TOUCHPAD

As interaction input control for use of In-Vehicle Infotainment System

COLLABORATION BETWEEN

- Interaktionsbyrån AB
- Volvo Cars Corporation AB
- Chalmers University of Technology
- OPTIVe

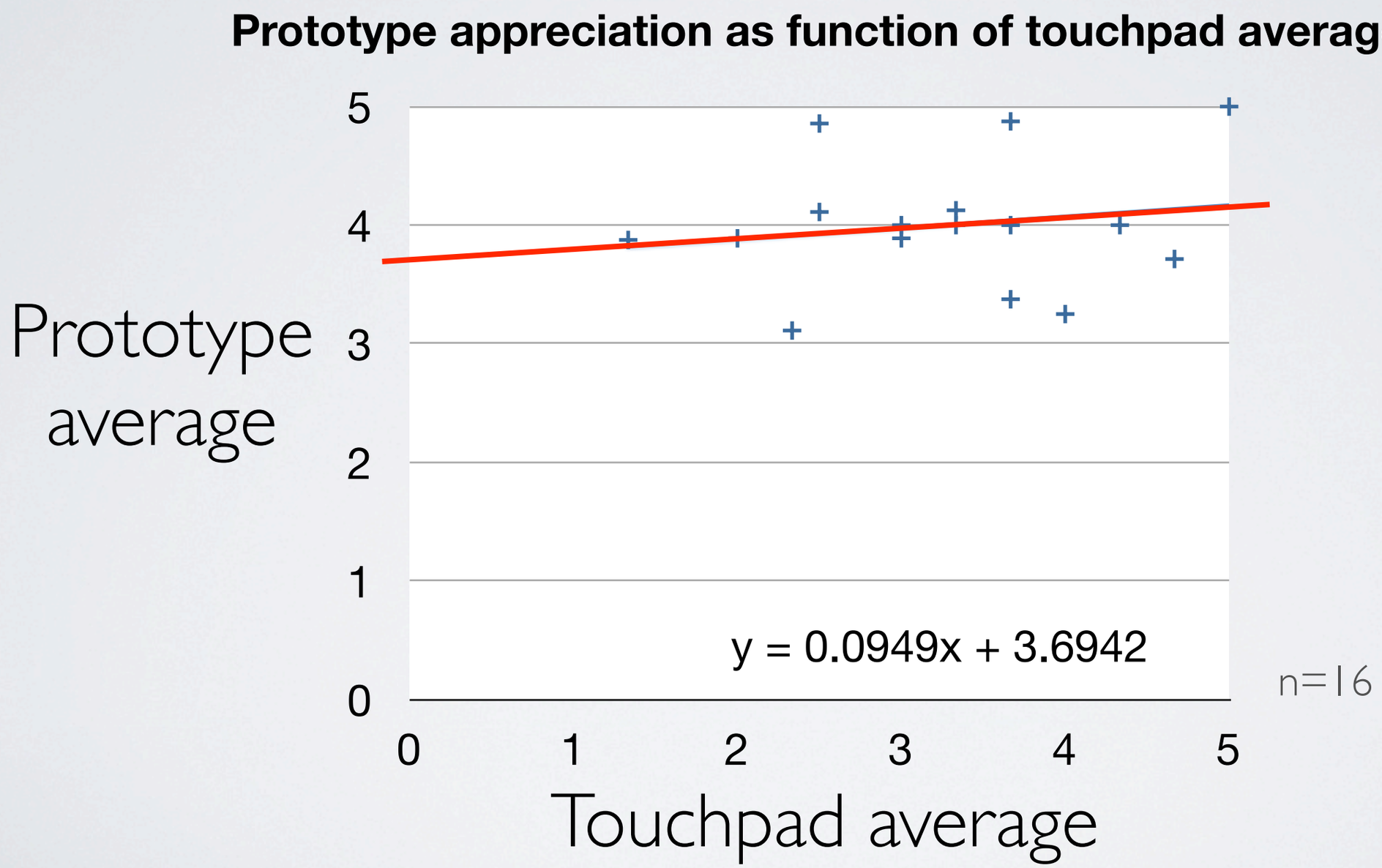
DISPOSITION

- Result
- Demonstration
- Process

RESULT

- No preference for touchpad needed to like this concept
- Scored 3.7/5 in test with 16 users in a mixed group

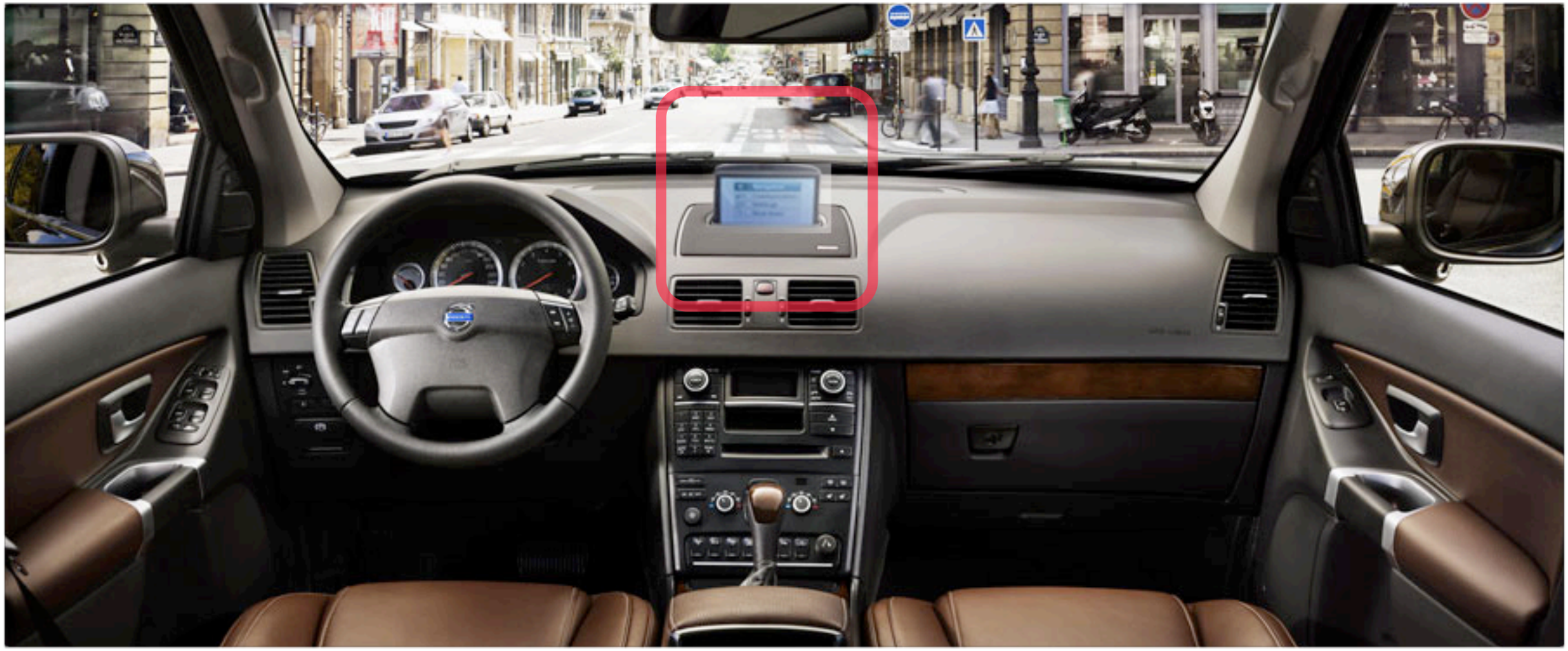
PROTOTYPE EVALUATION



CONCEPT

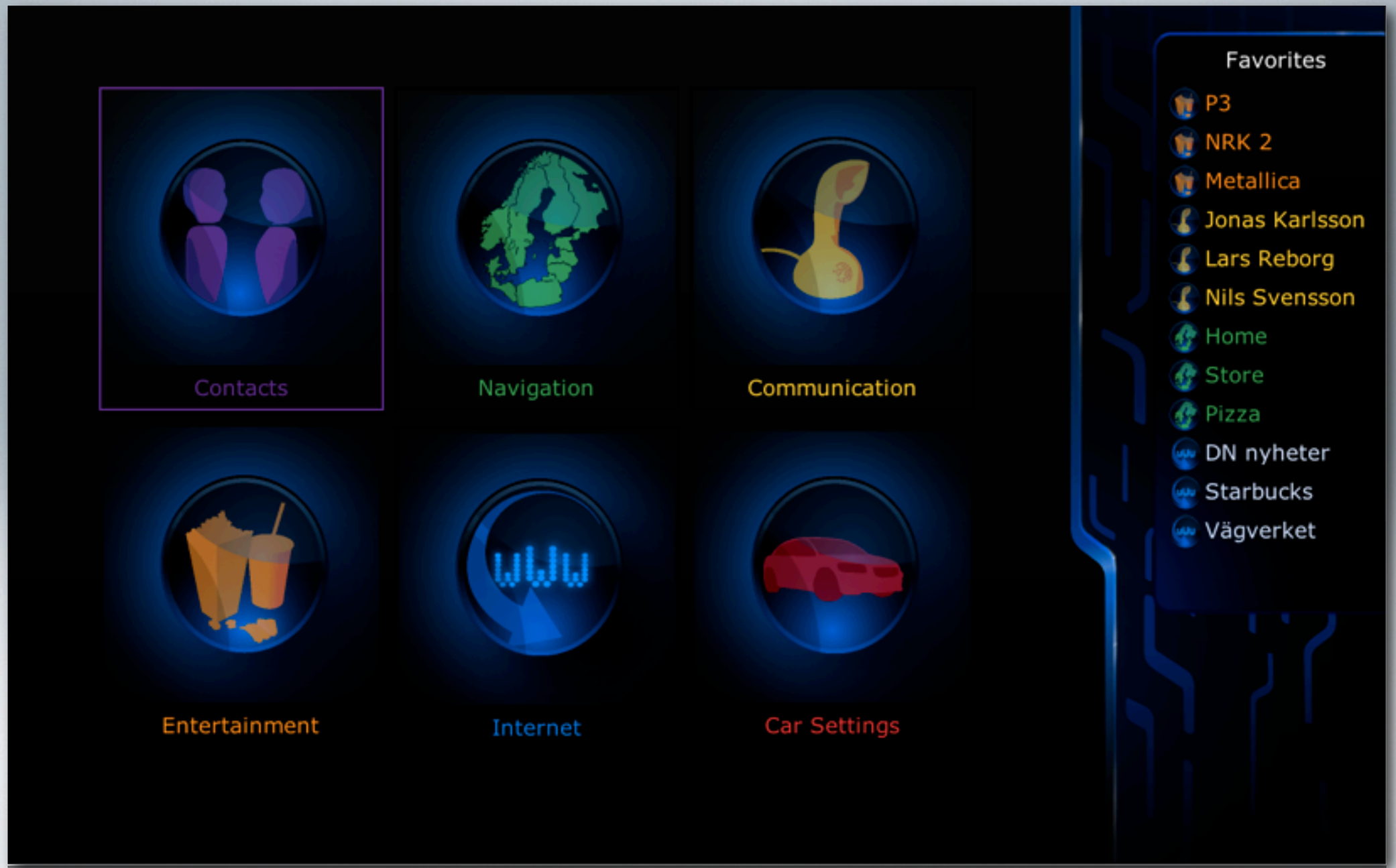
- Infotainment system for in-vehicle use
- Multi-touch enables direct access to often used functions (select, zoom, pan)
- Touchpad between front seats
- Screen close to windshield

