

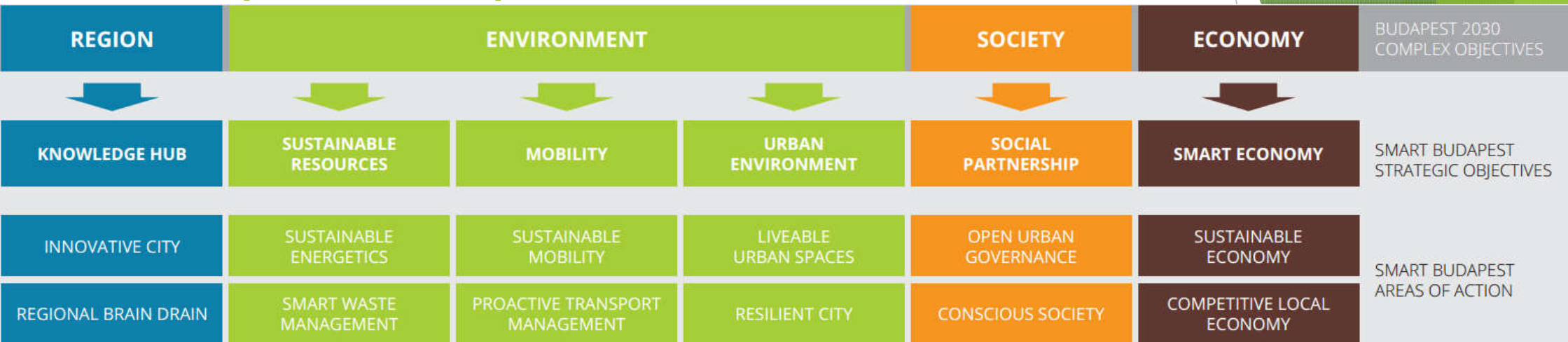
**SmartLab**  
Intelligent Interactions



# Smart City

Speech Technology and Smart Interactions Laboratory

# Example: Budapest



The aims of the vision's strategic areas:

- Budapest shall become a centre of international innovation thus a target for knowledge transfer;
- Budapest shall protect its environment by the sustainable utilization of resources and waste generated;
- Budapest shall establish a sustainable mobility system enhancing the liveability of the city;
- Budapest shall become capable of responding to the environmental and technologic changes of the 21th century;
- people in Budapest shall live in an open and cooperative society;
- Budapest shall continue to progress based on the development of sustainable and local economy.

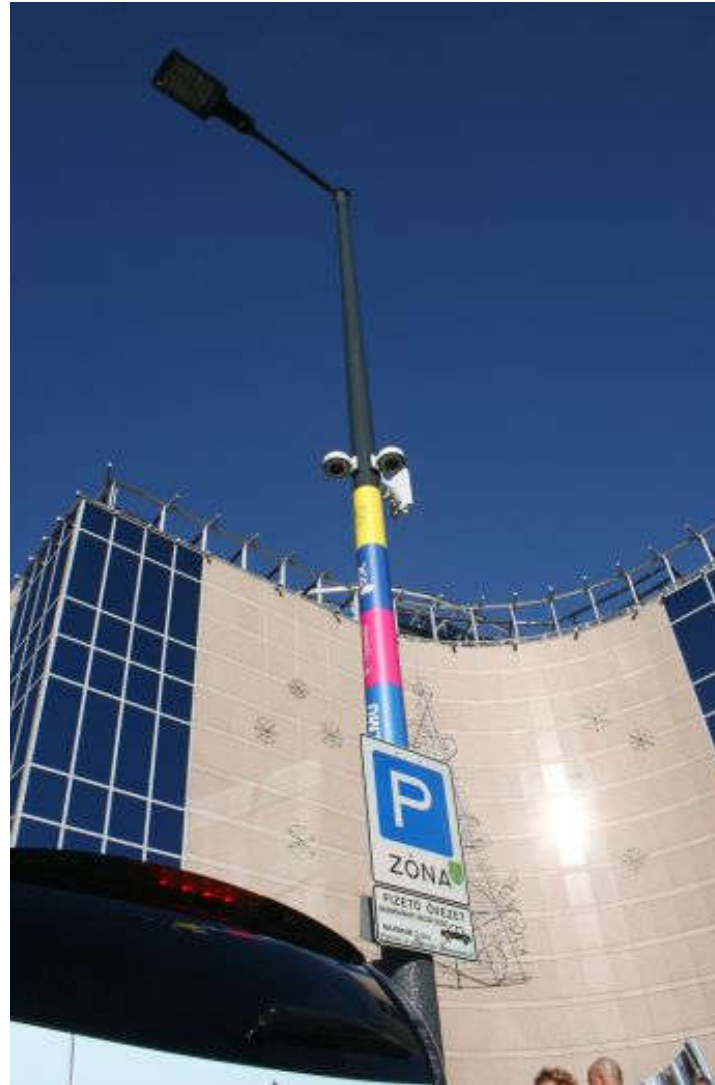
# Various application areas (Budapest examples)

- ▶ CNG fleet at the public space operator
- ▶ LED traffic lights
- ▶ Thermal weater heating in the Zoo
- ▶ Selective waste collection
- ▶ Pedestrian- and biker-friendly developments
- ▶ Accessible public transport
- ▶ Electric car charging station
- ▶ Lively public spaces
- ▶ Community spaces, e.g: Szilas-patak



