



# Intelligent Transportation Systems

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# Lecturers

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# Intelligent transportation systems

- 13 lectures
  - No lecture on October 23 (National Holiday)
  - Invited speakers from industrial partners (in 2016 Waze, Inventure, AIMotive, BKK, NNG)
  - Presence is not mandatory, but advised
  - Slides on-line: <https://www.tmit.bme.hu/intelligent-transportation-systems-2017>
- 6 practical works
  - Homework for the signature
    - On Thursday – presenting the topics, forming the teams
      - 6 teams of 4 people each
    - Mid-term report
    - December 4 – oral presentation, written report
      - One report per team, highlighting the contribution of every member

# Tell us about yourself...

- Where do you come from?
- What specialization?
- What is your background? How much do you know about transportation systems? How much do you know about networking, communication?
- Programming skills? Hardware or software?
- Why did you choose this course, what are your expectations?
- Are you free on Tuesday, from 10 to 12? Are you free on Friday, from 10 to 12?





# Intelligent transportation systems



# Intelligent transportation systems

- Smart City
  - A place where people like to live, good quality of life
  - Low pollution, low energy consumption
  - Sustainability
- One of the basic components of a smart city is the intelligent transportation system
  - Too many people in traffic jams – stress, lost working hours
  - Too many people in cars – pollution, energy wastage
    - In Budapest each year + 20-30,000 cars on the roads, more than 3 million cars in total in Hungary
  - **Too many cars**
    - Cars stay parked, empty, for 22 hours per day in average
    - Occupy a parking lot, at home or at work
- **The use of personal cars is not sustainable on the long run**
  - Thanksgiving traffic in Los Angeles

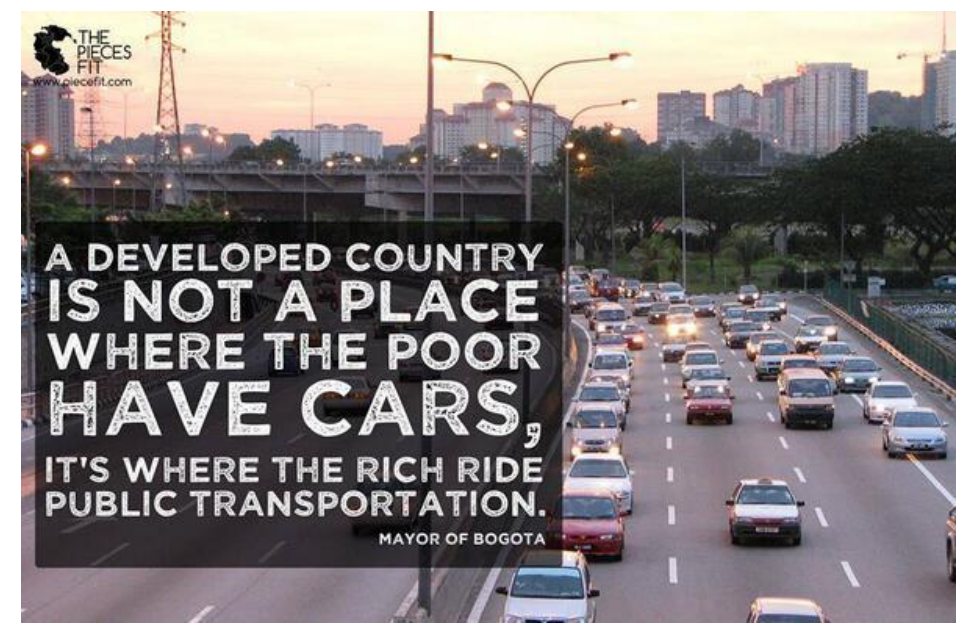


# Intelligent transportation systems

- Efficient public transportation
- Car sharing / Car pooling
- Connected car, C2C or V2V communication
- Intelligent road network, C2I or V2I communication
  - Today mostly static traffic signs, like 100 years ago



- Electric cars
- Self-driving cars



# Intelligent public transportation

- Improving the efficiency and quality of public transportation is very important
  - Bad example from the metro in Beijing (2013)
  - <https://www.youtube.com/watch?v=xG-meaGqg-M>
- If too many people and bad public transportation – **be aware of the motorcycles**
  - **Total chaos in transportation** – see South-East Asia
  - Crossroad in Saigon
  - <http://www.youtube.com/watch?v=gKLWZjBu2iQ>





# Advantages of public transportation

- **Much larger capacity**
  - 200 people – on 200 bikes, 1 tram, 3 buses or 177 cars
- **Reliability, predicatbility**
  - Real-time monitoring of vehicles (GPS), trajectory planning
  - Track-based solutions – underground, ground level or elevated





# BRT (Bus Rapid Transfer)

- Dedicated bus lane, possibly in the middle of the road (easy turning)
- Paying (by card) outside the vehicle, not at the driver – faster boarding
- Green lights at crossroads





