

Integrated Traffic Assignment

(Ver.3.04)

April 15, 2006

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Read Me & Thanks

Freeware

The methodology of engineering should be open to the public. Therefore this program package is basically freeware. Donations are of course always welcomed.

It is free to use this package for any purposes except selling this. It is also free to modify source programs except commercial purpose. However you are responsible for any problems and results by this package.

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Purpose

This simulation program can assign vehicle trips on road network and person trips on transit network at the same time. Up to now this kind of simulations were separated for vehicle trips and person trips, therefore it was difficult to simulate the impacts to road capacities by bus routes or the reductions of bus speeds by road congestions. This program is developed to ingrate them.

Bugs

There might be still some bugs because all cases and programs have not been tested. In case that the window for the execution suddenly disappears there is a possibility by bugs. I am pleased you send E-mail about the bugs to me (ojisan@ojisan.com) although I am not sure whether I can debug or not.

Please improve more and inform to me.

History

- (Ver.3.04) 2006.04.15 Bus way can be defined on ordinary road.
- (Ver.3.03) 2006.03.13 Revised "TrafficAssignment.exe" (changed round error)
- (Ver.3.02) 2006.03.07 One module "ODFiles.exe" is added.
- (Ver.3.02) 2006.03.03 Revised "RoutePassenges.exe" and fixed related bugs in main.
- (Ver.3.02) 2006.02.19 Revised "RampOD.exe" and "ModeBetweenOD.exe" with some additional menus.
- (Ver.3.01) 2006.02.14 Bugs in transit assignment to analyze screen & ramp calculation are fixed in "TrafficAssignment.exe".
- (Ver.3.00) 2006.02.09 PT OD for vehicle can be assigned by the definition of average number of passengers in "RoadPCU.txt". Some bugs are fixed about File Name definition.
- (Ver.2.41) 2006.02.08 One new menu is added on "RampOD.exe".
- (Ver.2.40) 2006.02.06 Revised Manual. In transit assignment the number of OD trips means PT, however in vehicle assignment the trips should be converted to VT before input.
- (Ver.2.30) 2003.11.17 Revised Manual
- (Ver.2.20) 2003.07.11 "MakeRampFile.exe" is added for Ramp OD analysis. A bug of "RampOD.exe" is fixed. "ModeShare.exe" and "ModeShare2.exe" are added for modal share analysis.
- (Ver.2.19) 2003.07.08 "StageGroup.exe" is revised. Please refer to Manual Ver.2.19.
- (Ver.2.18) 2003.07.06 "ODcalibration.exe" is revised and the format of input is different. A bug of "TrafficAssignment.exe" is fixed because the menu did not correspond to the functions of program.
- (Ver.2.17) 2003.07.04 "RoutePassengers.exe" is revised. (New output fields are added)
- (Ver.2.16) 2003.07.03 Grouping of the Average Impedance becomes "4". (And output of log file for checking the definition)
- (Ver.2.15) 2003.07.02 Processing speed of "TrafficAssignmnet.exe" is a little bit up. The other programs are also a little bit up.
- (Ver.1.03) 2003.03.29 Vehicle assignment processes were added.
- (Ver.1.01) 2003.02.06 Some revised modifications
- (Ver.1.00) 2003.02.04 The first "Transit Assignment Program"

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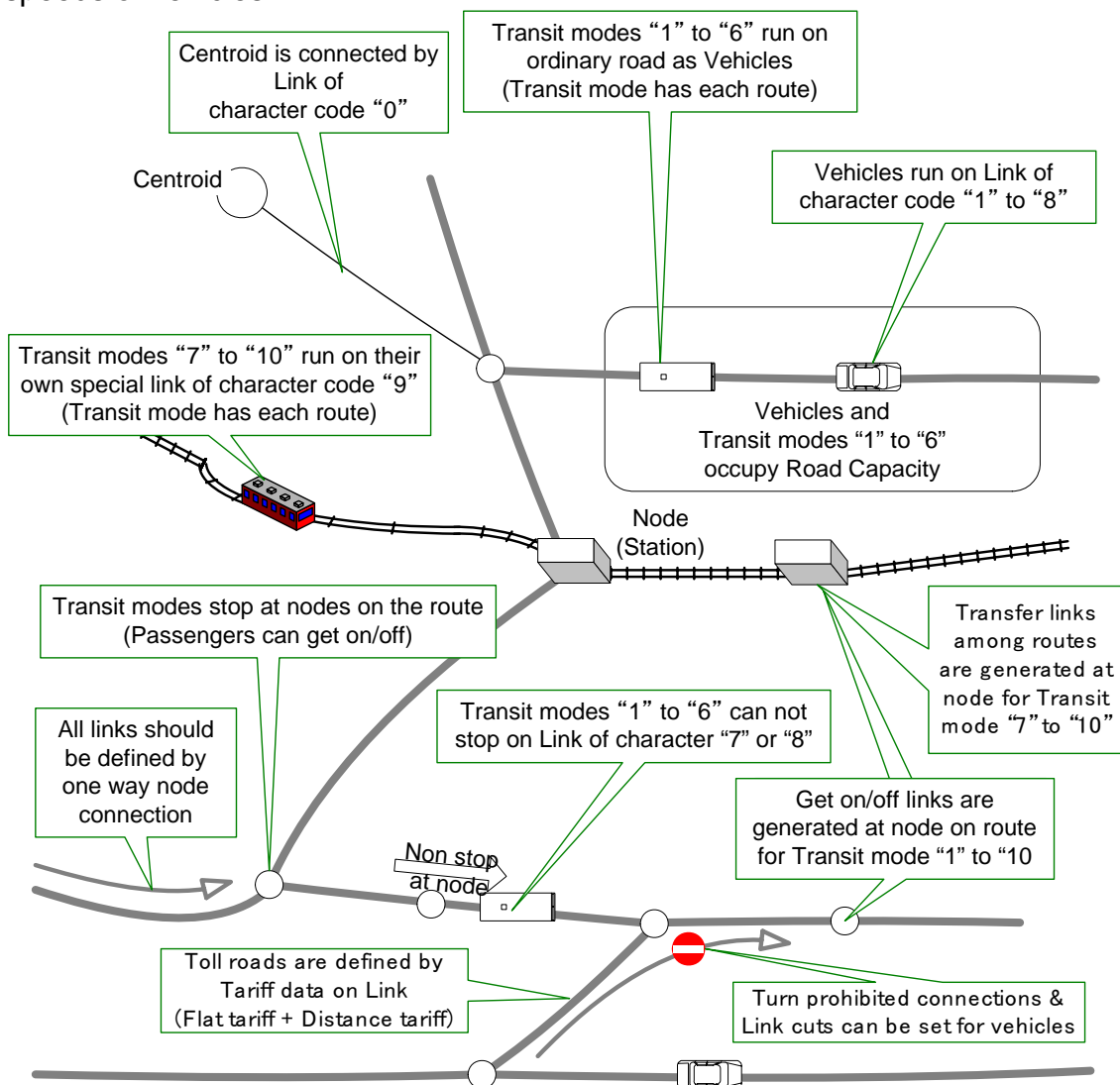
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1. Traffic Assignment Program

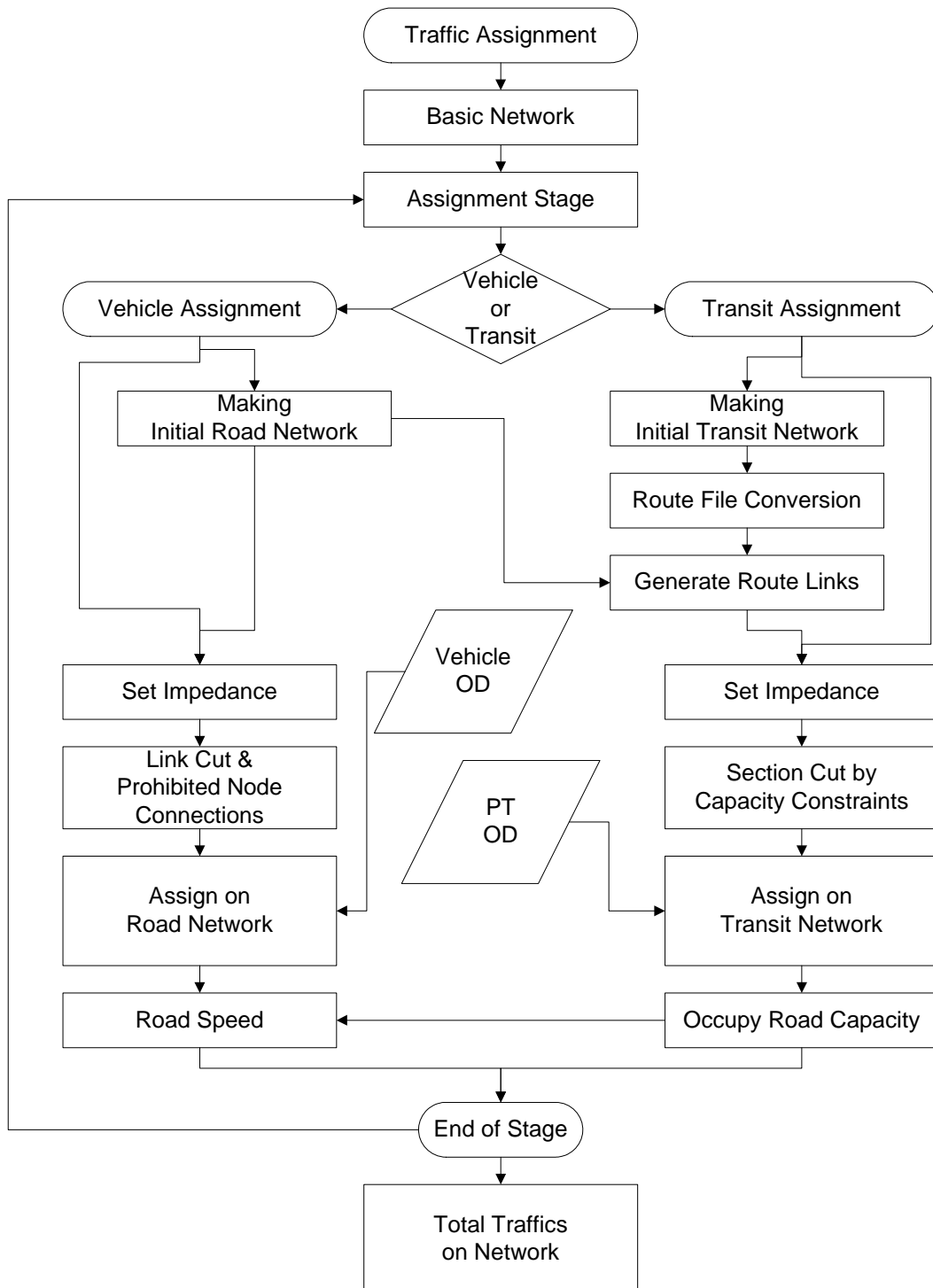
1.1. Abstract

This is the traffic assignment program in order to assign vehicle trips and person trips on the same network at the same time. Vehicle trips are assigned on road network and person trips by transit modes are assigned on their routes. Basic concept is to generate dummy links along bus routes on roads and to connect bus routes with road nodes by dummy bus stop links. Bus routes occupy a part of capacity of roads and the speeds of routes are affected by the speeds of vehicles.



1.2. Basic Processing Flow

The basic processing flow is as followings. The method is an incremental assignment. The detail of programming flow is shown in the Appendix.



1.3.Limitation

*) This program is tested to run on Windows XP.

Zone number is limited to 400.

This program regards “**Node Code =< 400**” as **Centroid** in order to decide number of zones.

The number of zones depends on the number of centroids for assignment process. So you need to set the centroid links on road network. The node code of centroid should be the same as zone number. (Zone”102” has the centroid code “102”.) All centroid must connect road network with two links (go/back) at least because link data must be one way in this program.

NOTICE: The program checks the maximum code of centroids and automatically decides the number of zones. In case that OD table is larger than maximum centroid code (or zone number), the data of bigger zones than centroid code is ignored. In case that OD table is smaller than maximum centroid code, bigger centroids than zones in OD table are ignored.

Network & Assignment

The basic network for the assignment includes all necessary node connections as road network, bus way, light railway, heavy railway and so on. Vehicle trips are assigned on road network and person trips are assigned on transit route network. So you should prepare vehicle OD matrices for vehicles and person trip OD matrices for transit modes.

Access Speed of Person Trip to Transit Mode

The input of the access speed on foot on road network to/from bus stops/ railway stations is requested.

NOTICE: It is recommended that the access speed is set 1 km/h on foot on Road Network to/from Bus Stop in the case that headways is long and the fare of bus is expensive relatively to time value.

Code of Node

The code of node should be within 5 digits except minus “-“..

The minus code on network in “Network.csv” is not permitted, but the minus code on bus route in “BusInput.txt” or “BusEdit.csv” is acceptable because the minus code means a bus stop without stopping (as -12345).

Number of OD zones	=<	400
Number of links (road & bus routes)	=<	300,000
Number of road links	=<	30,000
Number of nodes (including bus stops)	=<	98,000
Number of bus routes	=<	4,000
Number of bus nodes on one route	=<	300
Number of screen lines	=<	300
Number of screen node pairs on screen lines	=<	3,000
Number of ramp links	=<	1,000
Number of link cut & turn prohibited	=<	5,000 (only for vehicle)

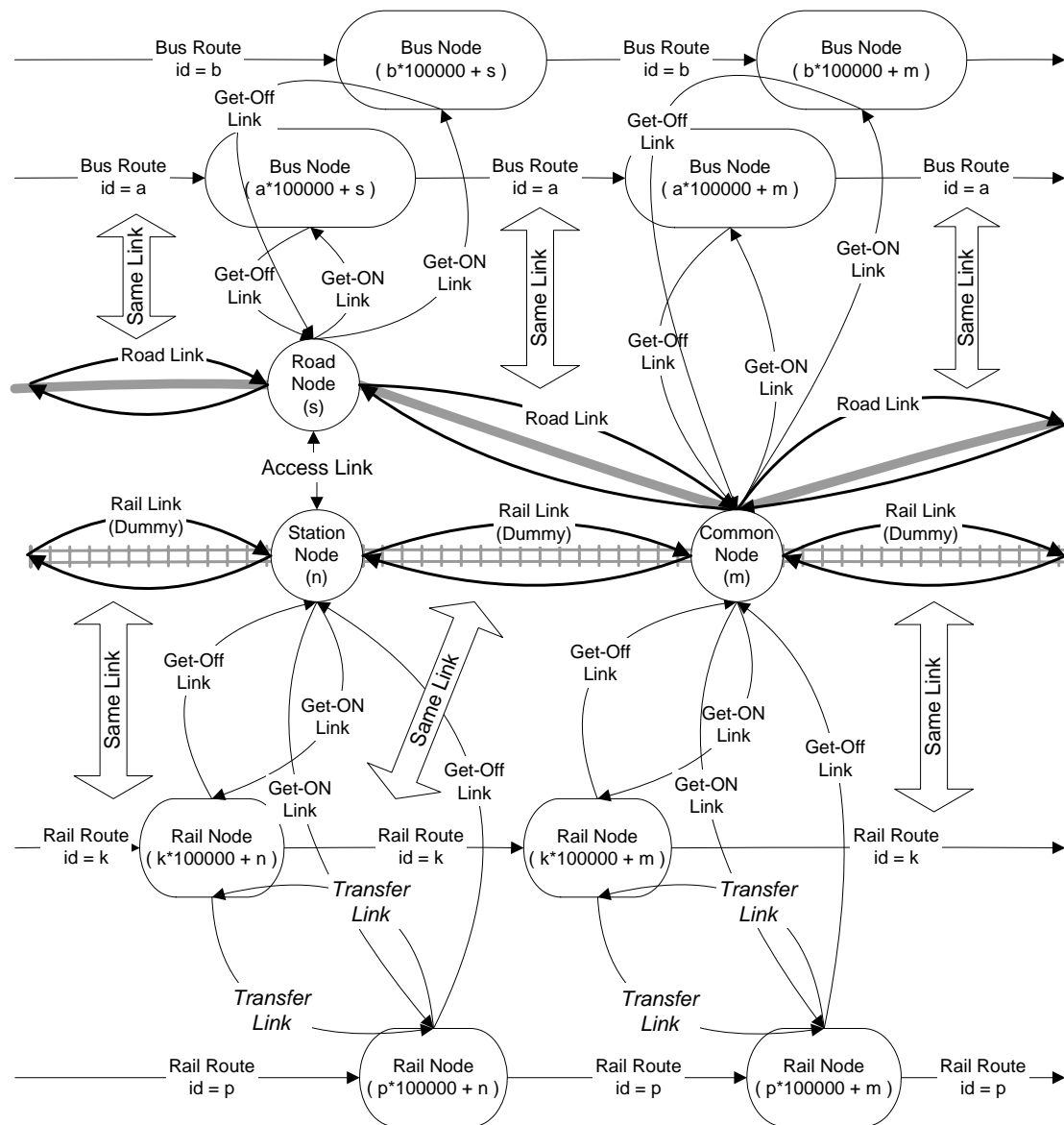
These limitations are written in “definition.inc” in source files. If you want to expand these limits, you can change the number and compile programs again.

Number of vehicle types	=<	10
Number of transit mode type	=<	10
Number of VT OD files	=<	100
Number of PT OD files	=<	100
Number of QV conditions	=<	99
Number of road tariff type	=<	99

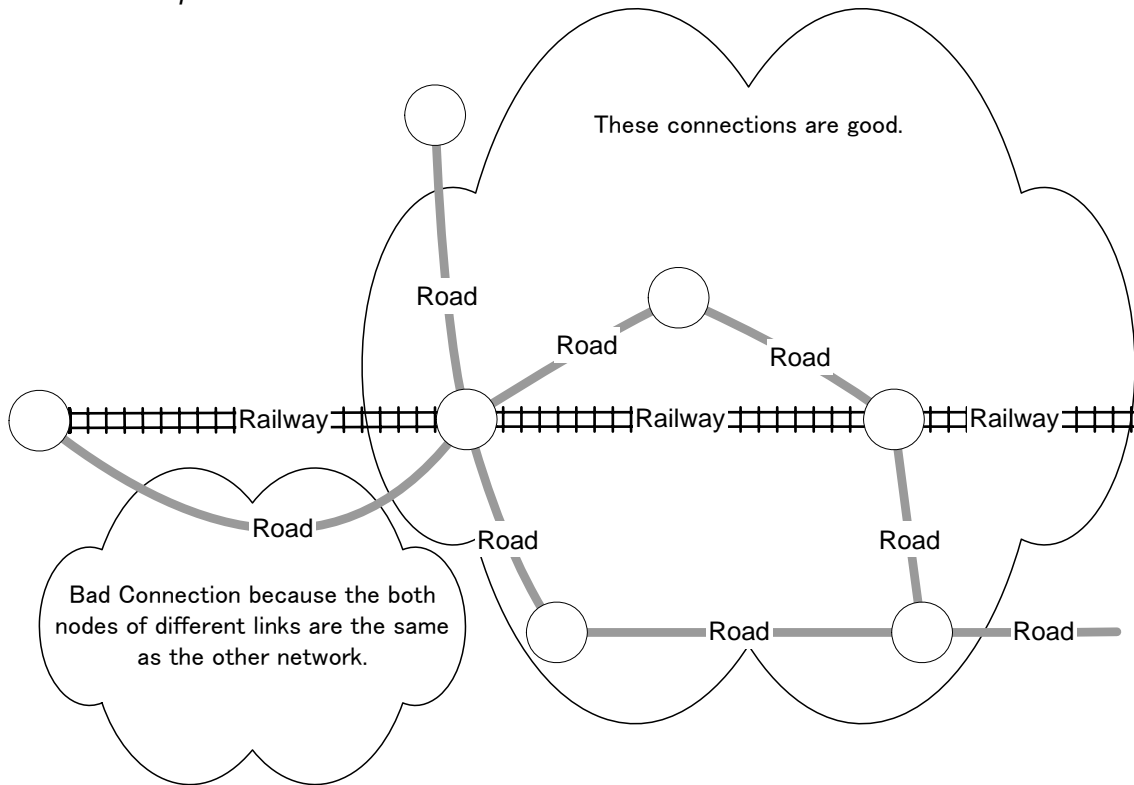
These limitations are defined directly in the programs. So it is not easy to expand these limits without detailed knowledge of programming.

NOTICE: Auto Generation & Necessary Definition of Dummy Links

Ordinary buses run on road network, so this program can generate dummy route links along roads and get-on/off links at nodes. Railways run on different networks. Base links like a kind of roads must be defined along railway line in order to generate their dummy links, get-on/off links at stations and transfer links.



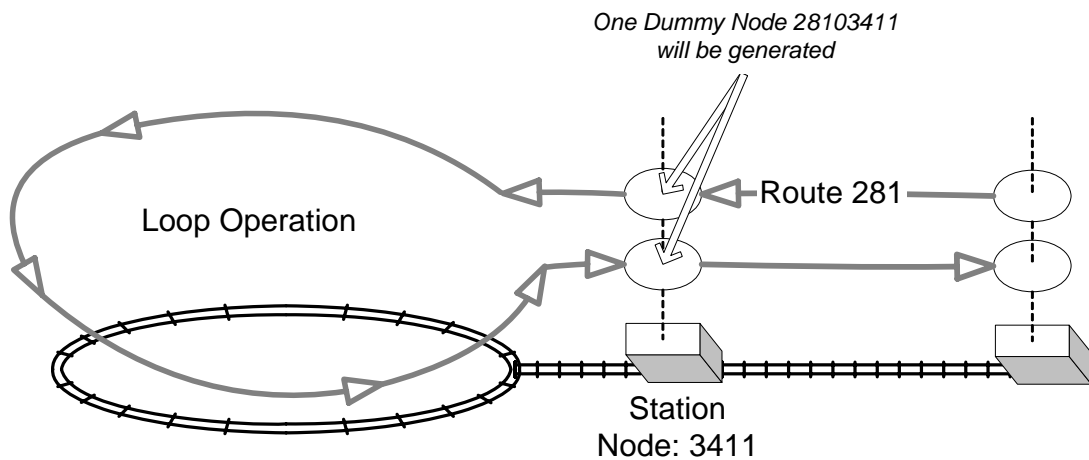
NOTICE: You can use the same node both for road and for railway. But the same link is not accepted.



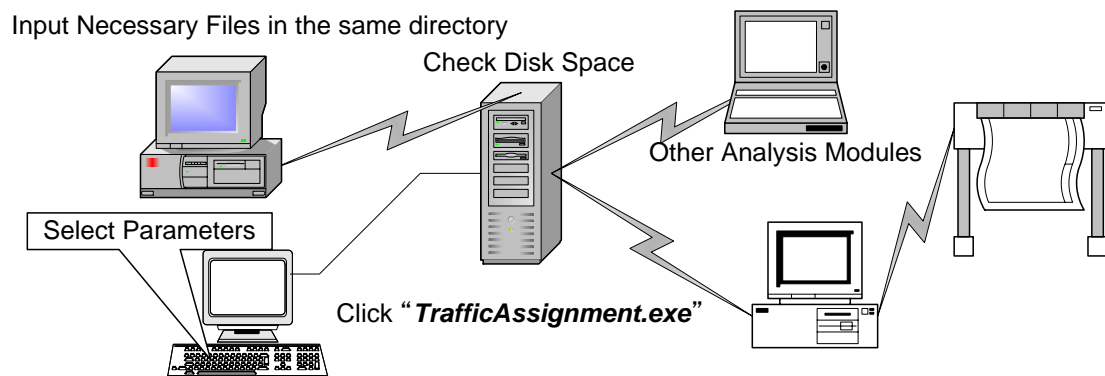
NOTICE: Loop Operation

The simulation of loop operation by transit mode is possible.

