Trip Generation Pseudo Code

This documents the order of operation of the subroutines in the Trip Generation model.

Input parameters are provide to the model via a text file (TG_INPUT.TXT).

Following the Trip Generation model, create_HHvtype_file.py is submitted to create a file used by the Mode Choice model.

Additional documentation of table attributes is included in the [Travel Demand Model Documentation](#).

Hard-coded variables:

Variable	Description	Value	Location
PEF	Pedestrian Environment Factor used to define the walkability of an area.	Capped at 40.0	SUB_HHVEH.for [Line 158]

Program Execution

CMAP_TG_2012.for	Master program that calls all subroutines and the random number seed routine. *Writes:* Output log (TG_OUTPUT.TXT [unit=16]) *Includes:* COMMON_PARAM.FI	
Call:	**SUB_CONTROL.for**	Subroutine reads the NAMELIST file to import all arguments and perform error-checking on parameters. *Reads:* NAMELIST parameters (TG_INPUT.TXT [unit=15]) *Includes:* COMMON_PARAM.FI., COMMON_CONTROL.FI

Call:	**SUB_GEOG.for**	Subroutine reads the geographic correspondence file establishing relationships between each subzone and the corresponding County/PUMA/zone. *Reads:* Geographic correspondence file (GEOG_IN.TXT [unit=17]) *Includes:* COMMON_PARAM.FI, COMMON_GEOG.FI	
Call:	**SUB_PUMS.for**	Subroutine reads a file of 624 household categories and creates an empty storage array. Households are defined by combinations of Adults-Workers-Children-Income-Householder age. *Reads*: File containing the definitions of household categories (PUMS_HHTYPE_IN.TXT [unit=19]) *Includes:* COMMON_PARAM.FI., COMMON_CONTROL.FI, COMMON_GEOG.FI, COMMON_HHSUMS.FI, ROW_COL.FI	
Call:	**SUB_TAZ_HHTYPE.for**	Subroutine reads a subzone control file to determine total households and reads a file of the synthetic households used to populate enumerated household matrix created in SUB_PUMS.for. *Reads*: Subzone level control file (HH_IN.TXT [unit=20]) and file of synthetic households (POPSYN_HH.CSV [unit=79]) *Includes:* COMMON_PARAM.FI., COMMON_CONTROL.FI, COMMON_GEOG.FI, COMMON_HHSUMS.FI, ROW_COL.FI	
Call:	**SUB_PRINT_TAZHH.for**	Subroutine summarizes household types (each attribute singularly) by county, 1% PUMA, and 5% PUMA. *Includes:* COMMON_PARAM.FI., COMMON_GEOG.FI, COMMON_HHSUMS.FI	
If HHENUM mode is set to TRUE.			

Call:	**SUB_PUMS_HHENUM.for**	Subroutine reads the ACS household input file, a comma-delimited file containing the 5% PUMA for the household, the household type, the serial number and the ACS PUMS weight for the household. Arrays are filled from the input file then the subroutine randomly selects PUMS households matching TG subzone household characteristics. *Reads*: ACS PUMS household input file (PUMS_HHENUM_IN.TXT [unit=31]) *Writes*: A file of enumerated households (SZ_PUMS_HHS_OUT.TXT [unit=32]) *Includes*: COMMON_PARAM.FI., COMMON_CONTROL.FI, COMMON_GEOG.FI, COMMON_HHSUMS.FI, COMMON_PUMSHHS.FI

Else If TRIPGEN mode is set to TRUE (default).

Call:	**SUB_HHVEH.for**	Subroutine reorganizes the household category into one that replaces income with the number of vehicles available within the category definition. This runs with one of two options: • SYNTH_VEH = TRUE: vehicle ownership levels are based on the attributes of the synthetic households. • SYNTH_VEH = FALSE: vehicle ownership levels are estimated from the model based on household attributes. If MODE_CHOICE is set to TRUE, the subroutine accumulate weights for vehicle ownership levels for input into the mode choice model; which are used as zonal-level worker HH auto ownership probabilities. *Writes*: A file of zonal vehicles ownership levels (MCHW_HH.TXT [unit=71]). *Includes*: COMMON_PARAM.FI., COMMON_CONTROL.FI, COMMON_GEOG.FI, COMMON_HHSUMS.FI, COMMON_PUMSHHS.FI, COMMON_HHMISC.FI, COMMON_POPSYN.FI
Call:	**SUB_HI_HHENUM.for**	Subroutine changes the household type for the enumerated households from the income-based to vehicle-based categories. Each household is processed and

household trips are enumerated by applying the trips from a like household in the travel survey: first by looking for similar households within the PUMA; then checking in adjacent PUMAs; then by checking within the study area; and finally by using household categories based on combinations of Adults and Workers and the presence or absence of children.

Reads: A file of travel survey household attributes (HI_HHENUM_IN.TXT [unit=41]); a file containing the number of households in a PUMA based on the vehicle-based household category and the matching category used (HHID_choices1.csv [unit=43]); and a file listing the travel survey household serial numbers for each category in the previous file (HHID_choices2.csv [unit=44]).
Writes: A file of the enumerated households selected by the matching process and their attributes (HI_HHENUM_TRIP_OUT.TXT [unit=42]).
Includes: COMMON_PARAM.FI., COMMON_CONTROL.FI, COMMON_GEOG.FI, COMMON_HHSUMS.FI, COMMON_PUMSHHS.FI, COMMON_HHMISC0.FI, COMMON_HIHHS.FI