SCREEN

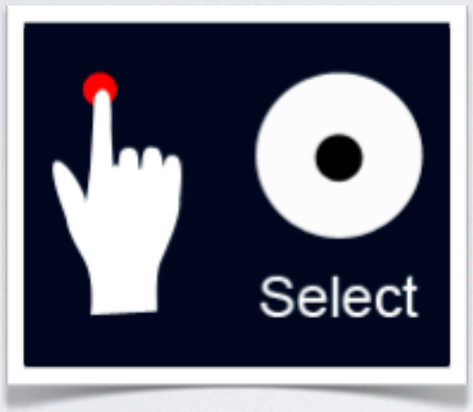


PLACEMENT

INTERFACE

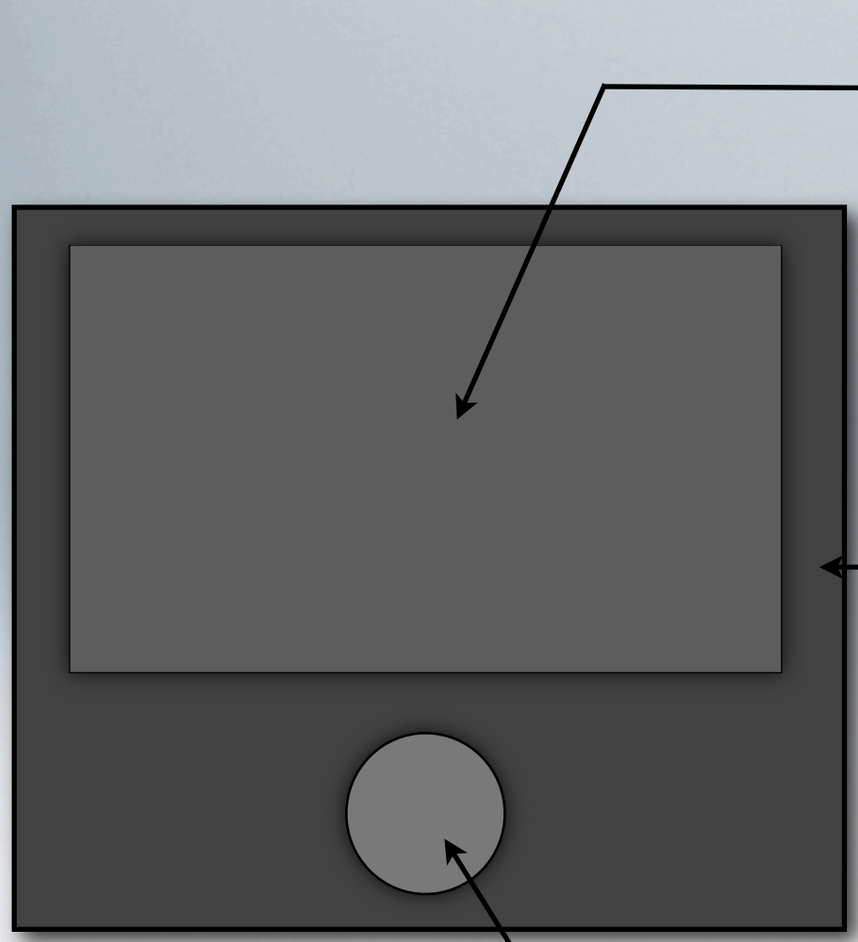

Contacts
Navigation
Communication
Entertainment
Internet
Car Settings
Favorites
P3
NRK 2
Metallica
Jonas Karlsson
Lars Reborg
Nils Svensson
Home
Store
Pizza
DN nyheter
Starbucks
Vägverket

GESTURES



TOUCHPAD

Click in pad



Touch surface

Edge

Home button

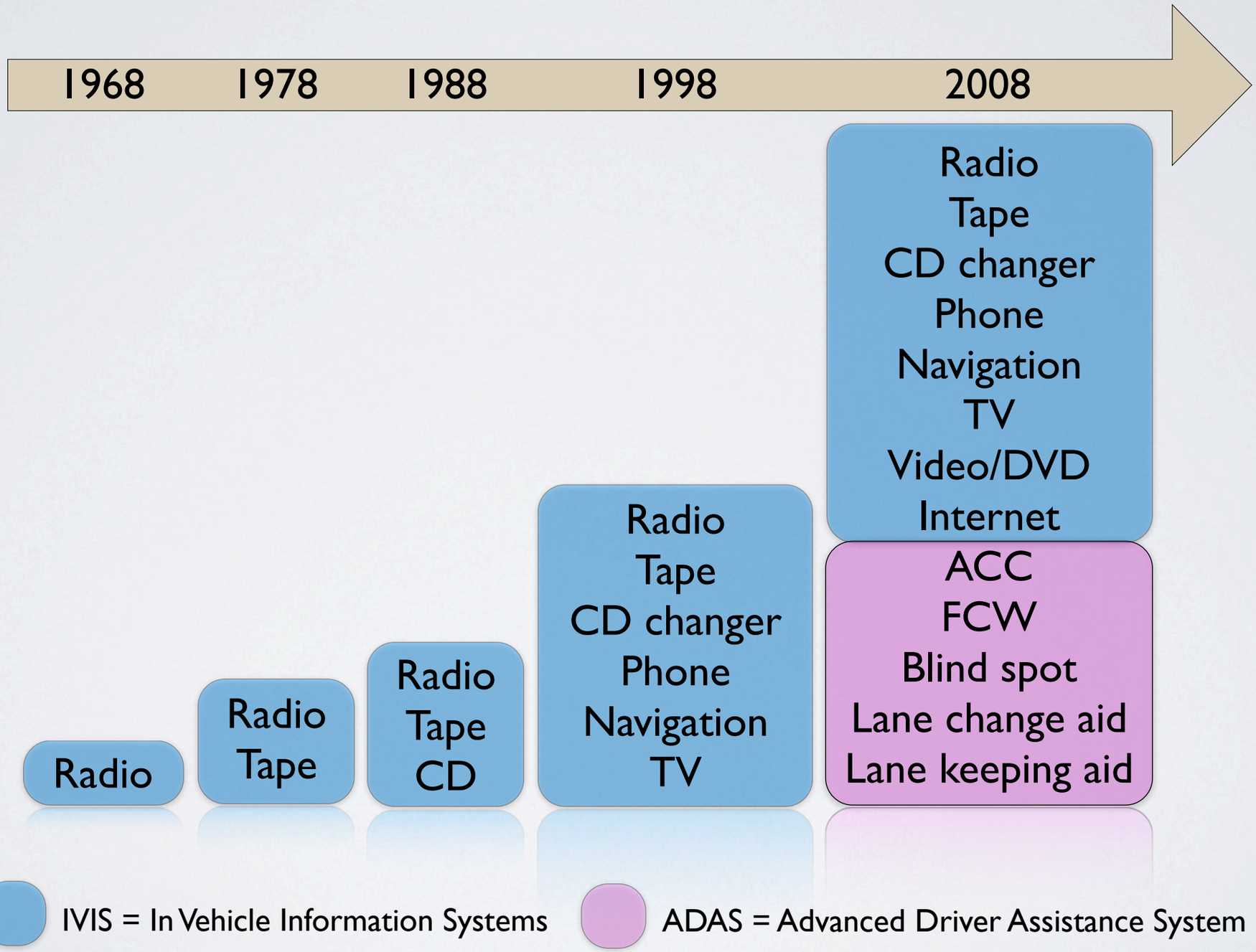
PROTOTYPE SUMMARY

- Touchpad between seats
- Interface controlled with multi-touch gestures
- Screen close to windshield

MOTIVATION

- More functionality in cars
- More devices uses touch technology
- More dimensions easily accessible

