GID-PROTOTYPING WORKSHOP

甲斐

Kai Kunze

First ...

get snsrlog from the AppStore

source code:
https://github.com/benFnord/snsrlog

Overview

Activity Recognition Intro

Common Practices for Creating Prototypes

Mobile Phone Sensing

grew up in a small village near Heidelberg, Germany

phD. from Passau, Germany, Summa Cum Laude (started in Innsbruck, Austria)

Assistant Professor at Osaka Prefecture University, Japan

BACKGROUND

Associate Professor — *Graduate School of Media Design, Keio University*

Research Assistant Professor — *Osaka Prefecture University*

Visiting Researcher at MIT Media Lab — *MIT, Cambridge, USA*

phD in Ubiquitous/Wearable Computing — *University Passau, Germany*

Collaborations with PARC, SUN, Deutsche Börse ... — *Palo Alto, Grenoble, Frankfurt,Innsbruck*

With the computers surrounding us in everyday life,
The performance bottle neck is
Human Attention.

For Computing to become useful in everyday situations, the interface needs to vanish as much as possible.

Computing needs to become pro-active

Activity Recognition -> Context-Aware Systems

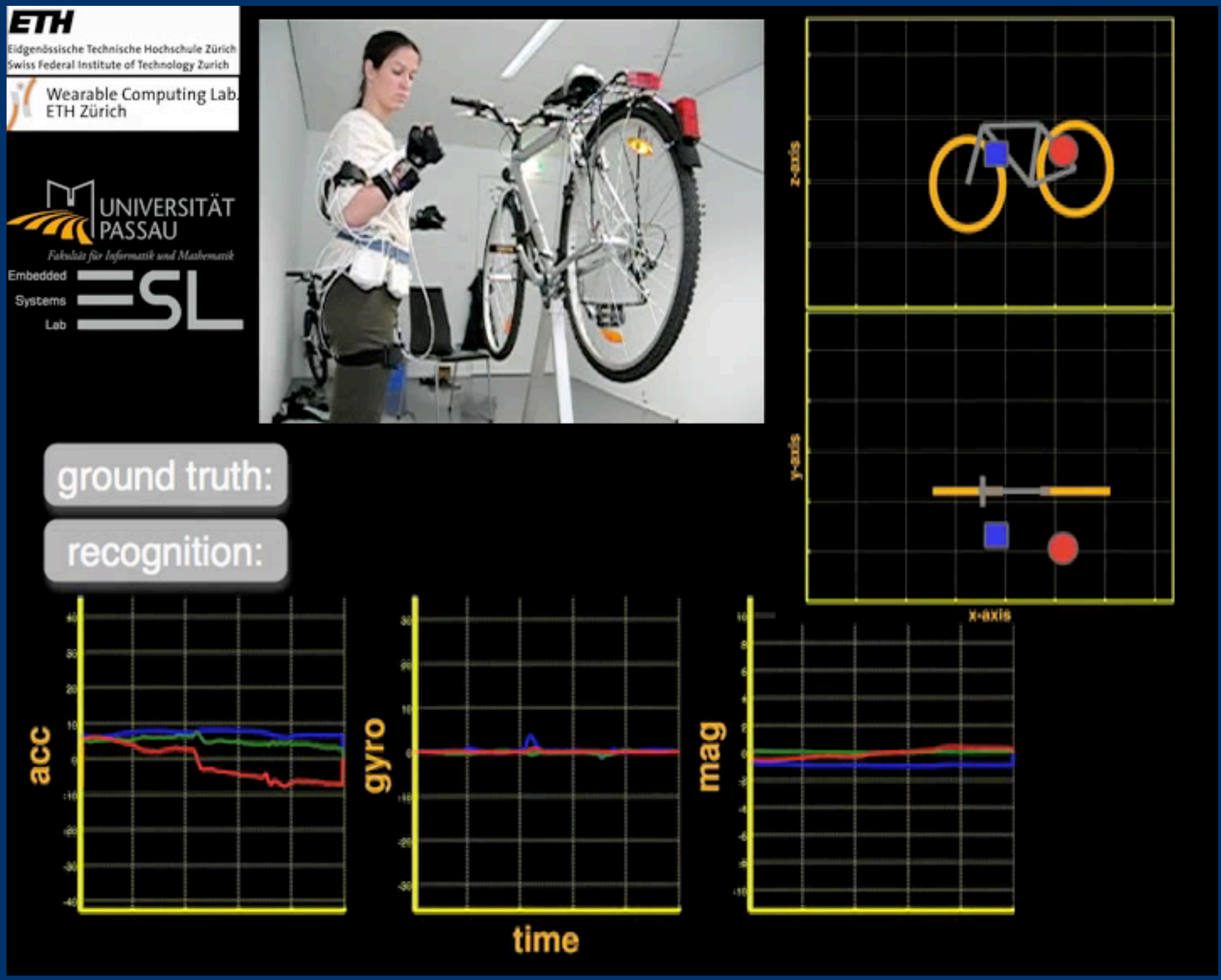
.. and a set of sensors/devices

worn by the user

wearable computing in 2006

Maintenance Scenario Collaboration with Zeiss, Oberkochen.

ACTIVITY RECOGNITION



Original work by: Georg Ogris

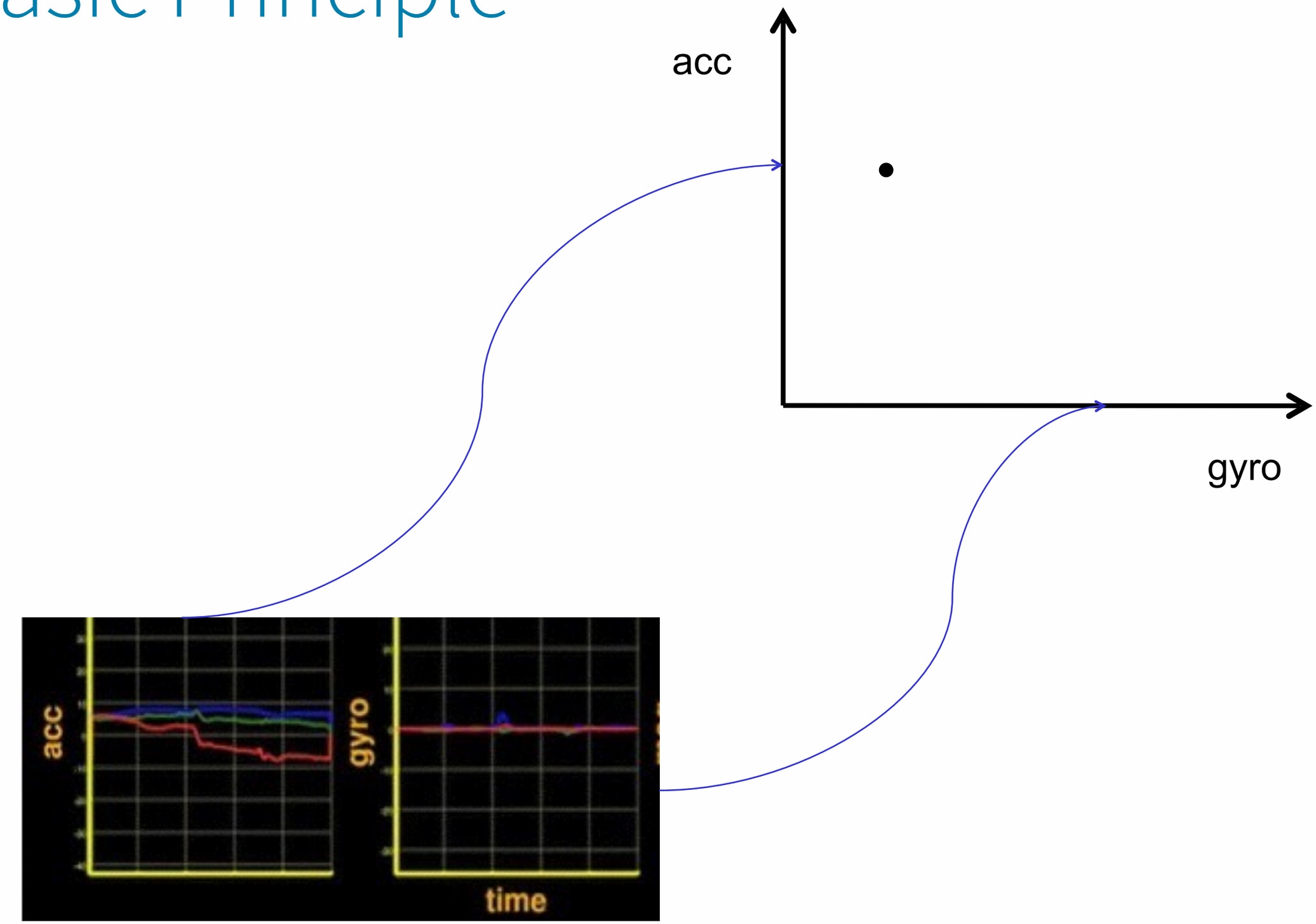
What is Context Recognition ?

Classical AI: imitating human cognition
- often video based
- includes interpretation

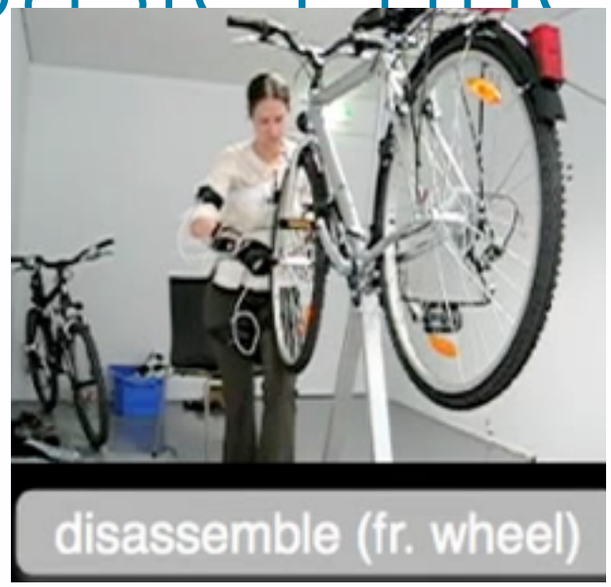
Context Recognition:
mapping signals from simple sensors onto a set of ***predefined, environment related*** states

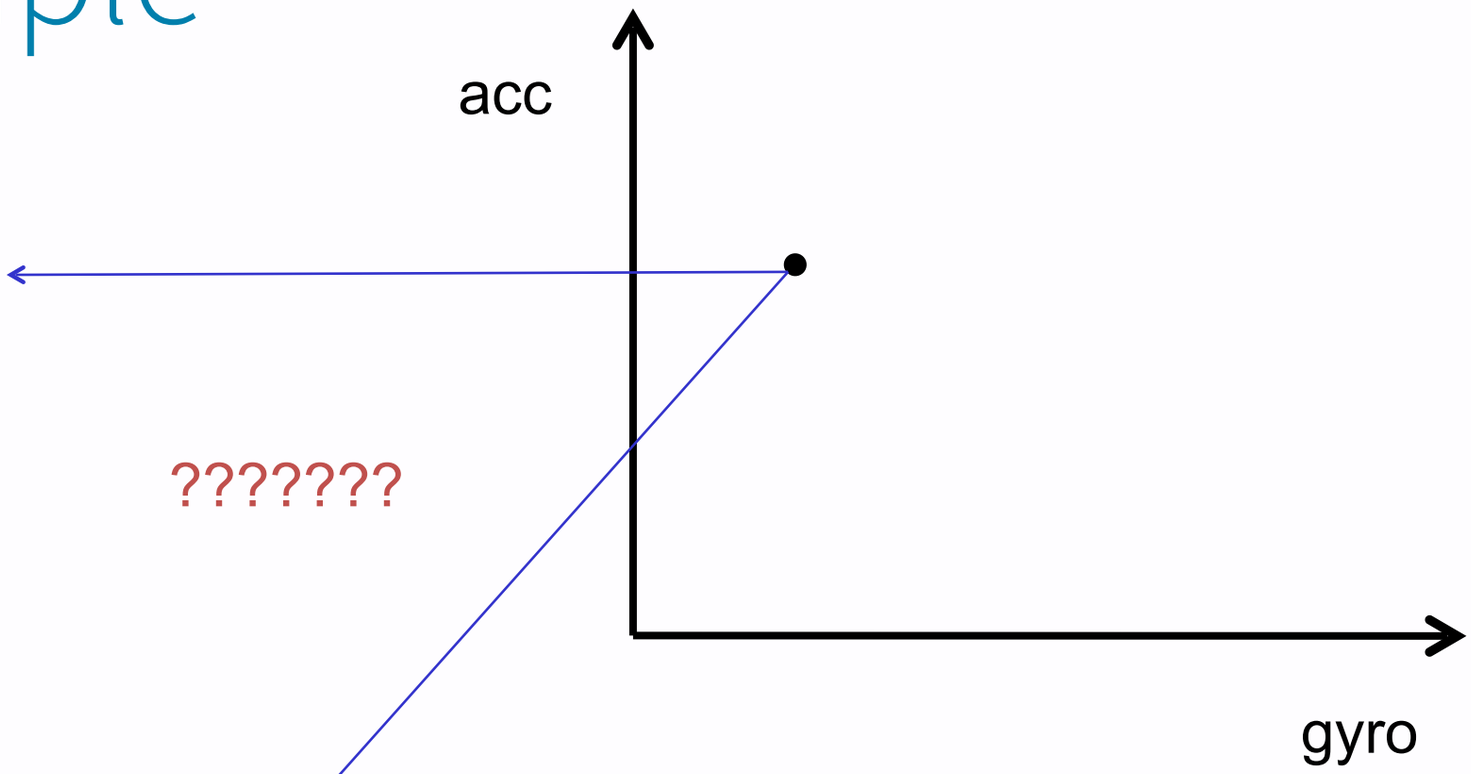
Embedded Controllers: feedback control loop