When you make node sequence data, you don't need to worry whether the operation is loop or not. However the software Viper rejects those kinds of input, so you should edit the file "BusInput.txt" by manual after output from the Viper.



1.4.How to Run



- 1) Check enough space of hard disk. (about more than 5GB recommended)
- 2) Prepare necessary Input Files and "**Traffic Assignment.exe**" in the same directory.
- 3) **Click "Traffic Assignment.exe"**
- 4) Check the list of existing files shown on your display.
NOTICE: "OK" is displayed if all files are set. If "CAN NOT WORK" is displayed under vehicle assignment or transit assignment, please confirm your settings.
- 5) Select way of **Transit Assignment** (if transit assignments exist) from the followings
 1. Normal Assignment
 2. Pre-Loading on Transit Routes by Operation Plan
 3. Operations increase by Demand of Passengers
 4. (Special Case) Pre-Loading but No Transit Assignment

1. **Normal Assignment**

By loading PCU converted from passengers on road section at each assignment stage, capacity of the road section decreases.

2. **Pre-Loading on Transit Routes by Operation Plan**

Transit modes are pre-loaded on road network according to their operation schedules by route. Number of passengers does not affect capacity of road any more.

3. Operations increase by Demand of Passengers

At first transit modes are pre-loaded on road network as same as the case 2. According to the demand of passengers who are assigned on route, the headway of operations decreases to the limit set by parameters and more buses are operated on the route. But transit modes do not affect capacity of road beyond the minimum headway.

This increase calculation is carried out **before the next vehicle assignment** because QV conditions are necessary only for vehicle. So if there are only transit assignments in all stage, this selection has no effects.

4. (Special Case) Pre-Loading on Transit Routes by Operation Plan but No Transit Assignment.

Transit modes are pre-loaded on road network like “Case 2”, but all stages of transit assignments will be skipped. Although transit assignments are not carried out, you must prepare all related files for transit assignment. The result of vehicle assignment is the same as “Case 2”.

6) Program requests the following parameters.

6-1) Access Speed (km/hour) on Foot for Transit Assignment

NOTICE: If walking speed is high and headway of bus is long, people do not wait bus and walk on foot. If you want to prevent those walking trips, please cut those road links at transit assignment.

6-2) Minimum path search for (Only zones of total generated trips >0) or (All zones)

NOTICE: This selection decides origin zones for minimum route search. If you need all impedance to calculate modal split model, please select “All zones”. For the traffic assignment, the processing time of “Generated trips>0” is faster.

6-3) Impedance of (Only OD pairs of some Trips) or (All OD pairs) about origin zones selected at the above

NOTICE: This selection does not affect the processing time.

6-4) (Output) or (Not) of Minimum Route file

NOTICE: By the reason that minimum path files (Vehicle PathVTxx.csv/Transit PathPTxx.csv) includes much information as not only minimum routes but also transfer bus stops, number of passengers at the transfer points, direction analysis,

walking sections and so on, it is recommended to output them if there is much space in your disk. But the size of these files is very huge.

6-5) Output of **minimum path** of (only OD pairs of Trips>0) or (All pairs) if (Output) is selected at the above.

7) For transit mode assignment, this program converts the Viper format data "BusInput.txt"(original file) to another format data "BusEdit.csv"(converted file) that is used in this program if "BusEdit.csv" does not exist in the directory. But if "BusEdit.csv" exists, this program uses this converted data file instead of the original format data even if "BusInput.txt" exists.

NOTICE: If you want to **convert again** the original Viper format data after editing, please **delete or rename** the converted data file "BusEdit.csv".

8) After the end of process, you need to calculate your necessary results from output files by database software or some additional modules.

NOTICE: If you want to change only the OD table and don't change other conditions as network, time value, link cut position and so on, you can replace the values of OD in the database of "Vehicle PathVTnn.csv" and "Vehicle Impedance00.csv" for vehicle assignment, or "Transit PathPTnn.csv" and "Transit Impedance00.csv" for transit assignment. It means the same route assignment by another OD table. However QV conditions or capacity constraint are not reflected on the network. "Traffic Assign00aa.csv" which includes all traffics on links can not also be replaced.

9) If there are some errors or strange results, please check "**Log.txt**".

1.5.Input Files & Output Files

The file names of input and output for this assignment program are as followings. All file names except OD tables are fixed.

The suffix “txt” of input files represents fixed formatted text file. The suffix “csv” represents comma separated format. All input files except “BusFare.csv” must not include the record name fields on the top.

The last part “XX” of output files depends on the assignment stage.

	COMMON	Vehicle Assignment	Transit Assignment
INPUT (necessary)			
	Assign.txt Network.csv OD tables.CSV	RoadVTOD.txt RoadPCU.txt QV.csv	PTOD.txt ModePCU.txt BusInput.txt (or BusEdit.csv)
INPUT (arbitrarily)			
	Screen.csv Ramp.csv	RoadTariff.csv CUTXX.csv	BusFare.csv
OUTPUT			
	Log.txt Traffic TotalLinkVol.csv TrafficTotalResult.csv	Vehicle PathVTXX.csv Vehicle ImpedanceXX.csv Traffic AssignXXVT.csv Vehicle ScreenVTXX.csv Vehicle RampVTXX.csv Vehicle ErrorXX.csv	Transit PathPTXX.csv Transit ImpedanceXX.csv Traffic AssignXXPT.csv Transit CapacityOverXX.csv Transit Operations.csv Transit ScreenPTXX.csv Transit RampPTXX.csv Transit ErrorXX.csv

2.Input Files

2.1.Assignment Definitions

2.1.1.Assign.txt

(fixed name, fixed format)

This file defines the way of traffic assignment. This program can assign vehicle trips on road network and person trips on transit network in the same assignment. By the parameters of this file you can also use this program only for vehicle assignment or only for transit assignment.

(1) Assign Stage (Integer) column 1-2	(2) Vehicle=1 Transit=2 (Integer) column 3-3	(3) Condition Flag (0 or 1) Default=0 Column 4-4	(4) Time Value Per hour (Real) column 5-10	(5) Transit Mode Selection						
				11	12	13	14	15	16	17
1	1	0	19747	(blank for vehicles)						
2	2	0	2860	1	1	1	1	1	1	1
3	1	0	6322	(blank for vehicles)						
4	2	1	6322	1	0	1	1	0	0	0
NSTAGE	NSTGFG	NCAPFG	TVALUE	MDSSEL(10)						

(continued)

18 19 20			(6) How many OD tables for this stage (Integer=<10) column 21-25	(7) Assigned OD Tables & Assigned Ratio						
				OD file (1)		OD file (2)		OD file (3)		
				ID	%	ID	%	ID	%	
			2	1	30	4	35			
			1	2	50					
			3	1	70	4	65	5	100	
			2	1	100	2	50			
NUMOD				IDOD(10),RTOD(10)						

NOTICE: Time value and ratio can be set with or without decimal points. Other data should be integer.

(1) Assignment Stage

This is the stage number of traffic assignment in sequence. This number controls the names of input files and output files.

NOTICE: Although it is strongly recommended to use the sequence number, you can also use individual sequence number for vehicle assignment and transit assignment. In that case the names of input and output files are used this number.

(2) Vehicle=1 or Transit=2

This field decides the type of traffic assignment which is vehicle assignment or transit assignment.

NOTICE: In this program the speed of transit mode on roads is affected by vehicle speed. If you want to use the speed of input for transit mode, it is better to assign transit modes before vehicle assignment or to set the "velocity reduction factor = 0.0" in the file "ModePCU.txt".

(3) Condition Flag

This field should be filled in with "0" for default mode.

(3-1) Speed Keeping Flag for Vehicle Assignment

Usually the speed of link is calculated after vehicle assignment by QV conditions for the next stage. In the case of this flag is on "1", the calculation is restrained **after** the vehicle assignment of this stage. If you want to **keep the speed** of link **for the next stage**, you can set on this flag.

NOTICE: You had better set "0" for the vehicle assignment just before transit assignment.

NOTICE: For example if vehicle trips are assigned by income group or purpose group, you can keep the speed of link during all groups are assigned. Please use this flag carefully because this flag affects the speed of the next stage.

(3-2) Capacity Constraint Flag for Transit Assignment

In the case this flag is on "1", the capacities of routes are checked and the overflow routes are cut **before** the transit assignment of this stage.

NOTICE: For example if person trips are assigned by income group under

different time value, this flag should be set after some ratios of all income groups are assigned under fair conditions.

NOTICE: *You can set capacity constraint by mode.* This flag can activate the constraints which are defined in the file "ModePCU.txt".

(4) Time Value per hour

You can change time value (per hour) by assignment stage, for example, in the case that OD tables by income group are assigned or vehicles of different tariff are assigned.

IMPORTANT NOTICE: *For vehicle assignment* this value should be ***the unit for one car (not PCU, not Person)***. For transit assignment this value should be the unit for one person.

(5) Transit Mode Selection

.There is 10 columns for the flags which are on/off. Person trips are assigned on the modes which have on-flags.

(6) How many OD tables for this stage

This is the number of OD tables assigned on this stage. The kind of OD table and the ratio of assigned traffics are defined at right part.

Max number of OD tables assigned in one stage is 10.

(7) Assigned OD Tables & Assigned Ratio

In case of vehicle assignment, IDs of OD tables should be selected from the definition file "RoadVTOD.txt". Each vehicle at the same stage is assigned on the same path, but those numbers are separated by vehicle type in the output.

In case of person trip assignment on transit modes, IDs of OD tables should be selected from the definition file "PTOD.txt". But each OD tables at the same stage are not separately assigned. Total person trips of those OD tables are assigned.

Ref) Time Value per hour in Jabodetabek, Indonesia

Time Value of Passenger in 2002

	Unit	Average	Income group		
			Low	Middle	High
Year 2002					
Houshold income	Rp. per month	1,581,000	709,000	1,875,000	6,129,000
Houshold size	person	3.9	3.7	4.0	4.1
Per capita income	Rp. per month	407,000	190,000	467,000	1,491,000
Hourly income	Rp. per hour	2,470	1,150	2,830	9,040
Time value	Rp. per hour	2,710	1,270 (48%)	3,110 (45%)	9930 (7%)
Future Time Value					
2007	Rp. per hour	3,290	1,290 (35%)	3,390 (55%)	9,960 (10%)
2010	Rp. per hour	3,880	1,300 (27%)	3,720 (61%)	10,700 (12%)
2020	Rp. per hour	6,510	1,510 (7%)	4,410 (56%)	10,590 (37%)

Note: 1) income group Low less than Rp. 999,999
 Middle Rp. 1,000,000 – Rp. 3,999,999
 High Rp. 4,000,000 – above

2) Annual working hour is estimated at 1,980 hours (38 hours x 52.1 weeks)

3) Indirect cost at 10% is include in time value estimates.

Source: SITRAMP Home Visit Survey

Time Value of Person in the Future

Rp./Hour	Average	Income Group		
		Low	Middle	High
2002	2,710	1,270	3,110	9,930
2005	3,058	1,282	3,278	9,948
2007	3,290	1,290	3,390	9,960
2010	3,880	1,300	3,720	10,700
2020	6,510	1,510	4,410	10,590

Passenger Occupancy Rate by Vehicle

Passenger Car	Motor-cycle	Bus			Truck	
		Large	Medium	Small	Pickup	Large
1.82	1.342	28.6	12.3	4.9	1.36	1.73

Source: Screen Line Count of SITRAMP

Time Value Assumption for VT & PT

		2005	2010	2020
Person	High	9948	10700	10590
	Middle	3278	3720	4410
	Low	1282	1300	1510
Car	High	18106	19474	19274
	Middle	5963	6767	8022
	Low	2331	2364	2745
Motorcycle	High	13350	14359	14212
	Middle	4397	4990	5915
	Low	1721	1745	2027
Truck		5703	6472	7673

2.2.OD File Definitions

2.2.1.RoadVTOD.txt

(fixed name, fixed format)

Vehicle Trip OD (or Person Trip OD by the vehicle) File Names are defined in this file. This sequence No is used in "Assign.txt". Max sequence number is 100, so you can process 100 OD files for vehicle assignment. Type of vehicle represents an assignment group which has the same PCU.

According to the next "RoadPCU.txt" the program understands the number of trips in OD means vehicle number or number of persons by vehicle. Although you can input Vehicle Trip OD files by vehicle trips (not PCU) or person trips, it does not depend on this file, but depends on the next file "RoadPCU.txt".

(1) Vehicle OD Table ID (Sequence) column 1-5	(2) Type of Vehicle (max=10) column 6-10	(3) Vehicle Trip OD File Name (Max number of tables = 100) *) you can input PT for vehicle. column 11-50 (within 40 characters)
1	1	Motorcycle by Low Income.CSV
2	2	Passenger Car by Middle Income.CSV
3	3	Trucks.CSV
4	2	Passenger Car by Low Income.CSV
	IDFVT(100)	FNAMVT(100)

2.2.2.RoadPCU.txt

(fixed name, fixed format)

PCU of each type of vehicle should be defined in this file.

In case that the column (3) is blank or zero, this program understands the inputted Vehicle OD means number of cars (VT OD table). If here is the number of average passengers, the inputted OD is divided by this number before traffic assignment because the OD table means person trips.

(1) Type of Vehicle (max=10)	(2) PCU	(3) Number of Average Passengers *) option
column 1-5	column 6-10	column 11-15
1	0.25	1.021
2	1.0	1.27
3	2.0	1.423
	VTPCU(10)	VTPAS(10)

*) **Before Ver.3.00** column (3) did not defined in this file, so it was necessary to convert OD from person trips to **vehicle trips**. By this improvement both person trips and vehicle trips are available for traffic assignment.

*) In case of no column (3) OD should be defined by Vehicle Trips. (compatible with ver.2.0)

*) In case of column (3) definition OD should be defined by Person Trips. (after ver.3.0)

2.2.3.PTOD.txt

(fixed name, fixed format)

The file names of **person trip OD** tables are defined in this file. The person trip OD table ID is used in the control file "Assign.txt".

OD tables defined in the same assignment stage of "Assign.txt" are added to one OD table which is assigned on transit network. If you want to separate person trips by Time Value, it is necessary to assign at different stages.

(1) Person Trip OD Table ID column 1-5	(2) Person Trip OD File Name column 6-45 (within 40 characters)
1	Low Income Group OD.CSV
2	Go To Work by Middle Income Group.CSV
	FNAMPT(100)

2.2.4.ModePCU.txt

(fixed name, fixed format)

This is the definition file of bus type (mode type) for transit mode.

(1) Mode ID (max=10) *) <i>Integer</i> column 1-3	(2) PCU column 4-8	(3) Average Passengers column 9-14	(4) Max. Passengers column 15-20
1	1.8	8.5	15.0
2	2.0	17	20
8	1.0	1200	2400

(5) Operating Hours column 21-24	(6) Capacity Constraint Flag column 25-25	(7) Velocity Reduction Factor column 26-30	(8) Min. Headway (min) column 31-35
14	0	0.8	3.0
15.5	1	1.0	4.0
16	1	1.0	5.0
PTPCU(10,7) *) <i>Decimal point is not always necessary.</i>			

(1) Mode ID

Mode ID represents networks constructed by routes of the mode. The maximum ID code of transit modes is 10.

The ID code =< 6 are used for ordinary buses which run on road network.

The ID code of 7, 8, 9 or 10 should be used for railways or bus ways which has their networks connected with road network only at stations. These modes are assigned on their links. The transfer dummy links among some routes at stations without initial fare are generated by the program. The links of basic network for ID 7,8,9 and 10 have the link character code "9" (* refer to the below note) in "Network.csv" because vehicles can not run on the links of the character "9".

NOTICE: You can define bus way which is operated without inflow of other traffic modes on ordinary road. In the case you don't need to set the character code "9" for ordinary road. This program assigns the special mode by constant speed.

NOTICE: This Mode ID code corresponds to the position of the column from (11) to (20) in "Assign.txt". For example if "Mode ID=7" exists, you should put the flag in column (17).

(2) PCU

In the case of "the way of Transit Assignment = 1 (normal type)" and "Mode ID = <6 (ordinary bus on roads)"

$(PCU) * \frac{PersonTrips}{AveragePassengers}$ are loaded on road sections of networks at

the next vehicle assignment stage.

In the case of "the way of Transit Assignment = 2 or 3 (pre-load type by operation)"

$(PCU) * \frac{60 \text{ min.}}{Headway} * (OperatingHours)$ are pre-loaded on transit routes of

networks at the first transit assignment (type=1) or at the next vehicle assignment stage (type=2).

PCU of "Mode ID >= 7" has no meanings because these modes do not affect road capacities, but please input some figures to avoid errors of data sequence.

(3) Average Passengers

This is the average passengers of each mode.

By the same reason as above, average passengers of “Mode ID>=7” are not used for assignment.

(4) Max. Passengers

This is the capacity in order to calculate the constraint of bus links or railway links. This number is effective to all modes.

In the case of “the way of Transit Assignment = 3 (type of increase operations to minimum headway according to the demand of passengers)”, additional loading PCU is calculated by the followings.

$$(Demand) = (Passengers\ of\ a\ maximum\ volume\ section\ on\ the\ route)$$
$$(NecessaryHeadway) = \frac{(Max.Passengers)}{(Demand)} * 60\ min. * (OperatingHours)$$

The Limit of $(NecessaryHeadway) \geq (8)Minimum\ Headway$
 $(Additional_Loadings_on_Road) =$

$$(PCU) * \left(\frac{60\ min}{NecessaryHeadway} - \frac{60\ min}{PresentHeadway} \right) * (OperatingHours)$$

(5) Operating Hours

This is the operating hours of each mode during simulation hours. The route links of which the assigned person trips are over than route capacity will be cut at the next assignment stage. This value is a factor to calculate the route capacity.

Route Capacity =

(Frequency)(Max. Passengers)*(Operating Hours)*

where Frequency = 60(minutes)/Headway(minutes)

If you want to set the constraint of route capacity for 3 hours in order to assign 3 hour traffics, you can input 3 in this field. For all day simulation, you should consider adequate value for each mode.

(6) Capacity Constraint Flag

If you want to set the capacity constraint, input “1” in this field. If you don’t want to set it, input “0” in this field.

In the case that this flag is on, the route of capacity overflow will be cut at the next assignment stage. In the case of “0” the capacity is ignored.

(7) Velocity Reduction factor

Transit modes have their initial speeds in the input route file. If you want to give their new speeds after the assignment of vehicles, set these values to reduce the speeds of vehicles on roads. The velocity reduction factor “1.0” means that the speed of the transit mode is the same as the speed of vehicles on road. However the speed does not come up more than the initial speed, for example, in case of not crowded roads.

The velocity reduction factor “0.0” represents the special case that the speed is the same as the initial input data.

(8) Min. Headway (min.)

In the case of “the way of Transit Assignment = 3” this parameter is used for the limitation of increase operations. In the other case this parameter is not used, but should be filled in this field.

In the case that **minimum headway = 0.0**, operations does not increase even if “Transit Assignment = 3”.

2.2.5.OD(arbitrarily name).csv

(comma separated format)

This is the OD data file of **vehicle trips** or **person trips**. The contents should be as follows by comma separated format. The file names are defined in “RoadVTOD.txt” (**OD must be counted by car or person**) or “PTOD.txt” (**OD must be counted by person**).

There is no problem that the other fields are added after the necessary three fields as origin, destination and trips (**integer**), but the file must not include the other records as field name record, blank lines or others.

*)

Origin Zone	Destination Zone	Number of Trips
		*) Integer

*) Don’t input the record of field names

2.3. Network Definitions

2.3.1. Network.csv

(fixed file name, comma separated format, necessary)

This is the data file of all basic network formatted by comma separated type as the following items in the sequence.

This program interprets two nodes sequence as one way data. So if you need two way link, please prepare two records that are the different sequence of nodes.

This file must not include any other kind of records as the field names, blank lines and others, but there is no problem that each record has the other fields after the necessary seven fields.

*)	(1) A Node	(2) B Node	(3) Link character	(4) Evaluation group	(5) QV type	(6) Tariff type	(7) Distance (m)
			*) 0,7,8,9				*) Integer

(1) A Node / (2) B Node

The length of node code should be **within 5 digits**. Each link has the direction from A Node to B Node. All links should be defined by one way connection.

(3) Link character (**Important for Processing**)

This field defines the character of links for traffic assignment by combinations of vehicle trips and person trips. The definitions of codes should be as followings. User can not change the definitions.

0 ; Centroid connections

1-6; Normal roads

7 ; Road which has no bus stops like toll road. On this road it is assumed that there are not any transfer of bus routes and there are also no get-on/get-off passengers at every node.

8 ; Road which has no bus stops as same as "7".

9 ; Light railway, Heavy railway, or bus way which has the same tariff system as railway

(4) Evaluation Group

User can use this field in order to identify the type of links or the group to evaluate. You can easily select necessary links by this evaluation group code from output result.

(5) QV type

Max number of types of QV conditions is 99. All codes used in this file should be defined in the file "QV.csv".

(6) Tariff type

Max number of type of tariff conditions is 99. All codes used in this file should be defined in the file "RoadTariff.csv".

(7) Distance (m)

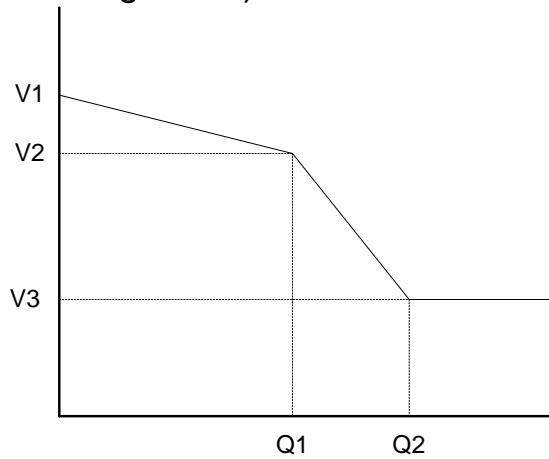
NOTICE: Unit is m, not Km.

Problem for walking links (2006.02.13)

NOTICE: In case that you add links only for walking or access from roads to railway stations, you should cut those links at the stage of "vehicle assignment" because vehicles can pass those walking links. Soon this problem will be fixed by link character=6, so please don't use the code "6" for link character definition. But it is not fixed, please cut them at Vehicle assignment stage.

2.3.2.QV.csv

(fixed file name, comma separated format, necessary only for vehicle assignment)



One way capacity because of one way of link in "Network.csv"

*)

(1) QV Type	(2) V1 (km/h)	(3) V2 (km/h)	(4) V3 (km/h)	(5) Q1 (PCU)	(6) Q2 (PCU)
1	80	40	30	36000	71000
2	100	50	35	18000	36000
3	40	30	15	9000	18000

2.3.3.RoadTariff.csv

(fixed file name, comma separated format)

The tariff of toll road represents the tariff for 1 PCU. Incase of that it is necessary to change tariff by vehicle type or income group, you should adjust the resistance by Time Value at the assignment stage.