# Smart Pole

- ▶ Lights (LED)
- ▶ WiFi
- ▶ Security camera
- ▶ Electric car charging station



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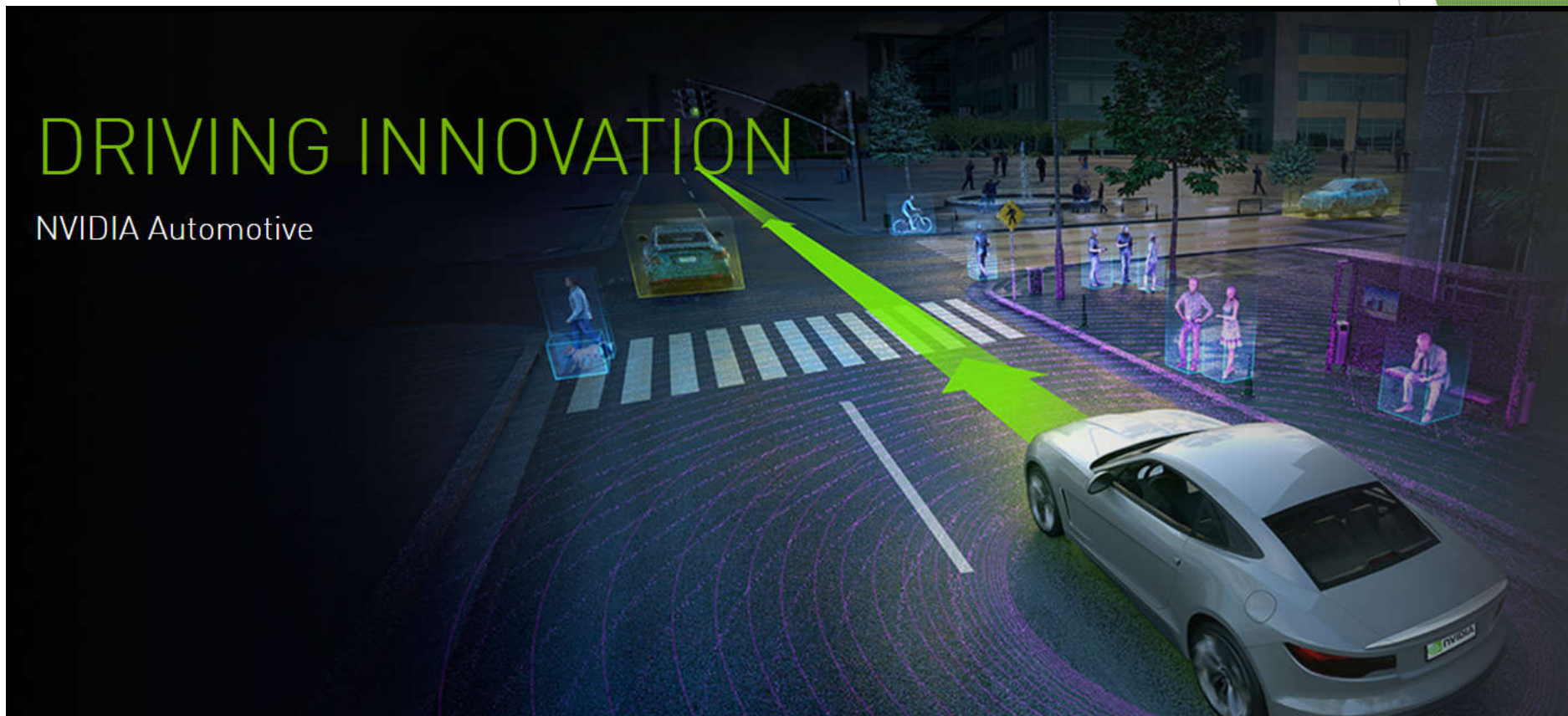
Forrás: [https://mno.hu/data/cikkek/1313/13136/cikk-1313678/D\\_MAR2015112003\\_focuspoint\\_926x504.jpg](https://mno.hu/data/cikkek/1313/13136/cikk-1313678/D_MAR2015112003_focuspoint_926x504.jpg)  
[http://galeria.vezess.hu/files/135/086/000/86135/86135\\_715252\\_784x523.jpg](http://galeria.vezess.hu/files/135/086/000/86135/86135_715252_784x523.jpg)

# Smart Transport

- ▶ Electric vehicles
- ▶ Bikes
- ▶ Charging systems
- ▶ Autonomous vehicles
- ▶ Dynamic lane management
- ▶ Dynamic speed management
- ▶ Advanced pavements/coatings and markings
- ▶ Dynamic-real-time traffic information and management
- ▶ E-charger lanes