MORE FUNCTIONALITY



MORE DEVICES

- Phones
- Laptops

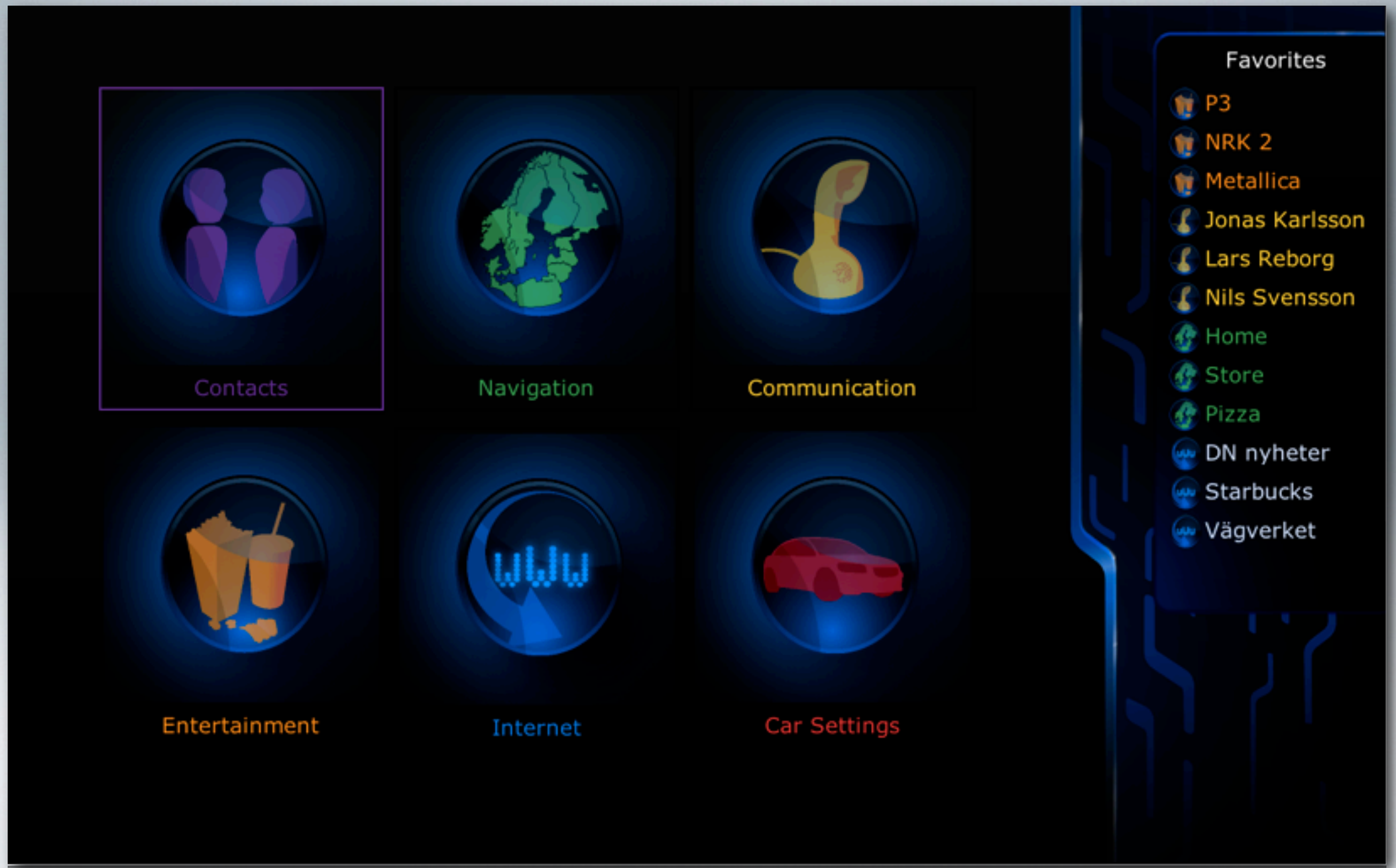
MORE DIMENSIONS

- Internet browsing for example
- Cannot control how certain pages are rendered
- Rotary-controller not as practical when navigating internet pages
- Character recognition with finger as stylus

CONCEPT DEMO

- Click (corresponds to enter)
- Select
- Zoom
- Pan
- Gestures
- Character input
- Home button

INTERFACE


Contacts
Navigation
Communication
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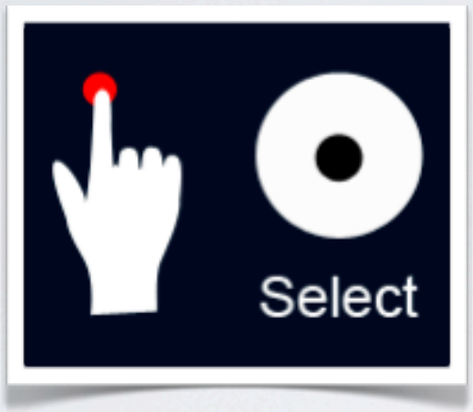
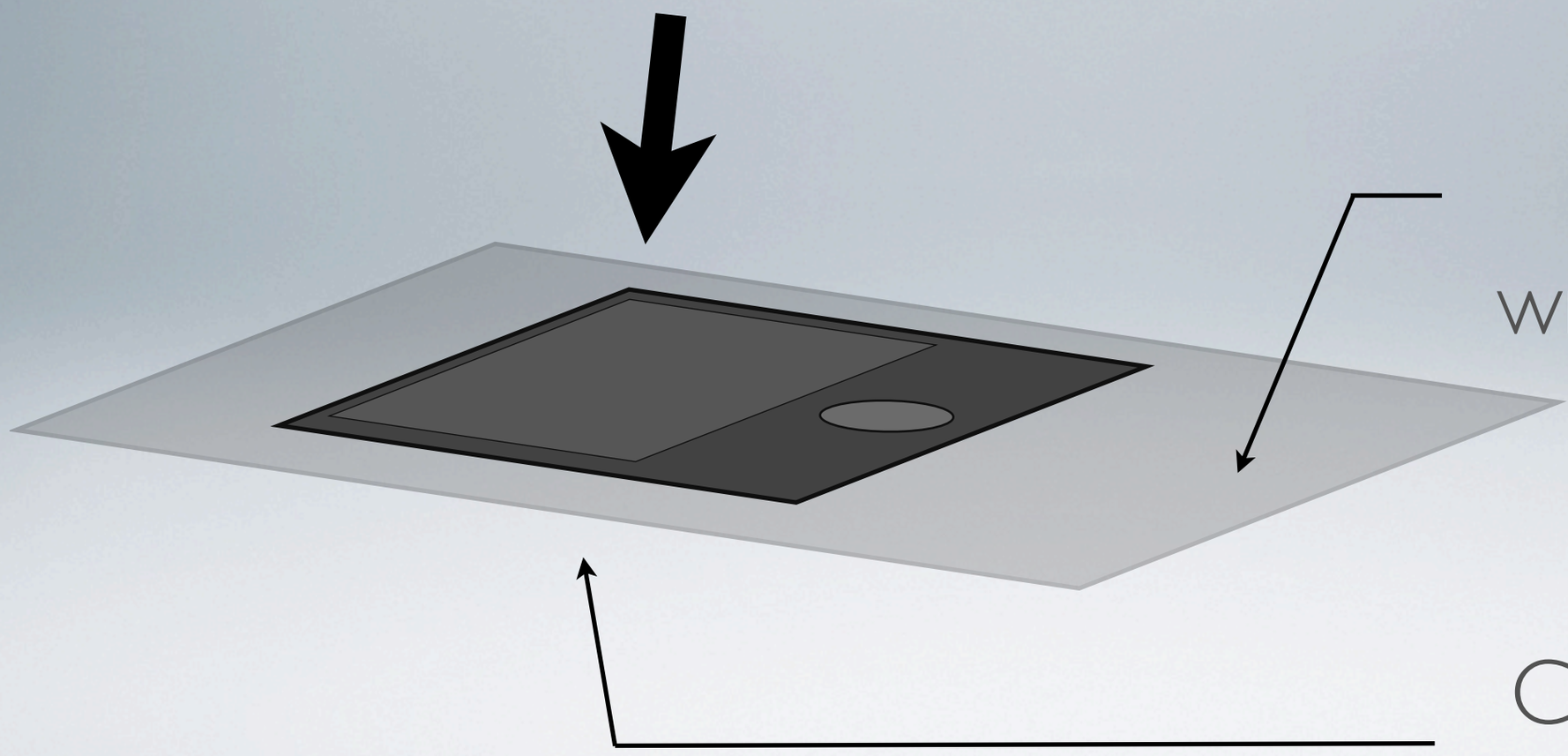
Metallica
Jonas Karlsson
Lars Reborg
Nils Svensson
Home
Store
Pizza
DN nyheter
Starbucks
Vägverket

