Technical Report for Intermediate Stop Generation

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Model Description

The intermediate stop generation model is a model that generate intermediate stops in a sequence. The intermediate stop generation will follow a process called "stop and go". Besides all stop purposes, a special alternative called `Quit` is in the choice set. For each half-tour, to generate stops, apply the generation model until the `Quit` alternative is selected or the maximum number of stops have been generated for the half-tour.

Choice Set

There are 5 alternatives: Quit, Work stop, Education stop, Shopping stop, and Other stop. The availability of the four stop purposes is determined in day pattern model.

Model Structure

The intermediate stop generation model is a MNL logit model.

```
V_work= cons_work+\
work_tour_dummy_W*1*(tour_type==1)+\
edu_tour_dummy_W*1*(tour_type==2)+\
shopping_tour_dummy_W*1*(tour_type==3)+\
other_tour_dummy_W*1*(tour_type==4)+\
female_dummy_W*female_dummy+\
student_dummy_W*student_dummy+\
```

```
worker_dummy_W*worker_dummy+\
driver_dummy_W*driver_dummy+\
passenger_dummy_W*passenger_dummy+\
public_dummy_W*public_dummy+\
time_window_work*time_window_h+\
tour_distance_work*log(1+distance)+\
a700_a930_work*p_700a_930a+\
a930_a1200_work*p_930a_1200a+\
p300_p530_work*p_300p_530p+\
p530_p730_work*p_530p_730p+\
p730_p1000_work*p_730p_1000p+\
p1000_a700_work*p_1000p_700a


V_edu = cons_edu+\
work_tour_dummy_E*1*(tour_type==1)+\
edu_tour_dummy_E*1*(tour_type==2)+\
shopping_tour_dummy_E*1*(tour_type==3)+\
other_tour_dummy_E*1*(tour_type==4)+\
female_dummy_E*female_dummy+\
student_dummy_E*student_dummy+\
worker_dummy_E*worker_dummy+\
driver_dummy_E*driver_dummy+\
passenger_dummy_E*passenger_dummy+\
public_dummy_E*public_dummy+\
time_window_edu*time_window_h+\
tour_distance_edu*log(1+distance)+\
a700_a930_edu*p_700a_930a+\
a930_a1200_edu*p_930a_1200a+\
p300_p530_edu*p_300p_530p+\
p530_p730_edu*p_530p_730p+\
p730_p1000_edu*p_730p_1000p+\
p1000_a700_edu*p_1000p_700a

V_shopping = cons_shopping+\
work_tour_dummy_S*1*(tour_type==1)+\
edu_tour_dummy_S*1*(tour_type==2)+\
shopping_tour_dummy_S*1*(tour_type==3)+\
other_tour_dummy_S*1*(tour_type==4)+\
female_dummy_S*female_dummy+\
student_dummy_S*student_dummy+\
worker_dummy_S*worker_dummy+\
driver_dummy_S*driver_dummy+\
passenger_dummy_S*passenger_dummy+\
public_dummy_S*public_dummy+\
time_window_shopping*time_window_h+\
```

```
tour_distance_shopping*log(1+distance)+\
a700_a930_shopping*p_700a_930a+\
a930_a1200_shopping*p_930a_1200a+\
p300_p530_shopping*p_300p_530p+\
p530_p730_shopping*p_530p_730p+\
p730_p1000_shopping*p_730p_1000p+\
p1000_a700_shopping*p_1000p_700a


V_other=cons_other+\
work_tour_dummy_O*1*(tour_type==1)+\
edu_tour_dummy_O*1*(tour_type==2)+\
shopping_tour_dummy_O*1*(tour_type==3)+\
other_tour_dummy_O*1*(tour_type==4)+\
female_dummy_O*female_dummy+\
student_dummy_O*student_dummy+\
worker_dummy_O*worker_dummy+\
driver_dummy_O*driver_dummy+\
passenger_dummy_O*passenger_dummy+\
public_dummy_O*public_dummy+\
time_window_other*time_window_h+\
tour_distance_other*log(1+distance)+\
a700_a930_other*p_700a_930a+\
a930_a1200_other*p_930a_1200a+\
p300_p530_other*p_300p_530p+\
p530_p730_other*p_530p_730p+\
p730_p1000_other*p_730p_1000p+\
p1000_a700_other*p_1000p_700a

V_quit= cons_Q+first_stop_inbound*first_stop*first_bound+\
second_stop_inbound*second_stop*first_bound+\
threeplus_stop_inbound*three_plus_stop*first_bound+\
first_stop_outbound*first_stop*second_bound+\
second_stop_outbound*second_stop*second_bound+\
threeplus_stop_outbound*three_plus_stop*second_bound+\
work_tour_dummy_Q*1*(tour_type==1)+\
edu_tour_dummy_Q*1*(tour_type==2)+\
shopping_tour_dummy_Q*1*(tour_type==3)+\
other_tour_dummy_Q*1*(tour_type==4)+\
first_tour_dummy_Q*first_tour_dummy+\
sub_tour_dummy_Q*has_subtour+zero_tour_remain_Q*1*(tour_remain==0)+\
one_tour_remain_Q*1*(tour_remain==1)+twoplus_tour_remain_Q*1*(tour_remain>=2)

#parameter estimation
#refer to html files
```

Variables

- `tour_type`: when generating intermediate stops for a particular tour, this variable indicate the tour type. it can take values from 1 to 4. 1 for work tour, 2 for education tour, 3 for shopping tour and 4 for other tour.
- `student_dummy`: `1 if person_type_id=4, 0 otherwise`
- `worker_dummy`: `1 if person_type_id in [1,2,3,8,9,10], 0 other wise`
- `driver_dummy`: 1 if the tour mode is drive alone (mode id =4), 0 otherwise
- `passenger_dummy`: 1 if the tour mode is shared ride 2 or shared ride 3+ (mode id=5,6), 0 otherwise
- `public_dummy`: 1 if the tour mode id is in [1,2,3], 0 otherwise
- `distance`: if we are modeling stops on the first half tour, the distance is `AM[(destination,origin)]['AM2dis']`. If we are modeling stops on the second half tour, the distance is `PM[(destination,origin)]['PM2dis']`. origin is home mtz and destination is primary activity location of the tour.
- `p_700a_930a`: if we are modeling stops on the first half tour, the dummy variable is 1 if the arrival time of tour primary activity is between 7 am to 9:30 am. If we are modeling stops on the second half tour, the dummy variable is 1 if the departure time of tour primary activity is between 7 am to 9:30 am.