# Self-driving cars



# Self-driving Bus

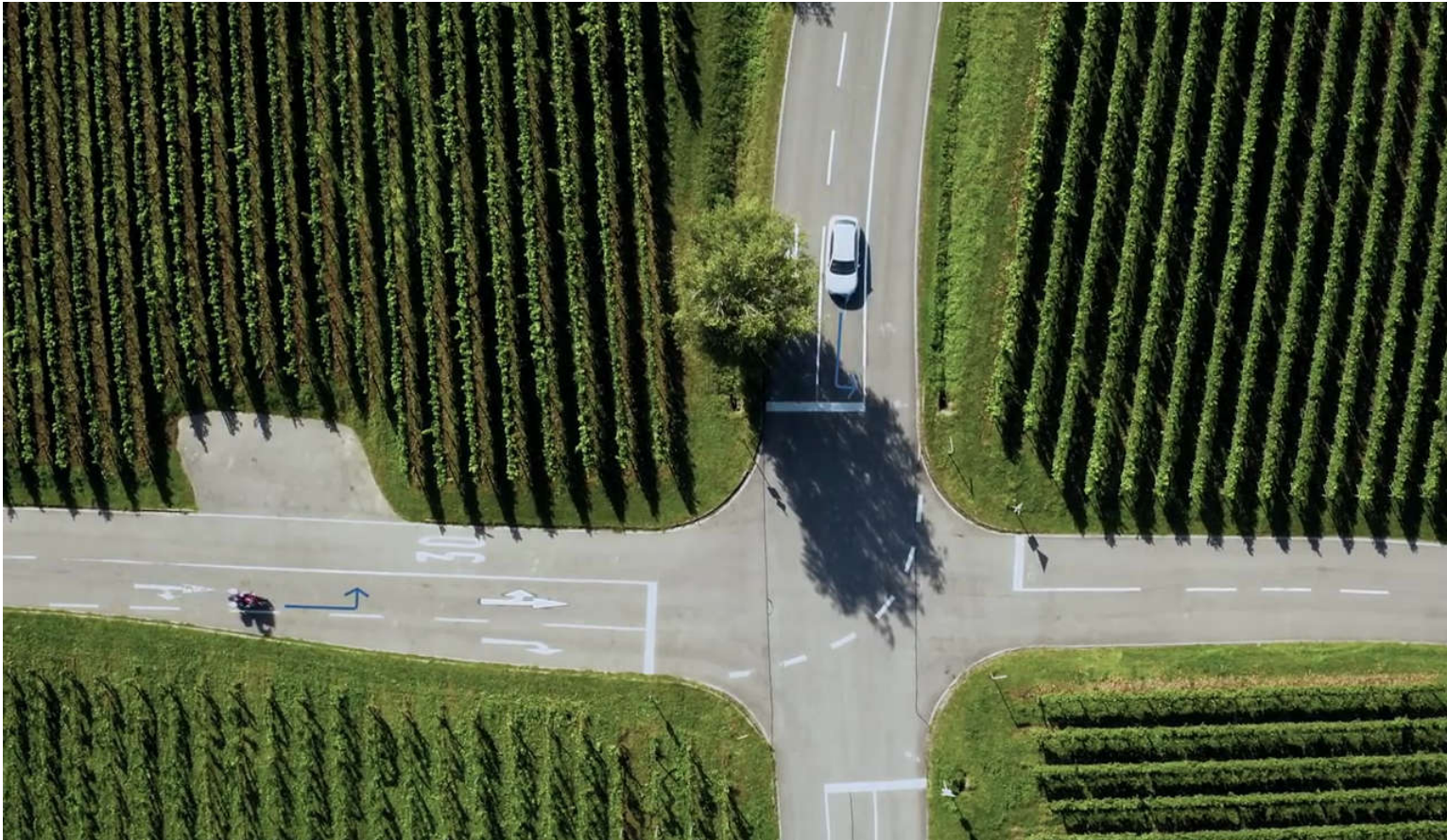


BR<sup>24</sup>

Intelligent Interactions

EDUCATION  
CENTER

# V2V



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# Vehicle to everything



# Smart parking indoors



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<https://www.swarco.com>, <http://smartparking.com>

# Smart parking outdoors

- ▶ Smart Parking - The Future of Parking in Wellington:  
<https://www.youtube.com/watch?v=UdAA2danoLY>



# Public transport development

- ▶ Mol Bubi



- ▶ Futár



# MOL Bubi bike hire



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## BÉRLÉS BICYCLE HIRE



**MOL BUBI JEGGYEL**  
WITH MOL BUBI TICKET

**1**

Kérjük, adja meg telefonszámát és PIN kódját a kerékpár hátsó részénél található érzékelőnél.

Please enter your phone number and your PIN code on the rear sensor of the bike.

**2**

Felvillogó zöld fény és sípszó jelzi, ha a kerékpár kivehető.

Blinking green light and beep from docking point signal that the bike can be removed.

**3**

Húzza ki a kerékpárt a dokkolóból. Jó biciklizést!

Remove bike from the docking stand. Have a nice ride.



**MOL BUBI BÉRLETTEL**  
WITH MOL BUBI PASS

**1**

Érintse MOL Bubi kártyáját a kerékpár hátulján található érzékelőhöz.

Touch your MOL Bubi card to the rear sensor of the bike.



**ÚJ FELHASZNÁLÓ?**  
ARE YOU A NEW USER?



Kerékpárbérléshez érvényes MOL Bubi jeggyel vagy bérlettel kell rendelkezni.

You have to be in possession of a valid MOL Bubi ticket or pass to hire a bike.



# Futár

- ▶ Complex system



# Futár - client side



Search for lines and stops

16:16  

**Trip Planner**

A Magyar tudósok körútja

B Rozmaring Kert Vendéglő

Start now 27/10/2017 16:16

**Planning options**

- walk
- MOL Bubi** ✓
- bicycle
- subway ✗
- rail ✗
- ferry ✗
- tram ✗
- trolleybus ✗
- bus ✗

Bicycling preferences:  
Bicycle friendly  Short

**Map:** Budapest, Hungary. Shows the Danube river, various districts (e.g., Budaörs, Újpest, Rákospalota), and landmarks like the Hungarian State Opera House and Margaret Island. A route is highlighted in orange, connecting the starting point (A) near the Danube and ending at the destination (B) in Rozmaring Kert.