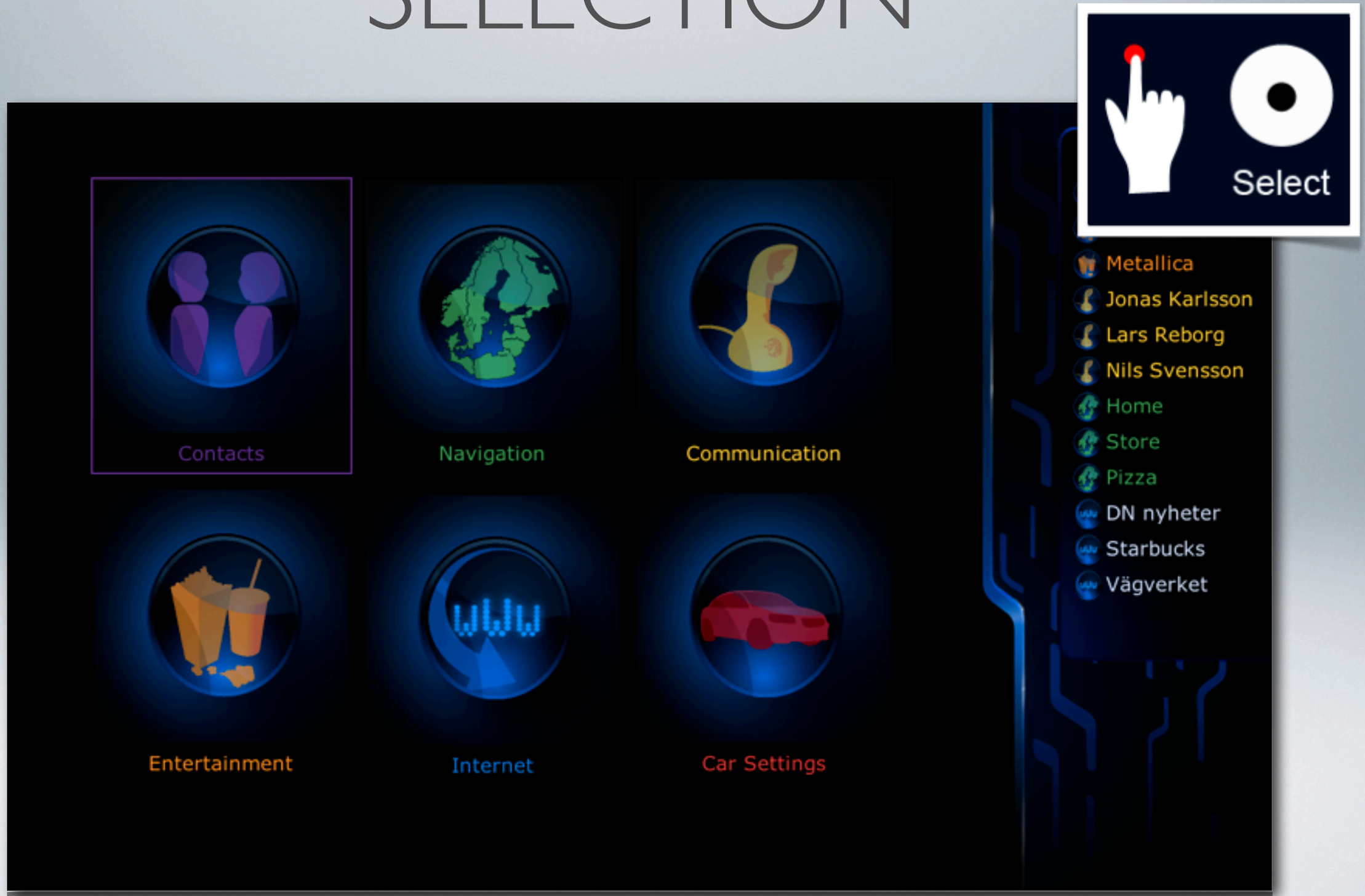
GESTURES



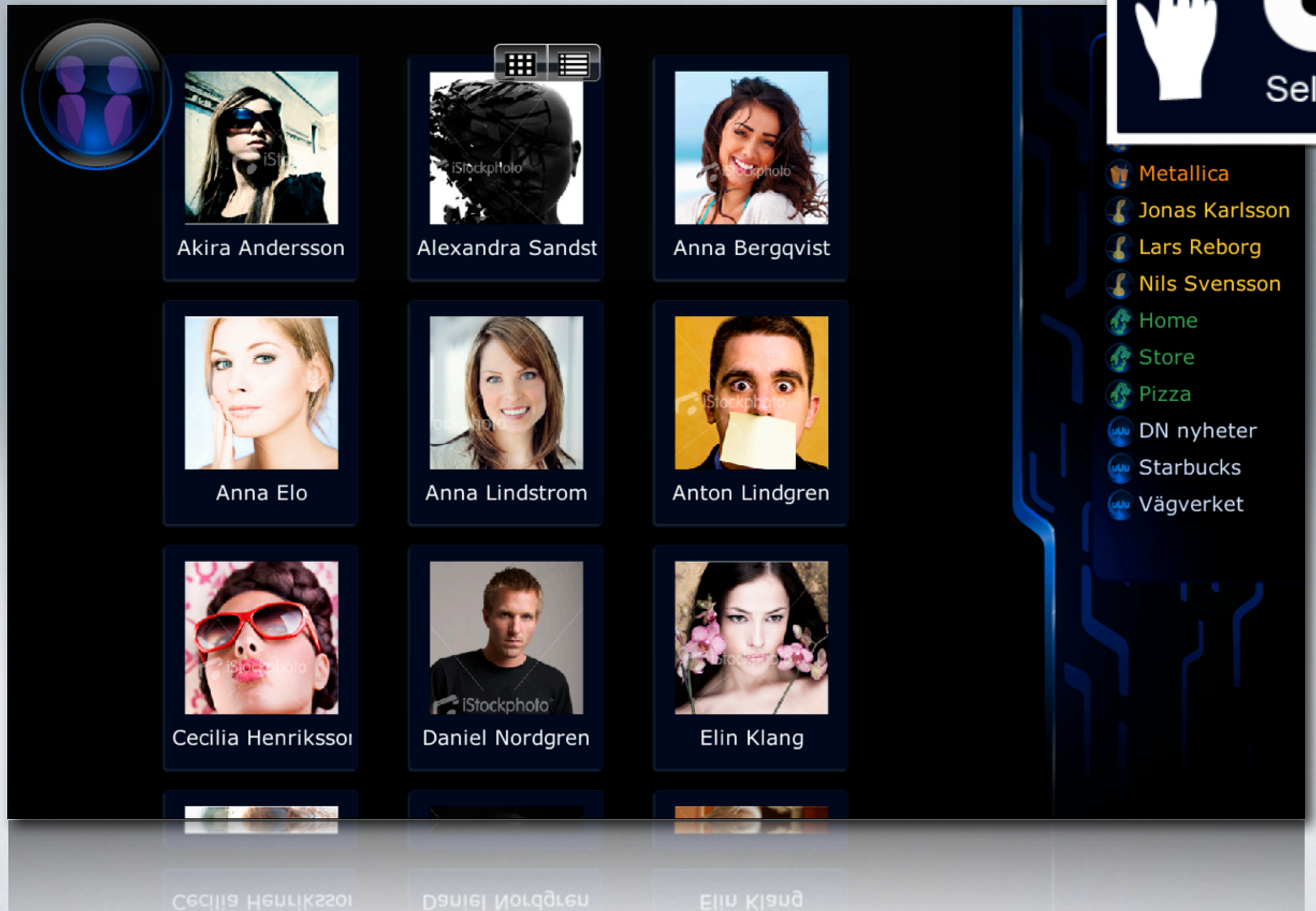
TOUCHPAD


Push for click
Armrest and wrist support
Click mechanics under pad

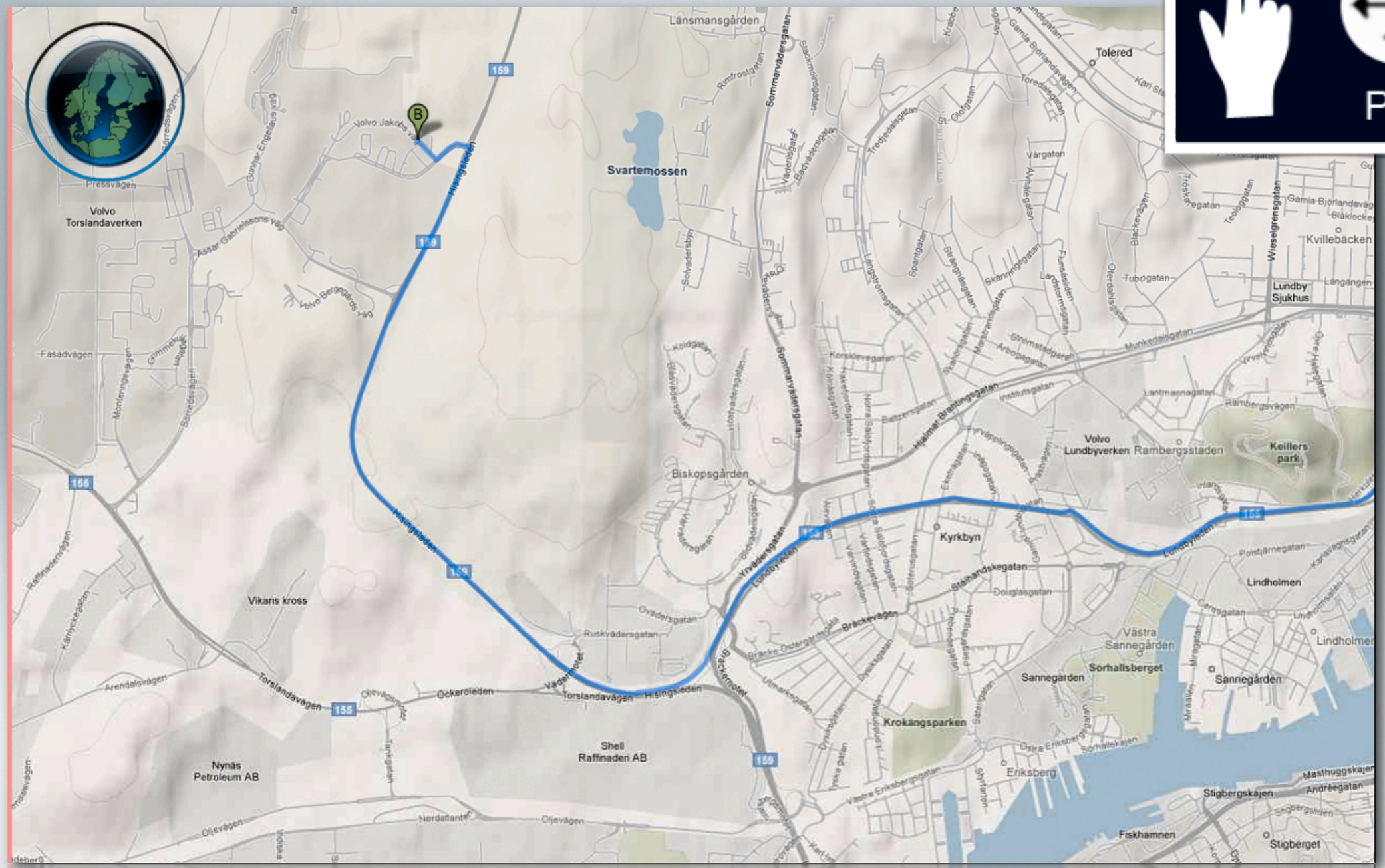
SELECTION


Select
Contacts
Navigation
Communication
Entertainment
Internet
Car Settings
Metallica
Jonas Karlsson
Lars Reborg
Nils Svensson
Home
Store
Pizza
DN nyheter
Starbucks
Vägverket