NOTICE: In the mathematical algorism tariff condition does not belong to vehicle type, but belongs to the network because the minimum route search is carried out under the fixed impedances of links.

In the real world the tariffs of toll roads are different by vehicle type or vehicle size. If the tariff is different by vehicle type, the structure of the network is also different in the mathematical world. That means there is another minimum path under different tariffs. So you should change the impedance in the case of different tariff to find the minimum path.

In that sense you should adjust the Time Value for different tariff at the stage which the vehicle type of different tariff is assigned. Although some existing software set the

different tariffs to different vehicle types and assign them at the same stage, it is a logical mistake.

Blank field is not accepted by this program. You should fill "0".

*)

(1) Tariff Type	(2) Flat Tariff	(3) Distance Tariff(/km)
1	2000	0
2	0	130
3	1000	100

2.3.4.CUTnn.csv

(fixed file name, comma separated format, arbitrarily)

"nn" represents assignment stage as CUT01.csv, CUT03.csv and so on

Link cuts and Prohibited Node Connections at the assignment stage "nn" on road network can be defined by this file which is formatted by comma separated (not included the field name record).

These files are used only for road network. At transit assignment, this data is used only for access links because the routes of transit modes are not controlled by turn prohibited.

NOTICE: If you want to change the routes of transit modes by stage, it is basically impossible by this program. By separating those modes and selecting the mode by each stage in the file "ASSIGN.txt", it becomes possible in those virtual modes.

If this file exists at the assignment stage "nn", the following links are cut and the following node connections are prohibited. If there is not the CUTnn.csv at the stage "nn", all node connections are assigned.

Max number of prohibited node connections is 4. If you want to prohibit right turn at the crossing, you should define 3 node sequences.

You want to cut some links at the special assignment stage "nn", you can define the list of 2 node sequences in the file CUTnn.csv. For example if motorcycle can not enter toll roads, you should cut the ramp links of toll roads at the assignment stage for motorcycle.

Not include this

Number				
--------	--	--	--	--

field name record	of nodes	Node 1	Node 2	Node 3	Node 4
Turn Prohibited	3	1003	1004	2003	
U turn prohibited	4	1003	1004	3002	3001
Link Cut	2	41234	41235		
Link Cut	2	50021	61022		

2.3.5. BusInput.txt

(fixed file name, Viper format, necessary for transit assignment)

This is the data file of all bus routes that never has any other records as the field names, blank lines and others. The format of this file should be the same as output of Viper.

The type of modes (MODE=) should be one digit. (max.digits are 2). This program interprets **FREQ[1] as the time interval (minutes) of the route.**

The bus speed (SPEED=) should be inputted by Km/hour (Integer).

All node connections of transit modes have to correspond with basic network. If the node pair of transit route has not the same node pair in "Network.csv", it becomes error.

The maximum width of one record is 100.

(*) You can use another format for the input. Please refer to intermediate file "BusEdit.csv"

Important NOTICE: *The mode identification numbers 7,8,9,10 are used for Bus way, Light Railway and Heavy Railway. Passengers can transfer the routes of the same mode at the station without any tariff.*

Those modes run on the links of that the "link character code=9" defined in the input table NETWORK.csv.

NOTICE: *In Viper format, minus sign of node is not permitted, but in this program minus nodes are interpreted that the routes do not stop at the node.*

NOTICE: *In Viper format, loop operation of transit mode is not permitted, but in this program it is possible to process. So after editing and output in Viper, please add the necessary nodes for loop operation by editor in "BusInput.txt".*

NOTICE: *This program can read only the following parameters. If you add some other parameters, it is necessary to make a new conversion program instead of "BusConv.for" in source file set.*

Viper Output text file format of Bus Route "BusInput.txt"

LINE NAME="Dki1110001", MODE=1, ONEWAY=T, FREQ[1]=20, N=14461,
SPEED=13, N=11081, 14429, 14433, 14431, 14423, 11649, 11651,
12173, 12177, 12233, 14251, 14247, 11979, 11981, 11983, 14005,
11931, 11805, 11791, 11927, 11813, 11823, 11829, 11839, 11841,
10833, 13935, 10787, 10785, 13425, 10783, 10781, 10561, 10559,
10557, 10555, 10553, 13415, 13409, 13411, 10551, 10369, 10373,
10365, 13407, 10371, 10361, 10355, 10353, 10261, 10259, 10257,
10255, 10251, 13641, 10249, 13635, 13667, 10247

LINE NAME="Dki1110003", MODE=1, ONEWAY=T, FREQ[1]=6.67, N=14461,
SPEED=13, N=11081, 14429, 14433, 14431, 14423, 11649, 11651,
12173, 12177, 12233, 14251, 14247, 11979, 11981, 11983, 14005,
11931, 11805, 11799, 11925, 11701, 11711, 12285, 12281, 11717,
12277, 11727, 12275, 11733, 12269, 11739, 11747, 11749, 10057,
10055, 10281, 10279, 10277, 13213, 10275, 10273, 13387, 10271,
10269, 10267, 10265, 10263, 10261, 10259, 10257, 10255, 10251,
13641, 10249, 13635, 13667, 10247

NOTICE: The above node sequence has the direction. If the node set includes non-entry links by this sequence because of opposite one way direction, this program will output errors in "log.txt" and stop at transit assignment stage.

"ONEWAY=T" means one way direction which shows go-route and back-route are different or it might be a loop operation. "ONEWAY=F" means two way direction which shows the node sequence is a go-route and the opposite sequence is a back-route.

So in the definition of the next "BusFare.csv" file, "ONEWAY=T" corresponds with one records and "ONEWAY=F" corresponds with two records.

2.3.6. BusFare.csv

(fixed file name, comma separated format, arbitrarily)

This file defines the flat fare and the distance fare of each bus route. The first record of field name should be put on the top of this file.

NOTICE: Please refer to "BusCost.csv" at the note of "Intermediate files" for the template to input.

*a)

RouteID	Flat Fare (/Get-on)	Dist Fare (/km)	Mode	Bus Route Name
			*) Type of Bus	*) not used in program

*a) This head record is necessary.

RouteID NOTICE: Although this ID code is not defined in the other file as "BusInput.txt", this code corresponds with the "BusInput.txt" directory through the intermediate files. This ID code is constructed by the sequence of one way route in "BusInput.txt". Because "ONEWAY=T" has one corresponded record and "ONEWAY=F" has two corresponded records, please set the sequence number according to the "BusInput.txt".

2.4. Other Definitions

2.4.1. Screen.csv

(fixed file name, comma separated format, arbitrarily)

Screen lines can be set by this file. The code of screen lines should be less than 300. Total number of definition records (node pairs) should be less than 3000.

Traffics passing through screen lines are outputted with O-zone, D-zone and the screen line ID code. The duplication of the same link is not permitted.

A Node	B Node	Screen line ID code.
		=< 300

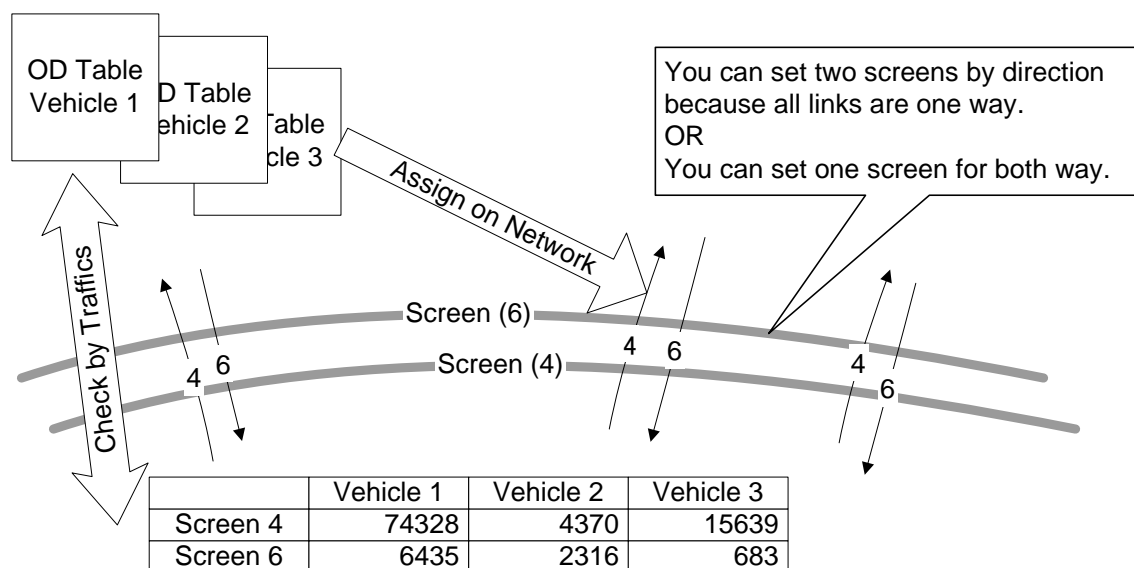
For the calibration of OD table, the following condition must be satisfied because surveyed trips passing through screen line can not be divided to different kind of OD tables.

In case of Vehicle trips

- 1) One vehicle type must correspond with only one OD table that can be calibrated.

In case of Transit modes

- 1) OD table of each mode that can be calibrated should be prepared.
- or
- 2) Only one PT OD table that can be calibrated should be prepared.



2.4.2.Ramp.csv

(fixed file name, comma separated format, arbitrarily)

Ramp links can be set by this file. The number of ramps is not fixed, but only one Ramp OD can be defined at the same time of Traffic Assignment. If you want to analyze another set of ramps, you can use another program “Ramp.exe” after the assignment. For the after analysis you should need to output the minimum path files at the assignment.

Traffics passing through these ramps are outputted with the inflow ramp position and the outflow ramp position. **All ramps must be closed** in one network. **The duplication of the same link is not permitted** (Don't use a connection link of two networks for ramp definitions of both network at the same processing).

A Node	B Node	Ramp Link Position	Matrix Position for Ramp OD Table
*a)		*b) Sequence Number	*c) (or blank) Arbitrary number =< 70

*a) Ramp link has one way direction. If you need both way results from A to B and from B to A, two records are necessary because “Network.csv” is defined by one way link.

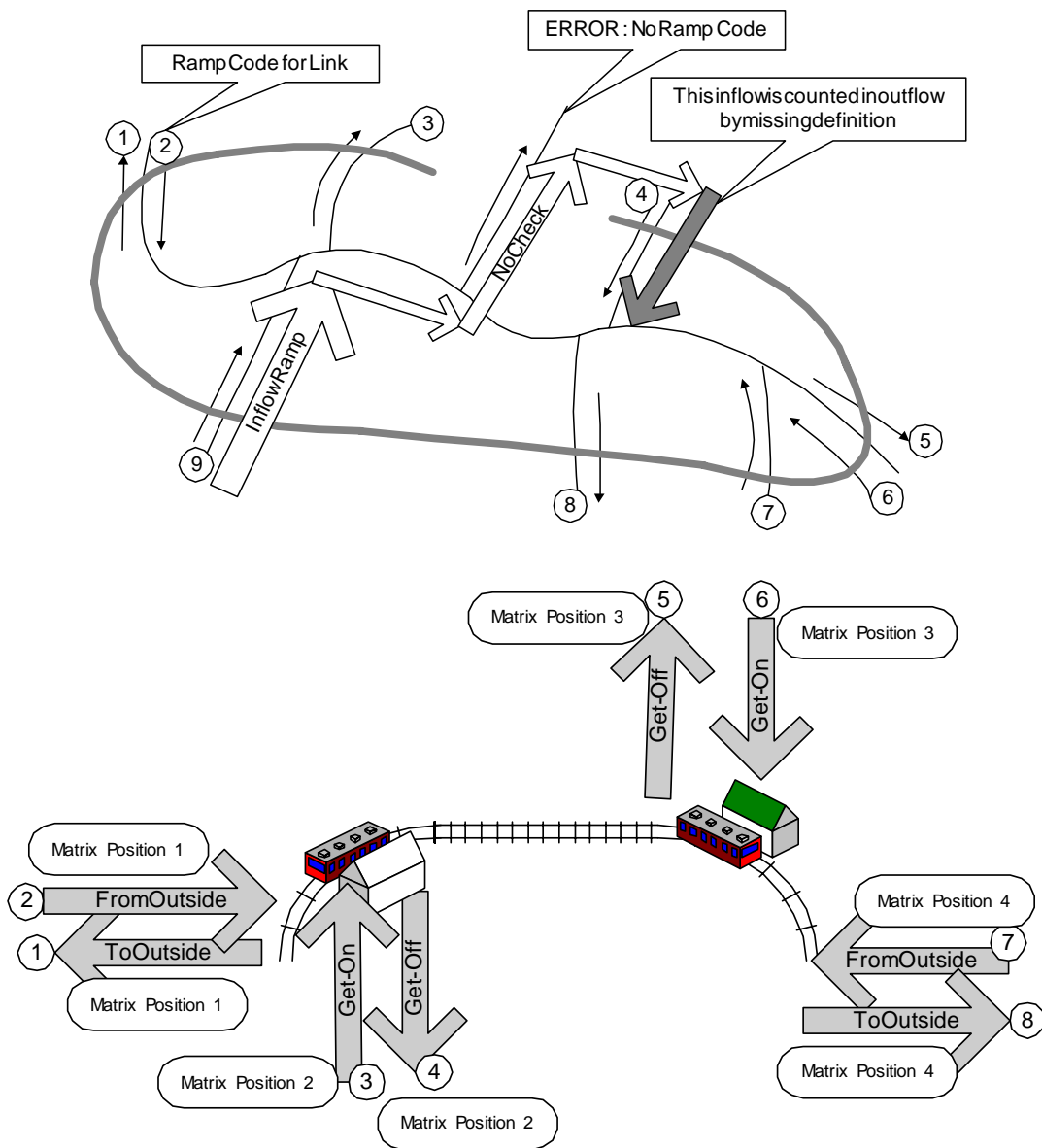
*b) Ramp Link Position is the sequence number for output of links. Because the link from A to B has the direction, the ramp link position will be outputted only in origin side or in destination side.

*c) If you want to make a link-combined OD table by ignoring the direction, please define the position of the OD table. This parameter is used only for the program “RampOD.exe” (this parameter is not used in the other programs). For example in case that one railway station has many access links this parameter might be defined by the station sequence code. By the station codes you can get station OD for railway ramps.

NOTICE: In the reason of *b) and *c) “Ramp Link Position” can not have the same code, but “Matrix position” can have the same codes.

NOTICE: If you want to make the other sets of ramps although only one set of ramps can be defined by this input style, you can make output files from minimum path files by the menu=1 in the module of "**RampOD.exe**" after traffic assignment.

NOTICE: Don't forget any open links to define ramps. If you forget to define it, the following error happens.



3.Output Files

The names of the most output files have the stage number at the end part before “.csv”. The result of each stage is outputted in each individual file because each stage has a different type of assignment.

All output files are stored by comma separated format. However the most files will exceed the maximum limit of EXCEL, so please import the result files by ACCESS or the other data base software.

3.1.Assigned Result by Stage

3.1.1.Vehicle PathVTXX.csv

NOTICE: “Vehicle PathVTXX.csv” and “Transit PathPTXX.csv” have different formats.

This file has the minimum routes between nodes at this stage “XX”. You can choose the way between output of this file or not because this file needs large space in your disk. If you do not output this file, the processing time becomes a little bit faster, but it might be some percents.

Mainly this file of vehicle trips is necessary for the direction analysis at crossings.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Link No	A Node	B Node	Time Impedance	From Zone	To Zone	Reverse Seq. on Min. Path
			Unit:0.01min Without toll resistance			

Vehicle Trips at this stage between these zone pair									
(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Type 9	Type 10

3.1.2. Transit PathPTXX.csv

This is one of the main output files on transit network at the stage “XX”. You can check the minimum transit route between zones. It is possible to make a band flow map of passengers of each route by accumulating all transit assignment stages, sorting route ID and grouping by route ID and node.

(1)	(2)	(3)	(4)	(5)	(6)
Flag	Link Position (Road Network)	A Node	B Node	Bus Route ID	Mode of Bus Route
0=Access 1=Get-On 2=Get-Off 3=Direct Transfer 4=Bus	*) Input Sequence of Road *) = 0 (Get-On/Off Link)	From Node Or Bus Stop Node Or Blank	To Node Or Bus Stop Node Or Blank		

(continue)

(7)	(8)	(9)	(10)	(11)	(12)
Next Bus Route ID	Time Impedance (unit: 0.01min)	Person Trips	From Zone	To Zone	Reverse Seq. No On Min.Path
*) only Transfer Case	*) Without Fare Resistance				*) from destination zone to origin zone

In this file the number of passengers by bus routes, on/off passengers at bus stops including transfer passengers, and person trips on access links are recorded. The type of records is specified by the flag in the first field.

First field = 0 ; access link (on foot)
 1 ; Get-On Bus Stop (Station)
 2 ; Get-Off Bus Stop (Station)
 3 ; Direct Transfer Connections
 4 ; Bus (or Railway)

By the reason why this record is stored by every minimum route search from Zone(i) to Zone(j), the same nodes are appeared in the file. According to your purpose, please accumulate passengers by flag, bus route, or zones.

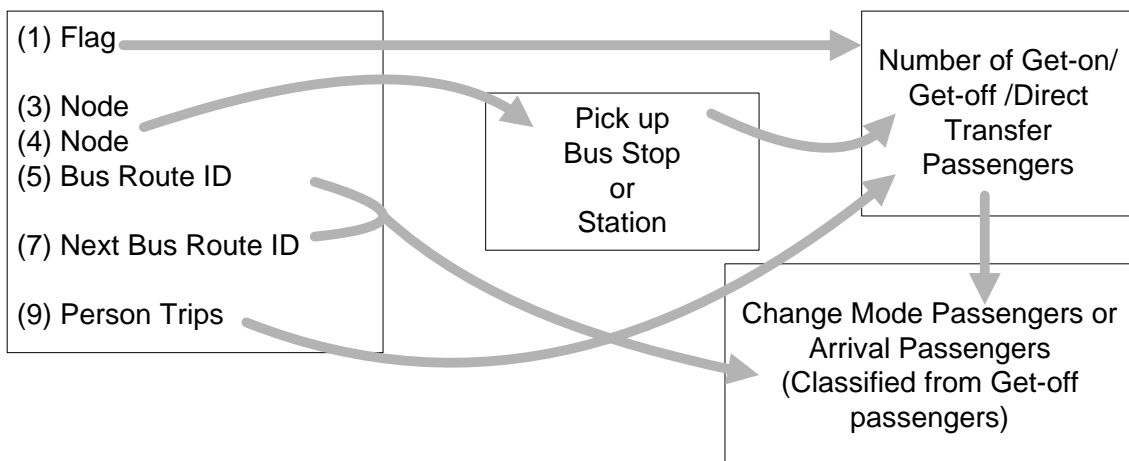
Link Position means the sequence number of data set "Network.csv". If you need other attributes of road network, you can use this code for the relations.

Bus route IDs generated in this program are recorded in the file "BusEdit.csv". So if you need the other attributes of bus route, please make the relations between this data & bus route in "BusEdit.csv" by database software.

Take care of that the sequence number of minimum path from Zone(i) to Zone(j) are coded in the reverse sequence from Zone(j) to Zone(i). That means the last link of minimum path has "1".

All Bus Route ID = 0 from origin to destination means that there are no minimum-time bus routes less than on foot or both centroids are connected at one bus stop. Please check again bus routes or ignore these OD pairs.

If you change only the OD table and don't change other conditions as network, bus routes, time value and so on, you don't need to process by this program. The assignment on the same minimum routes can be completed by replacing the values of OD in the following table.



3.1.3.Vehicle ImpedanceXX.csv / Transit ImpedanceXX.csv

These are impedance outputs between zones. The files of Vehicle and Transit have the same format for the purpose to analyze and compare them. All data in this file shows the number only in this stage because the minimum path at each stage is different and the purpose of this output is to get the impedance in this stage.

(Vehicle) Impedance and PCU at this stage are recorded in this file. “(4) Time impedance” includes toll resistance, but “(6) Travel time” does not include it.

(Transit) Impedance and number of bus routes on all OD pair are recorded in this file. The impedance (4) includes travel time by bus, waiting time at bus stop and the equivalent time converted from the resistance of bus fare, but does not include travel time on foot (or other access). So (4) Time Impedance=0 means that there are no minimum-time bus route less than on foot. “(6) Travel time” means boarding time plus waiting time. “(9) Walking time” means access time or transfer time on foot. The number of bus routes means the necessary bus routes from origin zone to destination zone, so for example “3” is that the times of transfer is “2”.

	(1)	(2)	(3)	(4)	(5)
VT	Origin Zone	Destination Zone	Vehicle Trips (PCU)	Time Impedance (Integer) (Unit:0.01min)	(Blank)
PT			Person Trips		Number of Bus Routes
				Bording Time +WaitingTime +Fare Registance	*) Get-On & Transfer

	(6)	(7)	(8)	(9)	(10)
VT	Travel Time Real (min.)	Distance of Road (km)	Toll road tariff	(Blank)	(Blank)
PT		Boarding Distance (km)	Total Bus Fare	Walking Time (min.)	Waiting Time (min.)
	Boarding Time +Waiting Time			access time + transfer on foot	Boarding time = (6) – (10)

3.1.4. Traffic AssignXXVT.csv / Traffic AssignXXPT.csv

The assigned result on the basic road network is recorded. (9)PCU is accumulated until this stage. (8)Velocity and the assigned traffics are only in this stage in order to analyze the data by velocity.

(1)	(2)	(3)	(4)	(5)
A Node (from)	B Node (to)	Link character	Evaluation Group	QV type of Road

(6)	(7)	(8)	(9)
Tariff Type	Distance (m)	Velocity (km/hour) In this stage	Accumulated PCU
		*) Assigned Velocity for VT *) Average Velocity for PT because each mode has different speed.	