**Right Panel:** Google Maps, Stops, Vehicles, MOL Bubi. A callout box says "Zoom in to view stops and vehicles!".

**Bottom Right:** Térképadatok ©2017 Google, Általános Szerződési Feltételek, License.

# Futár - HCI problems

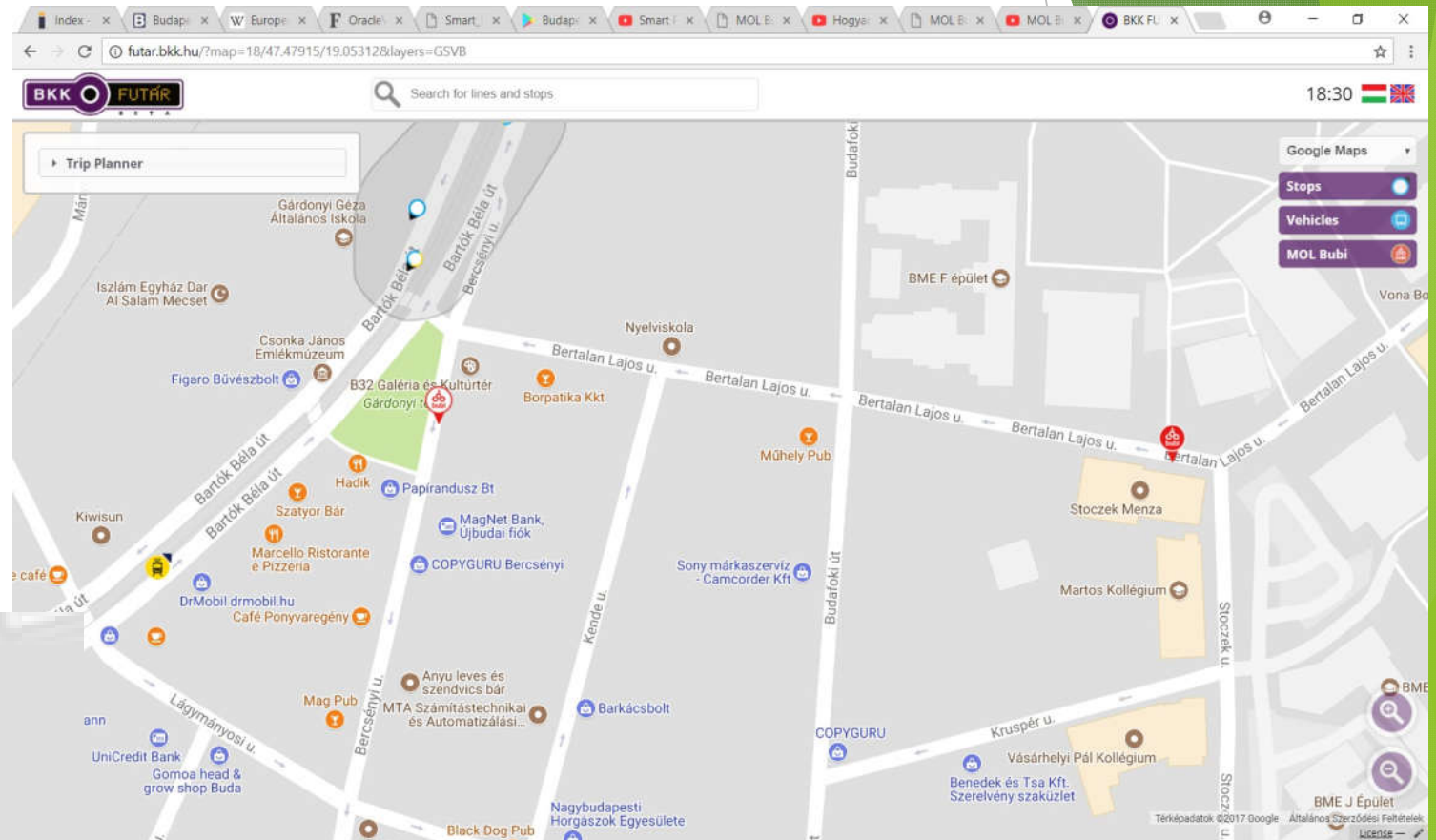
- ▶ Handling of multiple targets (Thököly út practice already discussed)
- ▶ Poorly defined targets
- ▶ Bad/professional wording

The screenshot displays the BKK Futár mobile application interface. At the top left is the BKK Futár logo. A search bar contains the text "Search for lines and stops". The top right corner shows the time "18:24" and the Hungarian and British flags. On the left side, a "Trip Planner" panel is visible, featuring input fields for "From" (A) and "To" (B), a "Start now" dropdown menu, a date field set to "25/10/2017", and a time field set to "18:23". Below these fields is a "Planning options" section and a "Plan" button. At the bottom left of the panel are links for "Report a bug" and "Updates". The main area is a map showing a route highlighted in yellow. A pop-up notification for bus stop "85E Cinkotai garázs" is displayed, stating "BPO009 Ikarus 280-as típusú autóbusz" and "The vehicle does not serve a public trip", with a timestamp of "32 seconds ago". On the right side of the map, there are three menu items: "Google Maps", "Stops", "Vehicles", and "MOL Bubi". The map shows various streets and landmarks, including "Rákos-patak", "Keresztúri út", "Jászberényi út", and "Vasló Kft".



# Futár

- ▶ Mol Bubi integration
- ▶ What is the meaning of different signs



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# Solution, on another website

► Mol Bubi

The screenshot displays the Mol Bubi website interface. At the top left, there are logos for MOL and Bubi. At the top right, it says "SZÉCHENYI 2020". Below the logos is a navigation menu with items: "Használat", "Díjzabás", "Regisztráció", "Értékesítési pontok", "Hírek", "Médiatár", "Tudástár", and "A I". The main content is a map of Budapest, Hungary, densely populated with red bicycle icons representing bike-sharing stations. The map includes various district names like Diósárok, Istenhegy, Kisvábhegy, and others. At the bottom of the map, there is a legend with three items: a red bicycle icon for "MOL Bubi gyűjtőállomás (regisztráció és jegyvásárlás)", a red bicycle icon with a grey circle for "MOL Bubi gyűjtőállomás", and a grey circle with a bicycle icon for "MOL Bubi gyűjtőállomás átmenetileg üzemben kívül". The bottom left corner of the screenshot shows the "SmartL" logo and the text "Intelligent Interac".