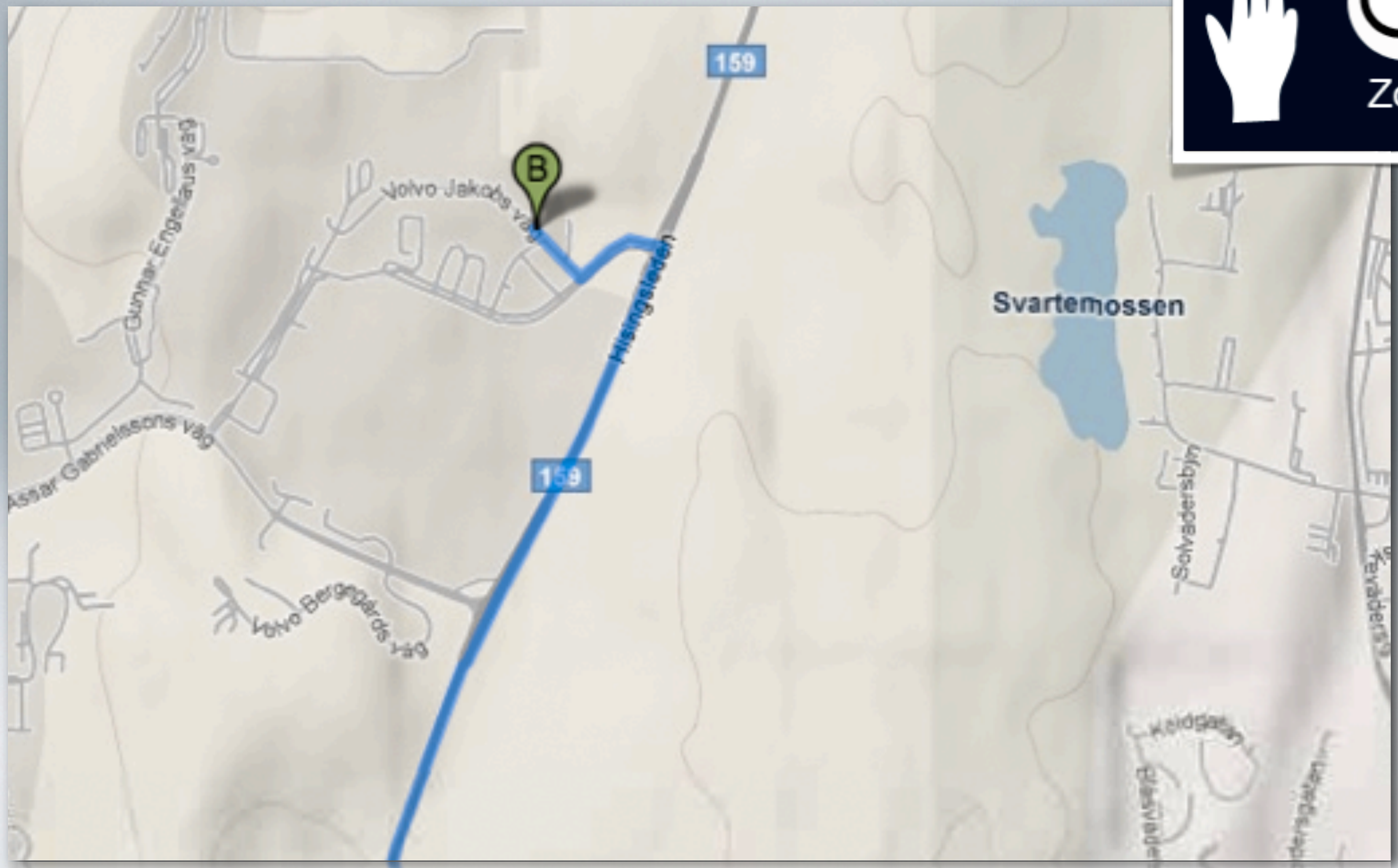
CLICK


Select
Akira Andersson
Alexandra Sandst
Anna Bergqvist
Anna Elo
Anna Lindstrom
Anton Lindgren
Cecilia Henrikssoı
Daniel Nordgren
Elin Klang
Metallica
Jonas Karlsson
Lars Reborg
Nils Svensson
Home
Store
Pizza
DN nyheter
Starbucks
Vägverket

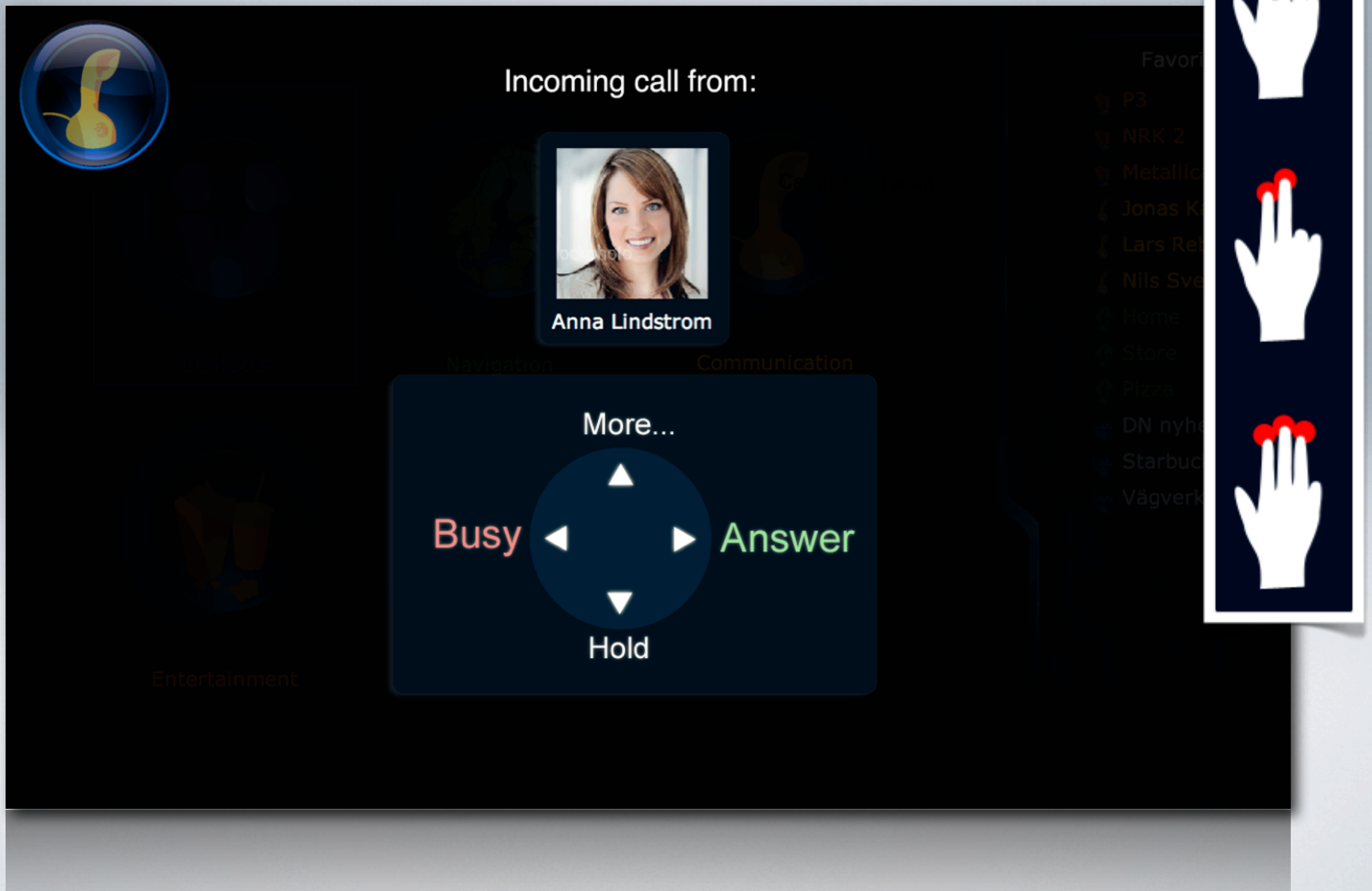
PAN


Pan
Volvo Torslandaverken
Pressvägen
Svartemossen
Länsmansgården
Tolered
Kvillebäcken
Lundby Sjukhus
Volvo Lundbyverken
Rambergsstaden
Keillers park
Biskopsgården
Kyrkbyn
Lindholmen
Västra Sannegården
Sannegården
Sörhallsberget
Krokängsparken
Eriksberg
Fiskhamnen
Stigbergskajen
Stigberget
Vikans kross
Nynäs Petroleum AB
Shell Raffinaden AB
Torslandavägen
Hisingsleden
Lundbyleden
Bräckemotet
159
155