# BRT (Bus Rapid Transfer)



Passing lanes at stations have increased the capacity of the system threefold

## TransMilenio, Bogota, Columbia

Walter Hook, Stephanie Lotshaw, and Annie Weinstock, More Development For Your Transit Dollar: An Analysis of 21 North American Transit Corridors,

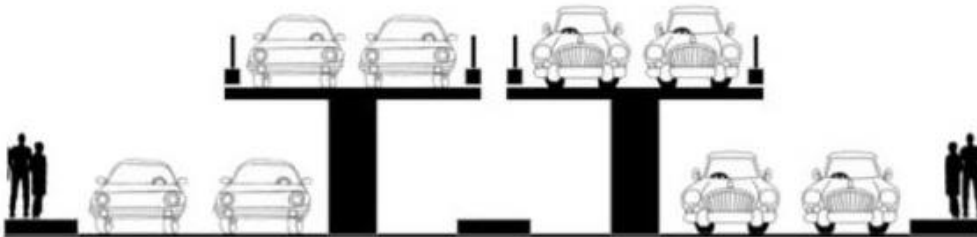
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# BRT (Bus Rapid Transfer)

3-lane carriageway



2 lanes + elevated road



Dedicated lanes for bus rapid transit



Capacity:



3,000 passengers per hour  
per direction



4,700

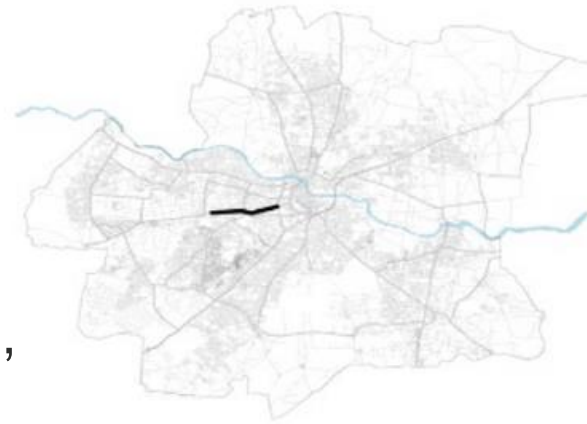


12,000 +

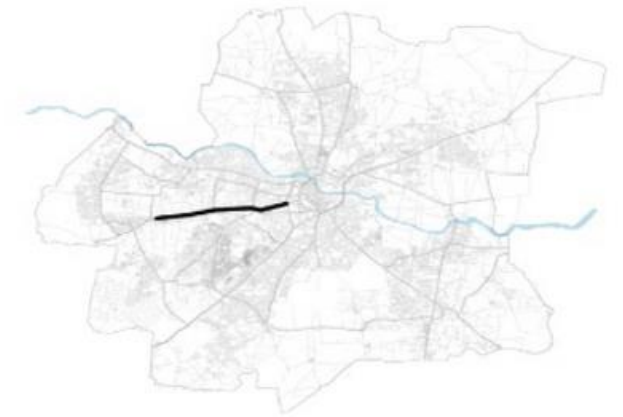


# How much does it cost?

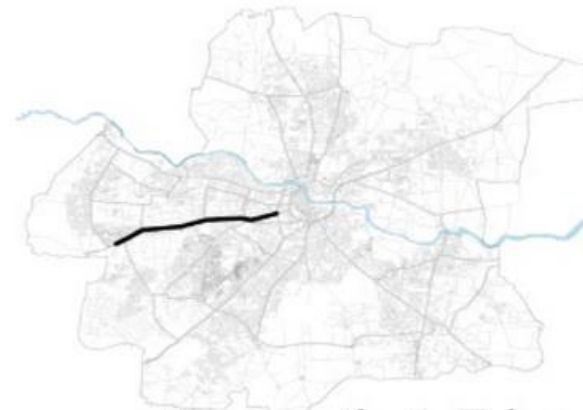
- The BRT is the cheapest solution, but cannot be applied everywhere
  - No space
  - Should not build the city for the cars, but for people
    - Building roads for buses is more acceptable than for cars
- **What could you build with 10 billion rupee (~ 156 million USD)?**