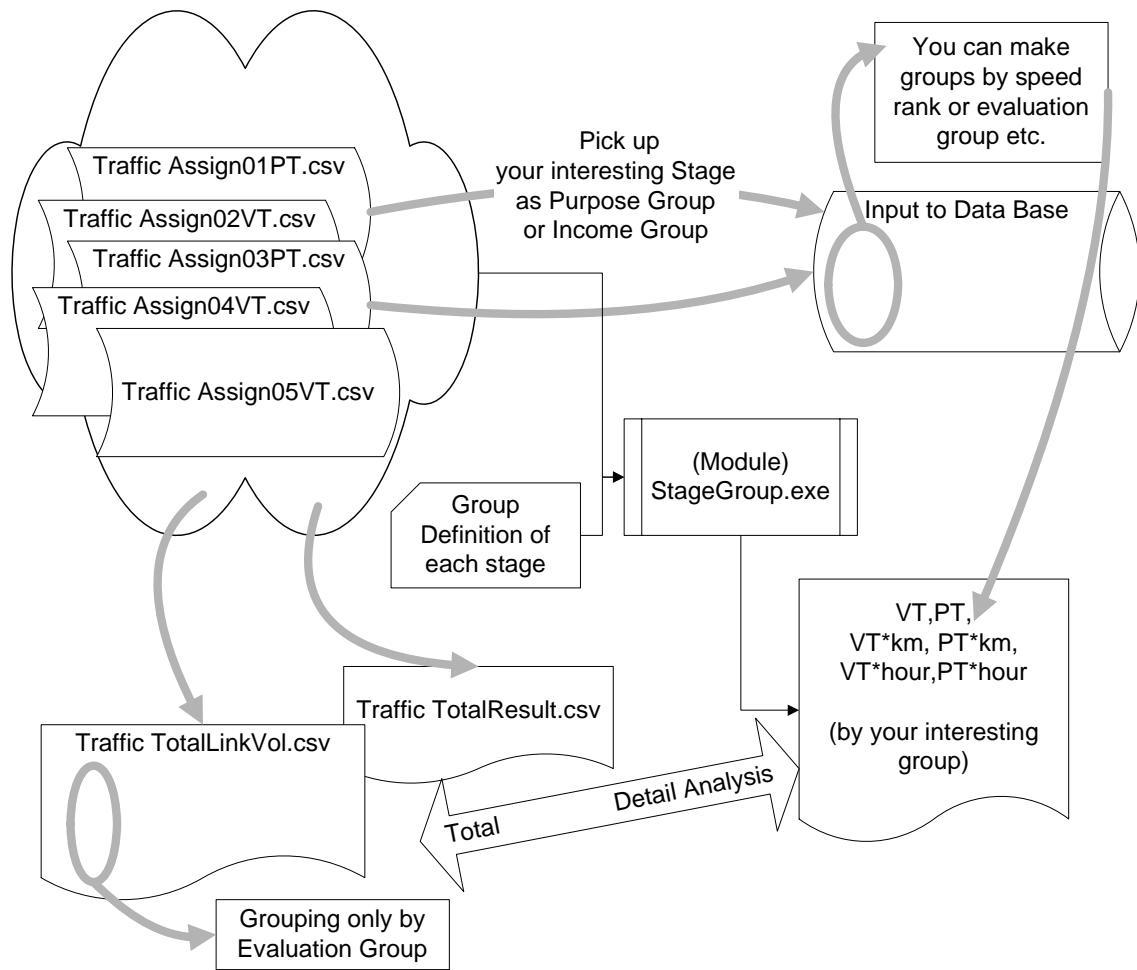
(From here the result is only at this stage)

(10)	(11)	(12)
VT of Type (1)	VT of Type (2)	VT of Type (3)
PT of MODE(1)	PT of MODE(2)	PT of MODE(3)

(20)	(21)	(22)
VT*Km of Type (1)	VT*Km of Type (2)	VT*Km of Type (3)
PT*Km of MODE(1)	PT*Km of MODE(2)	PT*Km of MODE(3)

(30)	(31)	(32)	(40)
VT*Hour of Type (1)	VT*Hour of Type (2)	VT*Hour of Type (3)	(blank)
PT*Hour of MODE(1)	PT*Hour of MODE(2)	PT*Hour of MODE(3)	Walking Persons

NOTICE: "VT*Hour" and "PT*Hour" do not include toll or tariff resistance.



3.1.5. Vehicle ScreenVTxx.csv / Transit ScreenPTxx.csv

The records are outputted at every time that each minimum path passes through the screen. The formats of vehicle and transit mode are different. If the screen line forms a circle, most passing through traffics are double counted.

	(1)	(2)	(3)	(4)	(5)	(13)
Vehicle	Screen No.	O Zone	D Zone	VT of Type (1)	VT of Type (2)	VT of Type (10)
Transit	Screen No.	O Zone	D Zone	Mode	Person Trips	

3.1.6.Vehicle RampVTxx.csv / Transit RampPTxx.csv

	(1)	(2)	(3)	(4)		(12)
Vehicle	Inflow Ramp No	Outflow Ramp No	VT of Type (1)	VT of Type (2)		VT of Type (10)
Transit	Inflow Ramp No	Outflow Ramp No	Mode <i>Ref)NOTICE</i>	Person Trips		

NOTICE: Under the situation that almost users define the ramp links on access links, so the transit mode is not fixed before getting-on, the column of "Mode" for transit assignment is ignored and put zero.

3.1.7.Transit CapacityOverXX.csv

This file contains the sections of routes which are cut by over capacity before the stage "XX". This file is created only in the case there are sections of over capacity at transit assignment.

(1) Route ID	(2) A Node	(3) B Node	(4) Mode	(5) Accumulated Assigned Person Trips

3.1.8.Vehicle ErrorXX.csv / Transit ErrorXX.csv

These files contain the trips which can not be assigned by the reason that the path can not reach to the zone centroid by link cut or capacity constraint. In the case that all trips can be assigned this file is automatically deleted at the end of assignment.

Vehicle	O Zone	D Zone	VT of Type 1	VT of Type 2		VT of Type 10
Transit	O Zone	D Zone	PT trips			

In most cases of transit assignment, this is not outputted because person trips can reach to the destination on foot. The number of walking persons on links are recorded in the file "Traffic AssignXXPT.csv". The file "Transit PathPTXX.csv" includes the number that they come from which zone to which zone.

3.2.Total of Assigned Result

3.2.1.Traffic TotalLinkVol.csv

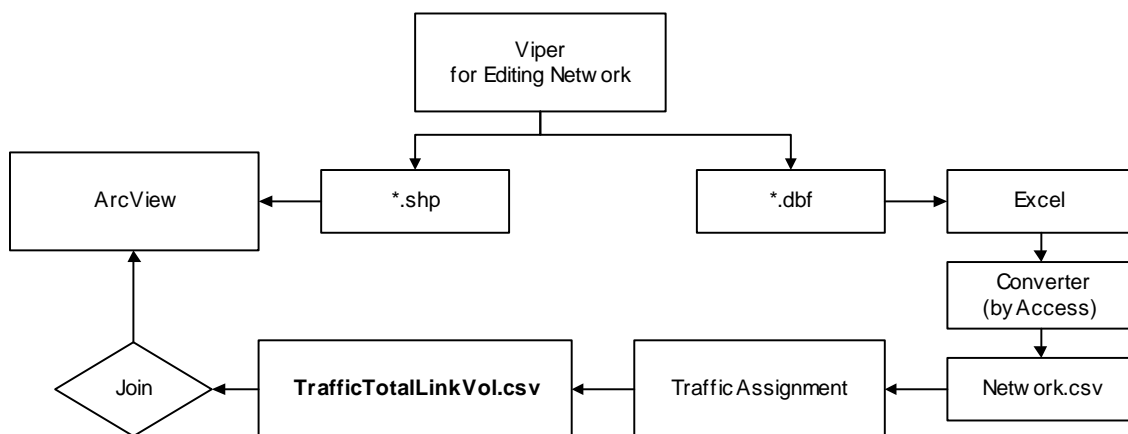
The total volume of link is summed up by all assignment stages. This is the result until final stage. According to the purpose of analysis it might be better to use another summation of some stages, for example, by the income group or by the same purposes.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
A Node	B Node	Link character	Evaluation Group	QV type of Road	Tariff Type	Distance (m)

(8)-(17)	(18)-(27)	(28)-(37)	(38)-(47)	(48)-(57)	(58)-(67)	(68)
VT Type1-10	VT*KM Type1-10	VT*Hour Type1-10	PT Mode1-10	PT*KM Mode1-10	PT*Hour Mode1-10	Walker (PT)

NOTICE: *In case that significant figures of VT or Distance are small, the velocity calculated by VT*km and VT*hour might have some rounding errors.*

NOTICE: *“.Hour” does not include tariff resistance.*



Sample of Process for Drawing Flow Map

3.2.2.Traffic TotalResult.csv

This is the accumulated result of “Traffic AssignXXVT.csv” and “Transit AssignXXPT.csv” by speed and Number of OD trips by the rank of “Vehicle ImpedanceXX.csv” or “Transit ImpedanceXX.csv”. All data can be read together by EXCEL to analyze them.

The speed, the distance and the impedance are different by the assignment stage. The rank is fixed by the program. If you need to accumulate them by different categories, please use database software or another program described at the later chapter.

This table can be used for economic analysis.

Assigned Speed (Km/hour) of Links	VT by Type PT by Mode (1) – (10)	VT*Km PT*Km (11) – (20)	VT*Hour PT*Hour (21) – (30)
S < 10 km/h	*) Not including trips on foot *) The speed of each stage is used. *) Not including tariff resistance *) Assigned speed of transit mode is the average link speed at each stage because the speed of each mode is different at the same stage. If you need to analyze more detail, please use another module after processing.		
10 =< S < 20			
20 =< S < 30			
30 =< S < 40			
40 =< S < 50			
50 =< S < 60			
60 =< S < 70			
70 =< S < 80			
80 =< S < 90			
90 =< S < 100			
100 =< S			

By using the following tables the modal share by distance and impedance can be checked. If OD tables and network comes from present survey, modal split model might be constructed.

OD Distance (Km)	PT	PCU by VT	VT1,VT2,VT3, --- VT9,VT10
D < 2 km	*) Distance of Road for vehicles Boarding distance for transit modes (not including on foot) *) Distance of each stage is used. *) Distance between zone pair is different by the stage because the minimum path is different. *) PCU includes only vehicle trips except transit mode *) Dummy links as centroid connections are not included.		
2 =< D < 4			
4 =< D < 6			
6 =< D < 8			
8 =< D < 10			
10 =< D < 15			
15 =< D < 20			
20 =< D < 25			
25 =< D < 30			
30 =< D < 35			
35 =< D < 40			
40 =< D < 45			
45 =< D < 50			
50 =< D < 60			
60 =< D < 70			
70 =< D < 80			
80 =< D < 90			
90 =< D < 100			
100 =< D			

OD Impedance (min) Generalized cost	PT	PCU by VT	VT1,VT2,VT3, --- VT9,VT10
T < 10 min	*) Including tariff resistance *) Impedance of each stage is used *) Impedance between zone pair is different by the stage because the minimum path is different. *) PCU includes only vehicle trips except transit mode. *) Impedance of VT does not include on dummy links as centroid connections. Impedance of PT does not include on foot.		
10 =< T < 20			
20 =< T < 30			
30 =< T < 40			
40 =< T < 50			
50 =< T < 60			
60 =< T < 70			
70 =< T < 80			
80 =< T < 90			
90 =< T < 100			
100 =< T < 110			
110 =< T < 120			
120 =< T < 150			
150 =< T < 180			
180 =< T < 210			
210 =< T < 240			
240 =< T < 300			
300 =< T			

3.2.3.Transit Operations.csv

The main purposes of this output are to check the section of maximum passengers and to get the final headway for increase operation type. The module "RoutePassenger.exe" can be used to get number of passengers of all sections.

Transit Route ID	Mode	Initial Headway	Final Headway
		*) In case 3, final headway is different.	

Max Passenger Section			Total sections & Passengers	
A-Node	B-Node	Max Passengers	Sections	Average Passengers
*) one of sections if there are many			*) Total Pass = Sections*AvePass	

Max Get-On Node		Max Transfer ON		Max Get-Off Node	
Node	Passengers	Node	Passengers	Node	Passengers
*) Get-on does not include Direct transfer-on.				*) Not include Transfer-off	

Max Transfer Off		Bus Fare	
Node	Passengers	Flat Tariff	Distance Tariff

3.3. Intermediate Files

3.3.1. BusEdit.csv

The contents of this file are the same as “BusInput.txt” by Viper format, but the Viper format is difficult to pick up the direct relations among Bus route, Mode and Frequency (Headway in this case).

You can easily make a table of Bus Route ID, Mode and Frequency by sorting the second column and getting the only bus route identification data from this file. For example, it will be useful to make the relations between Bus Route ID and the name of Bus Route in the file “BusCost.csv”.

The file “BusEdit.csv” is mainly for the purpose of data check and data base. The program makes a new “BusEdit.csv” from “BusInput.txt” at every process in the case that there is not “BusEdit.csv”. If you need to keep the contents, please rename the file.

The “BusEdit.csv” formatted by comma separated type can be read by “ACCESS” or “EXCEL”.

In the file “BusEdit.csv” all bus routes are divided to one direction data by interpreting “BusInput.txt”.

NOTICE: *In case that you use “BusEdit.csv” for the input of bus routes, **don’t remove the first record of field names.** The program skips the first one record at the input.*

(File FORMAT)

This file is constructed by comma separated format for editor. The size of records will exceed more than the limit of EXCEL. So please import the file by ACCES or other database software.

All bus route data are divided to one way route in this file, even though the original data file of “BusInput.txt” include two way routes (ONEWAY = False).

The contents of fields are as follows.

- 1) ID number for Bus Route (unique code) made in SUBROUTE BusConv.for. The ID codes are generated in the program. So if you change the input data, the ID codes are also changed by the program.
- 2) Sequence number of records for one bus route (from 0 to n). At the

- records of Seq.=0", bus identification data are recorded. So you can get the identification records by sorting by this column.
- 3) Mode Type of Bus that consist of basically 1 digit data or 2 digits (max.).
 - 4) Frequency from Viper Input = Headway Interval Time (minutes) (if Seq.=0). Real number is available only in this field.
 - 5) Number of Nodes on this Bus Route (if Seq.=0), blank (if Seq.>0). This number represents the number of records from the next record.
 - 6) Node (if Seq.>0). This field and the next field are filled in at Seq.>0. The maximum code of node should be "99999" in 5 digits.
 - 7) Speed (km/h) from this node to next node (if Seq.>0). This data should be integer.

Route ID	Seq.	Mode	Frequency	Number of nodes	Node	Speed
123	0	3	15	4		
123	1				11023	30
123	2				11024	15
123	3				11005	15
123	4				11004	*) 15
124	0	4	6.5	5		
124	1				23011	30
124	2				23301	30

*) The last speed data in the sequence of nodes has no meanings.

3.3.2. BusEdit2.csv

This is another output to check the input file "BusInput.txt" which is used for calculating the volume of supply.

Route	Seq.No	A Node	B Node	Mode	Frequency	Speed

3.3.3. BusCost.csv (you should rename this to “BusFare.csv”)

This is a template in order to input fares by route. This file is created at the time of converting Viper format. If you want to get this template file, please interrupt the program by two key “Ctrl + C” before the assignment starts.

This file has the following fields. However two fields of Flat Fare and Dist Fare are “0” at the time of converting from “BusInput.txt” (Viper format). So if you want to use time impedance of bus fare, you should fill in the data. ***Don’t remove the first record of field name*** when you input the bus fare.

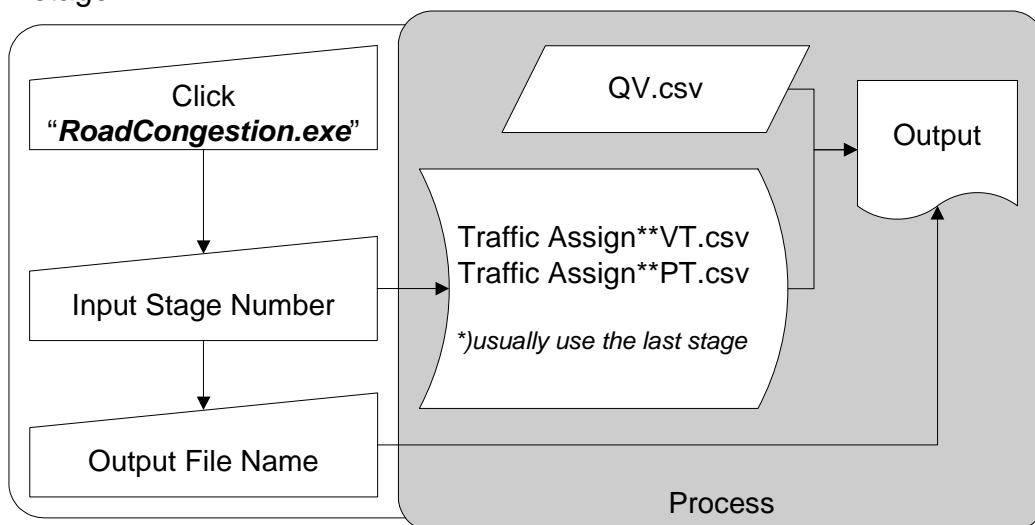
RouteID	Flat Fare (/Get-on)	Dist Fare (/km)	Mode	Bus Route Name

4. Traffic Analysis Programs after Assignment

Programs in this chapter are designed to analyze result files outputted by the traffic assignment.

4.1. Road Length by Congestion

This module sums up total road length by speed rank and congestion group from the result of one stage assignment, which is usually the last stage.



(Output Format) of 4 tables

Type of Classification	Type of Road (1) QV Condition (2) Evaluation Group
(1) Speed Rank (km) (2) Congestion Rank (%)	Each cell is filled in by Road Length (km)

4.2.Group Total Calculation

By grouping the assignment stages, **VT, VT*km, VT*hour, PT, PT*km, PT*hour by speed** rank can be summed up. You don't need all definitions of the group for all assignment stages. It is possible to define only the interesting stages in the group definition file.

"Traffic Assign00VT.csv" or "Traffic Assign00PT.csv" corresponding with the stages defined in the group definition file must be put in the same directory.

*NOTICE: For example, you can use this module in case that you want to sum up individual VT, VT*km and VT*hours by speed rank in order to analyze income group or purpose group after the assignment were carried out by income group or purpose group.*

You can select two options for this module.

1) Which speed do you want to use for transit mode?

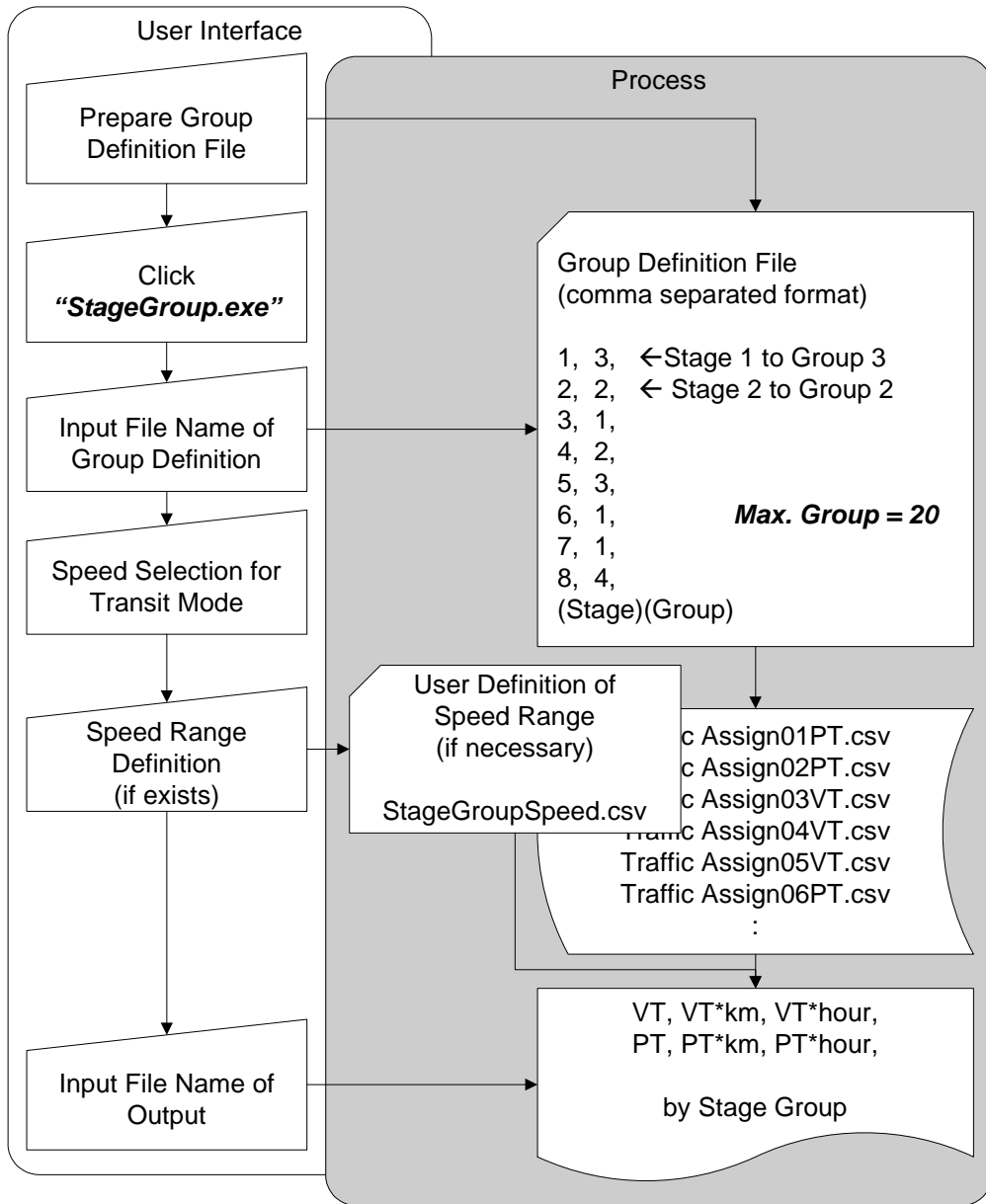
Usually average link speed of transit modes is used for classification of speed rank. But the speeds of transit modes are different even on the same link at the same stage because the speed of transit mode is decided by initial speed, reduction ratio and vehicle speed. If you want to use each speed of each mode for the classification, you can select it from menu. In that case a little rounding error might be included in the result.

2) Definition of Speed range by User

Usually the speed rank is set in the program. The range is divided by 10 km/hour. So you don't need any additional settings.

But if you want to define the speed range by yourself, you can set them by the file "StageGroupSpeed.csv" which should be the fixed name and have a comma separated format as following.

1,	15,
15,	30,
30,	40,
(km/Hour) =< Speed < (Km/Hour)	



4.3.Average Impedance

This module makes weighted average impedance tables by stage group. By one time processing you can make four groups each for vehicle assignment stages and transit assignment stages.