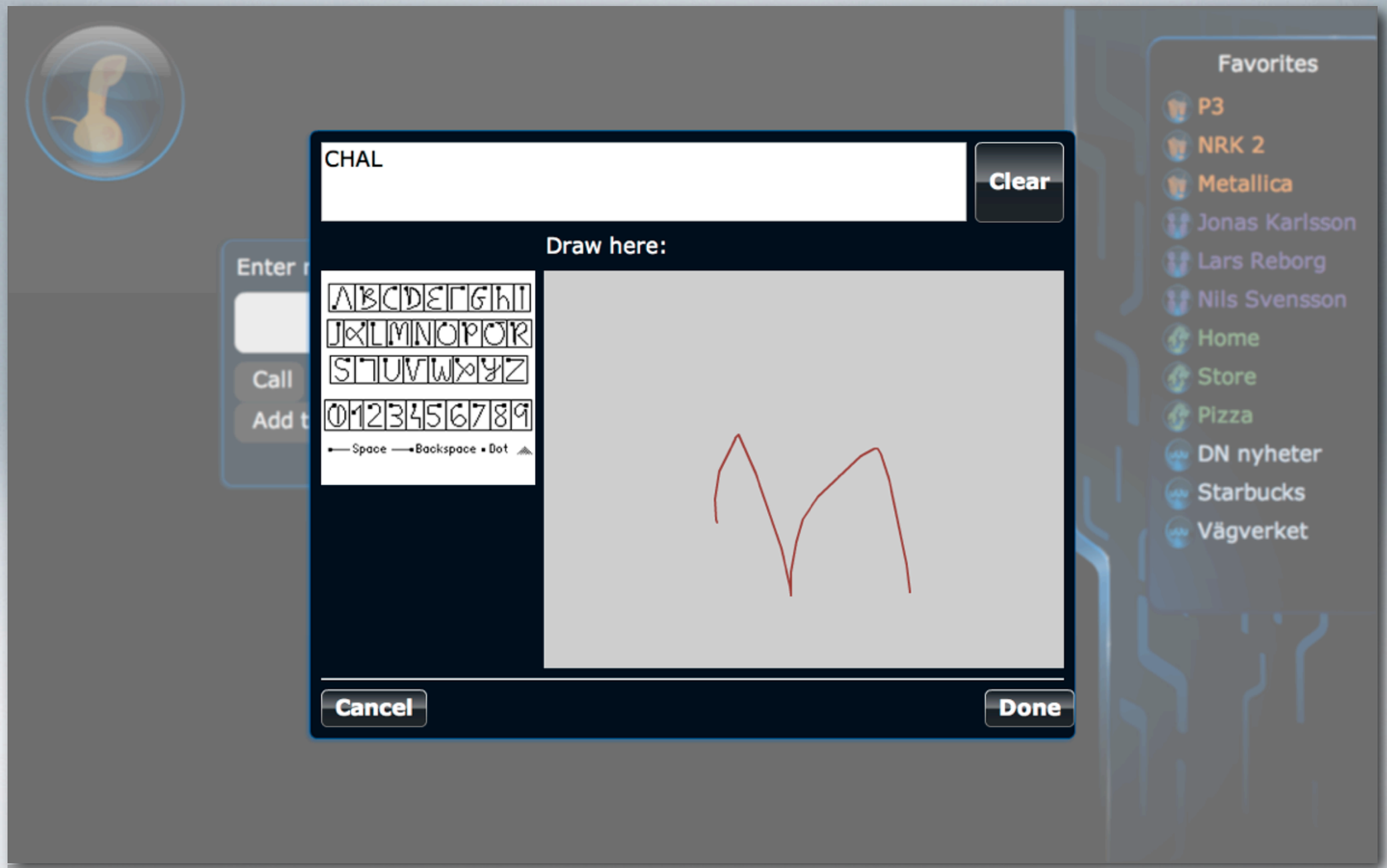
ZOOM


159
B
Volvo Jakobs väg
Gunnar Engelaus väg
Assar Gabrielssons väg
Volvo Bergqvists väg
Svartemossen
Schwedersbyn
Kvidgatan

GESTURES


Incoming call from:
Anna Lindstrom
More...
Busy
Answer
Hold
Navigation
Communication
Entertainment

INPUT

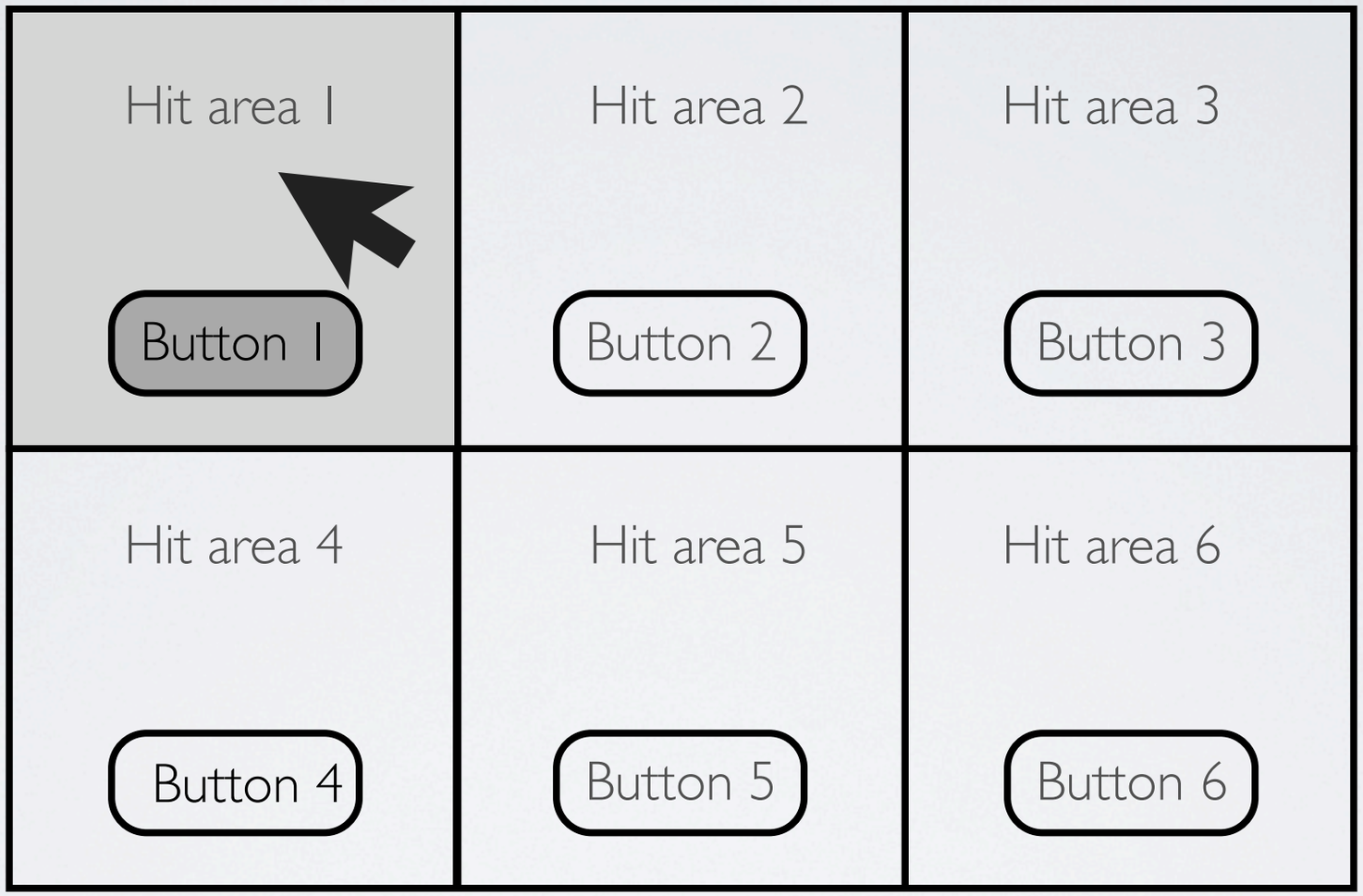

Favorites
P3
NRK 2
Metallica
Jonas Karlsson
Lars Reborg
Nils Svensson
Home
Store
Pizza
DN nyheter
Starbucks
Vägverket
Call
CHAL
Clear
Draw here:
Space
Backspace
Dot
Cancel
Done

DEMO EXPLAINED

BASICS

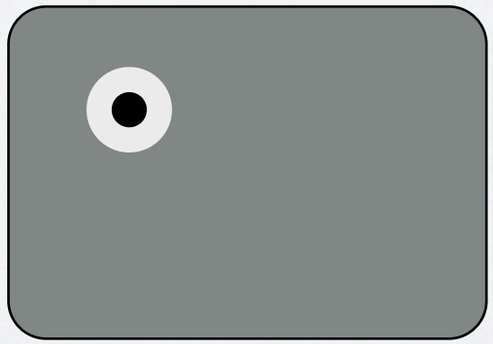
- Large icons
  - Groups functions - wide menu hierarchy
    - Enables future extensions - just add another icon
- Something is always selected - never lost in interface
- Favorites - for fast customizable access to most used functions
- Home button takes the user to start menu

