Transport Organization Mode Based on Passenger Demand for high-speed railway in China

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Operation 3 - Capacity
Outlines

- Overview of High-speed railway development in China
- Huge Passenger demand for high-speed railway in China
- Passenger demand Characteristics for high-speed railway in China
- Transport selection between direct arrival and transfer
- Transport organization modes

Cases study
Overview of High-speed railway development in China

Till Dec 2012
- In operation, ~9,700km
- Under construction, ~11,400km

Overview: China's high-speed railway network has expanded significantly. By the end of 2012, the network included approximately 9,700 kilometers of operational lines and around 11,400 kilometers under construction.
Huge Passenger demand for high-speed railway in China

- **Beijing, the city of the largest passenger demand for railway**
  - Entry-exit passengers per day: ~600000

- **Shanghai, Guangzhou, Shenyang, Tianjin, Wuhan, Xi’an and Chengdu etc. are the second largest demand cities**
  - Entry-exit passengers per day per city: exceed 200000

- **High-speed railway accounts for 30% railway market**
  - Until May 2012, 1500 EMU trains per day and 13400000 passengers
  - Beijing-Shanghai high-speed train line: 180000 passengers per day, and even 300000 at peak day.
  - Wuhan-Guangzhou high-speed train line, 100000 passengers per day, and 180000 at peak day.
Passenger demand Characteristics for high-speed railway in China

- In general, larger demand for long distance travel passenger than short distance travel passenger.
- The passenger volume fluctuates during seasons and holidays.
- In rush hour, short distance passengers affect transportation more than long distance ones do.
- Passenger not willing to transfer. However, cross-line passenger flow is very big and part of the inner-line passengers are transferred by cross-line trains.
- After new line starts operations, one or two years period is needed for passenger cultivations.

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Transport Selection between direct arrival and transfer(1)

- Selection principle: Try to reach directly, and choose to transfer reasonably.

- Direct arrival trains between cities are mainly for:
  - Huge amount of passengers between cities.
  - From main cities to important transferring stations.
  - Cost.
  - Station inconvenience:
    a. The majority of new stations are far from downtown.
    b. Steamline design.
    c. Large luggages.
Transport Selection between direct arrival and transfer(2)

- Supporting facilities and commute services in stations are provided for passive transfer passengers and initiated transfer passengers
  - better transfer condition for passengers and improve transfer reliability to keep passengers taking train
  (a) Train continuation
  (b) Ticket service
  (c) Station service: Waiting service being humanized, Transfer process being facilitated, providing distribute bus for passengers
Transport Organization Modes-- Mixed running modes (1)

- **Different speeds:** High-speed lines are run by different speed EMU trains and common passenger trains.

- **Different distance:** Long-distance trains and short-distance trains operate on the same line,

- **Different kinds:** A lot of cross-line trains operate with inner-line trains.

<table>
<thead>
<tr>
<th>Line</th>
<th>Inner-line trains</th>
<th>Cross-line trains</th>
<th>Inner-line passengers</th>
<th>Cross-line passengers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beijing-Shanghai</td>
<td>60%</td>
<td>40%</td>
<td>56%</td>
<td>44%</td>
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<tr>
<td>Wuhan-guangzhou</td>
<td>70%</td>
<td>30%</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>Shijizhuang-taiyuan</td>
<td>10%</td>
<td>90%</td>
<td>3%</td>
<td>97%</td>
</tr>
<tr>
<td>Jinan-Qingdao</td>
<td>39%</td>
<td>61%</td>
<td>24%</td>
<td>76%</td>
</tr>
<tr>
<td>Shanghai-Hangzhou</td>
<td>40%</td>
<td>60%</td>
<td>31%</td>
<td>69%</td>
</tr>
</tbody>
</table>

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Transport Organization Modes-- Mixed running modes (2)

- Different train quantities: Daily, in holidays and on weekends
- Different stops: non-stop, stop in big cities, stop in every station
- Different service frequency:
  - take Beijing-Shanghai high-speed railway for an example
    - Highest: 66 trains for Nanjingnan - Shanghai hongqiao
    - Average: 8 trains between all the 24 stations
- Periodic and aperiodic: periodic in starting station and big stations
Cases study(1)--Main lines in 2012

- Beijing-Guangzhou high-speed line connected with Shitai, Zhengxi, Guangshen, and Huhanrong
- Beijing-Shanghai high-speed line connected with Jiaoji, Yongtaiwen, Ninghang, Hebeng, Huhang, and Huhanrong
- In the network, speed of Shitai, Jiaoji, Yongtaiwen, and Huhanrong are of 200-250km/h
Cases study(2)-- Train operation mode

- The high density trains operate from Beijing to Shanghai, from Beijing to Wuhan, and from Wuhan to Guangzhou.

- Two factors effect long distance trains,
  - Considering Beijing’s large-scale passenger flow, we can increase more trains between Beijing and Guangzhou, Beijing and Shenzhen, Beijing and Xi’an, Beijing and Changsha.
  - Considering population and economic characteristics of Shanghai and Guangzhou, we can increase the start points and terminal points between Shanghai and Chengdu, Guangzhou and Xi’an, Guangzhou and Taiyuan.

- For Wuhan station, the passengers from Jingguang high-speed to Huhanrong high-speed depend on transfer.
Thank you!