# Mobile apps

- ▶ Smartcity Budapest Transport
- ▶ Budapest Public Transit
- ▶ BKK Futár

# Public transport

- ▶ Smartcity Budapest Transport

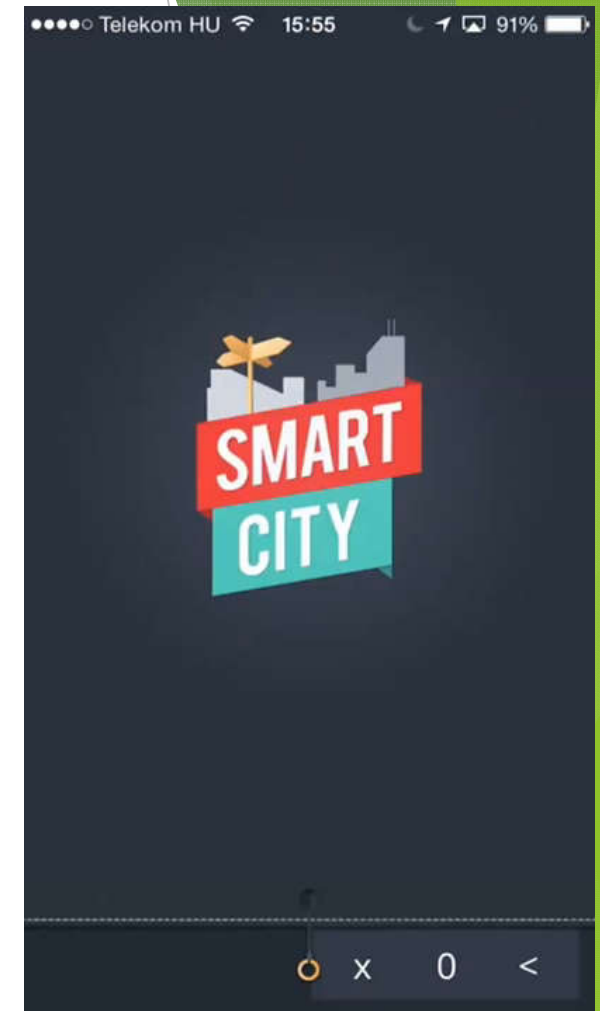
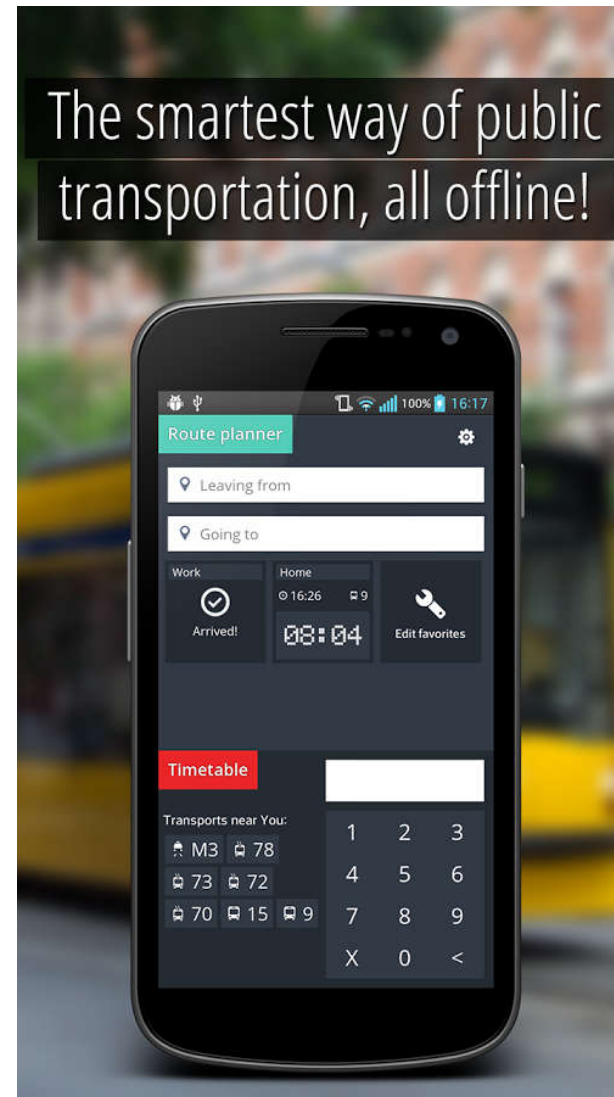
- ▶ Stop search with AR