SELECTION CONCEPT



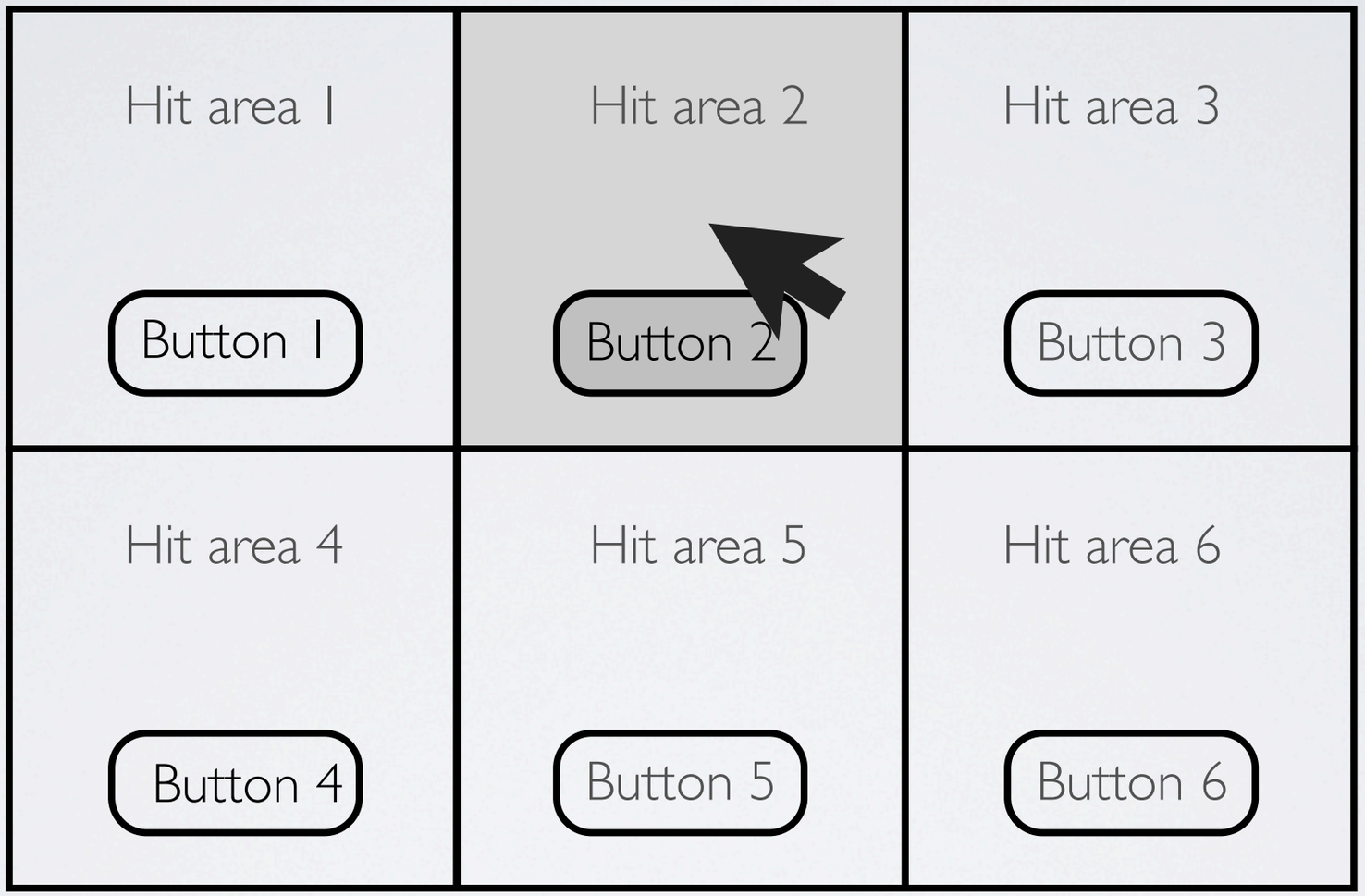
Screen

(Pointer is invisible)



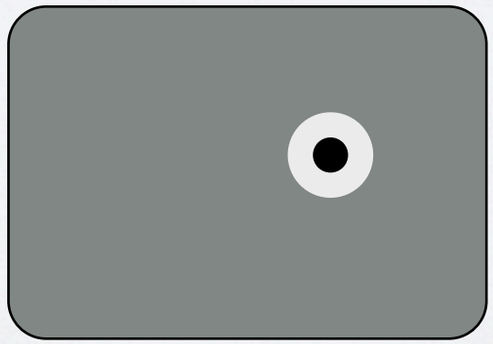
Touchpad

SELECTION CONCEPT



Screen

(Pointer is invisible)



Touchpad

GESTURES

- Direct more natural interaction
- Learn them fast
- Same gestures available consistently
- More efficient to perform a task

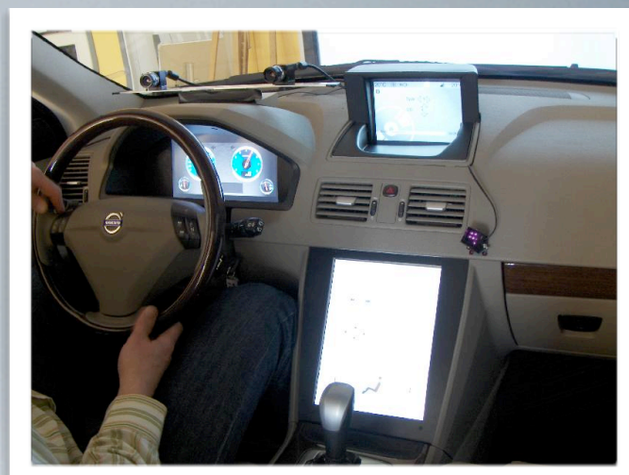
TECHNICAL OVERVIEW

Capture program

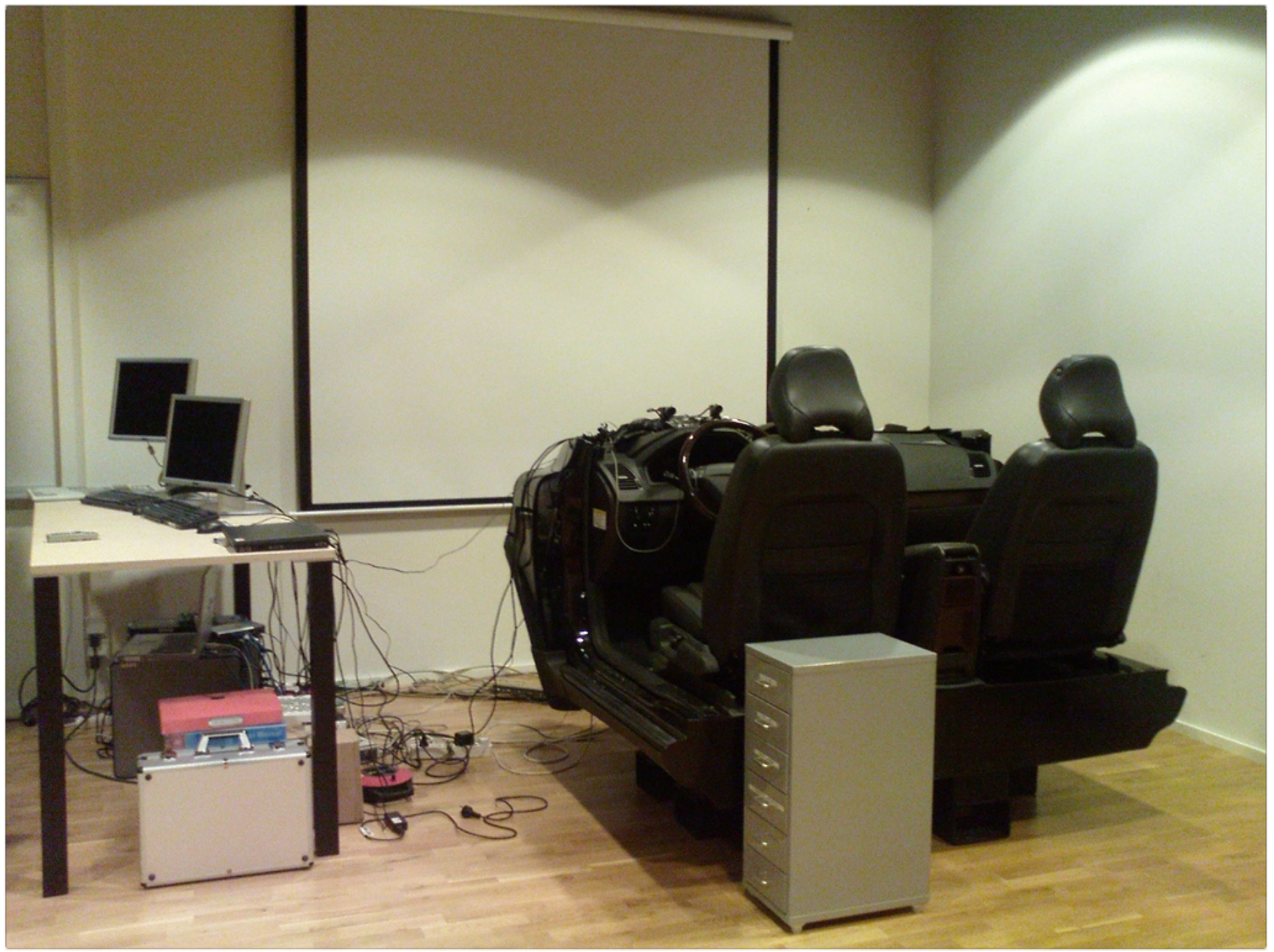
Touchpad

Laptop

Simulator/Car



SIMULATOR



TEST CAR

PROCESS

- Three iterations
- Introduction - Iteration 1
- Prototype - Iteration 2
- Evaluation - Interation 3

INTRODUCTION - ITERATION 1

- Interviews with people at Volvo to understand what they were expecting
- Literature to review theory that could be used for building the concept, driving, interaction
- Brainstorm to generate ideas for interface and information structure
- Paper prototypes for iteration 2