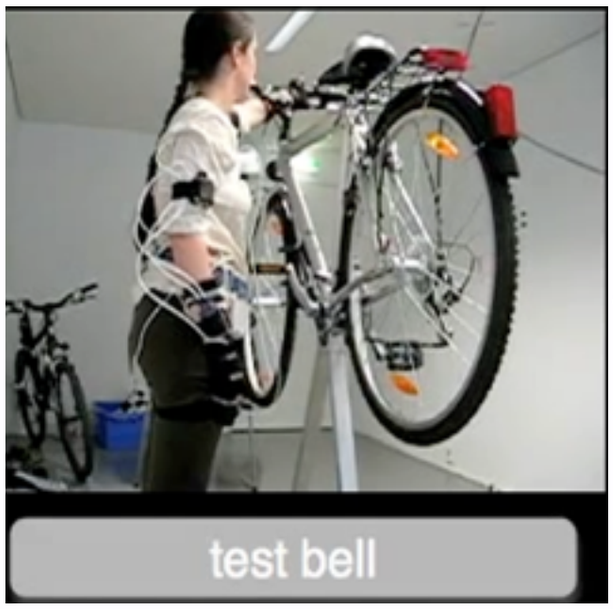
Basic Principle



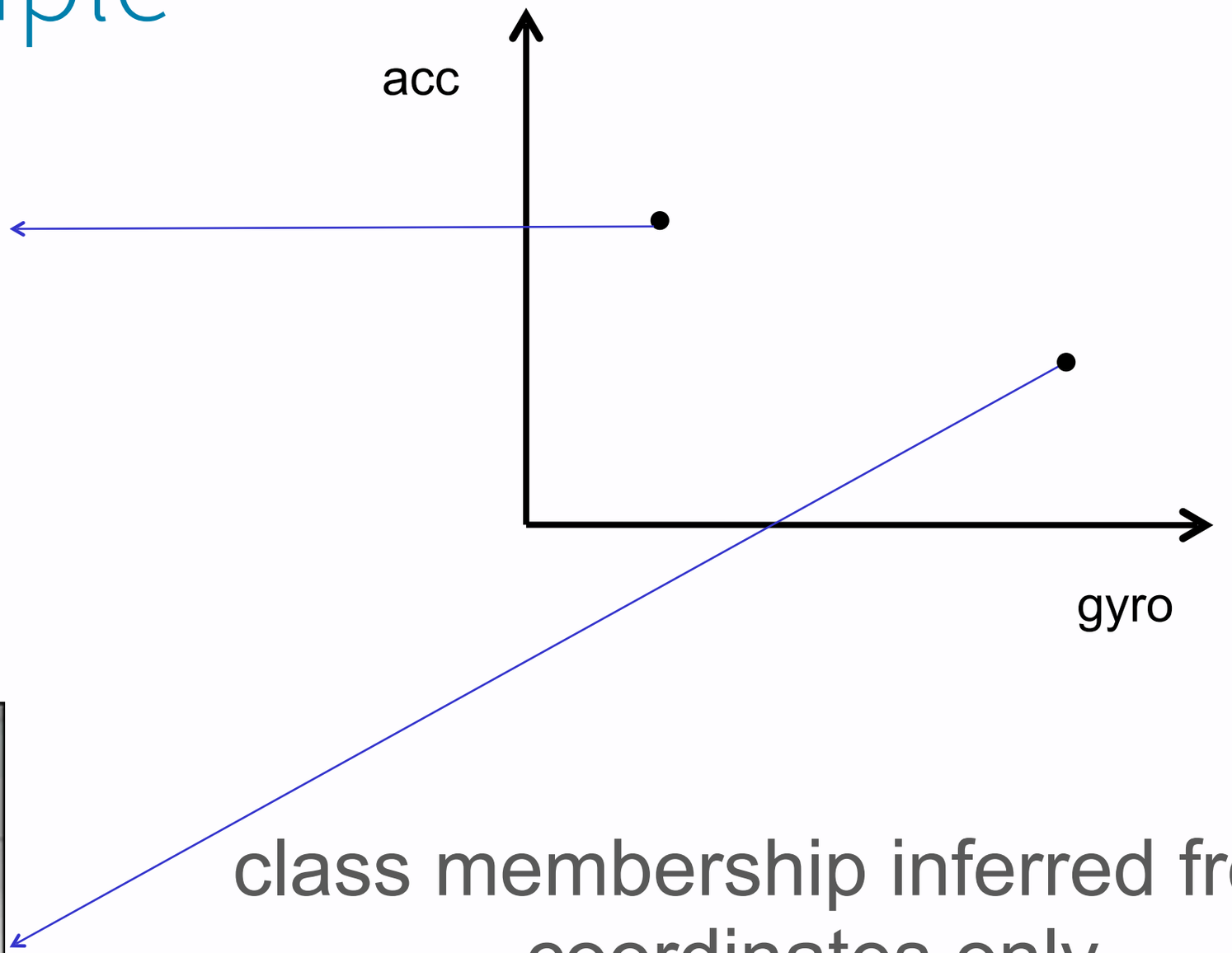
Basic Principle





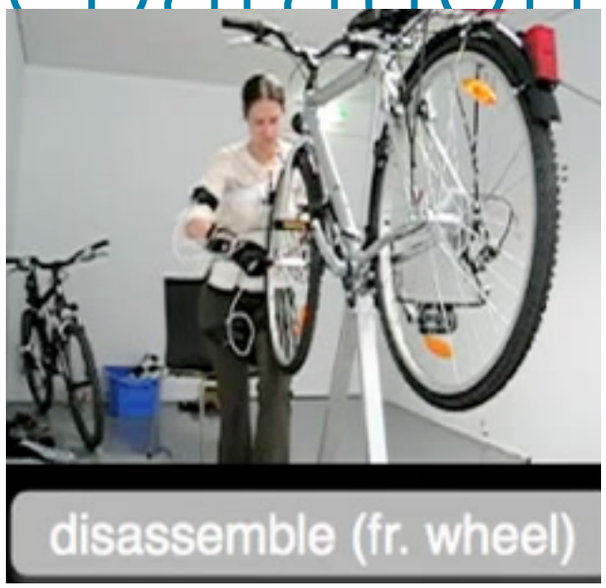


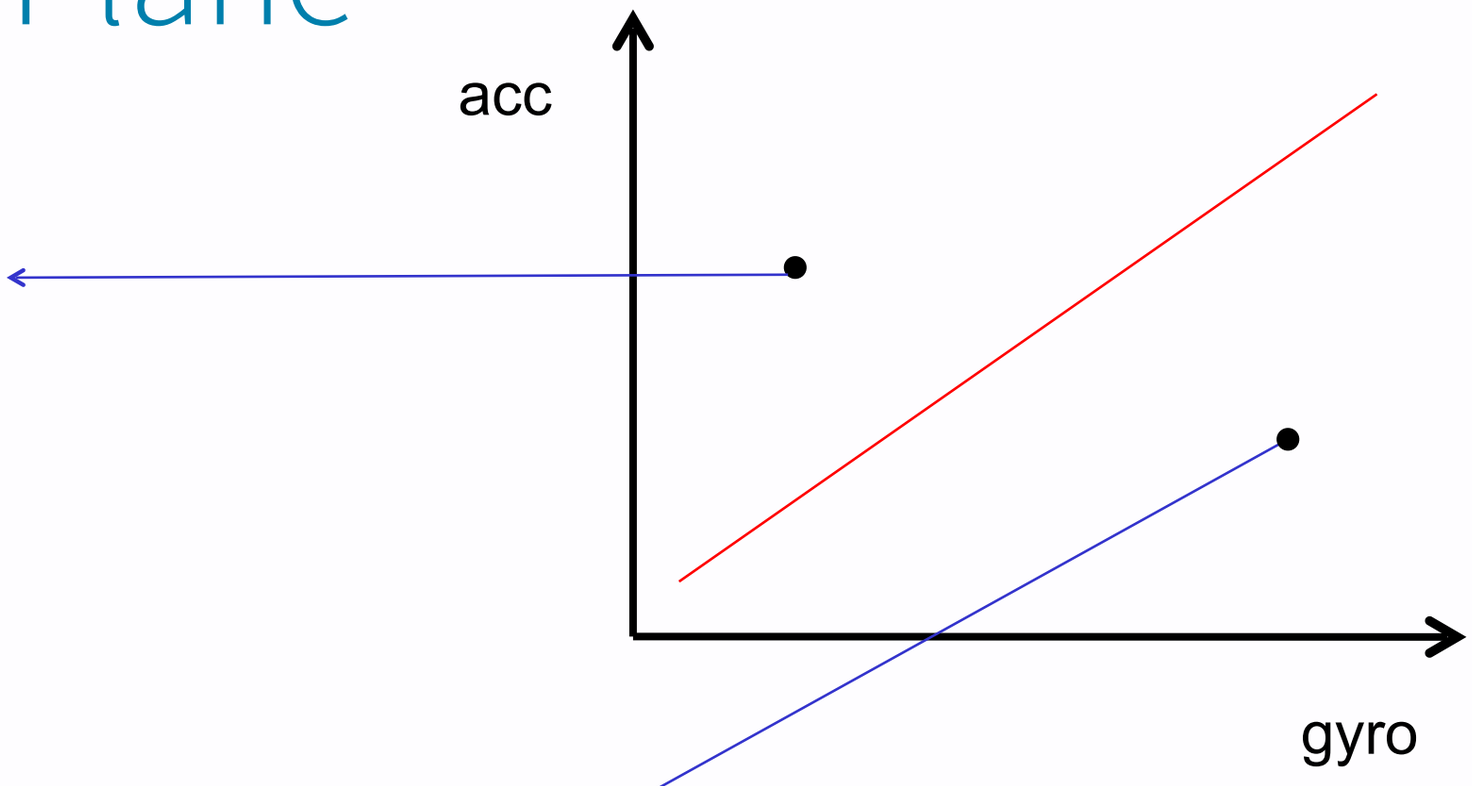
Basic Principle



class membership inferred from coordinates only

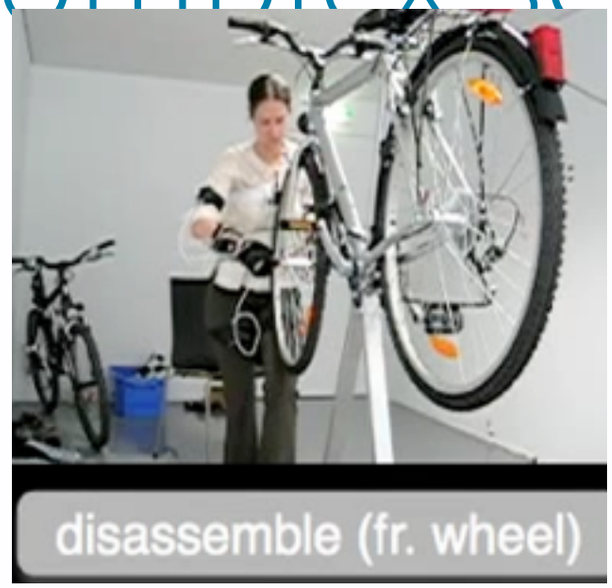
Separation Plane

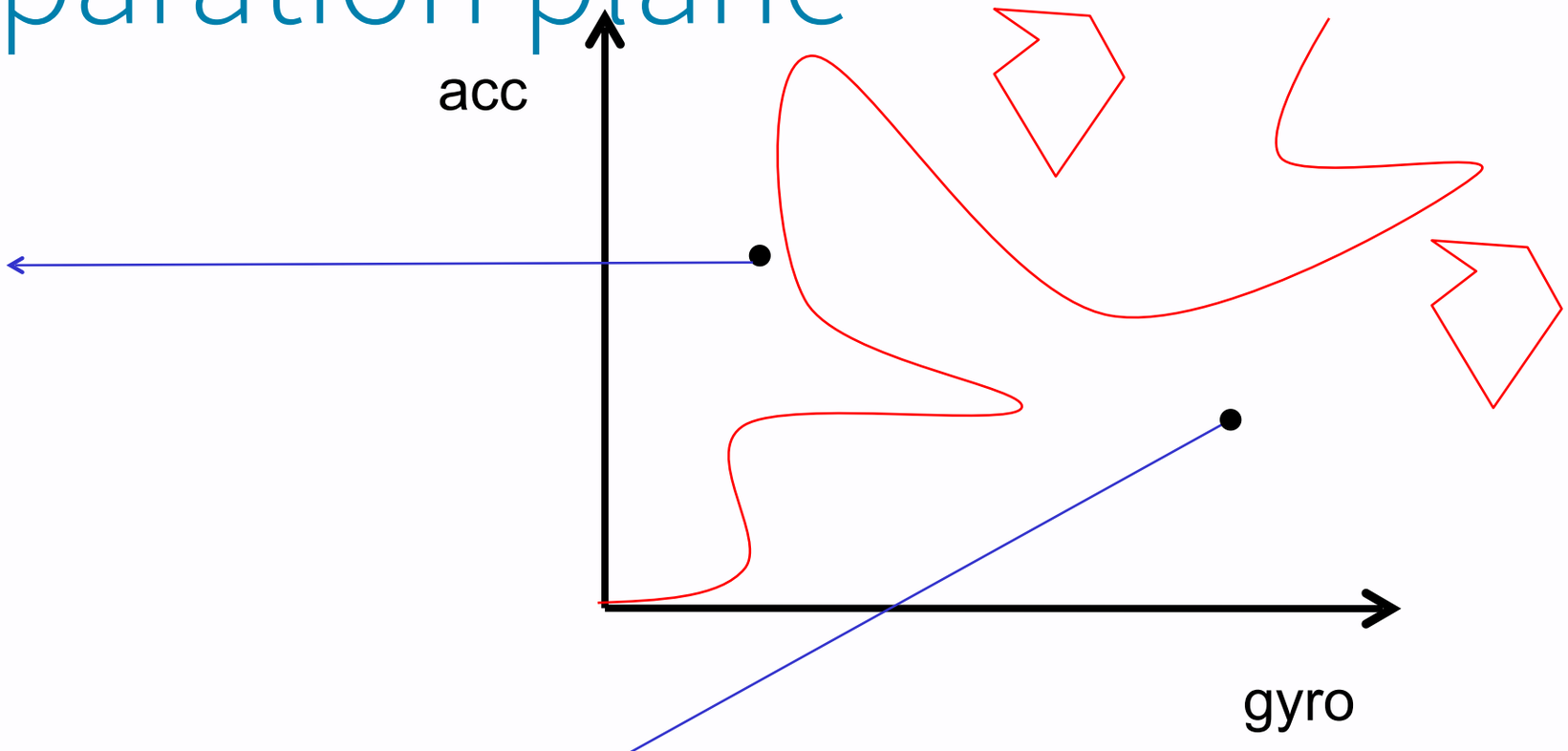




recognition given through separation plane

complex separation plane





often complex and impossible to represent in an analytic way

ZEISS

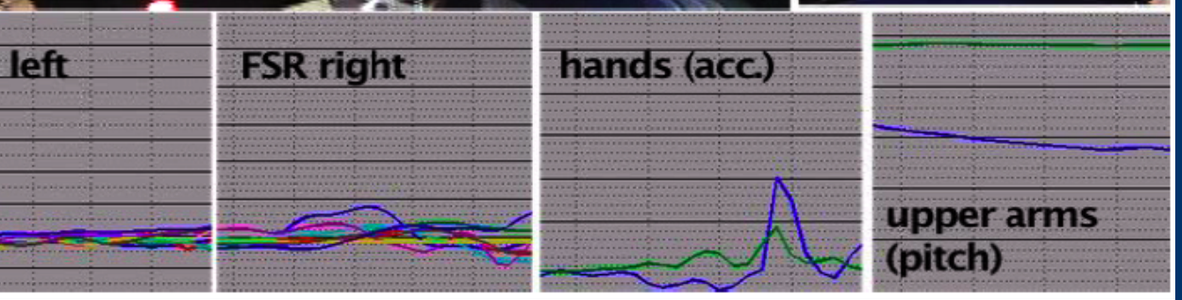
THALES

SAP

WEMBLEY
inspiring · memories

Allianz Arena

ESL



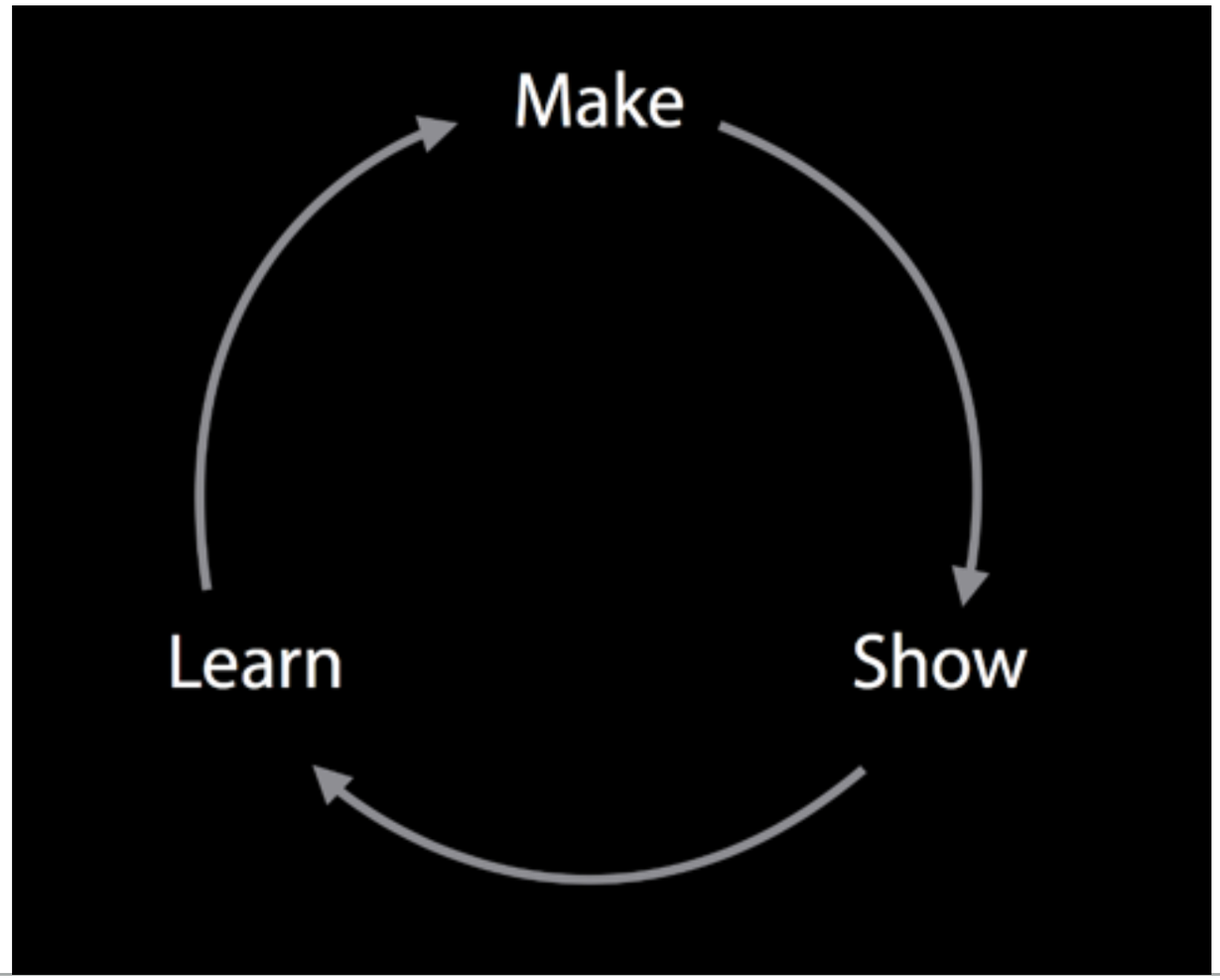
Prototyping

Prototyping

Make fake services/applications

Show people (best people who will use the service/app)

Learn from their feedback



Why Testing with People is Important!

Fake it!

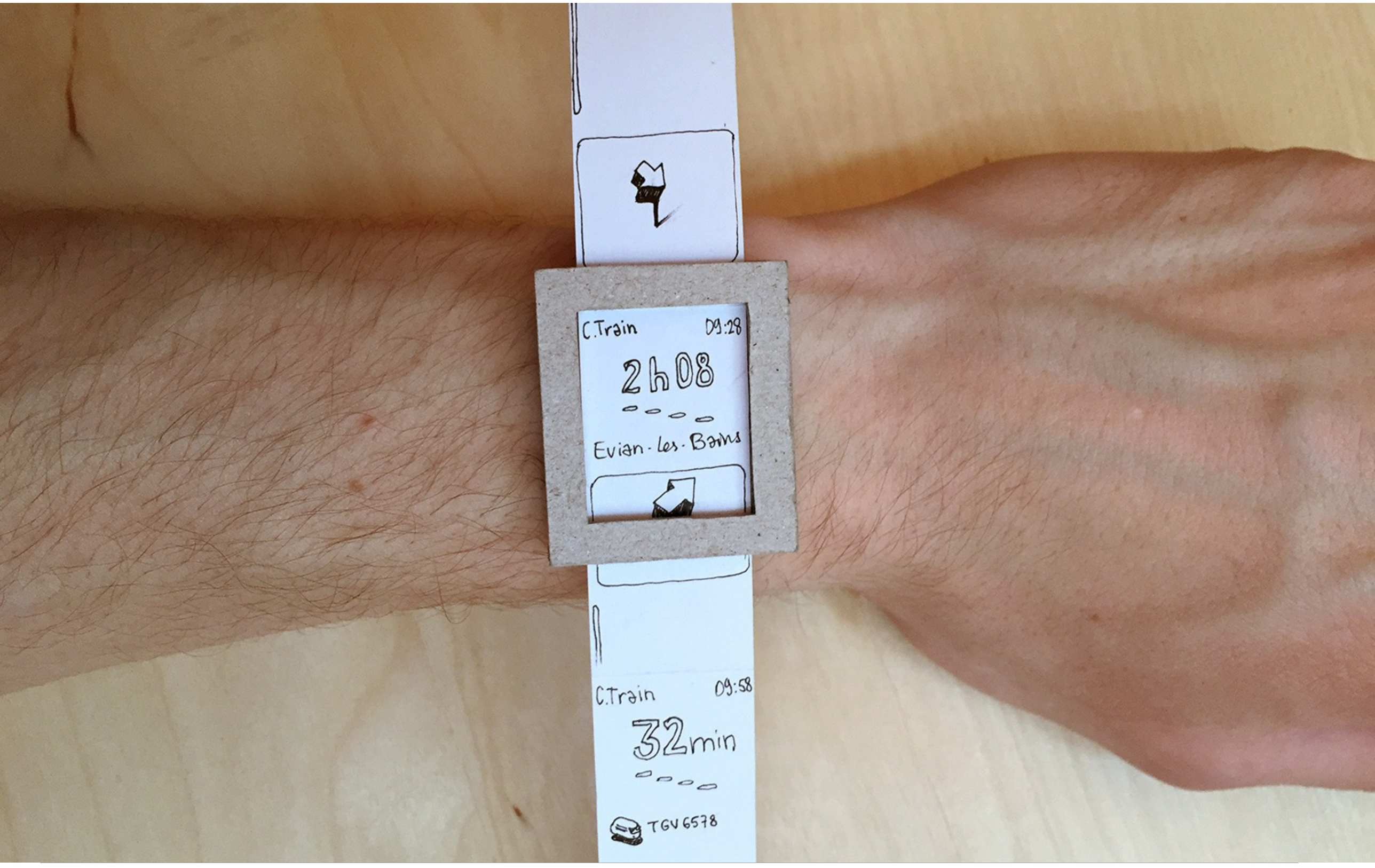
Let’s say you want to make a new device with display …

Fake it!

Fake hardware on screens

Fake software with pictures

Try it in context, at the right size, in the right place


C.Train
09:28
2h08
Evian-les-Bains
C.Train
09:58
32min
TGV6578


Lorem ipsum wir
versuchen mal 1
Lorem ipsum dolor sit
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sadipscing elitr, sed
diam nonumy eirmod
tempor invidunt ut
labore et dolore magna
aliquyam erat, sed diam
voluptua. At vero eos et

Further Infos

Paper Prototyping

http://groups.csail.mit.edu/graphics/classes/6.831/lectures/L9.pdf

Prototyping Future Hardware

https://developer.apple.com/videos/wwdc/2015/?id=803

Designing with Animations

https://developer.apple.com/videos/wwdc/2015/?id=803

Prototyping: Fake It Till You Make It

https://developer.apple.com/videos/wwdc/2014/

Mobile Phone Sensing

PHYSICAL ACTIVITY RECOGNITION BECOMES MAINSTREAM

Kunze Kai. Compensating for On-Body Placement Effects in Activity Recognition, 2011.