- ▶ Good idea

- ▶ Not implemented

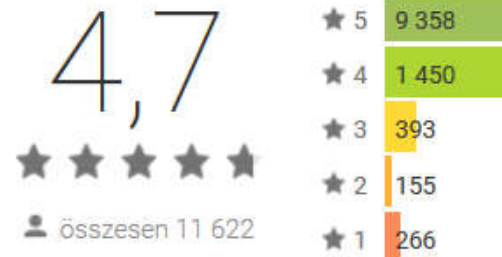
- ▶ See video

- ▶ <https://youtu.be/StwHGPrQY8g>

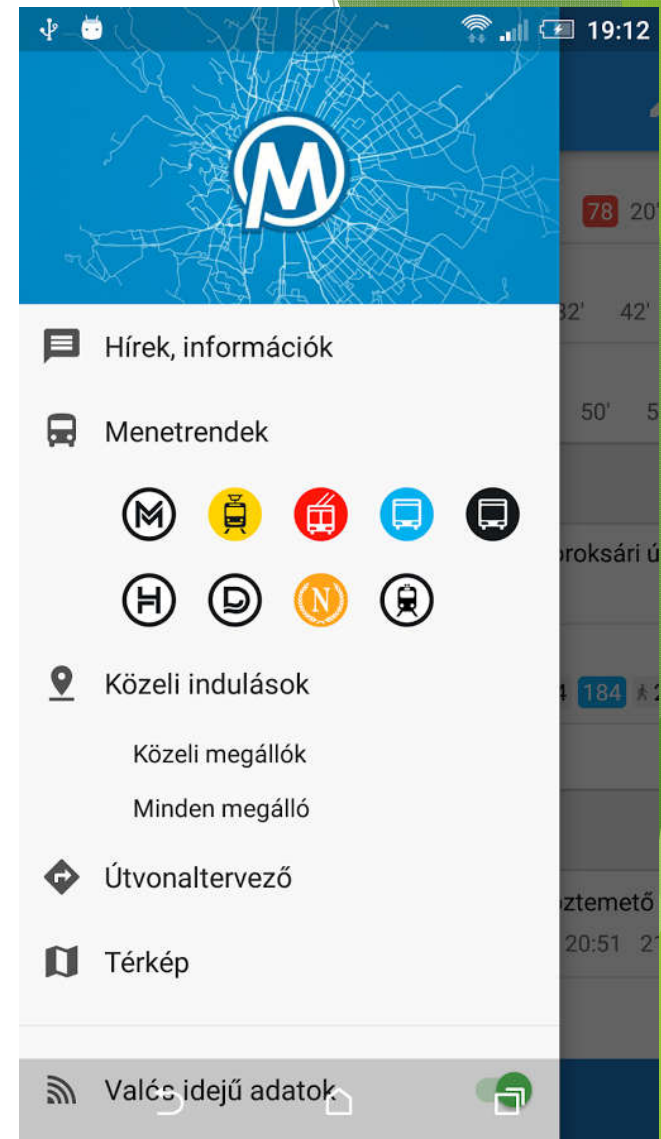


# Public transport

- ▶ Budapest Public Transit
  - ▶ Offline base-timetable
  - ▶ Real-time timetable (Futár compatible)

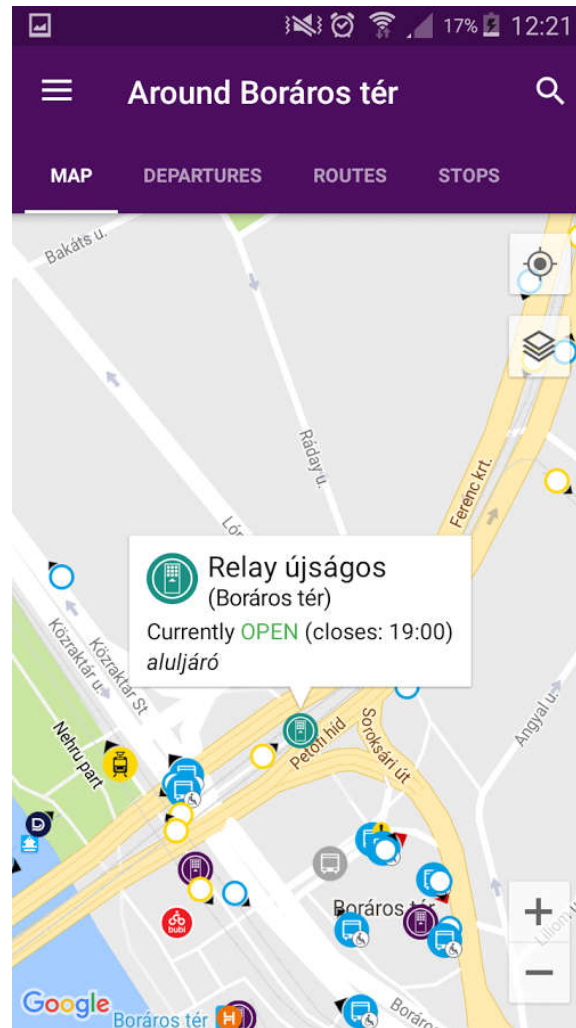


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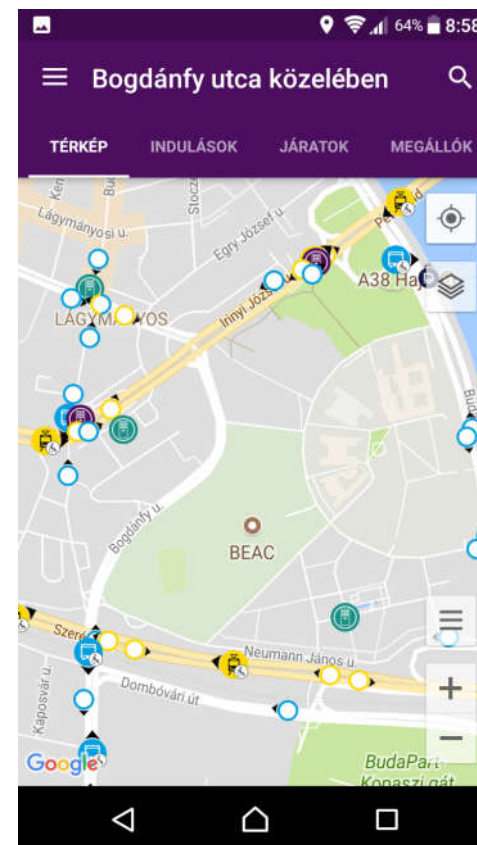
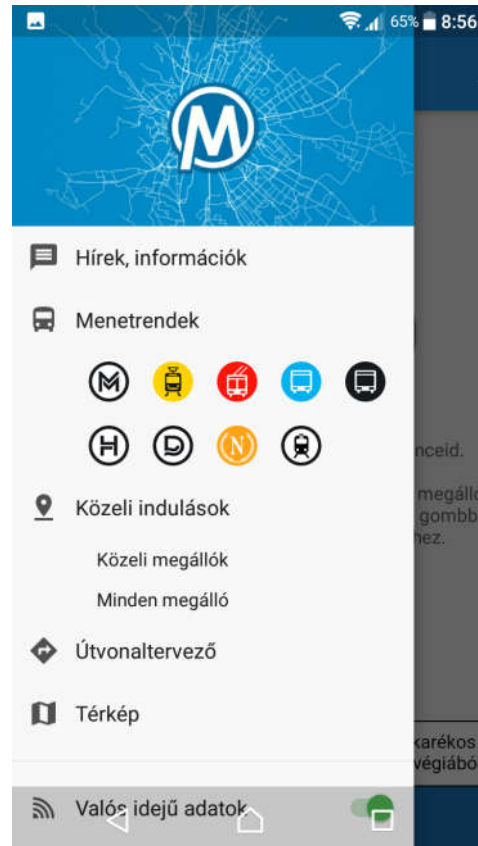
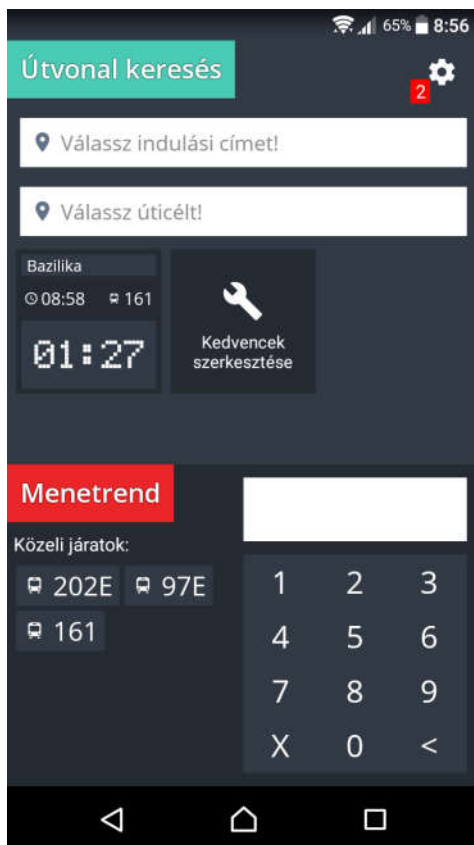


