Implications of automation on parking

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Enhanced mobility
Enhanced safety
Enhanced economy
AVs legislation and policy

First ride in driverless car is a bit jerky, but still 'pretty cool'

Wielding Rocks and Knives, Arizonans Attack Self-Driving Cars
Speed up the integration of AVs
Conventional Car-parks

Street Access

Building
AV Car-parks

Street Access

Building
Optimal Parking Facility Design

1- Design Demand
2- Plot Dimensions

- Island
- Gap
- Clearance Road
Optimal Parking Facility Operation

16:00

14:00

18:00

17:00

15:00
Robot parking
Regular Vehicle Parking

Conventional Vehicle Driver

Autonomous Vehicle Driver

Home Work Parking

Work  Home  Parking
Parking options

- **Home**
  - \( C_h = 2x_h c_t \)

- **Car-park**
  - \( C_p = 2x_p c_t + r_p(t_p - 2x_p) \)

- **Cruise**
  - \( C_c = t_p c_t \)

- \( x \)  Travel time
- \( c \)  Travel cost
- \( r \)  Parking rate
- \( t \)  Activity time
Hypothetical city
Base case scenario with $r_p = 3\left[\frac{\$}{hr}\right]$ and $t_p = 12\left[\frac{\$}{hr}\right]$

Daily link traffic flow.

Daily spatial distribution of cruising.

Daily spatial distribution of Parking

Daily spatial distribution of home
Parking cost sensitivity analysis

Daily spatial distribution of Parking

[r_p=0] [r_p=0.5] [r_p=1] [r_p=2]

[r_p=3] [r_p=4] [r_p=5] [r_p=10]
Travel cost sensitivity analysis

Daily spatial distribution of Parking
Parking location analysis – Center

Daily spatial distribution of cruising

Daily spatial distribution of Parking
Parking location analysis – 4 corners

Daily spatial distribution of cruising

Daily spatial distribution of Parking
Key findings

19 pm traffic flow snapshot

<table>
<thead>
<tr>
<th></th>
<th>No policy</th>
<th>Same parking price</th>
<th>Zero-occupant toll</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum cruising time</td>
<td>18 min</td>
<td>30 min</td>
<td>15 min</td>
</tr>
<tr>
<td>Average travel time to car-parks</td>
<td>12 min</td>
<td>10 min</td>
<td>11.5 min</td>
</tr>
<tr>
<td>Maximum travel time to car-parks</td>
<td>47 min</td>
<td>50 min</td>
<td>43 min</td>
</tr>
<tr>
<td>Change in VKT</td>
<td>-</td>
<td>+1 %</td>
<td>- 3.5 %</td>
</tr>
</tbody>
</table>
Thank You!

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