Mobile Phone Sensing

Microphone

Camera

Motion Sensors

Bluetooth/Wifi

Touch Screen (capacitive)

some:

Altimeter (Air Pressure)

Motion Sensors

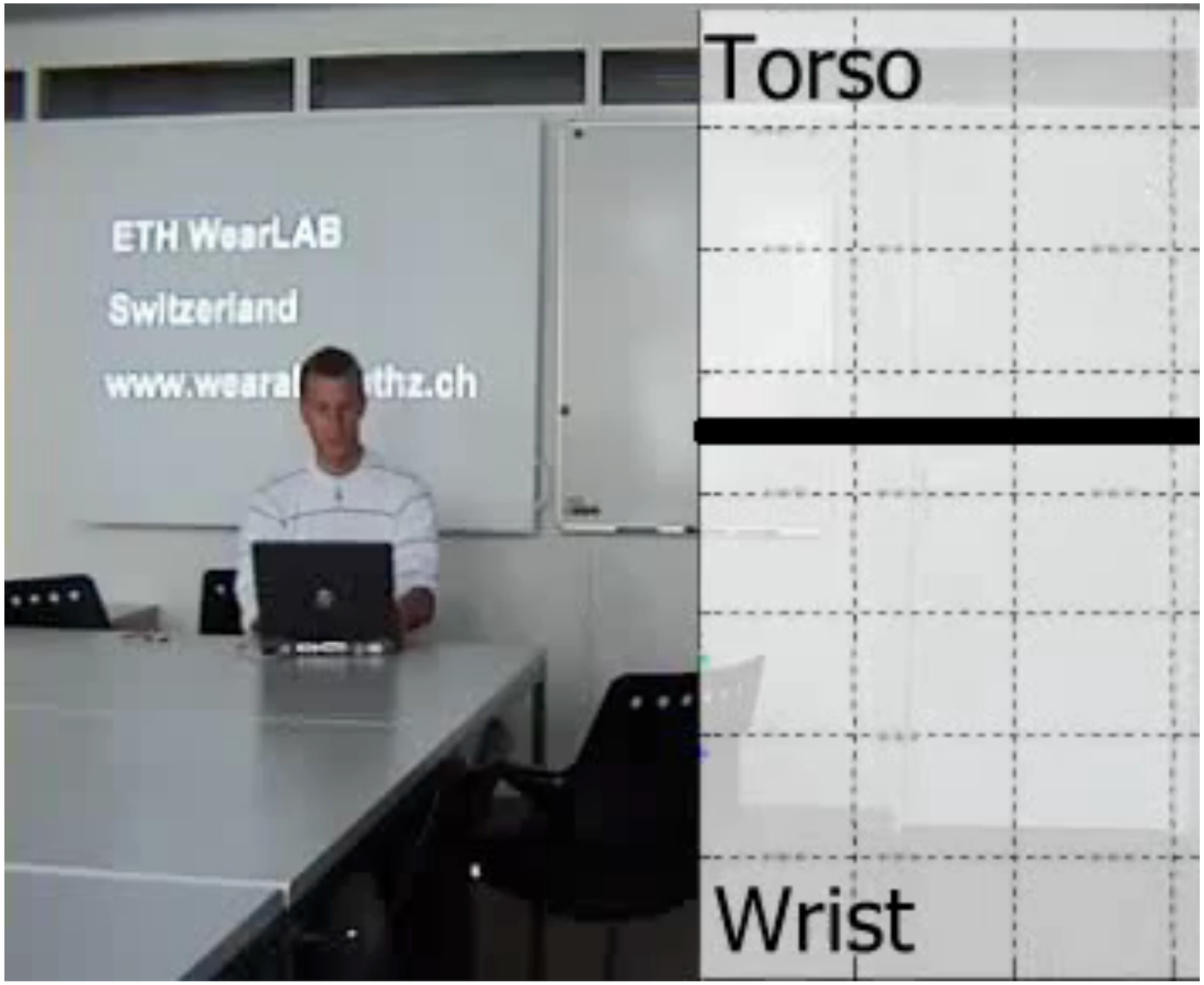
Accelerometer

Gyroscope

Magnetic Field Sensor

Air Pressure Sensor (Altimeter)*

Accelerometer



+1g

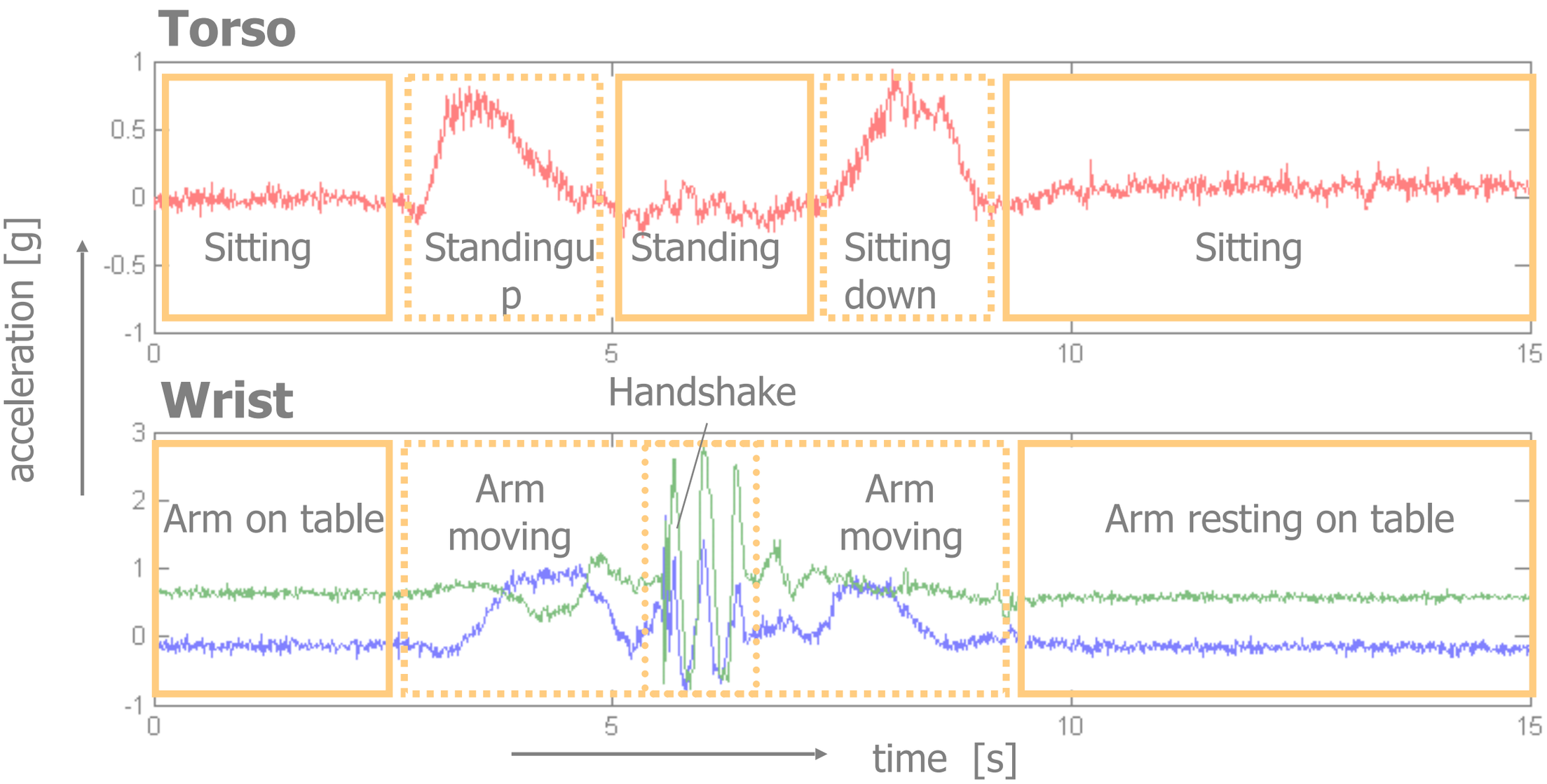
0g

+2g /+2g

0g /0g

-2g /-2g

Analyzing Recordings

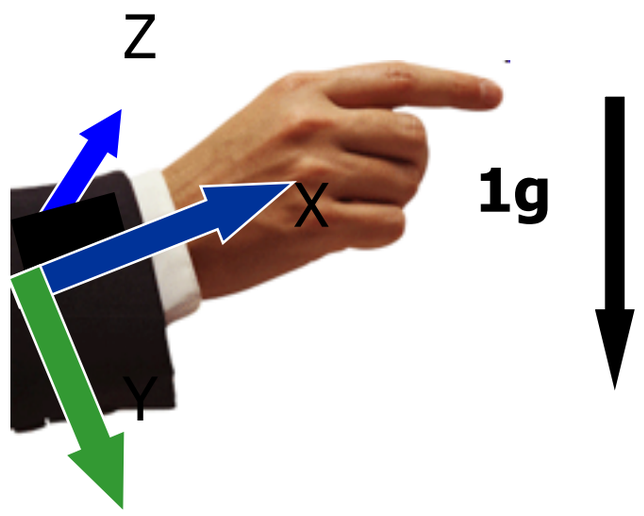


Acceleration Sensor

- **Acceleration sensors provides two types of information**

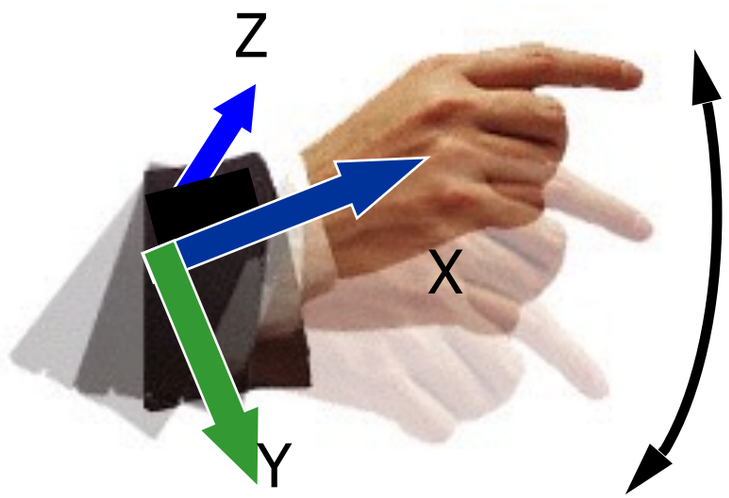
Acceleration Sensor

- **Acceleration sensors provides two types of information**
  - *Angle towards the gravity vector (tilt)*



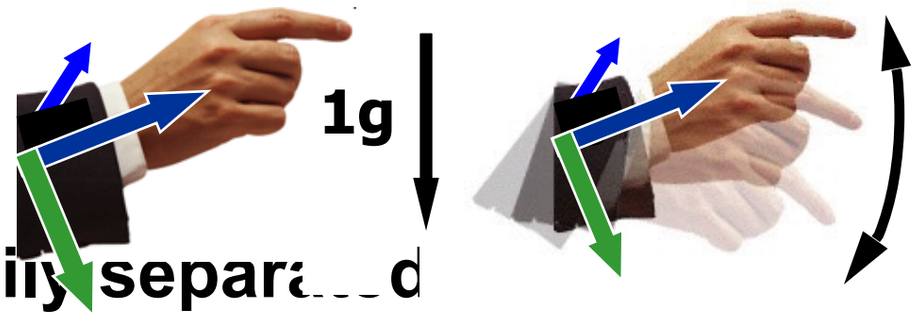
Acceleration Sensor

- **Acceleration sensors provides two types of information**
  - *Angle towards the gravity vector (tilt*
  - *Change of motion speed*

