Multi-Point and Multi-Class User Equilibrium Assignment

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Multi-Point Assignment (MPA)

• Standard User Equilibrium (UE) Assignment
  – Using shortest time path between zone centroids
  – Weak control on trip local loading directions

• MPA
  – Strong control on trip local loading directions
  – Not a method to assign trips from origins to destinations
  – Used together with UE or other assignment methods
Standard User Equilibrium (UE)
Assignment - Example

NC Model User Group Meeting - April 2011
Multi-Point Assignment (MPA) - Example

Zone Centroid - Origin
Zone Centroid - Destination
Access Point
Centroid Connector
Multi-Point Assignment (MPA) and Loading Strategy

• Fixed Rate Strategy, Robert Shull 1999 (implemented in TModel2)
• Mixed Strategy 1
  – Some centroid connectors got fixed loading rates
  – Other centroid connectors got the variable rates determined by UE assignment
• Mixed Strategy 2
  – Part of Origin-Destination (O-D) trips follows the fixed rate strategy
  – Other O-D trips follows the UE assignment rules
Fixed Rate Strategy for Loading/Receiving

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Mixed Strategy 1 - Example

- 40% O-D Trips Loaded onto West Ave
- 60% O-D Trips follow UE assignment to other 3 directions, i.e. \( r_1 + r_2 + r_3 = 60\% \)
Mixed Strategy 2 - Example

- 60% O-Ds follows the fixed rates
- 40% O-Ds follows the UE assignment rule, $r1 + r1 + 3 + r4 = 40\%$
What MPA can be used for

• Large Special Zone, e.g. Airport, University Campus, Shopping mall, ...
  – with large amount employment
  – with multiple loading directions
  – with socio-economic data that cannot be split into smaller zones
• Zone with Off–Site Loading, e.g. Office with off-site parking garage
• Zones with multiple vehicle class loading and different loading directions for each vehicle class
• Special Event Model, Stadium, Theater, ...
Example – Special Zone-RDU Airport

TRM v4 2005
PM Peak Period
(3:30-7:30)
Example – Zone with Off-Site Loading
MPA Tool

- Coded in GISDK for use in TransCAD
MPA Application

- Kansas City Metro Area, including the Kansas City Model, 2005-2006
- Special Event Traffic Study for the New Stadium, Scottsdale, AZ, 2009
MPA Application

• 2005 PM Peak Hour, Kansas City North Shopping Mall
MPA Test in TRM
MPA Test in TRM
Suggestions

• System-wide use of MPA in the regional travel demand – NOT Suggest at this time
• Use of MPA for a limited number of key zones in the regional model – Strongly Suggest
• Use of MPA for corridor or small area studies – Strongly Recommend
• Use of MPA for obtaining better assignment results – No comment