Input File (comma separated format)

1,	1,
3,	2,
4,	1,
5,	2,
Your necessary stages to calculate average.	
Average Group (Max.=4)	

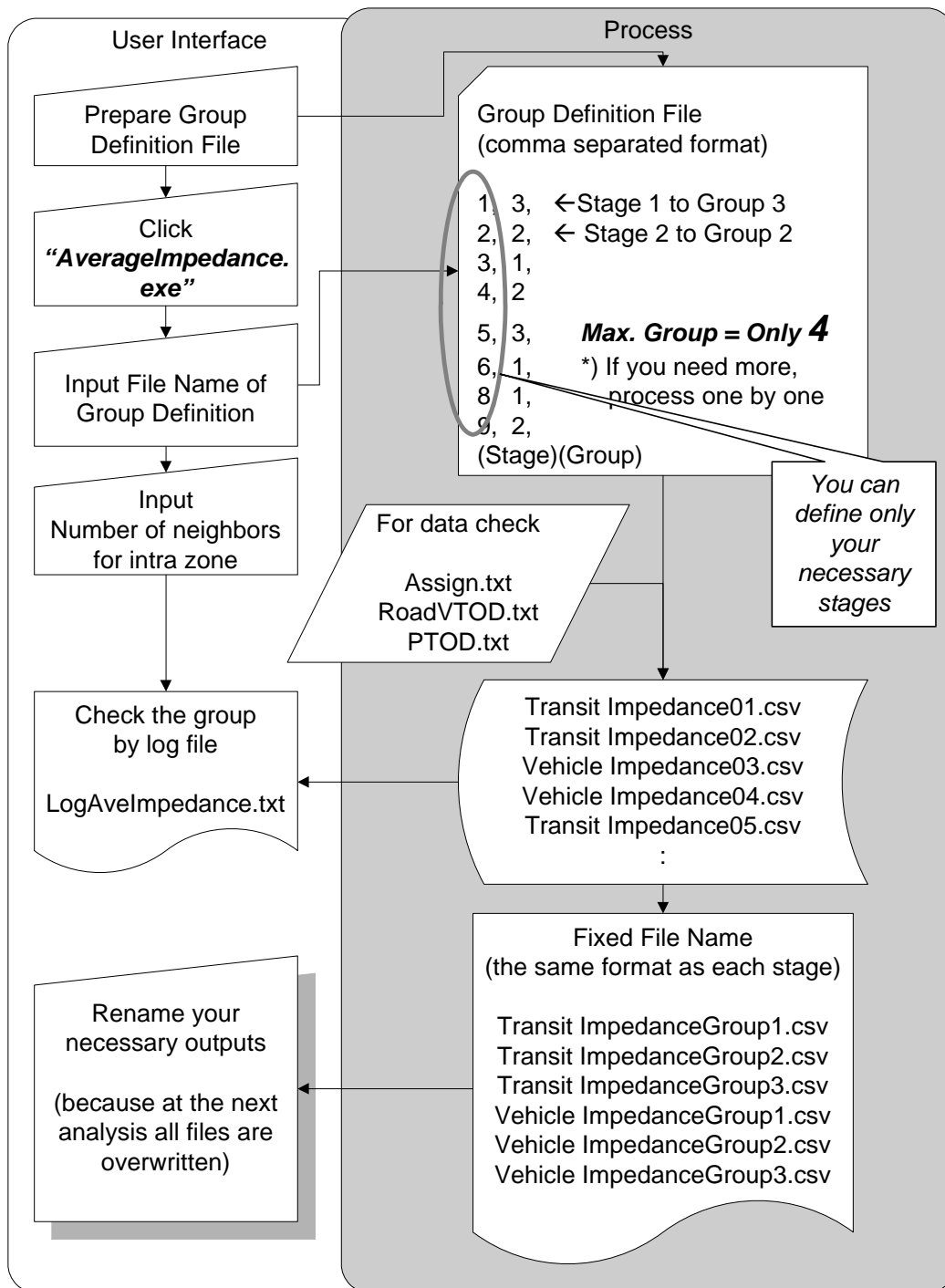
The same group number of vehicle and transit makes two individual outputs for vehicle and transit. So if you set the group “1” for all stage after integrated assignment of vehicle and transit, the number of output files is two because the code “1” is independent for vehicle and transit.

The impedance of OD pair which has no trips is calculated by simple average.

The impedance of intra zone is calculated by 50% of the average of the nearest neighboring zones. The nearest zones are selected by each item as generalized cost, distance and so on. In case that the impedance to neighboring zones is zero because the impedance of dummy links and links on foot is zero, intra zone impedance is also zero.

In case of transit mode walking time and waiting time are also summed up in the different fields of this output.

NOTICE: In case that you want to get all impedance of all OD pairs, at the start of this assignment program you should select parameters of “Do you want Minimum path search for ? (2.All zones)” and “Do you need all impedance ? (2.All Output)”.



4.4. Mode Composition by Impedance Ratio

The purpose of this module “*ModeShare.exe*” is to make the data for modal split model. However it is not possible to make modal split model directly from the output of this module.

At least three names of files should be defined in the input file. One is numerator file to calculate impedance ratio, one is denominator file and another is output file. The files for numerator and denominator should be the impedance files made by this traffic assignment. In the case you continue the names of OD files under the three files those trip of OD tables are attached as shown in the format of output file.

(Input File)

Transit ImpedanceGroup1.csv	Numerator to calculate impedance ratio	
Vehicle ImpedanceGroup1.csv	Denominator to calculate the ratio	
Impedance Ratio.csv	<i>File name of Output of the ratio</i>	
car-m.csv	OD table	*) options to attach OD trips in the file of impedance ratio *) OD format is a simple format as i, j and trips.
pub-m.csv	OD table	
*) <i>Max attached OD tables =< 200</i>		

The output file includes 5 types of impedance ratio for each OD pair. “0” is filled in the cell that the impedance ratio can not be calculated, and “99.9999” is filled in the cell that the ratio is abnormally too large.

(Main Output File) comma separated format

Zone	Zone	(1)	(2)	(3)	(4)	(5)	OD(1)	OD(2)	OD(3)
							*) If OD tables are defined in the input file, each trip of each OD table is attached here.		
							(Travel Time + Walking) Ratio		
							(Generalized Cost + Walking Time) Ratio		
							(3) Distance Ratio		
							(2) Travel Time Ratio		
							(1) Generalized Cost Ratio		
							Destination Zone		
							Origin Zone		

If you select a menu of “Modal Share Analysis Table”, you can get also the following output. This is a table of total of trips by the range of impedance ratio. Before the summation it is possible to avoid OD pairs which have not many trips by the input of smallest number of trips. This smallest number is total of all attached OD tables. So in the case of the smallest number = 0 all OD pairs are summed up in this table. And you also need to select the menu which you include intra zone trips or not. According to five types of impedance five tables are outputted.

However it should be carefully analyzed because the ratio calculated by this table means only the weighted average of modal share. If you need the range of modal share, the maximum ratio or the minimum ratio and so on, you had better use the above main output for plotting.

NOTICE: For the summation OD data which has no impedance data or abnormal impedance ratio is excluded. So the total numbers of trips are a little bit different among 5 type impedance tables.

5 types of (**Sum up Table by Impedance Ratio**) comma separated format

Range of Impedance Ratio	OD (1)	OD (2)	OD (3)
0.00 < Ratio < 0.05	Trips	Trips	Trips
0.05 =< Ratio < 0.10			
3.95 =< Ratio < 4.00			
8.00 =< Ratio < 99.9			

After the decision of which impedance is adequate for modeling by the above output, you can make more detail materials to analyze only for binary mode choice by the next module “**ModeShare2.exe**”.

Usually modal splits are different among the characters of zones. In this module you can define two types of zones which are urban zones and rural zones. 3 types of modal shares are calculated by this combination.

(Concept)

	Urban	Rural
Urban	Table 1	Table 2
Rural	Table 2	Table 3

For this classification you need to prepare zone definition file with comma separated format. The contents are very simple as followings. If you don't want to distinguish zones, you set "1" to all zones. If you want to neglect some zones for this analysis, you can exclude those zones from this file.

(Input : Urban & Rural Definition File)

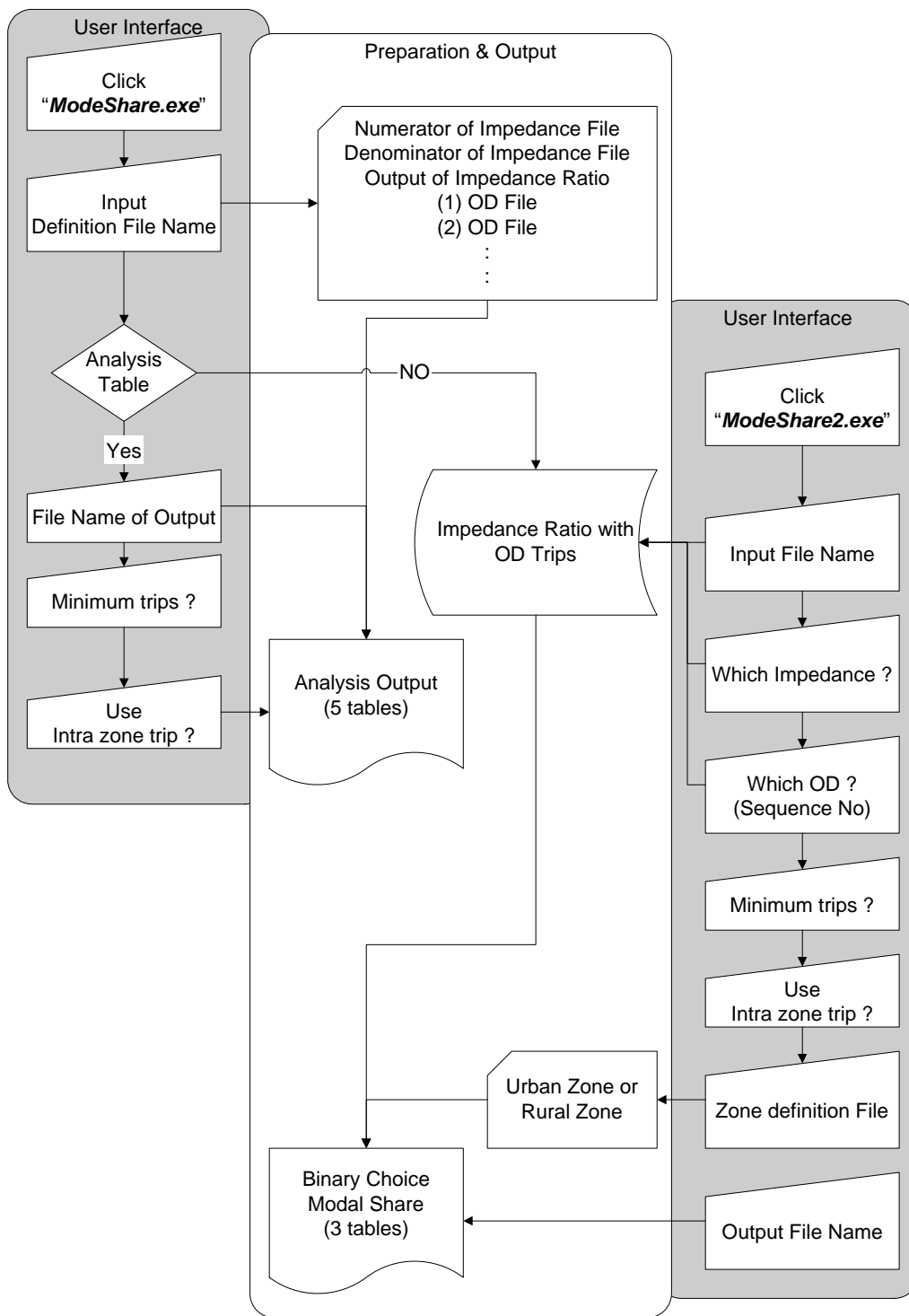
1,	1,
2,	1,
3,	2,
5,	2,
Zone Number	Urban = 1 Rural = 2

Output by this module "ModeShare2.exe" is as followings. You can get the distribution of modal share by impedance ratio.

(Output)

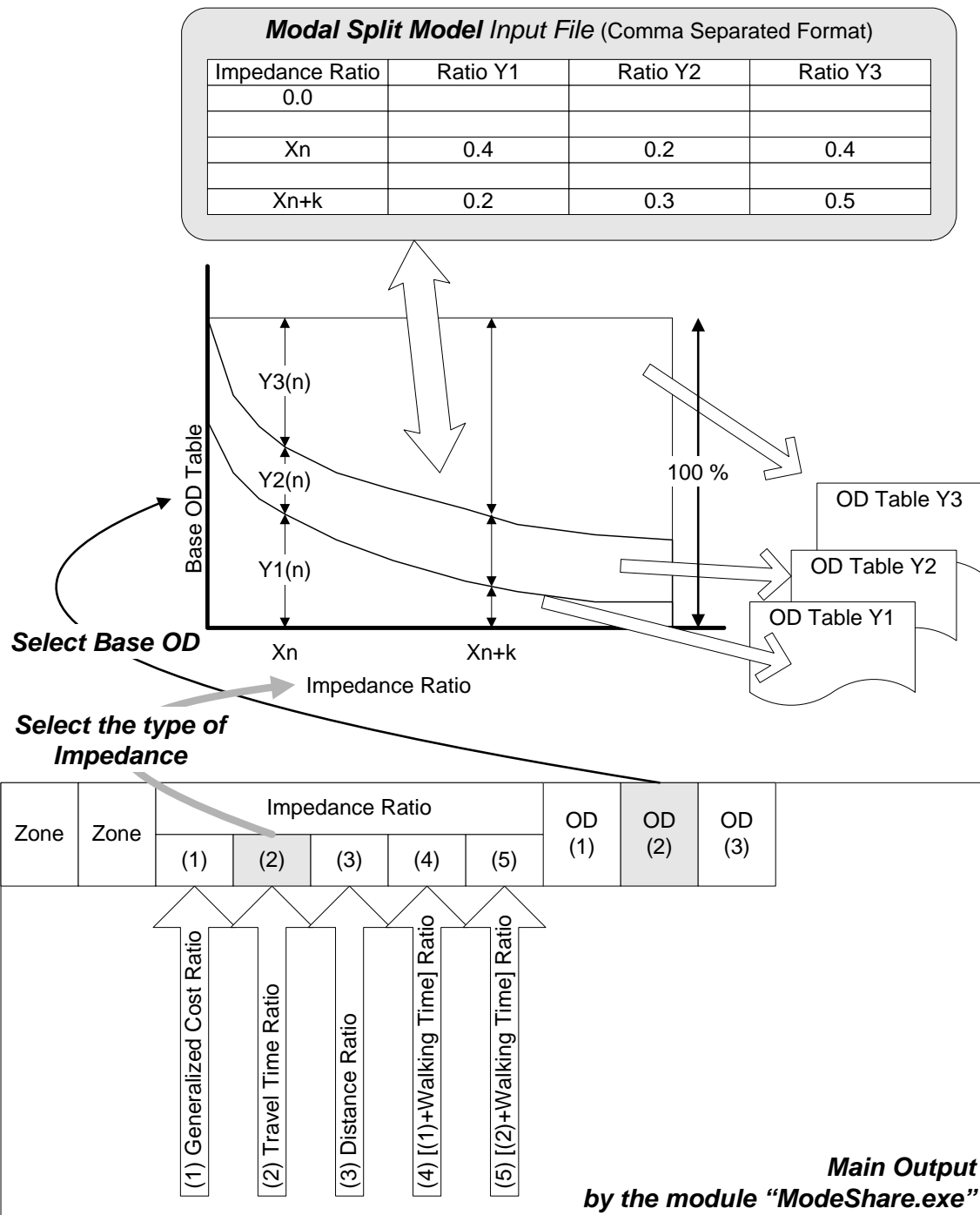
3 types (Urban-Urban) / (Urban-Rural) / (Rural-Rural) of modal share distribution by impedance ratio with comma separated format

Impedance Ratio (you have to select the type)	Modal Share 0 -10% = (A)/[(A)+(B)]			continue		
	Number of sample OD pairs	(A) Trips	(B) Trips			



4.5.Modal Split Calculation

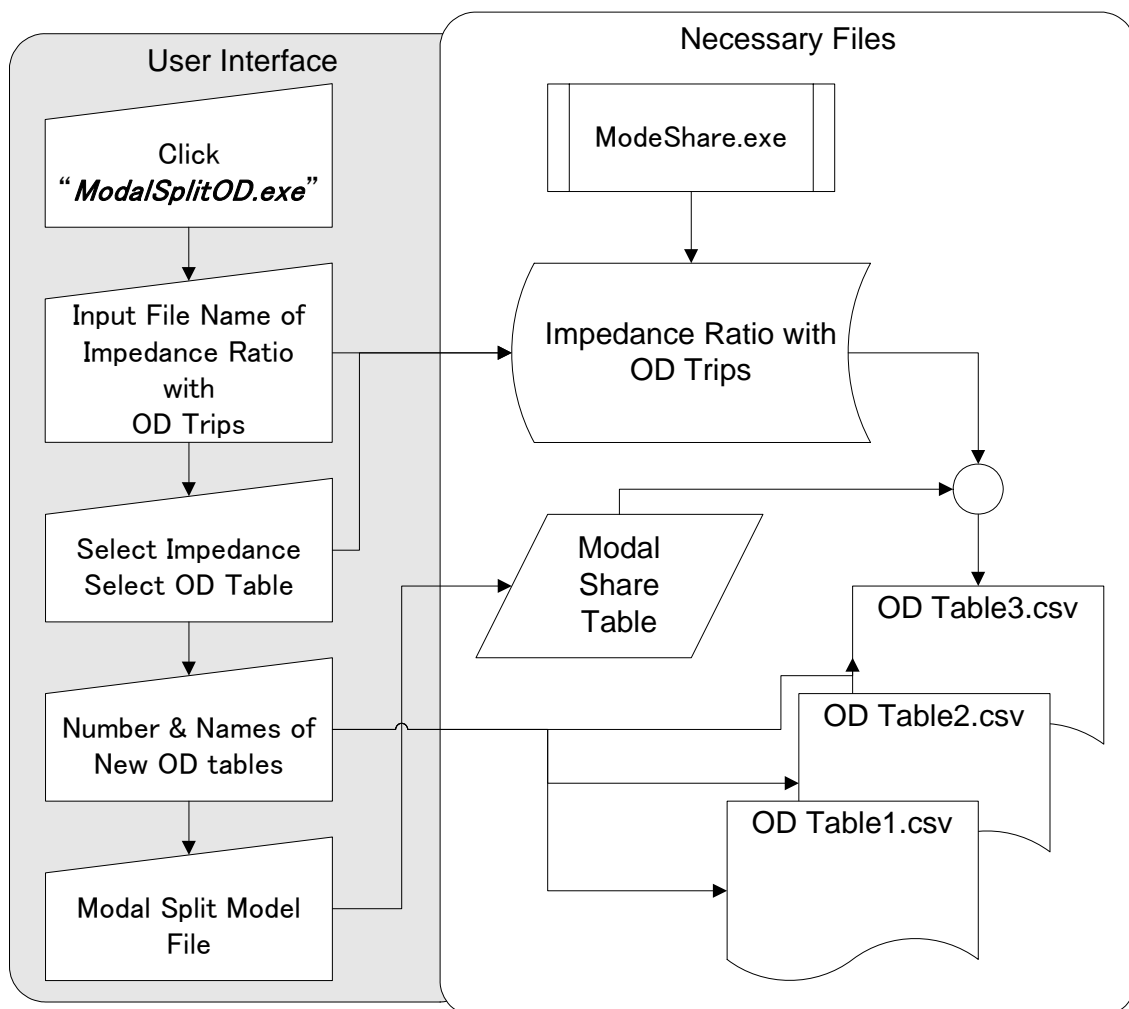
By this module you can make OD tables by **your Modal Split Model** from a base OD table and the impedance ratio made by module “ModeShare.exe”. This module has a function to calculate modal shares by your Modal Split Model which must be built up by yourself.



Input file of modal share has the following comma separated format. The first field is the value of X axis (impedance ratio). The interval of X axis value is arbitrary. The next following fields as Y axis are the ratios of new OD files. Total of the shares must be 1.0 (which means 100%). Each ratio is calculated by a line which is connected with two neighboring (X,Y) points.

(Input File of Modal Share)

0.0,	0.4,	0.2,	0.4,
0.2,	0.3,	0.25,	0.45,
1.5,	0.2,	0.3,	0.5,
Impedance Ratio	New OD 1 Ratio	New OD 2 Ratio	New OD 3 Ratio

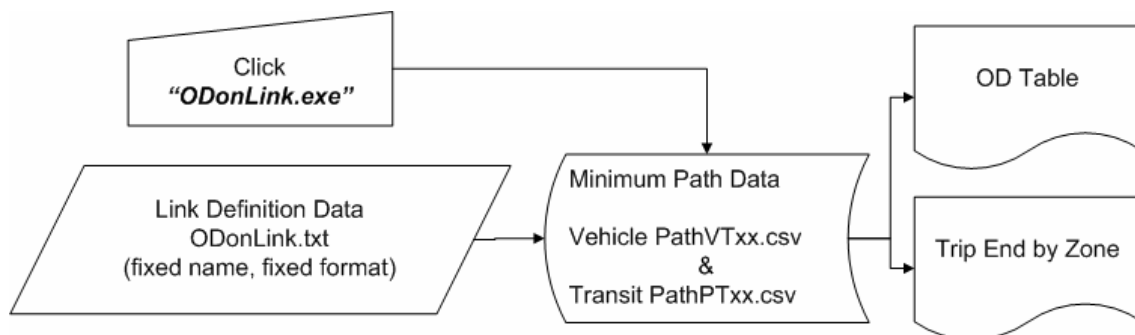


4.6.OD Analysis on Link

The OD pairs passing through and the volume of zones are necessary to analysis trips on a link. This module makes two kinds of output by a defined parameter file. One is an OD file which contains O-zone, D-zone and trips by vehicle type and mode type. Another is a trip end file of those trips by zone.

You can define necessary combinations of A-Node and B-node in a input parameter file which name and format is fixed by this module. For each combination, it is necessary to define one way or both ways, an OD file name and a trip end file name as the followings.

Trip end means the total of generated and attracted trips of zone. You should take care of the duplication of output file names.