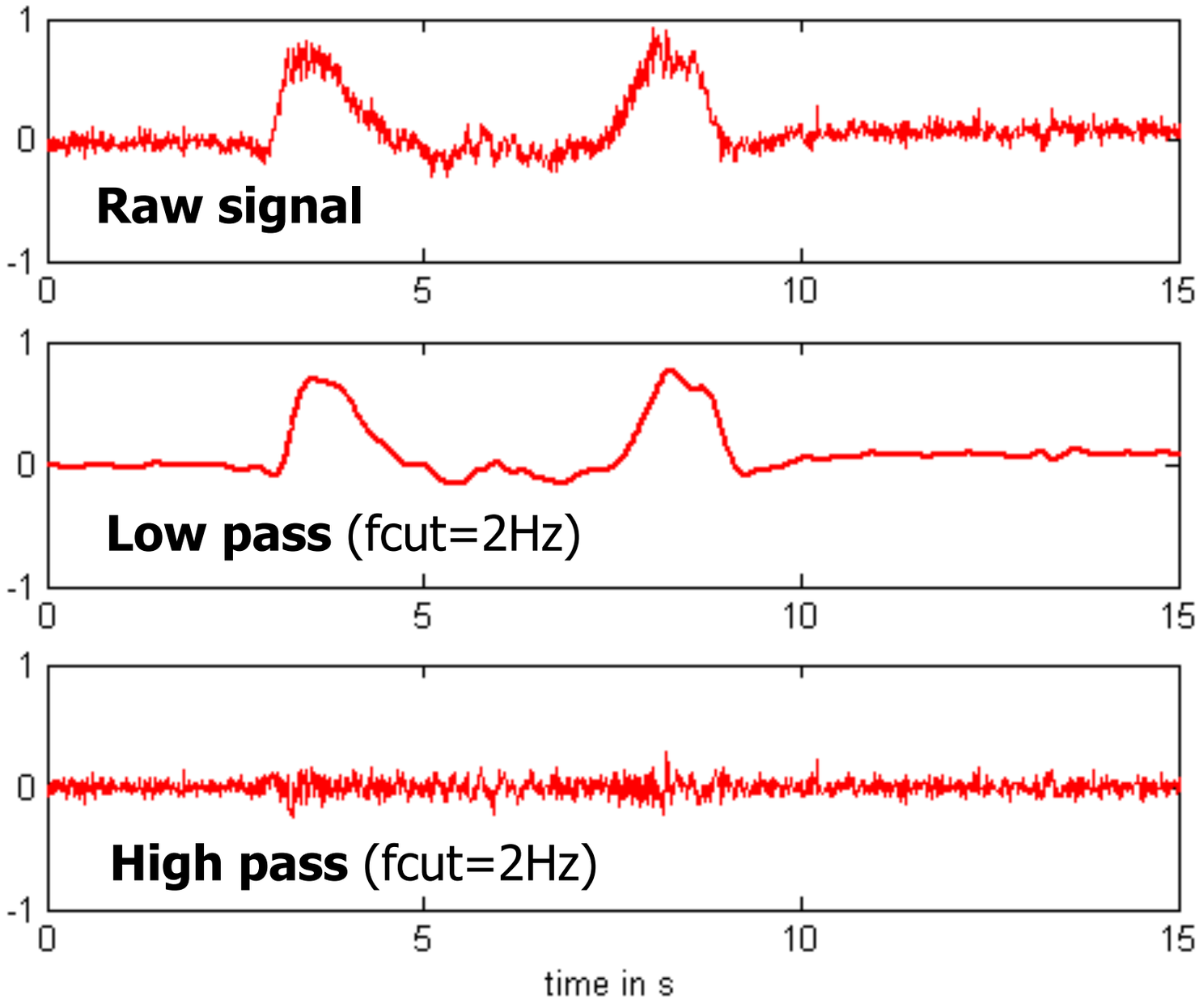


Acceleration Sensor

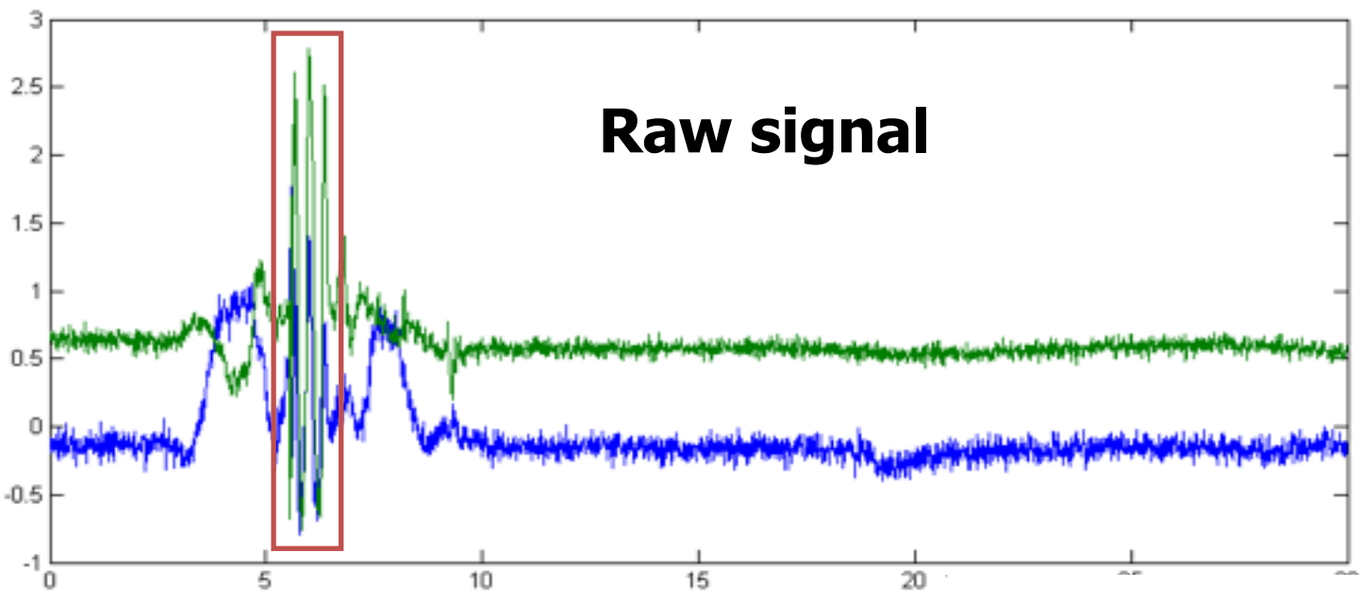
- **Acceleration sensors provides two types of information**
  - *Angle towards the gravity vector (tilt)*
  - *Change of motion speed*
- **These components can not be easily separated**

