680本文.pdf