ODonLink.txt (Input Parameter File, Fixed file name, Fixed format)

Number of Zone (Integer) Column 1-5	Number of Assigned Stage (Integer) Column 6-10	1 way ; only trips from A-Node to B-Node 2 way ; both way trips between A-Node and B-Node		
389	34			
A-Node Column 1-5	B-Node Column 6-10	Way 11	OD File Name (within 30 characters) Column 12-41	Trip End File Name (within 30 characters) Column 42-71
2483	2484	1	LK2483.csv	Trip2483.csv
35003	35002	1	LK35003.csv	Trip35003.csv
4811	4812	2	LK4811b.csv	Trip4811b.csv
3132	3133	2	LK3132b.csv	Trip3132b.csv
(adjust right)		(adjust left)		

(1) Output of OD File Format

(1)	(2)
From Zone	To Zone

Vehicle Trips by Vehicle Type									
(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Type 9	Type 10

Person Trips by Transit Mode									
(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Mode 1	Mode 2	Mode 3	Mode 4	Mode 5	Mode 6	Mode 7	Mode 8	Mode 9	Mode 10

(2) Output of Trip End File Format

(1)
Zone

Trip End of Vehicle Trips by Vehicle Type									
(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Type 9	Type 10

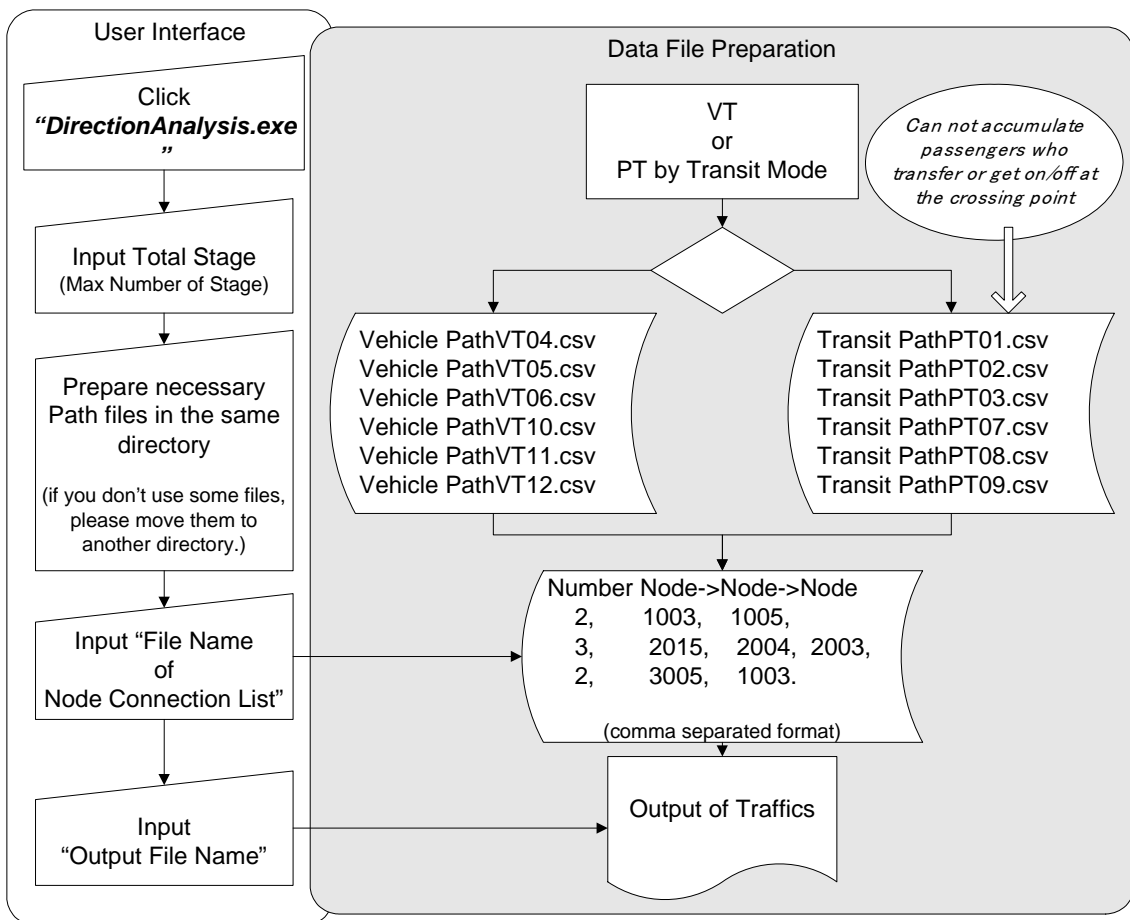
Trip End of Person Trips by Transit Mode									
(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Mode 1	Mode 2	Mode 3	Mode 4	Mode 5	Mode 6	Mode 7	Mode 8	Mode 9	Mode 10

4.7.Direction Analysis at Crossing

The minimum path files and the definition file of node connections are necessary for direction analysis at crossings. The definition file of node connections for input has the following comma separated format.

Input File which defines Node Connections (Arbitrary file name)

3,10052,10046,10044,
 2,10052,10046, ← Wrong Definition because this does not mean a direction
 3,10052,10046,10088,
 4,10052,10046,10088,13241,
 5,10054,10055,11743,11735,13087, ← Max. Number of Nodes = 5
 6,10054,10055,11743,11735,13087,1412 ← The Last Node will be ignored.
 Number of Nodes, node1, node2, node3, node4, node5,



Output File

Node Sequence				
(1)	(2)	(3)	(4)	(5)
Node	Node	Node	Node	Node

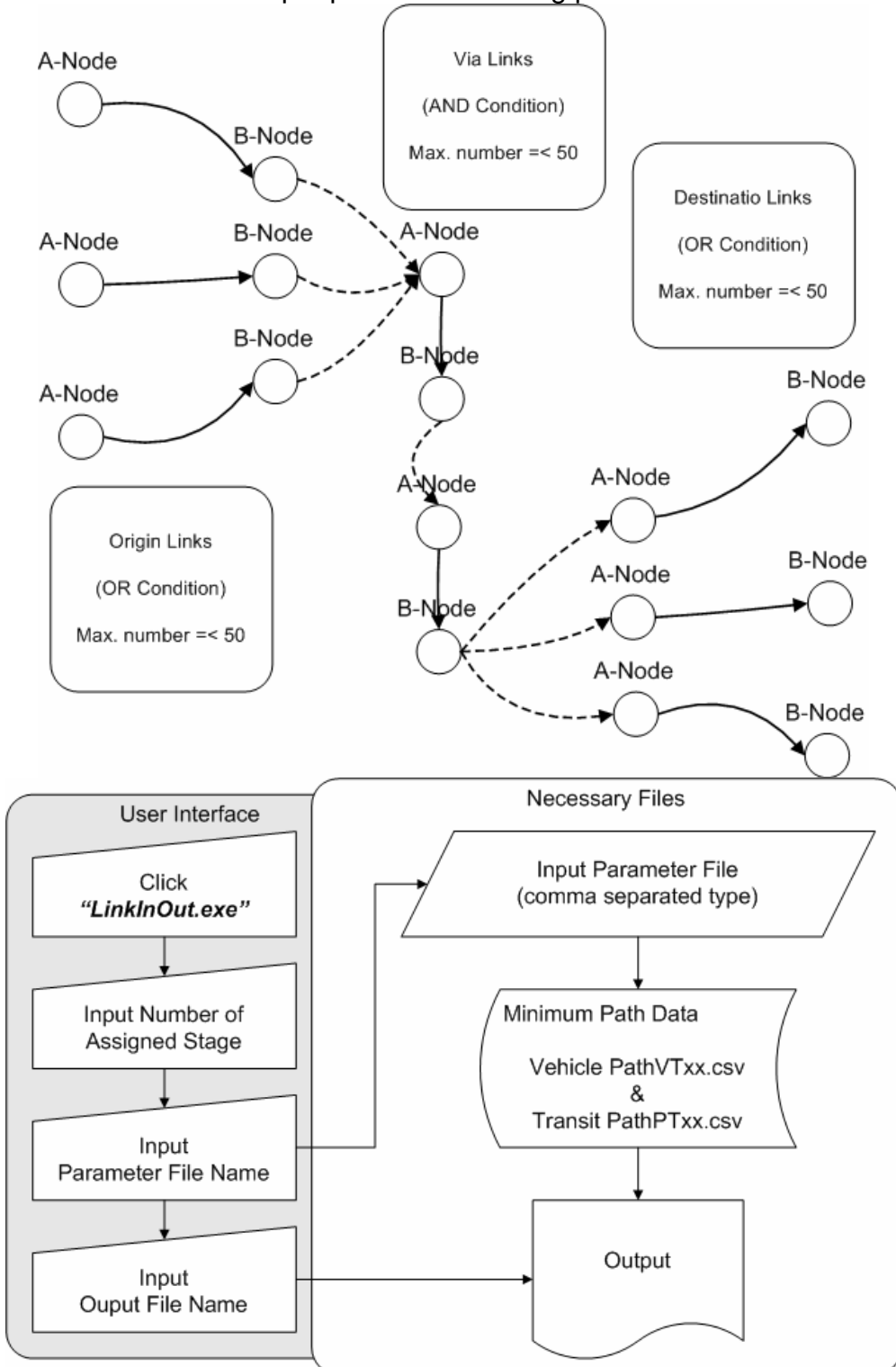
Vehicle Trips by Vehicle Type on this Direction									
(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Type 9	Type 10

Person Trips by Transit Mode on this Direction									
(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
Mode 1	Mode 2	Mode 3	Mode 4	Mode 5	Mode 6	Mode 7	Mode 8	Mode 9	Mode 10

NOTICE: *Only person trips by the same mode and the same route on this direction are accumulated in this table. Person trips which change mode or change route at the intermediate node on this direction are not included.*

4.8.Via Link Analysis

This module counts up trips as the following pattern.



Input Parameter File (comma separated type, arbitrary file name)

(example) *) all data have the direction.

4,	Number of Origin Link Data (=< Max.50)
10342,10343, 21002,21003, 32101,32100, 33564,33563,	Link Data (A Node & B Node) *) "OR" Condition (Trips must pass through any one of these links.)
2,	Number of Via Link Data (=< Max.50)
22108,22107, 22109,22108,	Link Data (A Node & B Node) *) "AND" Condition (Trips must pass through all links.)
4,	Number of Destination Link Data (=< Max.50)
37623,37622, 87120,87122, 65432,65444, 53249,53301,	Link Data (A Node & B Node) *)"OR" Condition (Trips must pass through any one of these links.)

Output of Trips passing through

(1)	(2)	(3)	(4)
Origin Link		Destination Link	
A Node	B Node	A Node	B Node

Vehicle Trips by Vehicle Type									
(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Type 9	Type 10

Person Trips by Transit Mode									
(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Mode 1	Mode 2	Mode 3	Mode 4	Mode 5	Mode 6	Mode 7	Mode 8	Mode 9	Mode 10

NOTICE: Mode composition of person trips is accumulated by the mode of origin links. The ratios of PT mode on via links or on destination links are different.

4.9. Number of Passengers at Bus Stop/Station

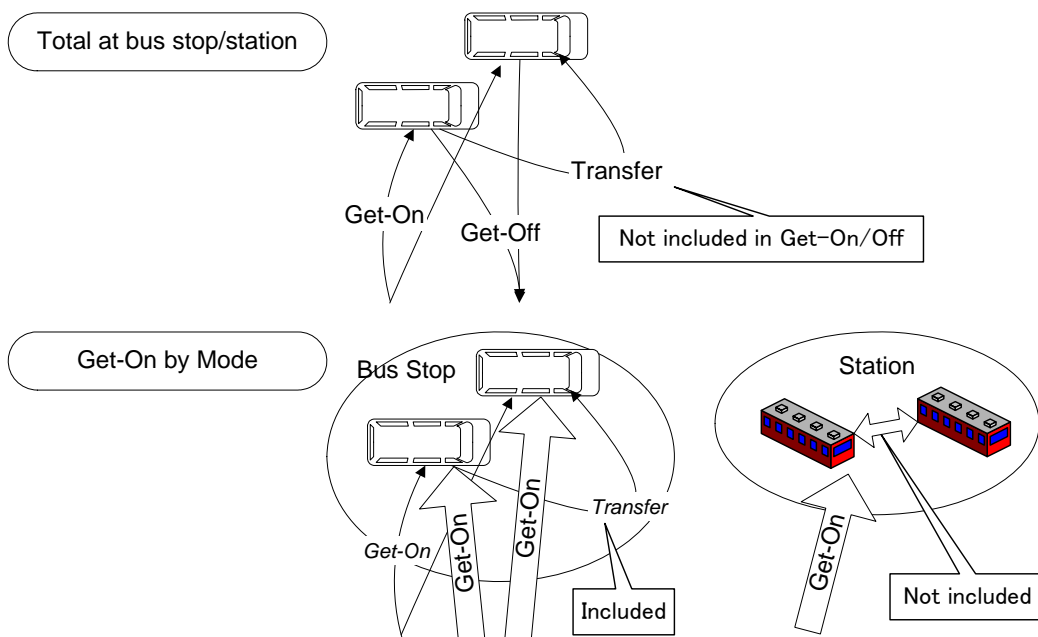
By this module the number of total passengers of get-on/get-off/transfer at bus stop and station can be summed up through all stages. For this calculation “Transit PathPTxx.csv” files and “Network.csv” file are necessary.

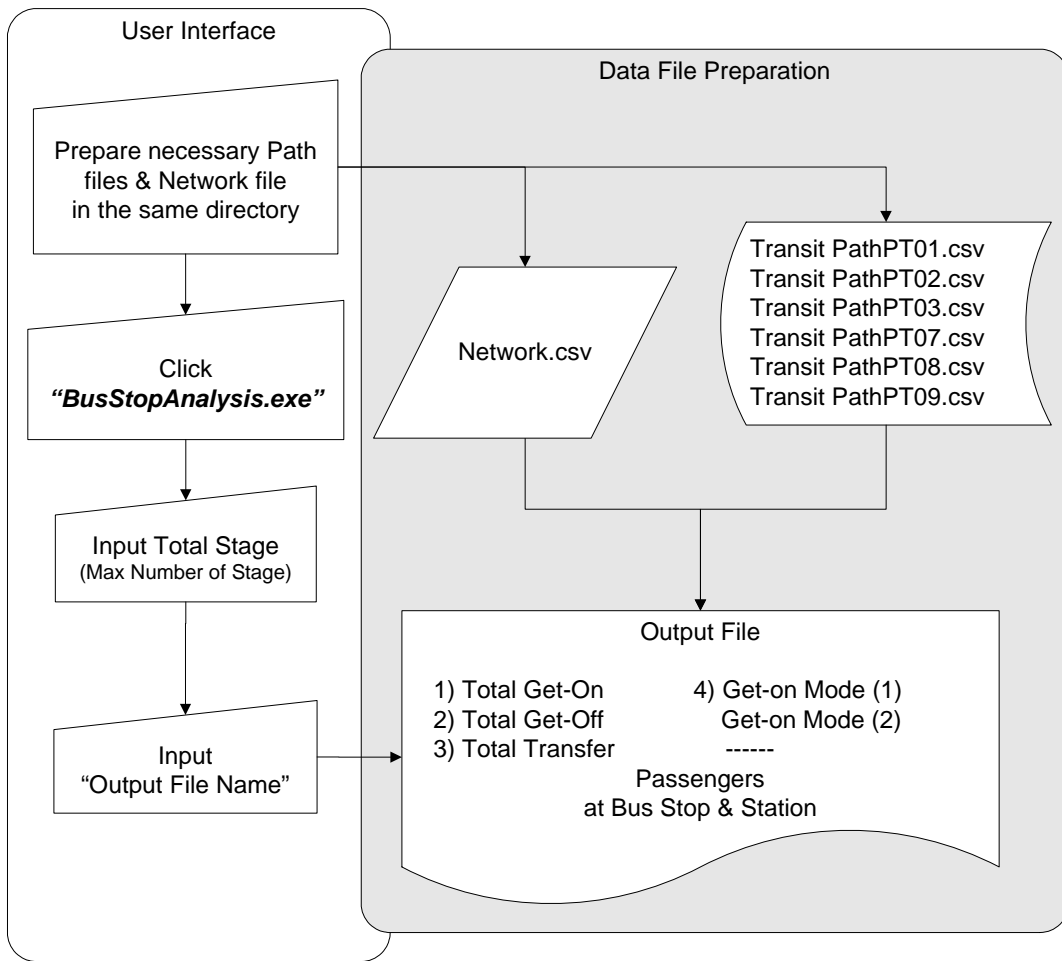
Total get-on passengers come from non transit modes as walk. Total get-off passengers go to non transit modes. Total transfer passengers get off from one transit mode and get on another transit mode at the bus stop or station. **Number of get-on/get-off passengers does not include transfer passengers.**

Number of passengers by Mode represents get-on passengers including transfer passengers except direct transfer passengers who change another train at station. This number means passengers who paid the first entrance fare.

(Output Format)

Total Get-On	Total Get-Off	Total Transfer	Get-On Mode (1)	Get-On Mode (2)		Get-On Mode (10)
*) Total user			*) Paying passengers			





4.10. Transit Passengers by Route & Section

This module sums up number of assigned passengers by section on each route. The files of “BusEdit2.csv” and minimum path output “Transit PathPT00.csv” are necessary. At sections of no passengers average time can not be calculated because those sections are not searched and not given the time at route search process.

The “Route ID” is corresponding with the first column of the input file “BusFare.csv”, therefore you can identify the route. And this “Route ID” is a sequence number in “BusFare.csv”.

You can select **a few options** for output as for example **all routes, selected routes, or selected nodes**. If you want to add node name in the output record, please refer to the below option.

(Output Format)

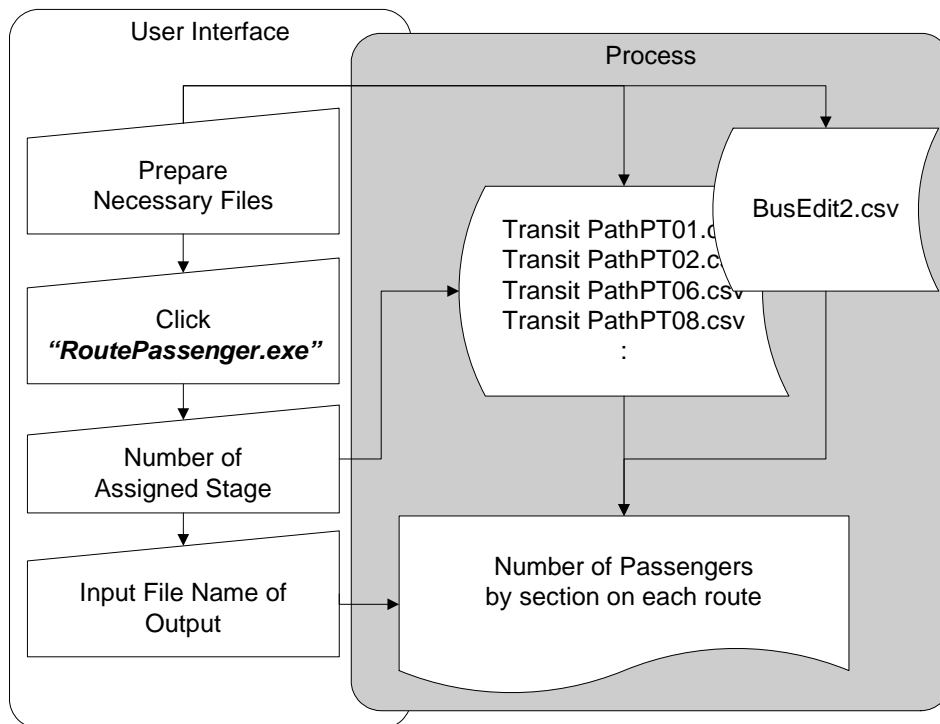
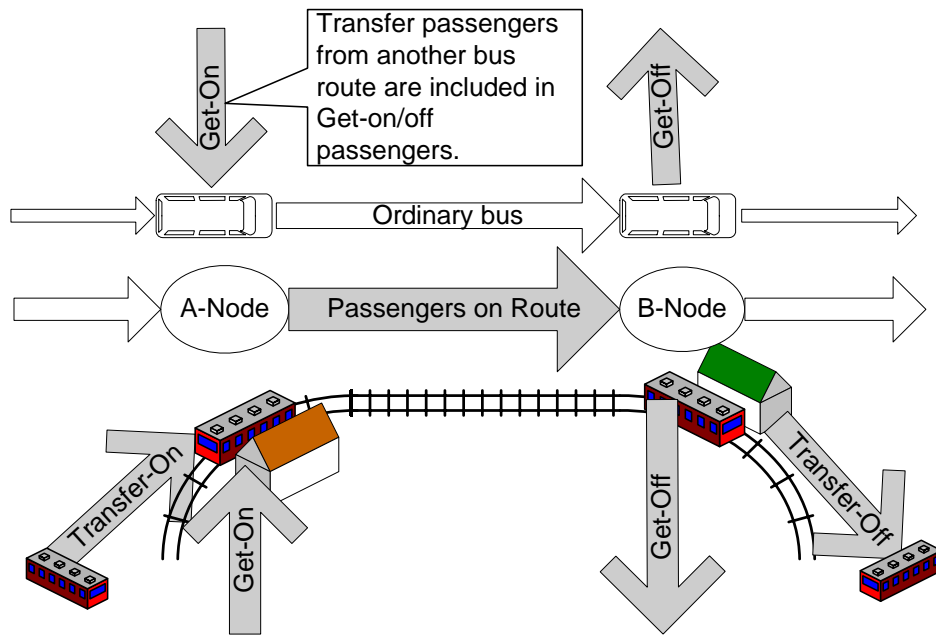
Route ID of Transit Mode						
Sequence No. of Section on Route						
Section of Route						
					Weighted travel time of section	
Route	No	A-Node	B-Node	Mode	Average Time (min.)	Passengers on Route
OUTPUT Format						

(continued)	From A-Node		At B-Node	
	Get-On	Transfer Get-On	Get-Off	Transfer Get-Off

Additional Option: “**nodeName.csv**” (Fixed File Nmae)

If you put a file “nodeName.csv” in your directory, node names are added on the output records. If there is not the file, this program ignores it. Maximum number of node name is 1,000. In case that node name is defined by CSV format, this program searches it and adds the name on output if the node is found. However the processing speed will be late because this program is not so sophisticated.

9007, Bogor↓
 9008, Cilebut↓
 9009, Bojong Gede↓
 9010, Citayam↓
 9011, Depok↓
 9012, Depok Baru↓
 9013, Pondok Cina↓
 9014, Universitas Inc↓
 9015, Universitas Par↓
 9016, Lenteng Agung↓
 9017, Tanjung Barat↓
 9018, Pasar Minggu↓
 9019, Pasar Minggu P.

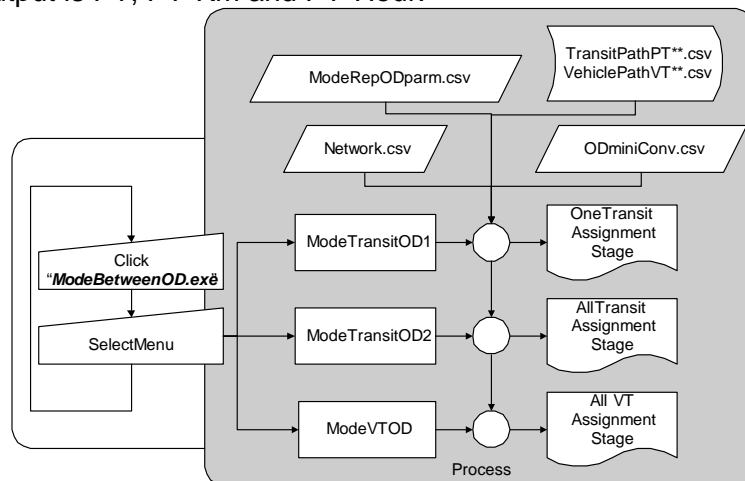


4.11. Mode Share Analysis between OD pair

The main purpose of this module “*ModeBetweenOD.exe*” is to get the share of representative mode between each OD pair. By this program you can get the total numbers of Person Trips, PT*Km and PT*Hour after traffic assignment by OD in order to compare the number between total inputs and the result.

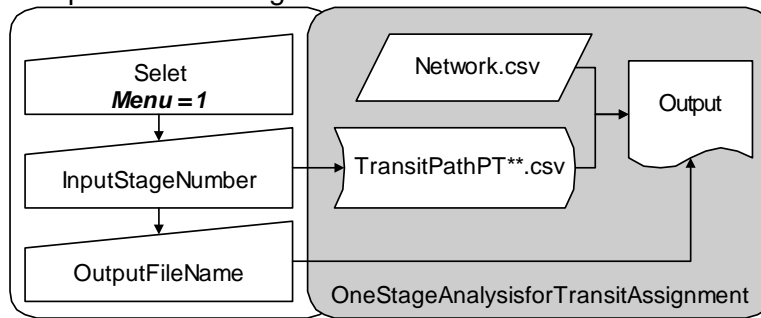
This module has 3 menus for the calculations. The first menu counts up some useful numbers from one stage of transit assignment. About one stage analysis there are no double counted data, so you can sum up trip distance through all modes. However this table can not add on the next assignment stage because there are possibilities that the representative modes and their routes are different between the same OD pair. So the second module is prepared to sum up only representative modes through all transit assignment stage. The third menu is for VT assignment in order to output the similar result as the above transit assignment. On vehicle assignments the concept of representative modes does not exist because all vehicle trips are independently separated to their OD tables before traffic assignment. For vehicle assignment in this program, modal shift does not include. If you need to forecast modal shift from private mode to public mode, you should those OD tables before the traffic assignment according to the impedance analysis and so on.