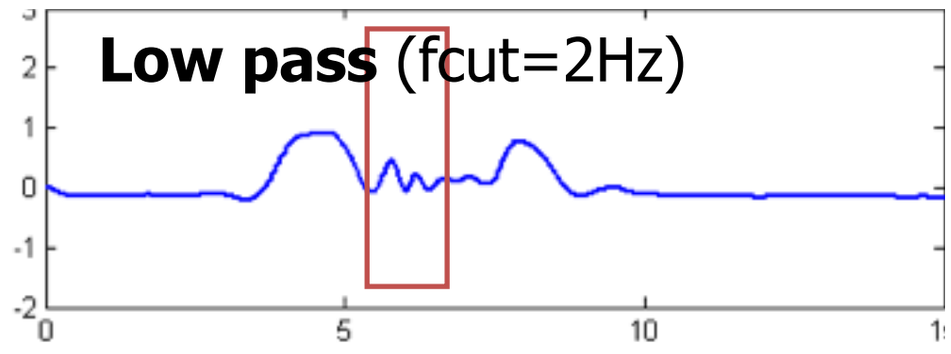


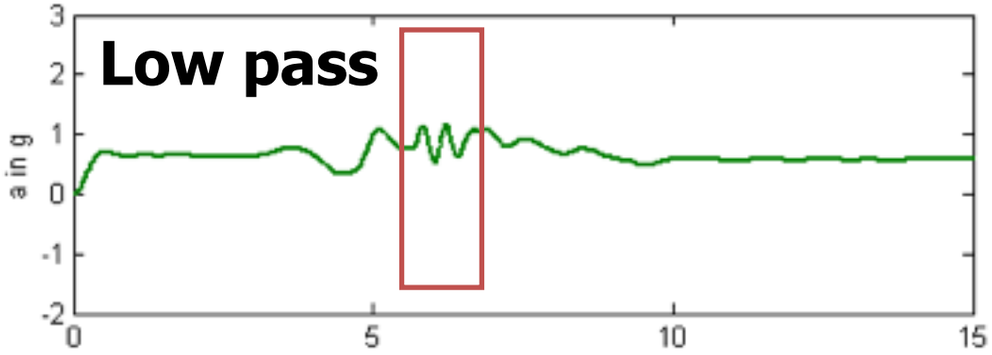
Filtering the Signal

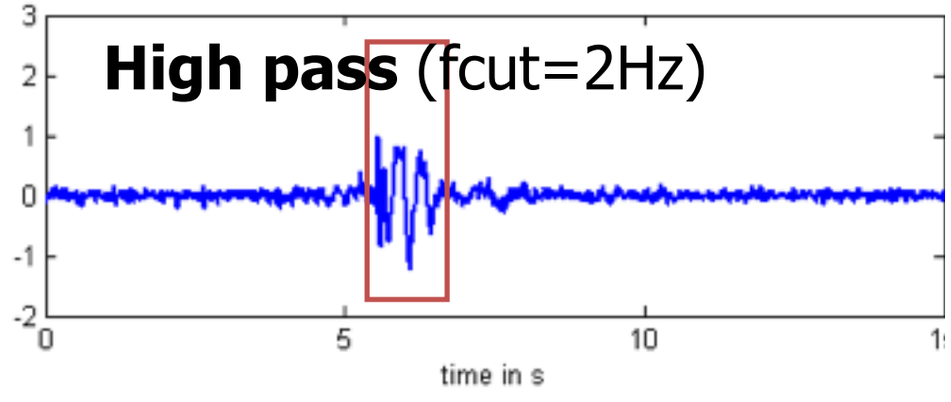


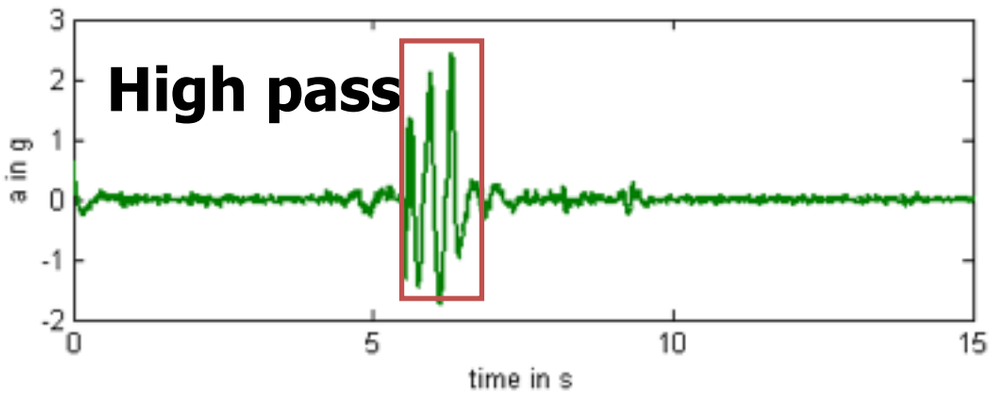
Filtering the Signal



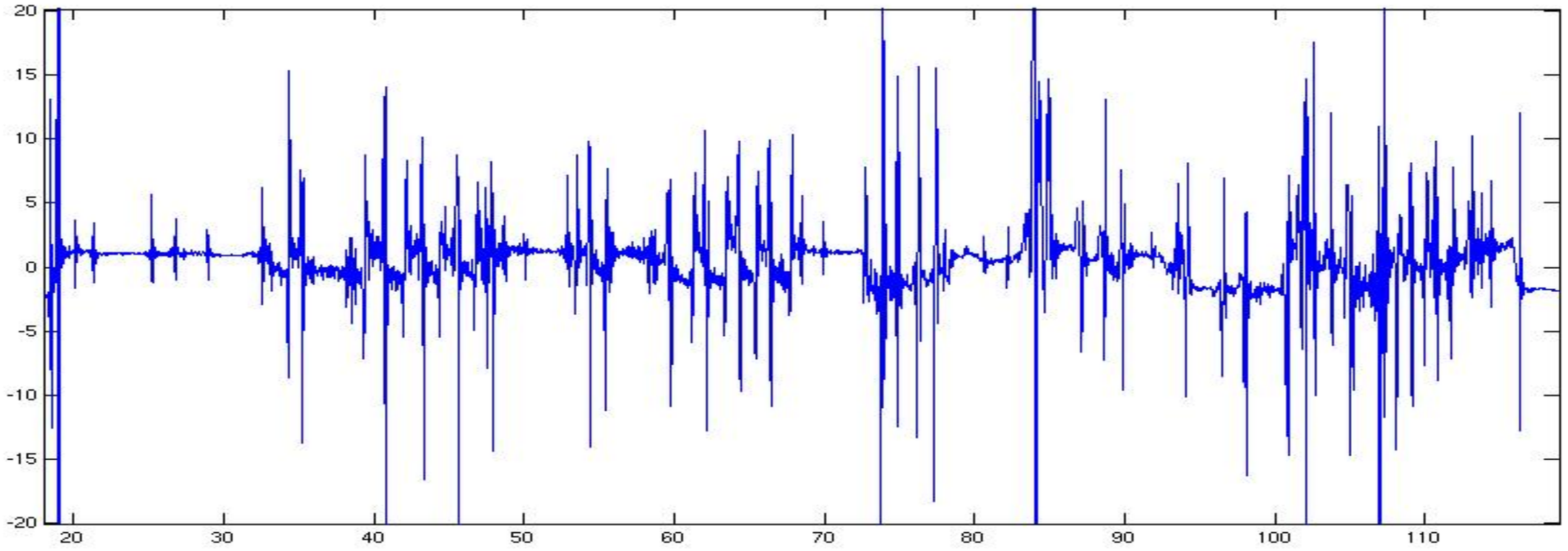








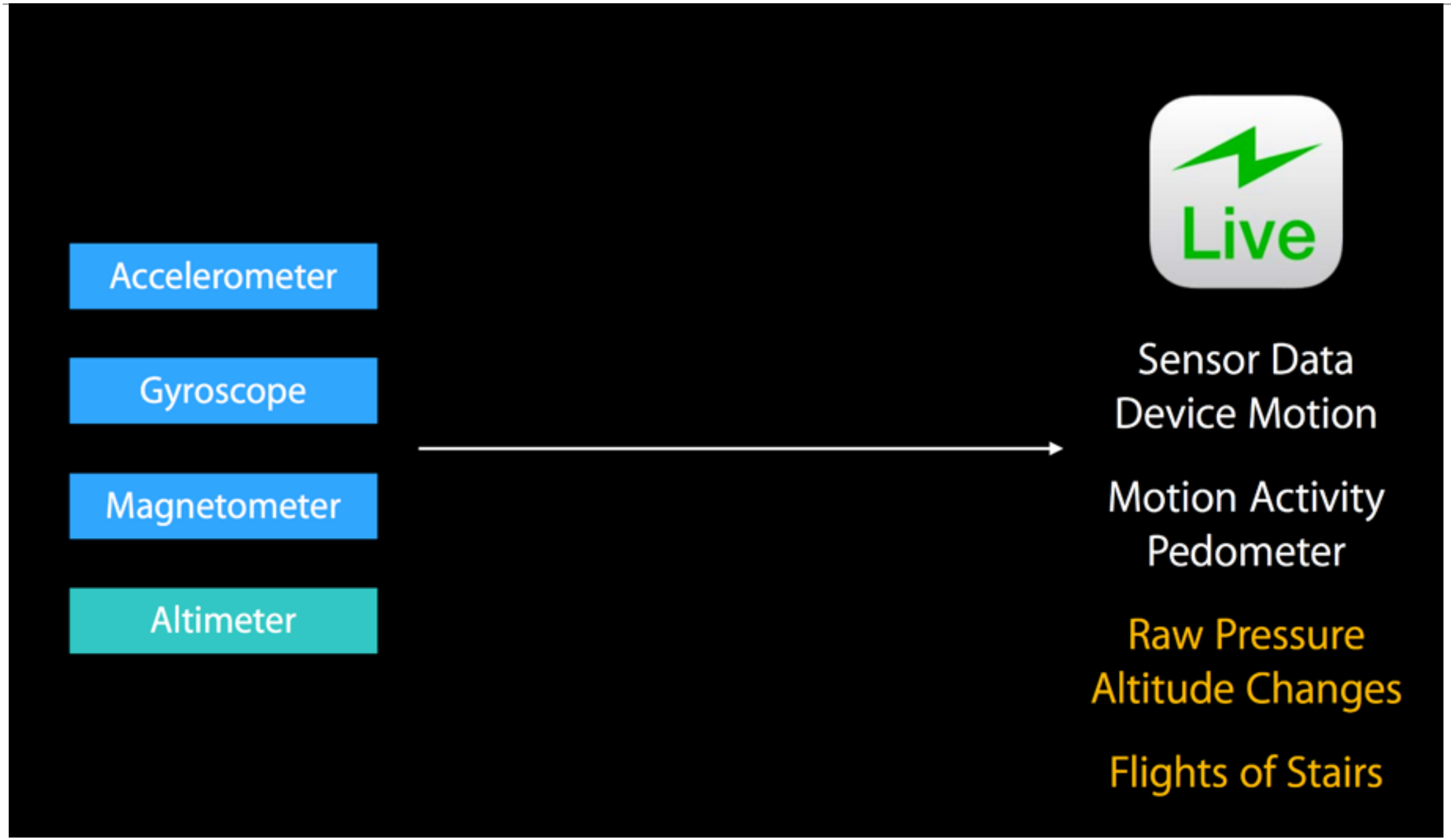
Motion Analysis



Gesture Recognition in Games

Early Prototype (around 2003-2004)

iOS



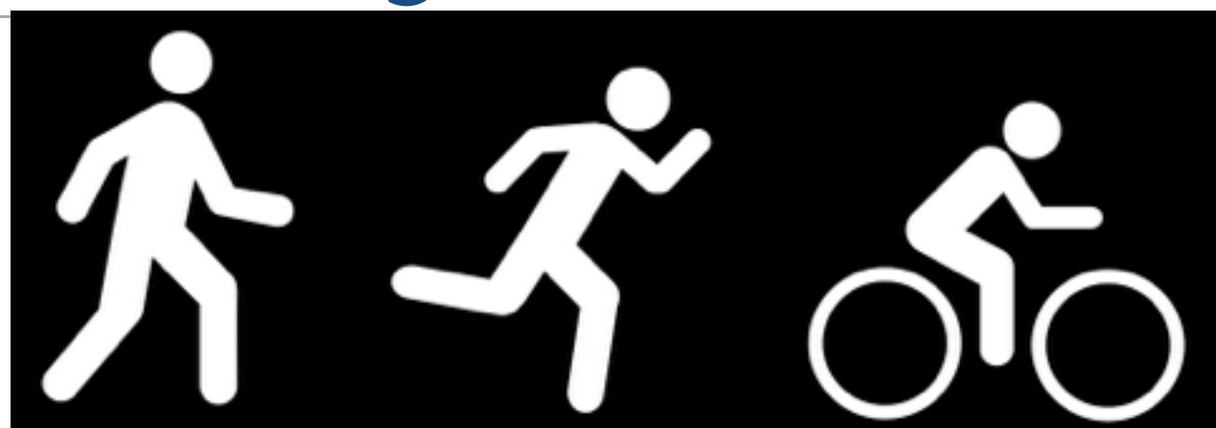
Altimeter (iPhone 6 /6+)

Altimeter (iPhone 6 /6+)

Motion Activity Recognition

implemented by Apple

Android has a similar API



Activity	iPhone 5S	iPhone 6/6+	Watch
Walking	✓	✓	✓
Running	✓	✓	✓
Cycling		✓	✓
Automotive	✓	✓	
Stationary	✓	✓	✓

More

iOS code:

Magnetic Field Sensor

https://developer.apple.com/library/ios/samplecode/Teslameter/Introduction/Intro.html

Accelerometer

https://developer.apple.com/library/ios/samplecode/AccelerometerGraph/Introduction/Intro.html

Sound

Easy:

how loud the environment is

Specific activities are easy to detect (e.g. grinding coffee)

Speaker detection (if somebody is speaking not who)

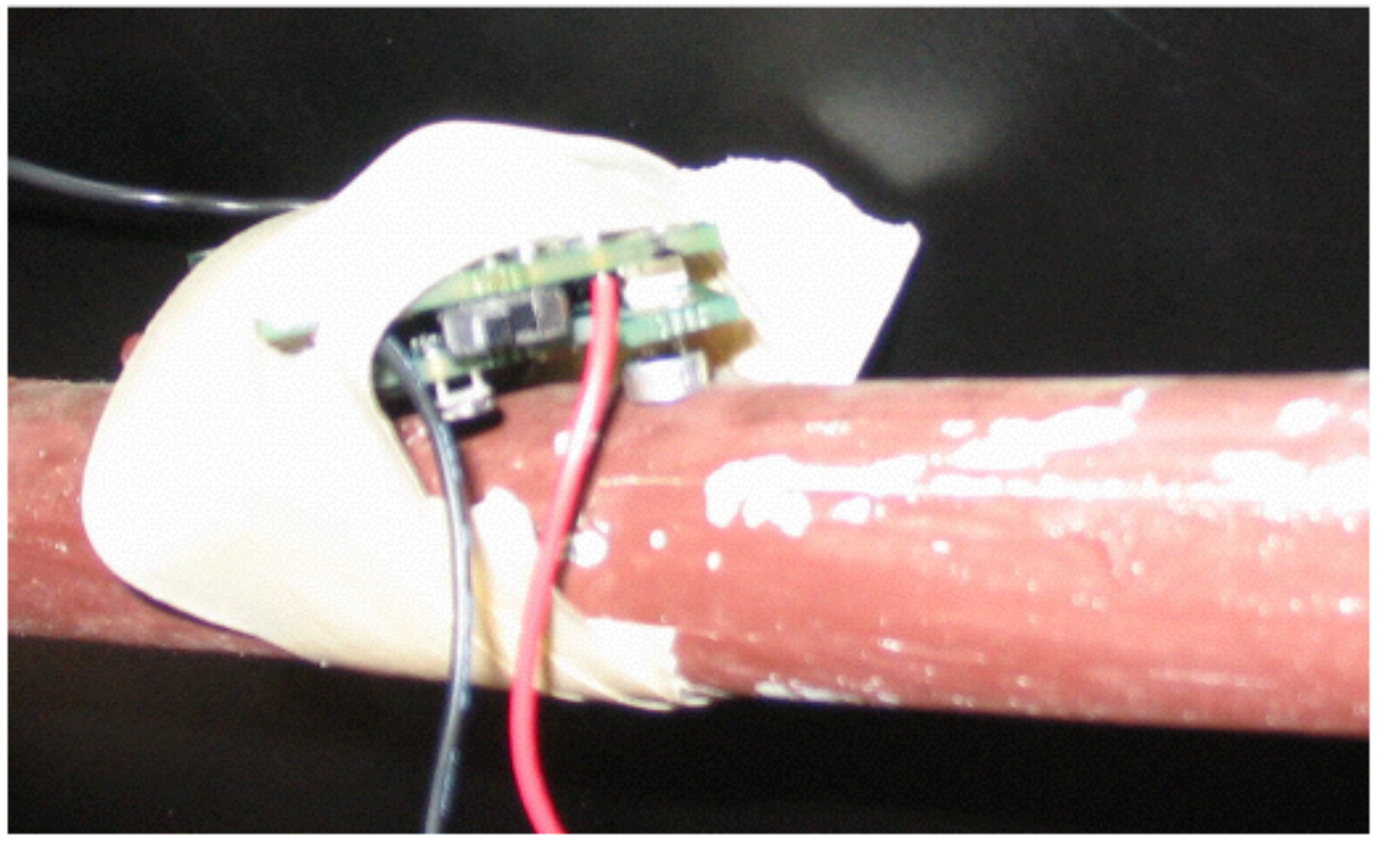
blowing on the microphone

more complicated:

semantic location

other recognition tasks ...

Water Pipe Sounds



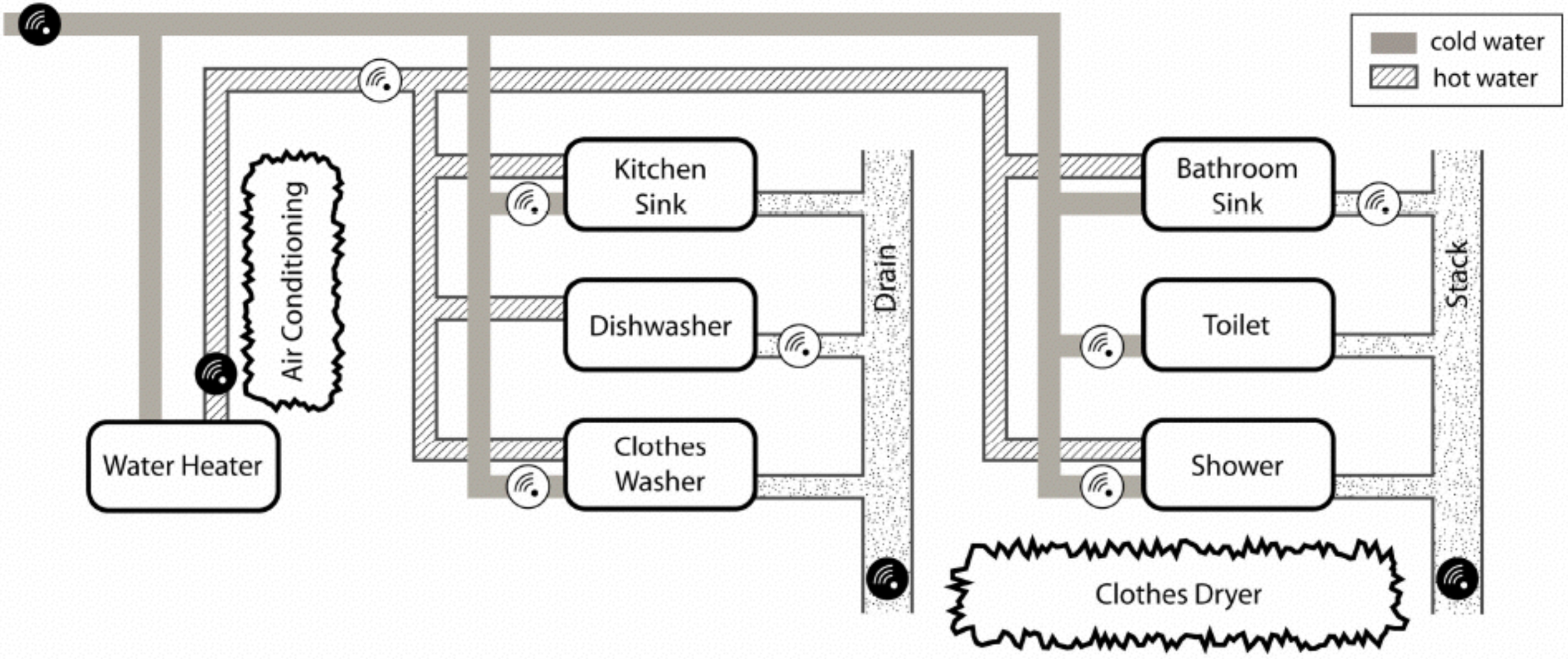
Forgarty, Au, Hudson,

UIST 2006

Figure 2. Our prototype sensor attached to a water pipe. The microphone is the cylinder in the center. We pressed the microphone against the pipe and secured the sensor with tape.

