Model Task Force

Modeling Mixed-Flow Transit Travel Times in FSUTMS Voyager

presented to

MTF Transit Committee

presented by

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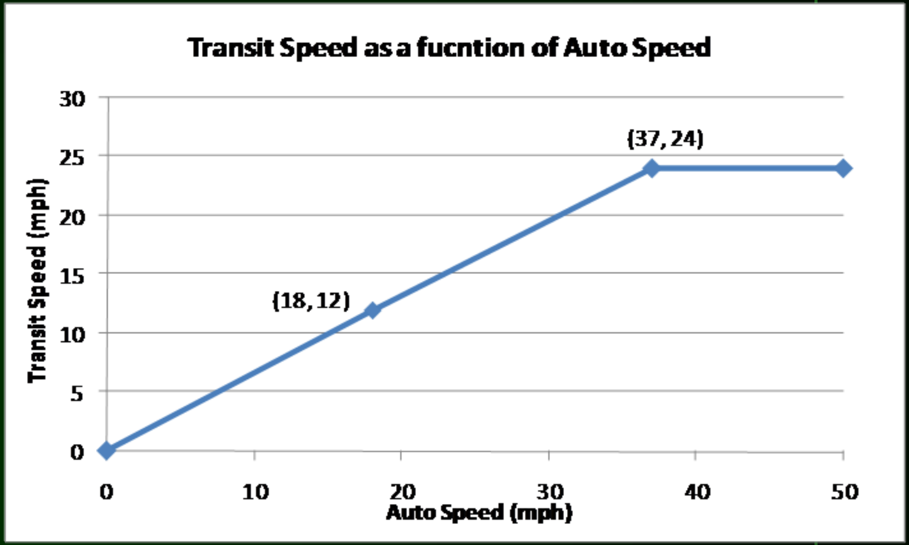
Transit Travel Time

- **Why is transit travel time important?**
  - **Used to calculate the transit impedances in mode choice**
  - **In Small/New Starts evaluation, almost all of the user benefits come from transit travel time savings**
- **Mixed-flow transit travel time is a function of:**
  - **Auto travel time**
  - **Acceleration/deceleration of the transit vehicle**
  - **Number of stops/stations**
  - **On/off activities at stop/station**
  - **Other elements**

Review of the Existing Practice

- **Used by most FSUTMS models**
- **Transit speeds are a piecewise linear function of the auto speeds based on:**
  - **Facility type**
  - **Area type**
  - **Transit mode**
- **Different “curves” used for various combinations of FT, AT and mode**



Shortcomings

- Extremely challenging and time consuming to calibrate route travel times; near-omniscience required
  - Assessment of each route's travel time estimation
  - Knowledge of facility/area type combinations commonly used by each route
  - Detailed understanding of curves as currently defined
  - General sense of curve adjustment impacts
- Extremely challenging to collect observed data
- Recent transit speed/delay survey indicated that the transit speed is a linear function of auto speed *
- The curves are insensitive to transit demand

*Transit Speed and Delay Report (April 2006) prepared by Kittelson & Associates for FDOT, PTO

A New Approach

- $Time_{transit} = Time_{auto} + Factor_{group} * NumStops$
- $Factor_{group}$ reflects all types of dwell and delay time incurred by transit vehicle
  - Can vary by mode, agency, geography, etc.
  - Calibrated separately for peak and off-peak periods
  - Incorporated in PT line file using "DWELL_C" sub-keyword
- Individual routes can be precisely calibrated using the TIMEFAC sub-keyword
- This approach has been implemented CFRPMv5, and a similar approach is being implemented in WCFRTM

DWELL_C

- NODES sub-keyword, so it is placed inside the node strings for each route
- Use: "`DWELL_C = 0.50`"
- For each stop, PT adds the user-specified time (in minutes) to the total travel time of the route
- DWELL_C does not vary by time period (unlike HEADWAY), so procedures are needed to avoid coding multiple transit line files

CFRPMv5 Implementation

- Create a DBF file with group code, peak and off-peak DWELL_C values
- Assign a group code to each route using USERN5
- Scripted procedures remove USERN5 keyword and insert period-specific DWELL_C value in node string (runs 2x)

NUMBER	PKDWELL	OPDWELL
1	0.6	0.6
2	0.45	0.5
3	0.55	0.75
4	0.55	0.6
5	0.45	0.45
6	0.35	0.35
7	0.35	0.4
8	0.4	0.5
9	0.2	0.5
		0

Input Transit Line File

```
LINE NAME="LY3 LK MT IB", MODE=21, OPERATOR=1, USERN5=2, ONEWAY=T,
     HEADWAY[1]=60, HEADWAY[3]=0, HEADWAY[2]=60,
     LONGNAME="LYNX-3 LAKE MARGARET INBOUND", N=16582, 16657, 16729,
     16706, 16650, 16625, 16598, 16572, 16535, 16517, 16504, 16555,
     ..............................
     17012, 17024, 17043, 17059, 17083, 17112, 17131, 17163, 17218,
     17236, 17264, 17259, 17252, 17239, 17232, 17217, 17263, 17270
```

Updated Transit Line File

```
LINE NAME="LY3 LK MT IB", MODE=21, OPERATOR=1,  ONEWAY=T,
     HEADWAY[1]=60, HEADWAY[3]=0, HEADWAY[2]=60,
     LONGNAME="LYNX-3 LAKE MARGARET INBOUND", N=16582,DWELL_C=0.45, N= 16657, 16729,
     16706, 16650, 16625, 16598, 16572, 16535, 16517, 16504, 16555,
     ..............................
     17012, 17024, 17043, 17059, 17083, 17112, 17131, 17163, 17218,
     17236, 17264, 17259, 17252, 17239, 17232, 17217, 17263, 17270
```

CFRPMv5 Calibration Process

- Gather observed transit travel times by route by using public time tables, driver run sheets or other sources
- Use 0.50 as initial DWELL_C values for both peak/off-peak periods for all groups
- Run a single PT script to get the estimated travel times
- Compare observed and estimated travel times by group
  - Investigate major differences
  - Solution may be to create new (collapse) groups or vary DWELL_C value
- Make adjustments & iterate until reasonable estimates of travel times are achieved

Example: Peak DWELL_C Values in CFRPMv5

Group Code	Agency	Grouping	Initial DWELL_C	Final DWELL_C
1	LYNX	Northeast	0.5	0.6
2		Southeast	0.5	0.45
3		Southwest	0.5	0.55
4		Northwest	0.5	0.55
6	VOTRAN	Votran	0.5	0.35
7	SCAT	Titusville	0.5	0.35
8		Melbourne	0.5	0.4
9	SunTran	SunTran	0.5	0.2

Example: CFRPMv5 Peak Calibration Results

		%RMSE	
Agency	**Group**	**CFRPM v4.5 (Existing Method)**	**CFRPM v5.0 (New Method)**
LYNX	Northeast	7%	8%
	Southeast	7%	9%
	Southwest	9%	14%
	Northwest	11%	7%
VOTRAN	Votran	8%	8%
SCAT	Titusville	4%	3%
	Melbourne	7%	6%
SunTran	SunTran	3%	6%

Findings & Lessons Learned

- Straightforward calibration process; easy to put together a semi-automated calibration routine
- More realistic and consistent coding of stops needed
- Group codes should be defined broadly so that planned routes can use a value from the existing groups
- The ability to precisely reflect travel times on individual routes is very helpful for detailed transit studies
- Still doesn’t fully account for impacts from demand