Usually the unit of this module is Person Trips, However in case that your inputted OD table only by vehicle unit, the output units of the result are made by Vehicle trips, VT*Km, and VT*hour. If your inputted the trips after converting from vehicle unit to person unit, and you define average passengers of vehicles in column (3) "RoadPCU.txt" (which means the inputted OD is person trip base), the unit of output is PT, PT*Km and PT*Hour.



4.11.1. Single stage for Transit Assignment

This module **Menu=1** in **“ModeBetweenOD.exe”** for transit assignment counts up the number of get-on of each mode, the distance and the time by mode between OD pairs at one stage.



OUTPUT

Origin Zone	Destination Zone	Walking Distance (km)	Walking Time (min.)

(continue from right of the above row in the same row)

Get on Mode (1)	Get on Mode (2)	<i>*) Numbe of Get-on</i>	Get on Mode (n)

(continue from right of the above row in the same row)

Transfer in the same Mode (1)	Transfer in the same Mode (2)	<i>*) Number of (non charge) direct transfer for railway and so on</i>	Transfer in the same Mode (n)

(continue from right of the above row in the same row)

Boarding Distance (km) on Mode (1)	Boarding Distance (km) on Mode (2)		Boarding Distance (km) on Mode (n)

(continue from right of the above row in the same row)

Boarding Time (min.) on Mode (1)	Boarding Time (min.) on Mode (2)		Boarding Time (min.) on Mode (n)

(continue from right of the above row in the same row)

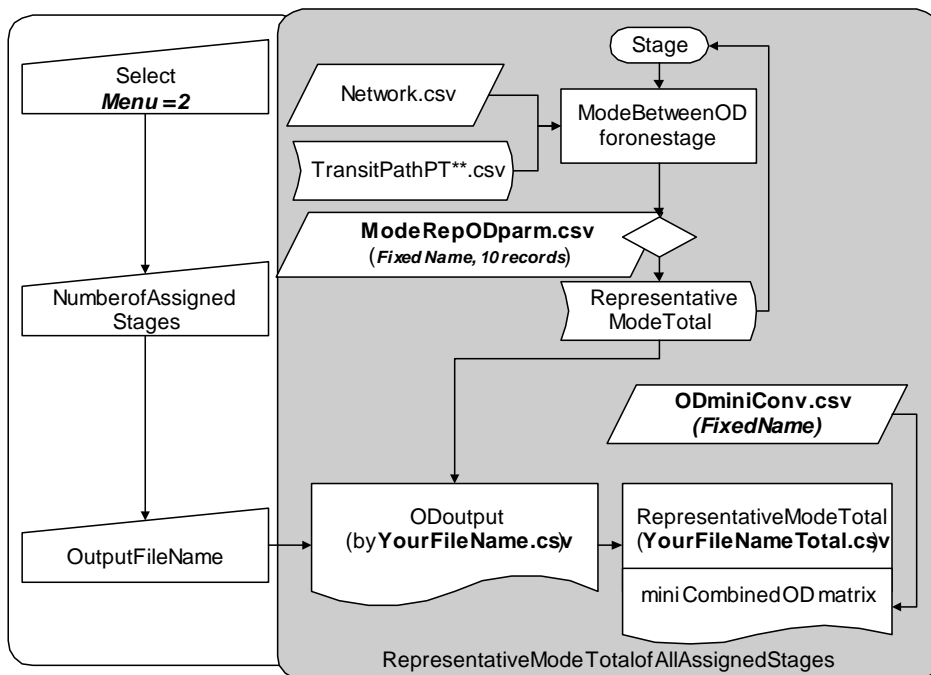
Waiting Time (min.) for Mode (1)	Waiting Time (min.) for Mode (2)	<i>*) including get-on and transfer time</i>	Waiting Time (min.) for Mode (n)

4.11.2.All stages for Transit Assignment

At one single assignment stage transit mode ratio can be analyzed by the above table because traffics pass through one route between each OD pair. In order to calculate average trip distance and trip time the total of PT*km and PT*hour at the stage can be divided by assigned person trips in the stage.

However it is mathematically wrong to divide them by person trips after summing up the results of all stage because number of inputted person trips is the same whether trips pass through single mode or many modes. Therefore we need to define the priority sequence of representative modes to select one mode at one stage for each OD pair. This module summed up PT, PT*km and PT*hour by representative mode through all assignment stage. The file name of the priority definition of mode is fixed to **“ModeRepODparm.csv”**. And you select **Menu=2** in **“ModeBetweenOD.exe”**.

Input File : ModeRepODparm.csv (necessary)	
Data : Mode Code, Priority	
1,3,←	You need to define the priority by unique
2,4,	number from Mode(1) to Mode(10)
3,8,	even if you don't use some modes.
....	*) The mode codes are defined in the
9,1,	file “ModePCU.txt”
10,2,	



OUTPUT

Origin Zone	Dest.Zone	PT(1) ---(10)	PT*Km(1)---(10)	PT*hour(1)---(10)

After the output by your inputted file name, this program automatically make another file named by "**your input file nameTotal.csv**" that includes grand total PT, PT*km and PT*hours. For the additional file there is an option. If you have prepared the OD zone-combination definition file named by "**ODminiConv.csv**"(**fixed name**) in the same directory, combined OD matrix tables will be made in the total file. However the size of combined OD tables should be within **30 zones**. In case that there is no "ODminiConv.csv" in the working directory or the combined zone size is over 70, this process is skipped. The format of "ODminiConv.csv" is a comma separated type which has the original zone number and combined zone number as followings.

Input File: ODminiConv.csv *) option
1,3, <= From Original Zone 1 To Combined Zone 3
4,1, (Right Hand) Combined Zone Code =<30
.....
200,4,<=From Original Zone 200 To Combined Zone 4

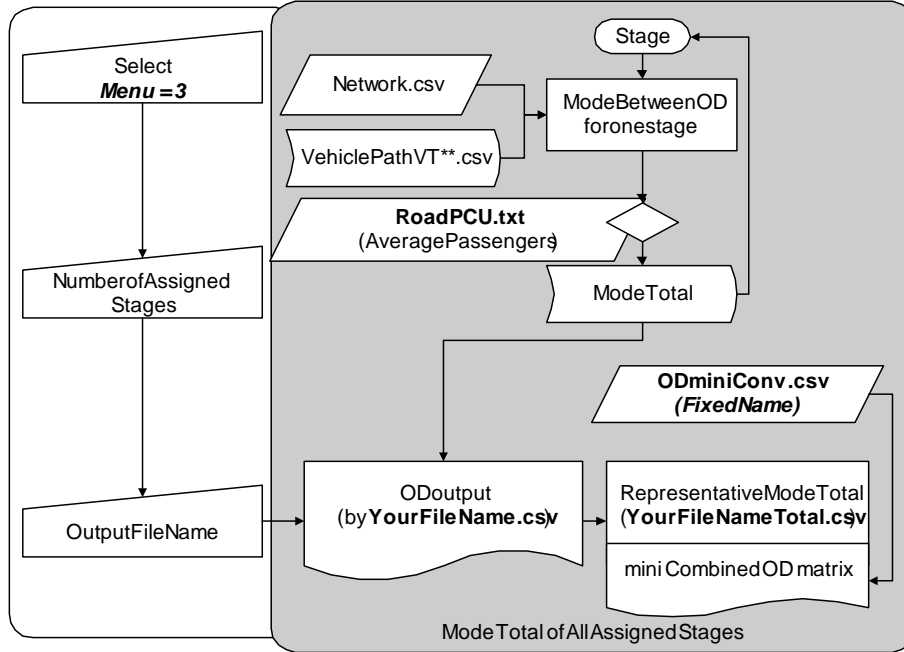
NOTICE: In the output the mode means the representative mode by OD pair. Therefore the average trip does not represent it of the representative mode. It means the average of the trips by OD pair which use that kind of representative mode.

4.11.3.All stages for Vehicle Assignment

The purpose of this **menu=3** is just only for corresponding with menu=2. You can get the major results from another module, but it is easy to compare on the same format as Transit case.

About vehicle mode the outputs whether PT base or VT base depend on inputted OD types. If the inputted OD files are based on vehicles, this output is also based on vehicles because there are no data of average passengers in (3) rd column of "RoadPCU.txt". If the inputted vehicle OD files are base on person trips, this output is converted to person trips after reading assignment result based on vehicles. The trips between OD pairs are the same as the input number because

all modes of inputted OD files show independently representative modes. For this menu “Network.csv”, “RoadPCU.txt” and assignment results “VehiclePathVT**.csv” are necessary in the same directory. Total number of VT (or PT) will be outputted in another file. If you set “ODminiConv.csv” in your directory, combined OD matrices are added in the total file.

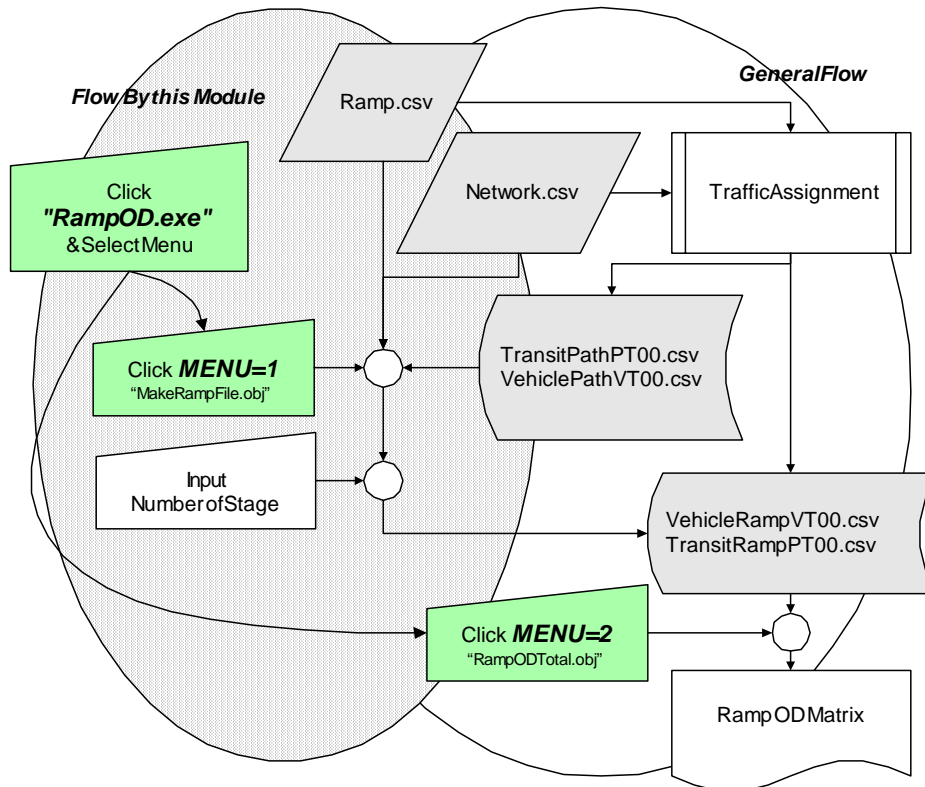


OUTPUT

Origin Zone	Dest.Zone	VT(1) ---(10) PT(1) ---(10)	VT*Km(1)---(10) PT*Km(1)---(10)	VT*hour(1)---(10) PT*hour(1)---(10)

4.12.Ramp OD Analysis

This module makes a ramp OD matrix table, which can be used for traffic flows between inflow/outflow ramps on highway networks and stations on railway network. The output matrix consist of inflow ramps (or getting-on railway station) and outflow ramps (or getting-off stations).



4.12.1.Creating new Files for Ramp OD Analysis

If **there are already necessary Ramp OD files** as "Vehicle RampVT00.csv" and "Transit RampPT00.csv", **you can skip this menu** and make OD tables among ramps by the next menu=2. However in the case that you want to create newly those basic files or you want to define new sets of ramps after traffic assignment, this module is useful that you can select the **Menu = 1 in "RampOD.exe"** to pick up all ramp traffic data after traffic assignment.

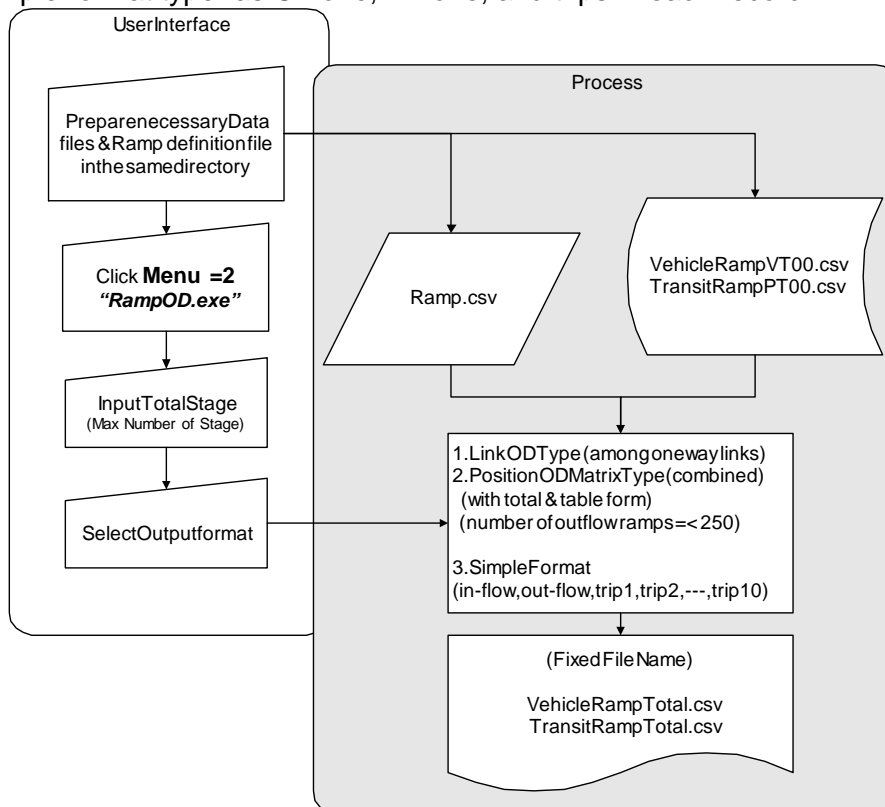
For this module it is necessary to put minimum path files, "Network.csv" and "Ramp.csv"(The name is not fixed in this processing) in the same directory. Although you can define a new "Ramp.csv", you should take care not to overwrite because the names of output files are the same by traffic assignment.

4.12.2. Making Ramp OD Table

Before this module, you need to prepare “Vehicle RampVT00.csv” and “Transit RampPT00.csv” which are made by “TrafficAssignment.exe” or Menu=1 in “RampOD.exe”. If you had defined “Ramp.csv” before traffic assignment, necessary files are already in your directory. If there are no such kinds of files, you can make them by Menu=1 by the above module.

Menu=2 in “RampOD.exe” makes two total tables of ramp ODs which are outputted at each stage. The names of output files are fixed. The format of output can be selected from Matrix type and Simple format type. Ramps which have no trips are omitted from outputs. If you want to make a total of some special stages, unnecessary files should be moved to another directory before processing because this program picks up all “Vehicle RampVT00.csv” and “Transit RampPT00.csv” in the same directory.

In case of matrix OD type the zone size is limited within 250 zones because it is the limit of width of EXCEL. If you want to make larger OD file, you must select “Simple-format type” as O-zone, D-zone, and trips in each record.



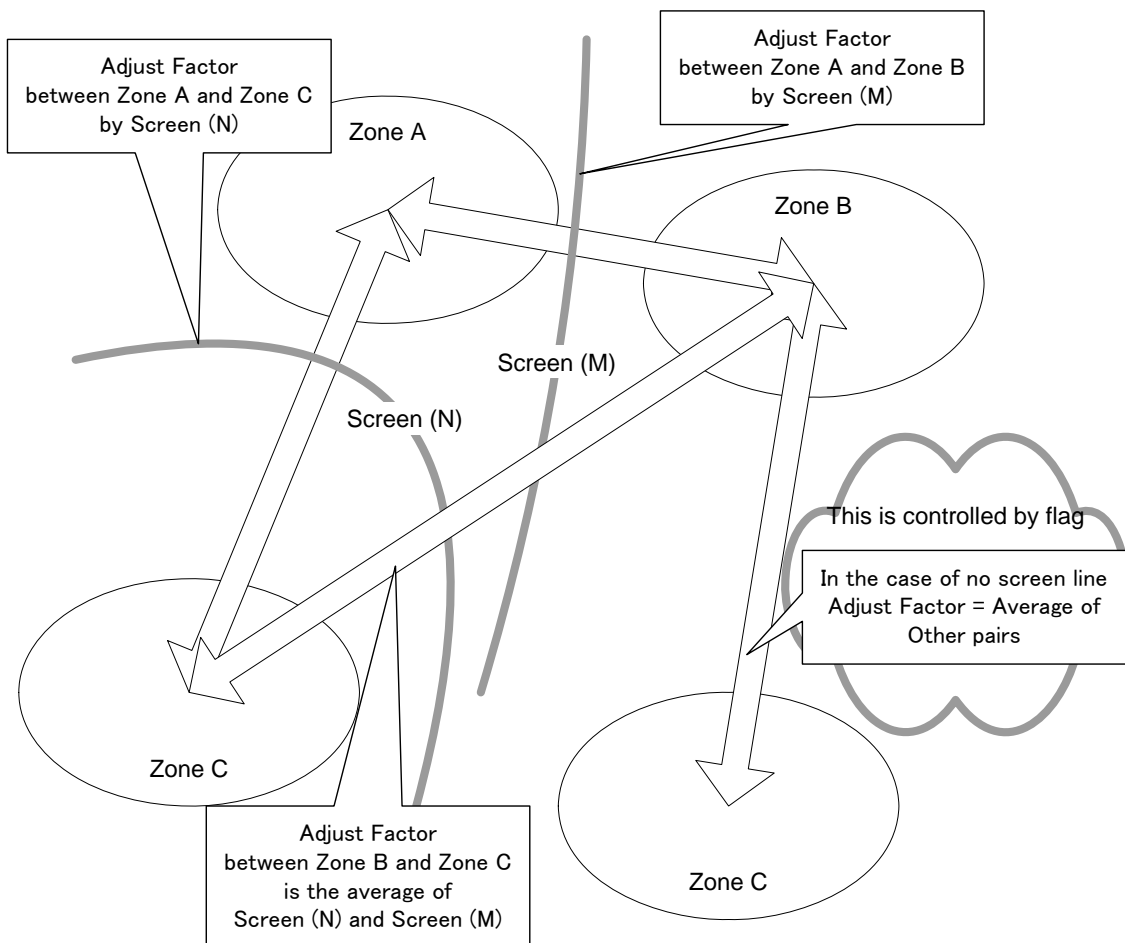
4.13.OD Calibration

4.13.1.Condition to Calibrate

In order to calibrate OD tables by the comparison between the traffic counts of surveys and the results of simulation, the categories of the simulation have to correspond with surveys. In this traffic assignment program the categories are divided to 10 types for vehicle and 10 modes for transit modes So 10 vehicle type OD tables, 10 mode OD tables, or one total PT OD table can be calibrated by the output of “Vehicle ScreenVT00.csv” or “Transit ScreenPT00.csv”. The other type OD tables can not be calibrated from these data. For example it is impossible to calibrate two OD tables which belong to the same category.

4.13.2.How to Calibrate

The methodology to calibrate is shown as the following figure.



4.13.3.Necessary Input Files for Calibration

Before processing it is necessary to prepare the following code definition file. The format of this file is fixed. It must not include any header records or blank records. The name of the file is arbitrary.

Type Code or Mode Code	Flag (*)	File name of OD table to calibrate
column 1-2	column 3-3	column 4-43
In case of Vehicle Trips		
1	1	Motorcycle.csv
2	1	Passenger Car.csv
3	0	Truck.csv
NOTICE: <i>Can not process Vehicle & Transit at the same time.</i>		
In case of Transit Trips (OD tables by Mode)		
1	1	PT by small bus.csv
2	0	PT by medium bus.csv
3	1	PT by large bus.csv
*) One code must correspond to Only one OD table.		
*) Each code should correspond to the code in the assignment.		

(*) Flag: In the case that this flag is on “1” trips which do not cut any screen lines are expanded by the average expansion ratio. But it might be over-estimated. In the case of flag “0” those trips are not expanded. So it is recommended that this flag is off “0” if there are many screen lines. This flag can be set individually for each vehicle type or transit mode.

In case that one total PT OD table is calibrated, the code definition file is not necessary because you can input the file name from keyboard at the processing and select the flag.

Traffic counts data that is the base to calibrate is of course necessary. The format of this file is comma separated format. For the calibration of vehicle

types and PT modes, corresponding fields must be filled in the same sequence as the traffic assignment.

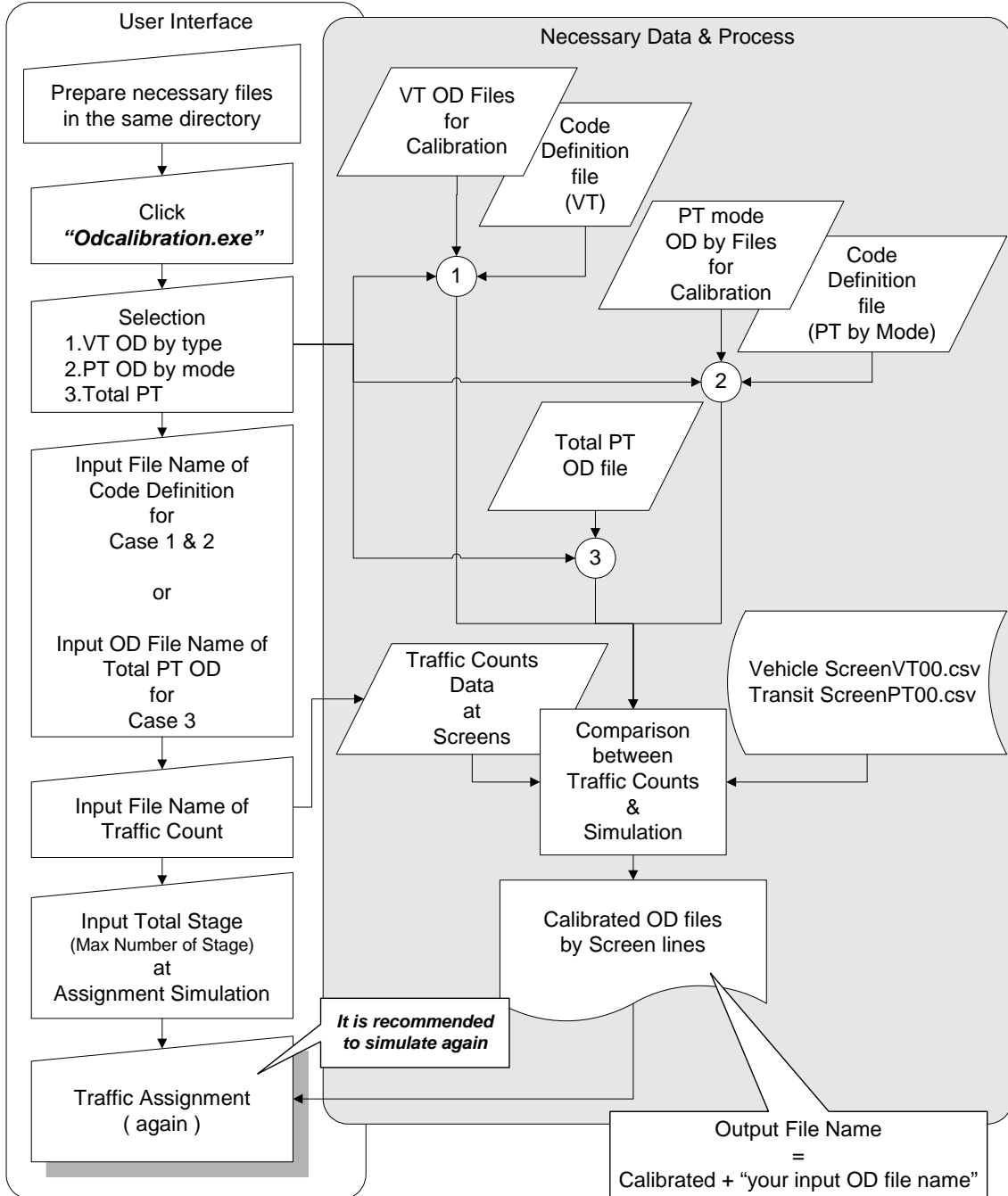
You can select screen lines in this file for calibration. If you don't want to use some screen lines, those traffic counts data must not be included. But this selection can not be set individually for each vehicle type or transit mode. So if you want to change screen lines individually for each vehicle type, you should process **one by one after renaming** the calibrated results.