(b) The cold water sensor's view of a toilet flush occurring during a shower. The long jittering is water usage by the shower, while the higher plateau is caused by the toilet. The cold water sensor is labeled as on for the entire signal jitter, thus masking the toilet flush.

Water Pipe Sounds



Water Pipe Sounds

Clothes Washer

Cold:	**Mostly On:** 3 to 9 minutes	**Mostly Off:** 6 to 18 minutes	**Mostly On:** 3 to 9 minutes	**Mostly Off:** 90 seconds to 6 minutes
Drain:	**Mostly Off:** 7 to 21 minutes	**Mostly On:** 40 seconds to 2 minutes	**Mostly Off:** 5 to 15 minutes	**Mostly On:** 35 to 105 seconds	**Mostly Off:** 0 to 5 minutes

Toilet

Cold:	**Mostly On:** 40 to 70 seconds		
Stack:	**Mostly Off:** 0 to 10 seconds	**Mostly On:** 3 to 20 seconds	**Mostly Off:** 30 to 55 seconds

Dishwasher

Hot:	**Mostly On:** 45 seconds to 2.5 minutes	**Mostly Off:** 2 to 3 minutes	**Mostly On:** 45 seconds to 2.5 minutes	**Mostly Off:** 5 to 7 minutes	**Mostly On:** 45 seconds to 2.5 minutes	**Mostly Off:** 45 to 90 seconds	**Mostly On:** 45 seconds to 2.5 minutes

Shower

Cold:	**Mostly On:** 5 to 30 minutes
Hot:	**Mostly On:** 5 to 30 minutes
Stack:	**Mostly On:** 0 to 30 minutes

Camera

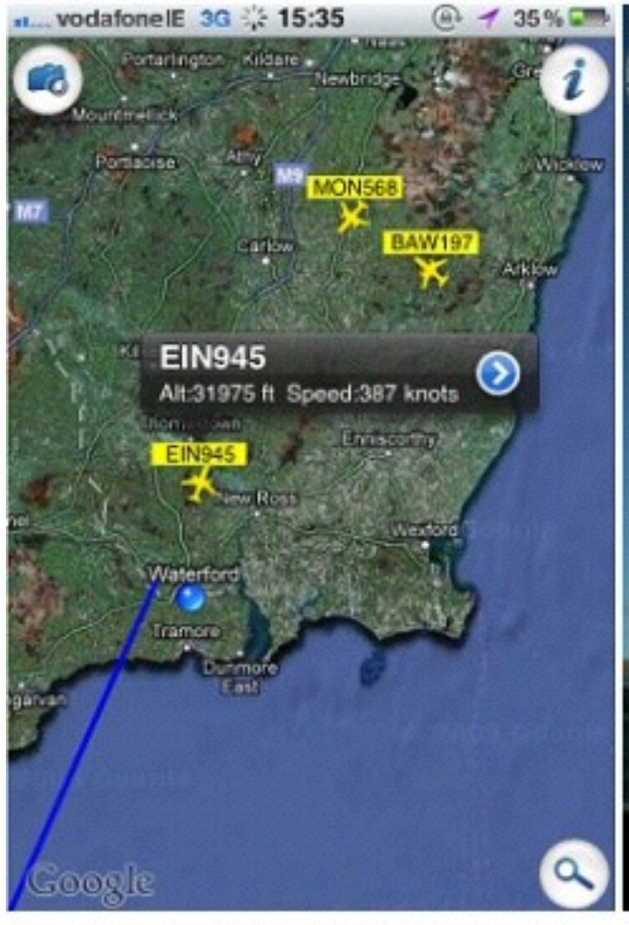
Computer Vision (OpenCV … it’s expensive)

Detecting Faces in a Picture

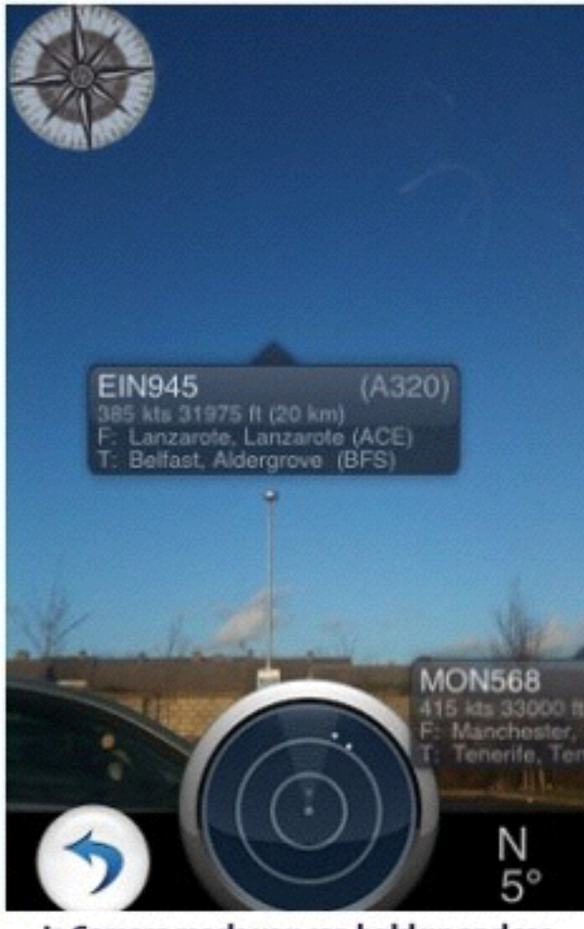
Detect + Track AR Markers (AR Toolkits etc.)

…

“Augmented Reality”



Shows the aircraft, and its track and information



In Camera mode you can hold up and see position in real time

“Augmented Reality”

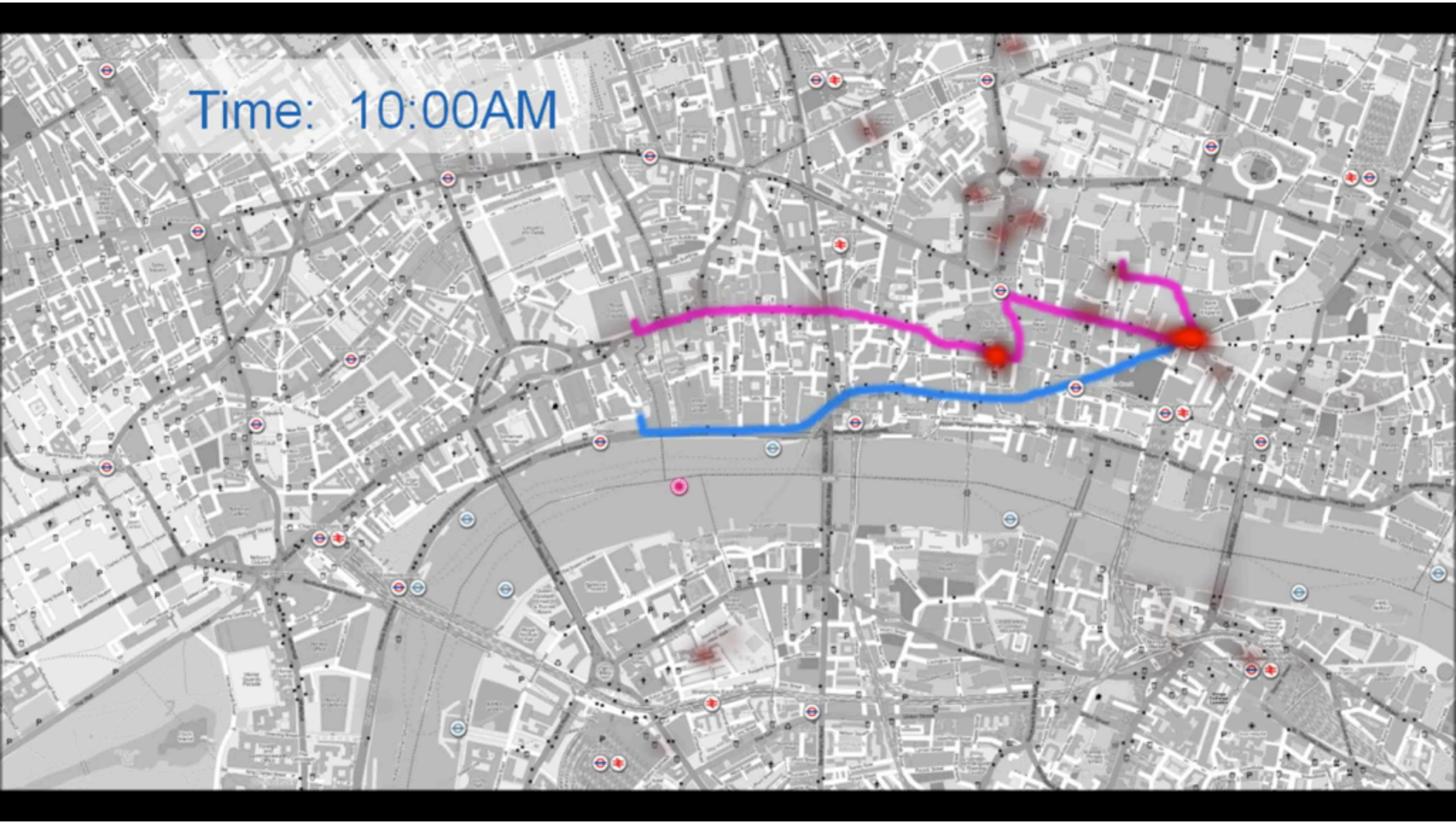
Camera Based Tracking (expensive)

Location + Motion Sensors (cheaper but might not be as accurate)

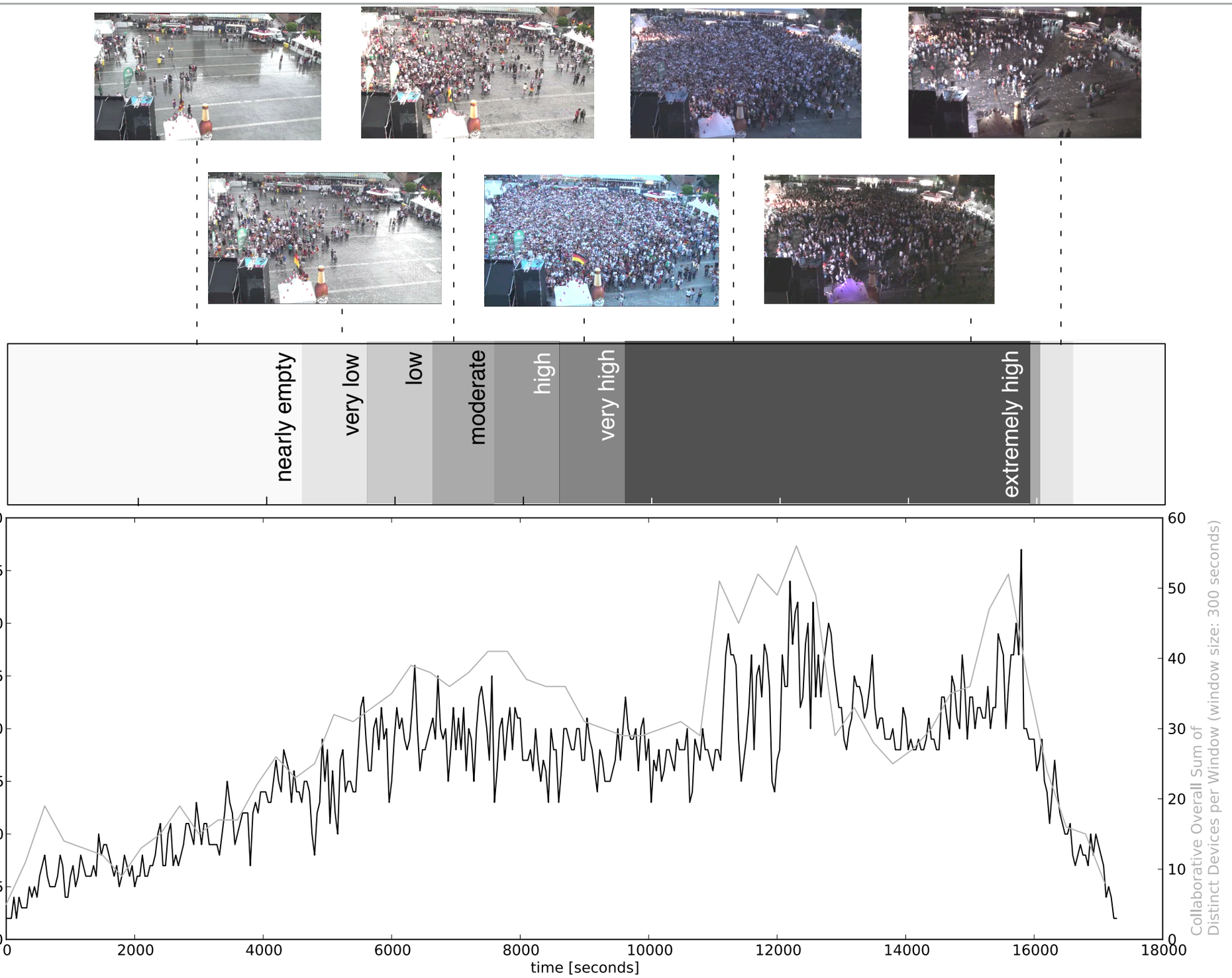
Relative Positioning/Step Counting

https://github.com/reckonMe/reckonMe

Location — Crowd Sensing


Time: 10:00AM

Crowd Density Measurements with Bluetooth Signal Strength



[WL13] Jens Weppner and Paul Lukowicz. Bluetooth based collaborative crowd density estimation with mobile phones. In IEEE International Conference on Pervasive Computing and Communications (PerCom), volume 18, page 22, 2013.