Underground metro: 2.5 km



Elevated metro: 5.0 km



Monorail: 6.7 km



BRT: 67 km

# Bringing down some roads

Seoul, South-Korea

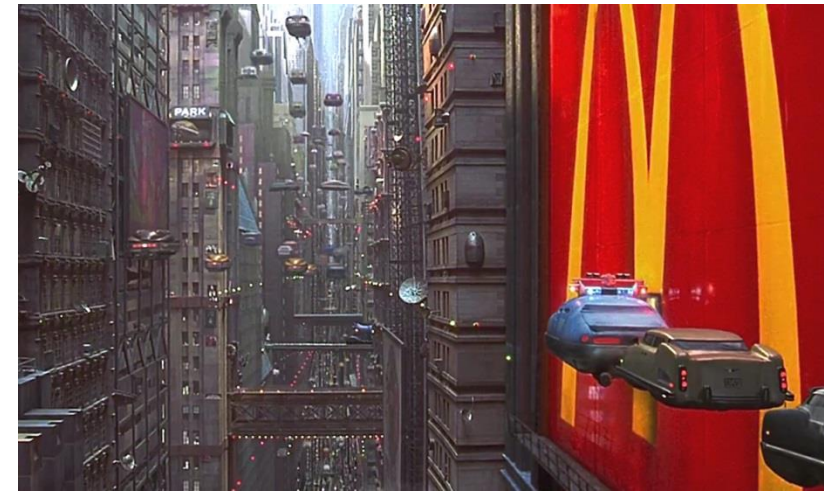
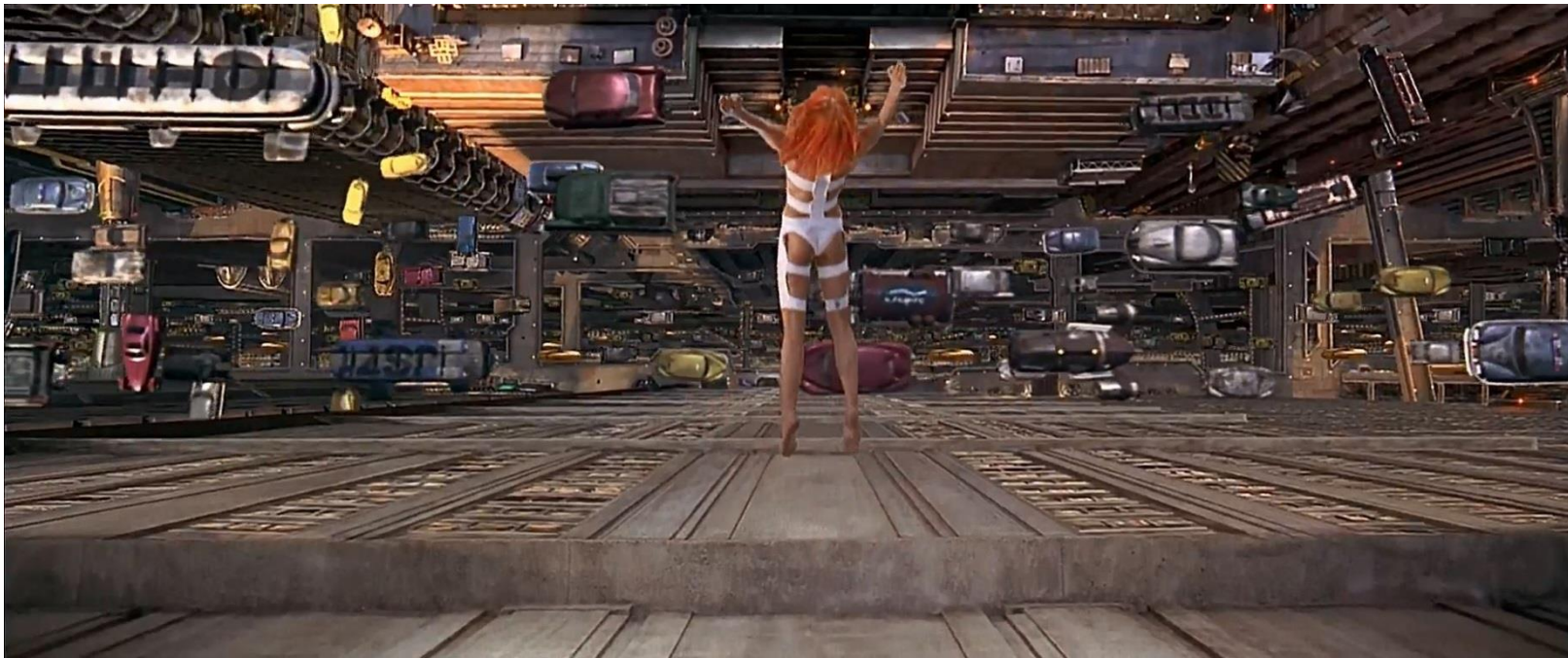


Portland, Oregon



# Futuristic ideas

- Remember Leeloo's jump scene, in the Fifth Element?



[https://www.youtube.com/watch?v=pK\\_sGCG-L\\_c](https://www.youtube.com/watch?v=pK_sGCG-L_c)



# Futuristic ideas

- Gyroscopic transportation, on multiple heights



<https://www.youtube.com/watch?v=1m5vWdeTIno>



# Futuristic ideas

Elon Musk (46 years)

- **PayPal** – online payment system
  - Bought by eBay in 2002 for \$1.5 billion
- **SpaceX** – private space tourism, private satellites
- **Tesla** – electric cars
- **Solar City** – 2nd largest solar power provider in the US
- **Hyperloop** – transportation at 1200 km/h, in reduced-pressure tubes



# Futuristic ideas

Elon Musk (46 years)

- **The Boring Company** (2016)
  - System of underground tunnels for rapid transportation
  - Digging started in LA in the summer of 2017

<https://www.youtube.com/watch?v=ul3oJqMBpPs>