Screen No.	Trips VT Type1 PT Mode1	Trips VT Type1 PT Mode1	Trips VT Type1 PT Mode1		Trips VT Type9 PT Mode9	Trips VT Type10 PT Mode10
1,	3230,	6341,	0,		0,	0,
3,	12400,	24674,	1864,		0,	0,
5,	8700,	7653,	3240,		0,	0,
*) Comma separated format *) Fill all necessary columns. In the case that there is an unnecessary column between your data columns, please fill 0 (zero). *) For one table of all PT (case 3), fill the screen number & the first field (= the first column).						

Traffic counts data, screen traffics by assignment and the coefficient to calibrate are outputted to the file "**LogScreen.csv**". If there are many differences between the traffic counts and the result of simulation, you had better check input data or select screen lines.

4.13.4. User Interface of this module

It is recommended to assign again after calibration in order to check the traffic volume at screen lines.



5. OMAKE

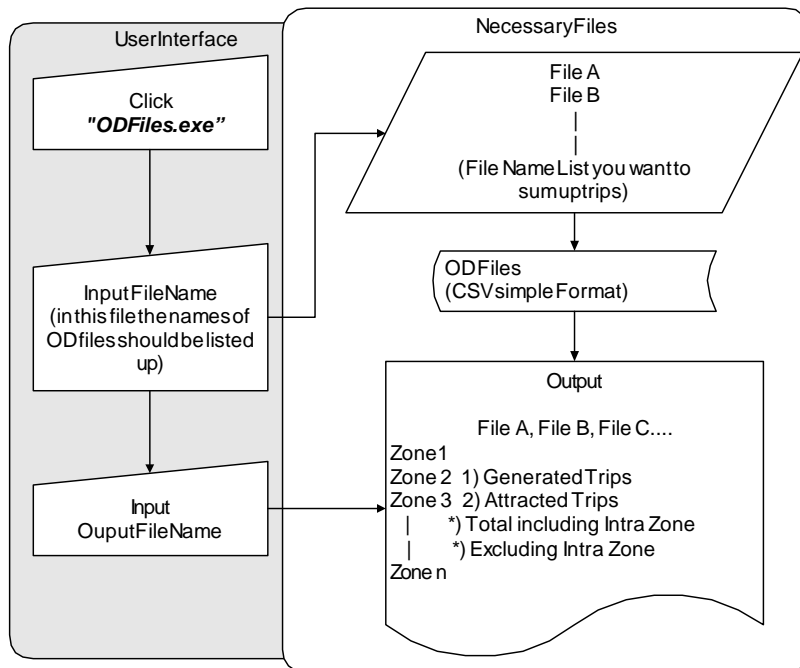
5.1. OD File Processing

Menu of ODFiles.exe

1. Sum up trip total by Zone of OD Files
2. Convert from PT to VT or from VT to PT
3. Make Combined Matrix (New Zones =<250)

“ODFiles.exe” sums up trips by zone from OD files formatted by CSV simple format (i zone, j zone, trips) or TRANPLAN simple fixed format. You can sum up 40 OD files at the same time. Maximum zone number is 400.

This module can also convert trips between PT OD and VT OD as the above format. You need a file list which has a fixed format (0-5column Average Passengers, 6-25column Input OD File Name, 26-45column Output OD File Name). And combined OD matrixes can be made by this module from file name list and zone conversion CSV file (origin zone, combined zone).



5.2.Potential of Zone

This module calculates potential of Zone (j) by the following formula.

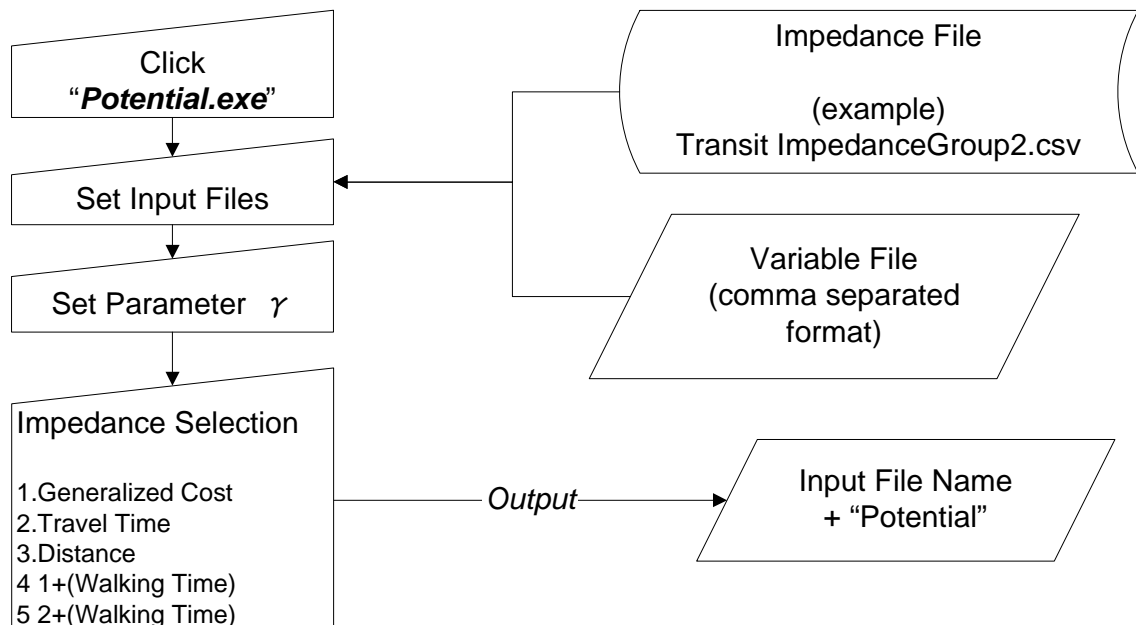
$$Potential_{Zone(i)} = \sum_j \frac{Variable_{Zone(j)}}{impedance_{ij}^\gamma}$$

Input & Output file (comma separated format)

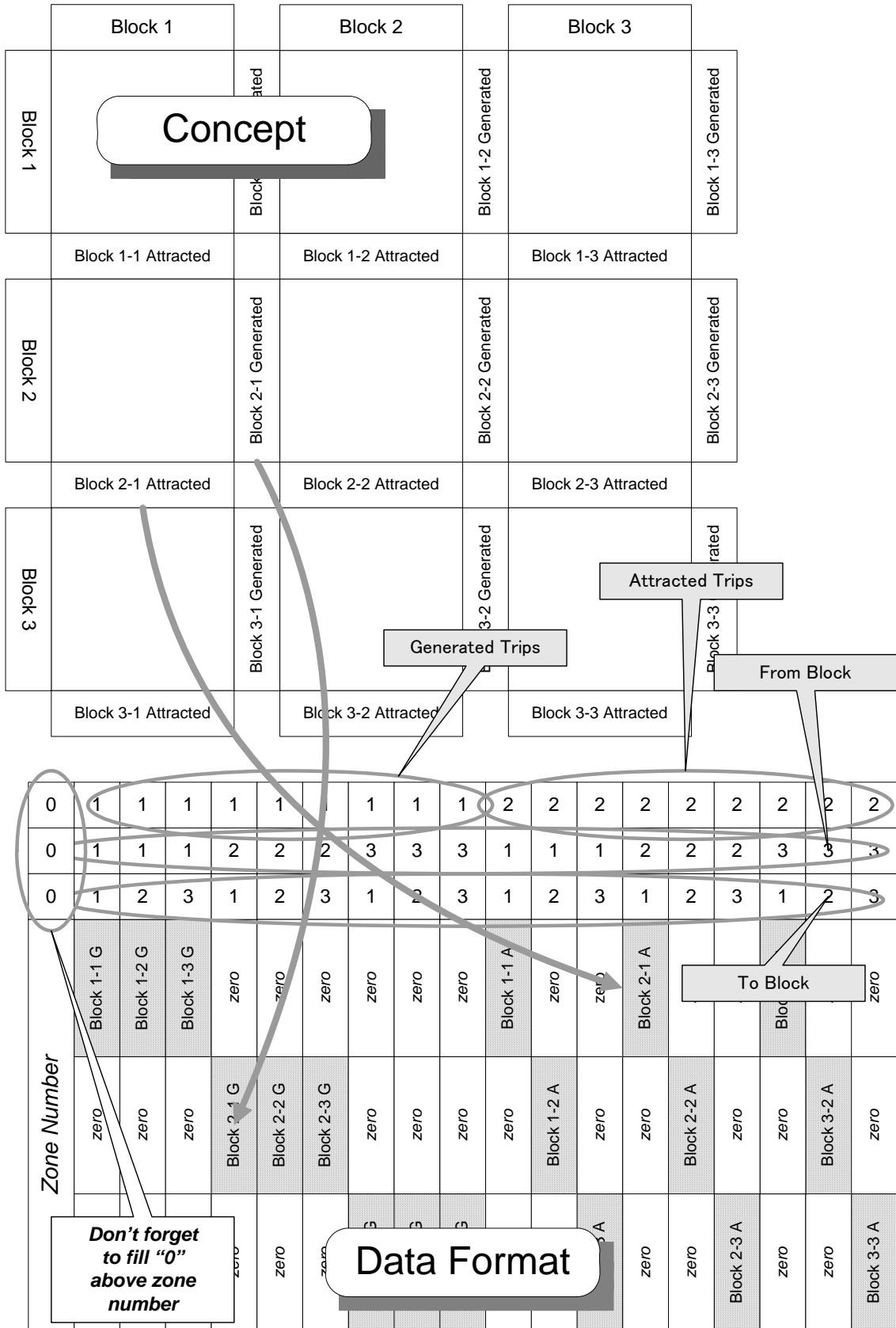
1,	532,	*) Results of calculation are added on right side.
2,	642,	
3,	284,	
Zone Seq. No.	Characteristic Variable	Potential

Number of zones is set by “Zone Seq. No” field in the first column. So you should input all zone data.

The unit of impedance (generalized cost) is minutes. The output unit is (variable unit)/(minutes). Input file should not include any header records, blank records or records which have characters.



5.3. Block Fratar Calculation



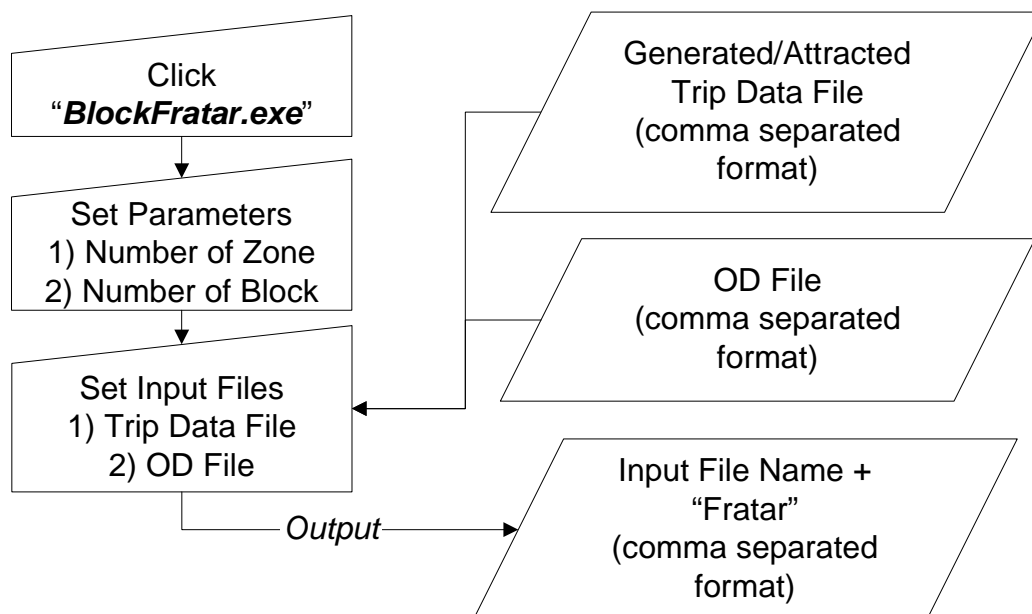
This module makes a FRATAR calculation to OD table which is divided by blocks. Because each block is converged by the method one by one, it is necessary to prepare generated trips and attracted trips classified by block.

However It is **not necessary to arrange zones** (rows) in order of block sequence or zone sequence because the block to which each zone belongs is decided by whether trip data exists or not. It is also **not necessary to place the columns as the figure's sequence** because this module interprets the position of blocks by the first three records.

The Format of this data file and OD table is a comma separated format which must not include any character records and blank records.

Data Format of ordinary 1 Block type

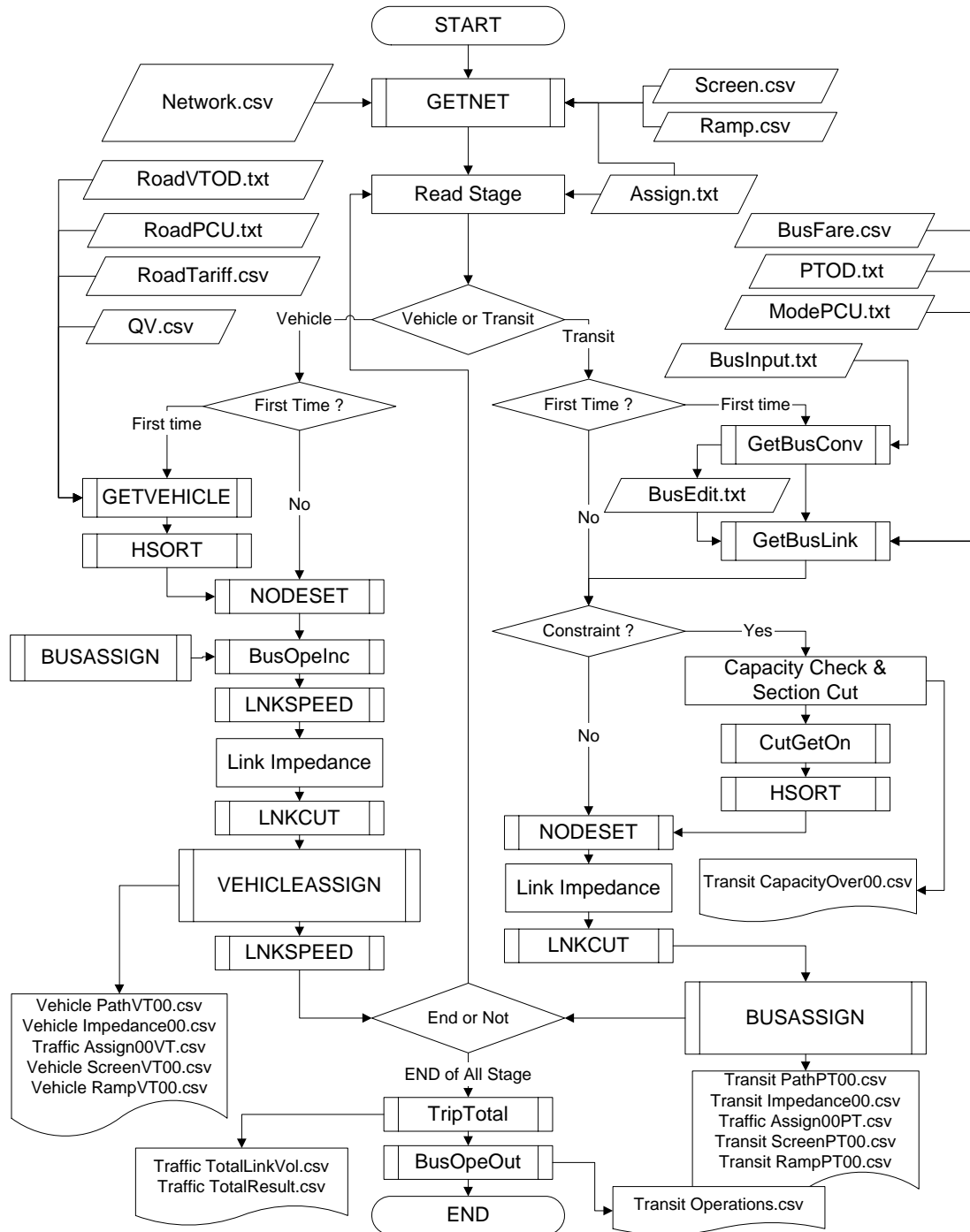
0,	1,	2,	Generated = 1, Attracted = 2
0,	1,	1,	From Block
0,	1,	1,	To Block
1,	3421,	3500,	
3,	23075,	22985,	
2,	53200,	53195,	
Zone	Trips	Trips	



6. Appendix Information only for programmer

*) Programs are written in Compaq Visual Fortran Ver6.6. Please refer to source files.

6.1. Flow Chart of Traffic Assignment Program



6.2.Variables

Parameters

- LKSIZE = Link Size (including roads, bus routes and dummy)
- NDSIZE = Node Size (including roads, bus stop and cenroid)
- NZSIZE = Zone Size of OD table
- LRSIZE = Link Size (only Road Network)
- LBSIZE = Number of Bus Routes (one way)
- NDRTBS = Number of nodes on one Bus Route
- NSCRID = Number of Screen Lines
- NSCR SZ = Number of OD pairs (links) on Screen Lines
- NRMP SZ = Number of Ramp Links
- TURN SZ = Number of Prohibited Node Connections

Road Network Table

LROAD(I,J)

Number = LR	J=1	J=2	J=3	J=4	J=5
	Node	Node	Link Character	Evaluation Group	QV type

J=6	J=7	J=8	J=9	J=10	J=11
Tariff Type	Distance (m)	Speed (km/h)	Total PCU on link	Screen No.	Ramp Position

Link Cut Table

NOTURN(TURNSZ,4)

Number = KSTURN	J=1	J=2	J=3	J=4
	Node	← Node	← Node	← Node
	*) Last Node	*) Flag Set		

- *) Input File ; Normal Sequence
- *) On memory ; Reverse Node Sequence
- *) J=2 Node has a On-flag in a table NODES(I,5)
- *) For transit assignment this table defines capacity over links.

QV Table

QV(99,5)

J=1	J=2	J=3	J=4	J=5
V1 (km/h)	V2 (km/h)	V3 (km/h)	Q1 (PCU)	Q2 (PCU)

Tariff Table

TARIFF(99,2)

J=1	J=2
Flat Tariff	Distance Tariff

Assigned Vehicle/Person Trips on Road Network

WORK(LR,10,3)

	J=1	J=2	J=3		J=10
K=1	VT of Type (1) or PT of Mode (1)	VT of Type (2) or PT of Mode (2)	VT of Type (3) or PT of Mode (3)		VT of Type (10) or PT of Mode (10)
K=2	(PT/VT)*Km	(PT/VT)*Km	(PT/VT)*Km		(PT/VT)*Km
K=3	(PT/VT)*Hour	(PT/VT)*Hour	(PT/VT)*Hour		(PT/VT)*Hour

Bus Route Temporary Input Table

NWORK(I,J)

J=1	J=2	J=3
Node	Node	Speed (km/h)

Max node connections = NDRTBS

*) Node Code<0 means Non-stop station for express bus

Centroid

NCENT(I,J)

J=1	J=2
Centroid Node	Position of Centroid
	*) Pointer to NODES (NPATH)

Link Table for Minimum Route Search

NTABL(I,J) / NRTABL(I,J)

J=1	J=2	J=3	J=4	J=5
Link Position	Origin Node	Destination Node	Distance (Impedance) unit:0.01min.	Destination Node Position
*) Pointer to LROAD	*) should be sorted by this field		*) Integer (Include all resistance for search)	*) Pointer to NODES (NPATH)

J=6	J=7	J=8
Travel Time (Impedance)	Mode	Accumulated Person Trips
*) Integer (boarding time & waiting time)	*) Mainly for Transit Case *) Rail = 99 for Road	*) For capacity constraint

Node Table fro Minimum Route Search

NODES(I,J)

J=1	J=2	J=3	J=4	J=5
Node	Starting Position in sorted NTABL	End Position in sorted NTABL	Position "I" of the Centroid Zone(i)	Prohibited Node Connection Flag
should be sorted by ascending sequence	*) Pointer to NTABL	*) Pointer to NTABL	*)Most data=0	Previous Node of the Last Node or Not

Result Path Table on Minimum Route

NPATH(I,J)

J=1	J=2	J=3	J=4	J=5
Node	Previous Node	Distance (Impedance)	Data Position of NTABL	Previous Node Position
			*) Pointer to NTABL	*) Pointer to NODES (NPATH)

Bus (or Railway) Route Data

Mode of Route MDBUS(LBSIZE)	Frequency (Headway) FRQBUS(LBSIZE)	Fare of Route BUSFARE(LBSIZE,2)	
J=1	J=1	J=1	J=2
Mode	Frequency	Flat Fare (Get-On)	Dist Fare (/km)

Type of Node Connections

Road or Railway	0	Road Node(KK2)	→→→	0	Road Node(KK4)
Bus	Bus Route (KK1)	Node (KK2)	→→→	Bus Route (KK1)	Node (KK4)
Direct Transfer	Bus Route (KK1)	Node (KK2)	→→→	Different Bus Route (KK3)	Same Node (KK2)
Get-Off	Bus Route (KK1)	Node (KK2)	→→→	0	Road Node(KK2)
Get-On	0	Road Node(KK2)	→→→	Bus Route (KK3)	Road Node(KK2)
Access Link	0	Road Node(KK2)	→→→	0	Road Node(KK4)