Call:	**SUB_TRIPGEN4.for**	Subroutine prints summaries of household-based trip productions and attractions to TG_OUTPUT.TXT. *Writes:* A subzone-level file of productions (HI_HHENUM_TRIP_OUT.TXT [unit=42]). *Includes:* COMMON_PARAM.FI., COMMON_GEOG.FI, COMMON_HHSUMS.FI, COMMON_PUMSHHS.FI, COMMON_HHMISC0.FI, COMMON_HIHHS.FI
Call:	**SUB_TRIPGEN5.for**	Subroutine to estimate group quarters trip productions. . The trip rates for group quarters are the following: the work rate was estimated from PUMS group quarters data. Gqw_h_workp is the home to workplace production trip rate for gq workers. Gq_frac is the fraction of work trips that are by motorized modes. All gq workers are assumed to be in the less than median

		regional earnings category. Trip rates for other purposes are assumed to equal those of a worker or nonworker in a single person HH without a vehicle or children in the lowest income quartile. Low income home to workplace (prods(1)): 1. First factor workers per group quarters person; 2. Second factor home-workplace productions per worker; 3. Third factor is fraction of vehicle trips. *Reads:* A subzone-level file of persons in four types of group quarters (GQ_IN.TXT [unit=44]). *Writes:* A subzone-level file of GQ productions in ten categories (PRODS_GQ_OUT.TXT [unit=45]). *Includes:* COMMON_PARAM.FI., COMMON_GEOG.FI, COMMON_GQ.FI.
Call:	**SUB_TRIPGEN6.for**	Allocates attractions for non-home based trip ends. Subzone employment is separated into high-income/low-income. Household productions are accumulated at the home end -- first for workers, then non-workers, then children 12-15, then the remaining types. The process is repeated for group quarters productions -- workers, non-workers, then the remaining ones. Production shares for non-home productions are accumulated and allocated to productions. Attraction shares are calculated and allocated to attractions. *Reads:* A subzone-level file of retail and total employment, and the fraction of high earners working in the subzone (ATTR_IN.TXT [unit=50]). *Writes:* A subzone-level file of initial productions and attractions in 49 categories (FIRST_PA_OUT.TXT [unit=51]). *Includes:* PARAM.FI., COMMON_GEOG.FI, COMMON_HHSUMS.FI, COMMON_GQ.FI, COMMON_ATTR.FI.
Call:	**SUB_TRIPGEN7.for**	Subroutine to estimate trips to and from external locations. Read file unit=55 (EXT_IN.TXT): PUMA5 factors for home-workplace external trip adjustment (household-generated trips only).

		Reads: A PUMA-level file of factors to adjust external productions and attractions (EXT_IN.TXT [unit=55]). *Writes:* A subzone-level file of externa productions and attractions in two categories (EXTERNAL_PA_OUT.TXT [unit=56]) and a final subzone-level file of productions and attractions in 49 categories (SECOND_PA_OUT.TXT [unit=57]). *Includes:* COMMON_PARAM.FI., COMMON_GEOG.FI, COMMON_ATTR.FI, COMMON_EXT.FI.
Call:	**SUB_TRIPGEN8.for**	Subroutine to estimate non-motorized productions and attractions based on Travel Tracker data. Bias constants were adjusted to account for additional block coding in Census 2010. Calculations are completed for workers and non-workers for the CBD and non-CBD. *Writes:* A subzone-level file of non-motorized productions and attractions (NONMOTOR_PA_OUT.TXT [unit=58])[1] and a subzone-level file that can be used to verify the calculations (NONMOTOR_REVIEW_OUT.TXT [unit=80]) *Includes:* COMMON_PARAM.FI., COMMON_GEOG.FI, COMMON_ATTR.FI, COMMON_HHSUMS.FI, COMMON_GQ.FI, COMMON_NM.FI.
Call:	**SUB_TRIPGEN9.for**	Subroutine prepares the final summaries of productions and attractions. *Writes:* A subzone-level file of productions and attractions summarized by either 11 categories (TRIP11_PA_OUT.TXT [unit=61]) or 49 categories (TRIP49_PA_OUT.TXT [unit=60]). *Includes:* COMMON_PARAM.FI., COMMON_GEOG.FI, COMMON_ATTR.FI, COMMON_HHSUMS.FI, COMMON_GQ.FI, COMMON_NM.FI.

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[1] The fields in NONMOTOR_PA_OUT.TXT are: subzone, zone, triptype (1-49), non-motorized productions, fraction of all productions that are non-motorized, non-motorized attractions, fraction of all attractions that are non-motorized.

Common Blocks

COMMON_PARAM.FI	Declares NAMELIST variables used throughout program
COMMON_CONTROL.FI	Declares NAMELIST regional control variables
COMMON_GEOG.FI	Define common blocks for GEOG_IN.TXT
COMMON_HHSUMS.FI	Define common blocks for regional households in five-year ACS PUMS
ROW_COL.FI	Provide household distributions (adults, workers, children, income, age of householder)
COMMON_PUMSHHS.FI	Declare matrices to hold enumerated households.
COMMON_HHMISC.FI	Holds two matrices: a) proportion of workers in a HH who are high income (above median) by adult-worker and income quartile, and b) proportion of children in a HH who are between 12 and 15 by adult-worker, number of children and age of householder
COMMON_HHMISC0.FI	Declare matrices defined above.
COMMON_HIHHS.FI	Declare matrices to hold travel survey input households.
COMMON_GQ.FI	Declare arrays to hold GQ productions/attractions.
COMMON_ATTR.FI	Declare common blocks for attraction file (ATTR_IN.TXT).
COMMON_EXT.FI	Declare common blocks for external productions/attractions.
COMMON_NM.FI	Declare common blocks for non-motorized trip productions/attractions.
COMMON_POPSYN.FI	Declare matrices to hold enumerated households from PopSyn.