# Public transport

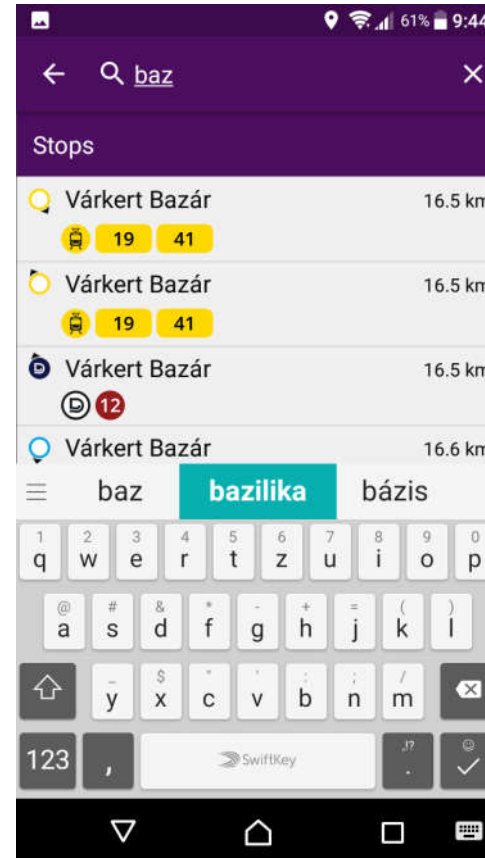
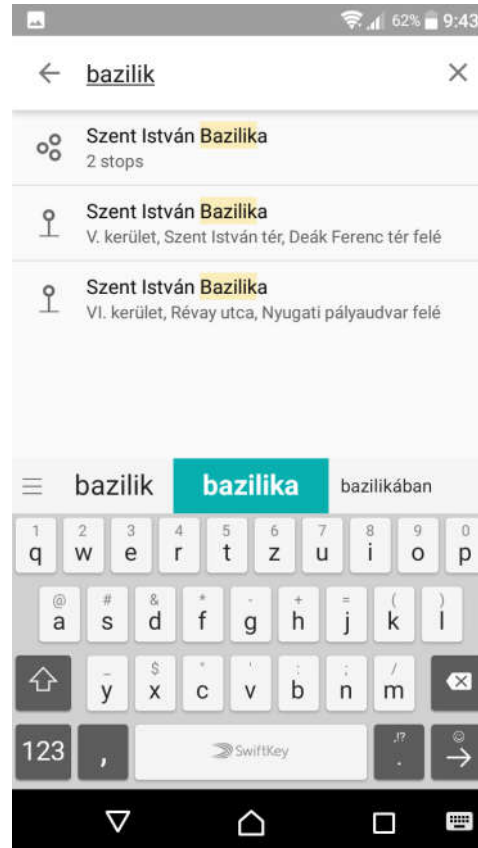
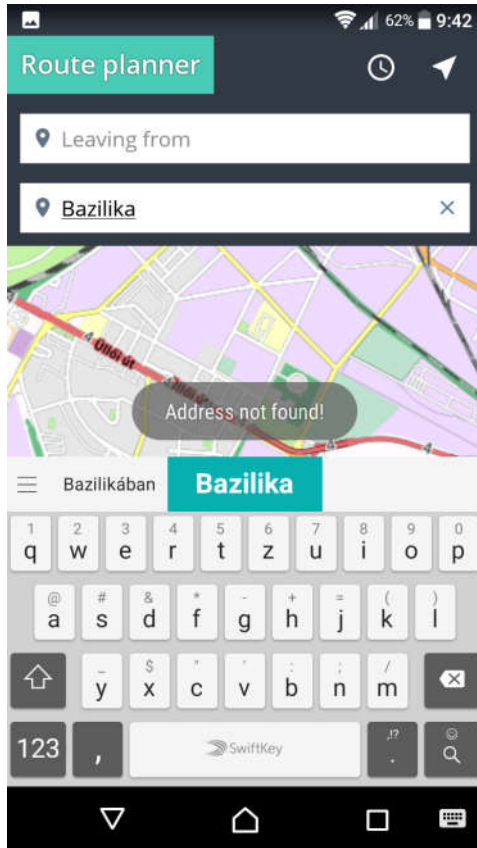
- ▶ BKK Futár
  - ▶ Official APP
  - ▶ Bubi integration