PROTOTYPE - ITERATION 2

- Implementation and technical solution to create a functional prototype

- Simulator test to get comments and observe how the users handled the prototype which gave interesting and good results

- Test driving at Volvo to get real feedback gave extremely useful insights

EVALUATION - ITERATION 3

- 16 persons took part in the test - 11 experts and 7 novices with mixed backgrounds and age
- Presentation to introduce the gestures and the prototype
- Questionnaire to fill in to collect data
- Questions to discuss among them to collect opinions

RESULTS - ITERATION 1

- 4 concepts generated 1 chosen for further development
- Something always selected
- Relative selection style
- Physical back button
- Software back buttons where needed

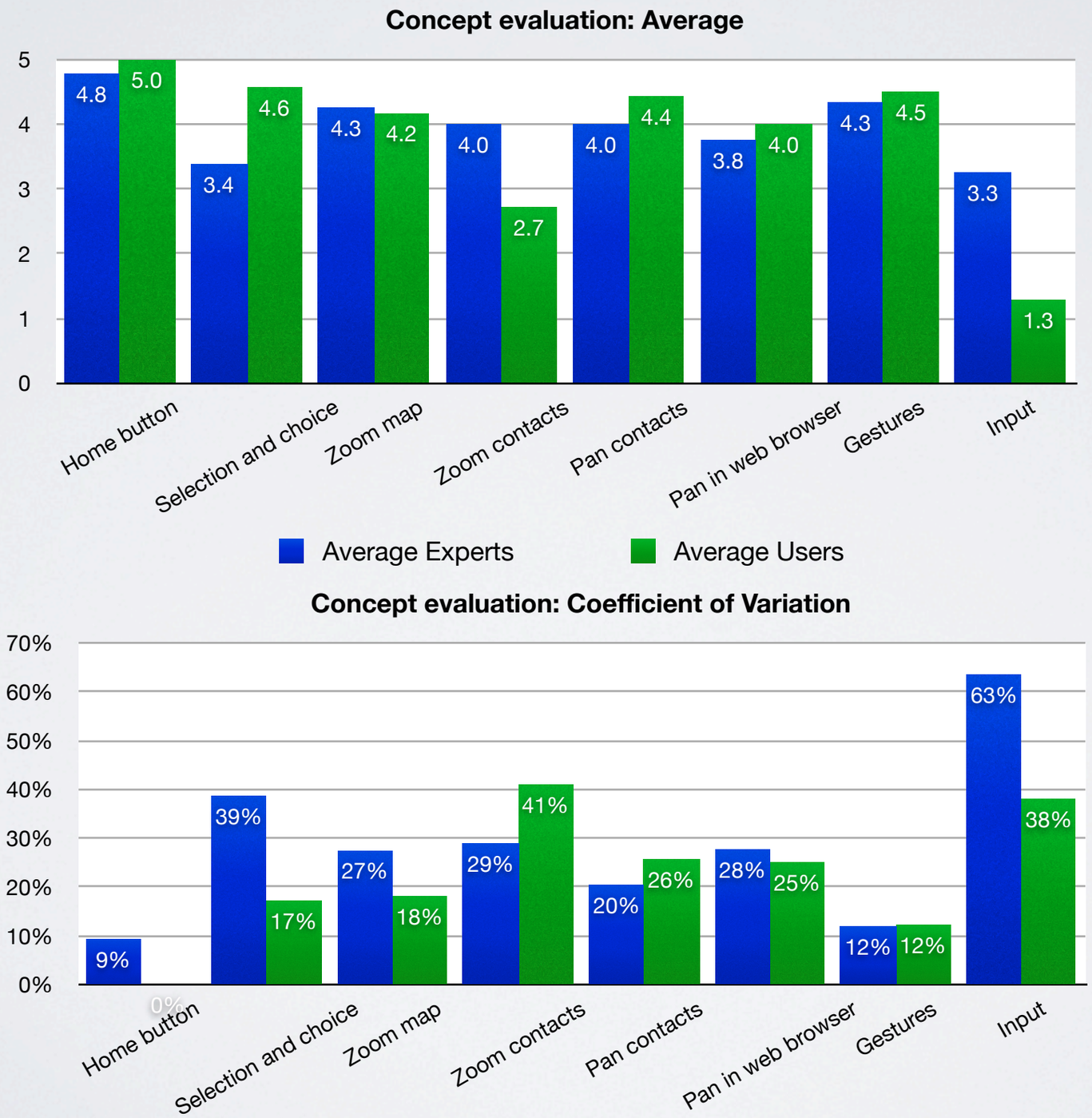
RESULTS - ITERATION 2

- Haptic or audio feedback needed
- Feature that clearly indicated chosen menu
- Surface texture was too sticky
- Graphic design was too computer-like
- Touchpad angle created friction
- Pointer speed vital for control

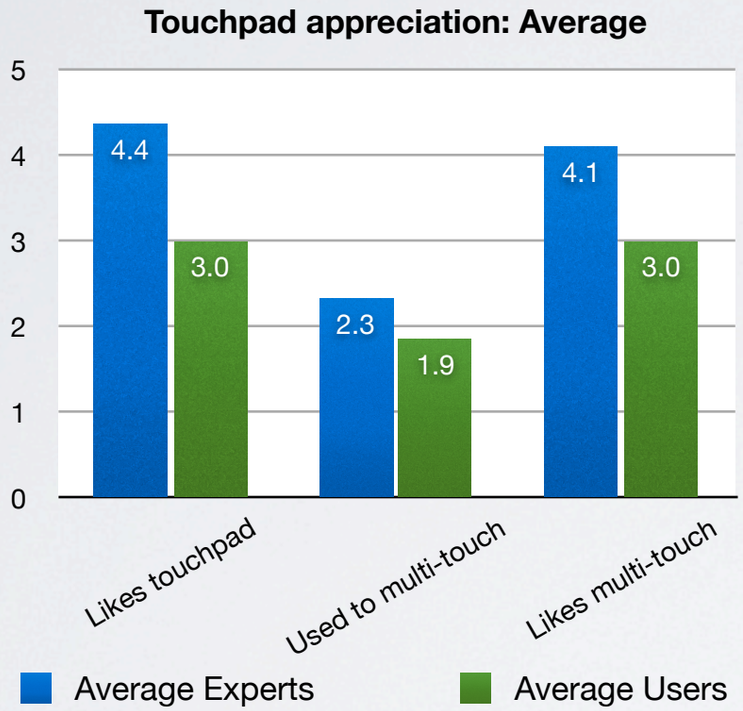
RESULTS - ITERATION 3

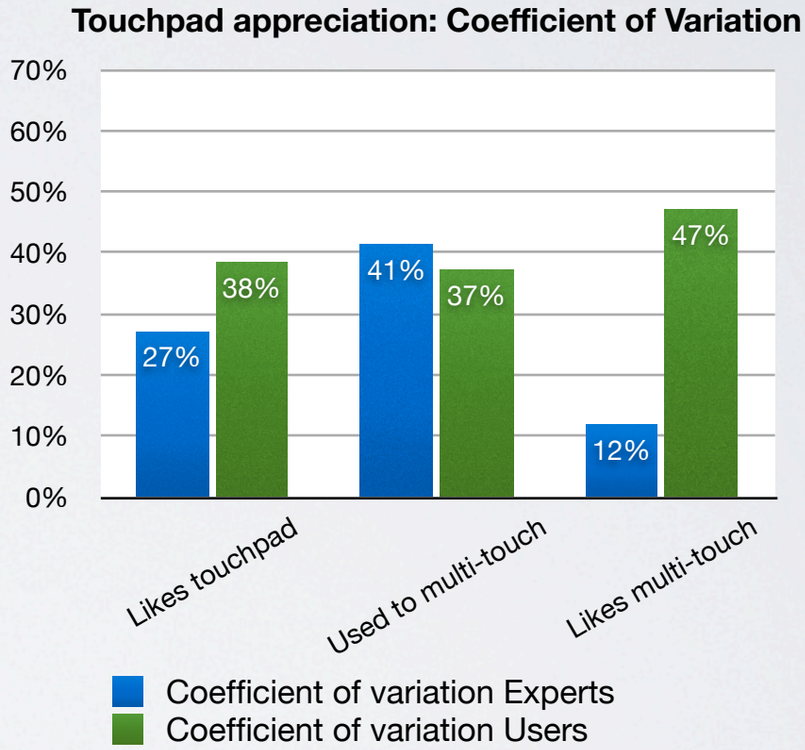
- Graphic redesign made it more car-like
- User tests grade prototype grade ~ 4/5

RESULTS - ITERATION 3



RESULTS - ITERATION 3





DESIGN CHOICES

- Touchpad properties
- 80/20 design
- Users
- Future proof

TOUCHPAD PROPERTIES

- Flat
- Adaptable
  - Selection - Fitt's Law and Higg's Law
  - Formless - Can take any shape defined on screen

80/20 DESIGN

- A high percentage of effect in any large system are caused by a low percentage of variables (Pareto's principle)
- Design to make the most utilized functions easily accessible
- 20 percent of the functions are used 80 percent of the time
- Focus resources on them

USERS

- Mixed demographic - age - education - work
- Different requirements - professional - joy
- Design for ease of use

FUTURE PROOF

- Icon list to make updates possible
- More internet applications
- Install applications as on the iPhone

FINAL REMARKS

- Responsive interface to maintain control
- Should use multi-modal feedback
- Important with real driving test

FUTURE WORK

- Study hapticons and touchpad - Nintendo Wii uses one kind of this to create a haptic texture
- Build a fully functional system to evaluate performance compared to rotary controller
- Study what features users mostly use and make these easily accessible

END

- Thanks for listening