# Opening screens



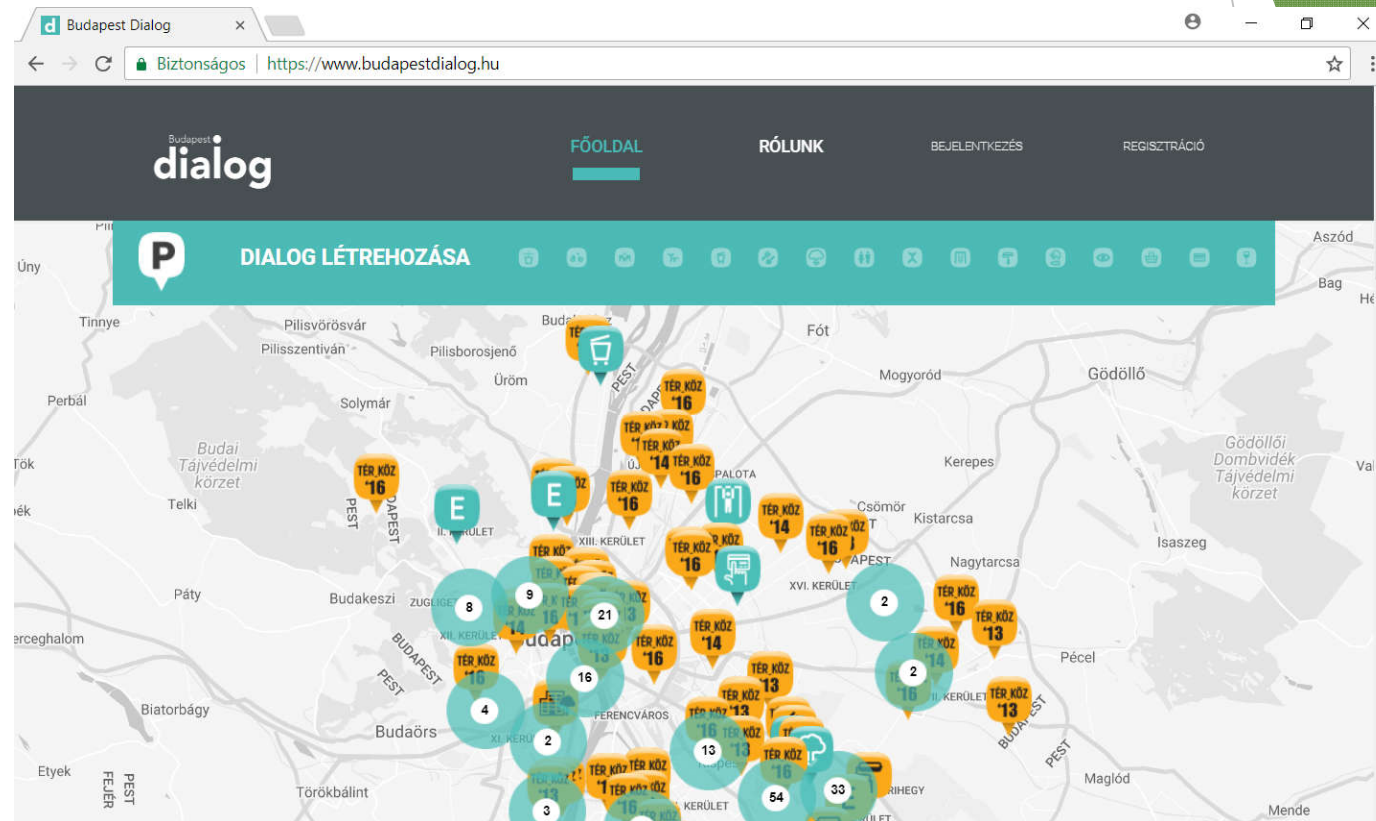
# Search





# Involving the community in the development

► BudapestDialog



# User-centered design (summary and rehearsal)

- ▶ Active involvement of end-users and understanding user and task related requirements
- ▶ Definition and separation of user and technology roles
- ▶ Iteration of design solutions
- ▶ Multi-disciplinary design

# Activities

- ▶ Defining and understanding user context
- ▶ Defining user and organizational requirements - defining usability related targets
- ▶ Solution implementation
- ▶ Solution evaluation based on the requirements

# Information collection

- ▶ Questionnaires
  - ▶ Interviews
  - ▶ Watching
  - ▶ ...
- 
- ▶ Aim: Find „pain points” of user activities

# Understanding the tasks

- ▶ Storyboard
- ▶ Scenarios
- ▶ Persona
  
- ▶ Defining usability criteria (The Five Es)
  - ▶ Effective
  - ▶ Efficient
  - ▶ Engaging
  - ▶ Error Tolerant
  - ▶ Easy to Learn

# Design - Prototype

- ▶ Fast
  - ▶ Paper prototype
  - ▶ Mockup
- ▶ Iterative development!!!
- ▶ Evaluate everything possible



# Evaluation

1. Strategy
2. Plan
3. Testing
4. Evaluation
  - ▶ Everything OK: The system is ready
  - ▶ Cannot decide, sufficient data is not available: Further tests
  - ▶ Insufficient data : New plan
  - ▶ UI errors: Improvement and new evaluation (strategy, plan, test, evaluation)