More

iOS code:

https://github.com/benFnord/snsrlog

Magnetic Field Sensor
https://developer.apple.com/library/ios/samplecode/Teslameter/Introduction/Intro.html

Accelerometer
https://developer.apple.com/library/ios/samplecode/AccelerometerGraph/Introduction/Intro.html

Group Work (10 min.)

Think about the mobile phone sensing.

Could you apply it to your project?

Which sensors make sense?

After the group work, report back (1-3 min):

What can you use? How?

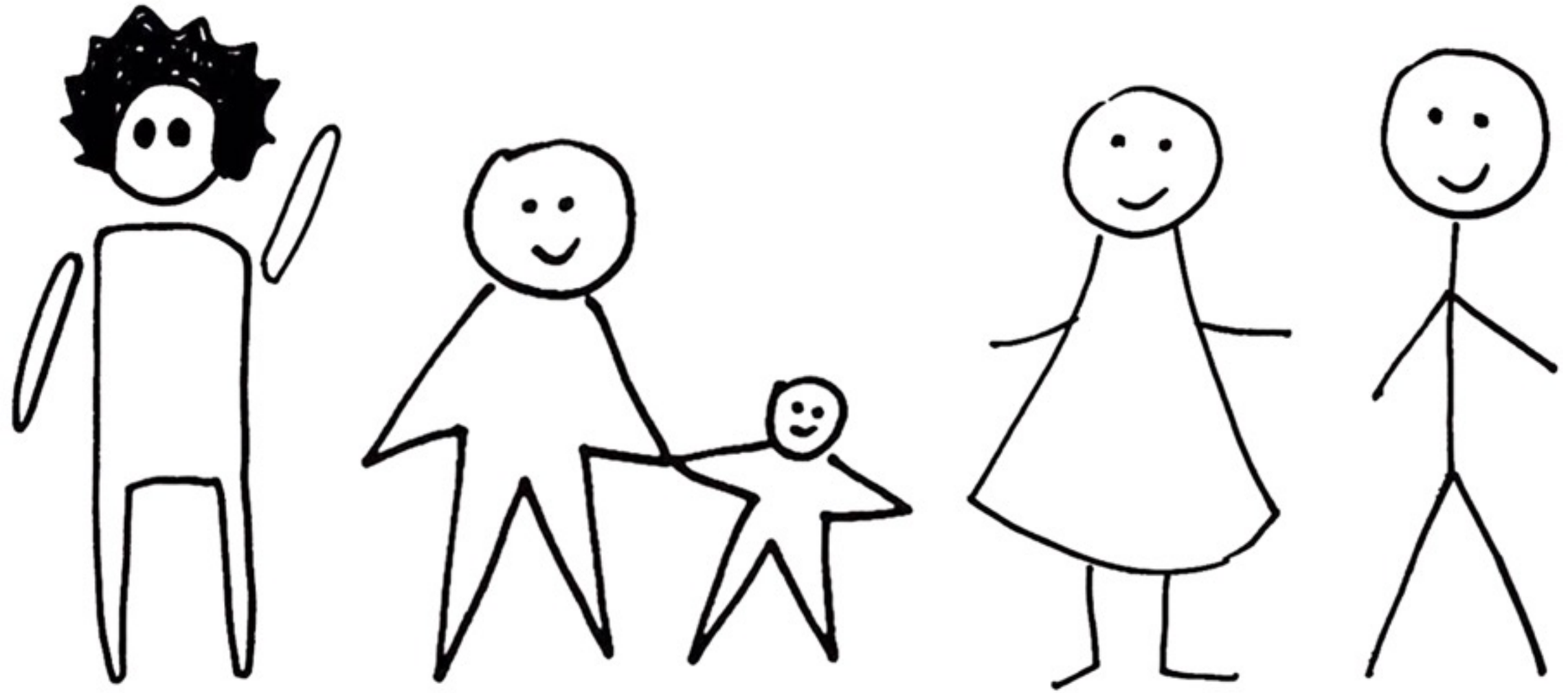
Storyboarding

Storyboarding

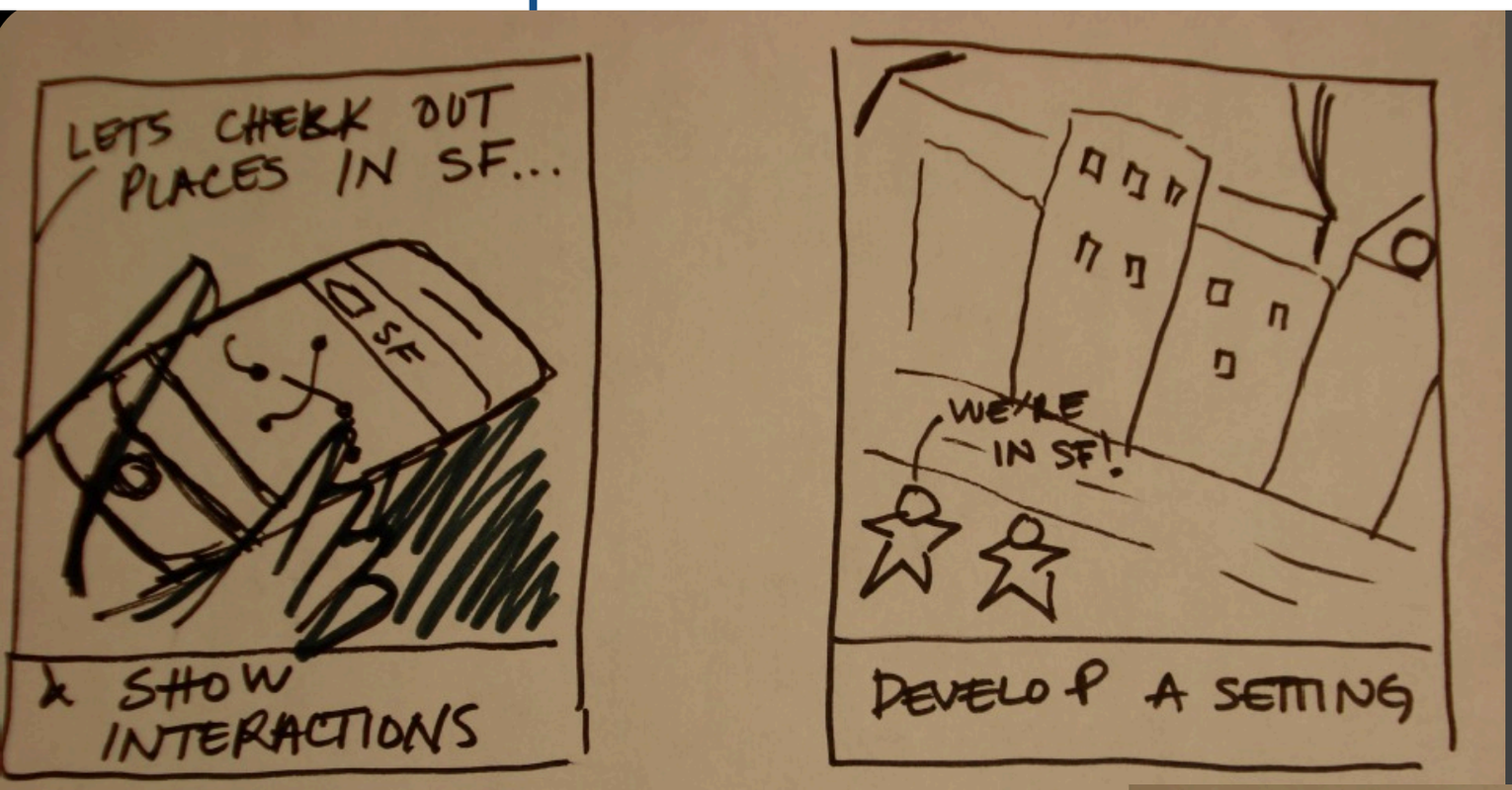
Storyboarding isn’t about “pretty pictures”

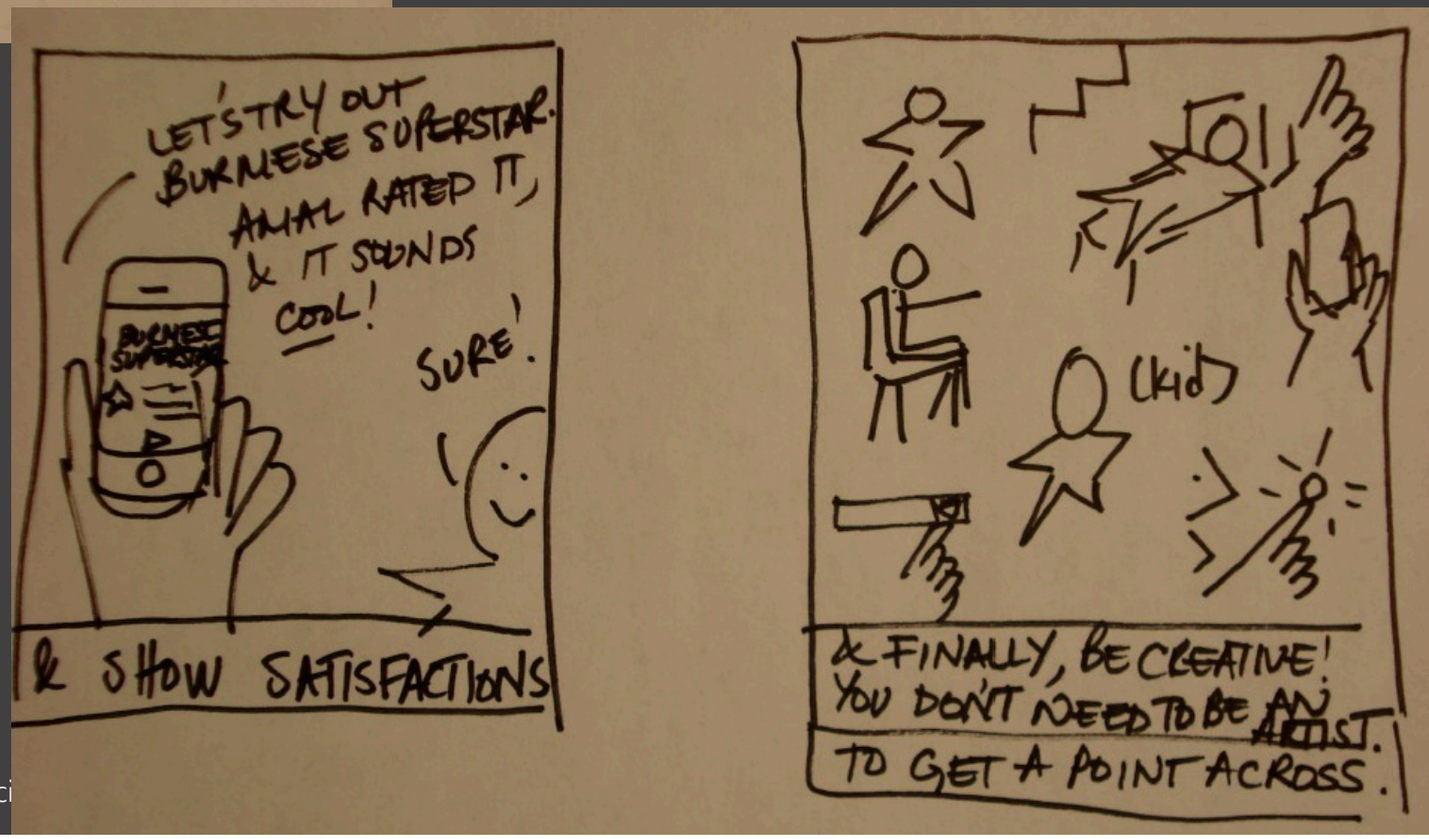
it’s about communicating ideas

Star People (Bill Verplank)



Example





adapted with permission from Amal Dar Aziz, Guide to Storyboarding, http://hci

Storyboards Should Convey

Setting
People involved
Environment
Task being accomplished

Sequence
What steps are involved?
What leads someone to use the app?
task is being illustrated?

What

Satisfaction
What's motivates people to use this system?
does it enable people to accomplish?
does the system fill?

What
What need

Benefits for Storyboards

Holistic focus: Helps emphasize how an interface accomplishes a task

Avoids commitment to a particular user interface (no buttons yet)

Helps get all the stakeholders on the same page in terms of the goal

Prototyping

Money

Time

People

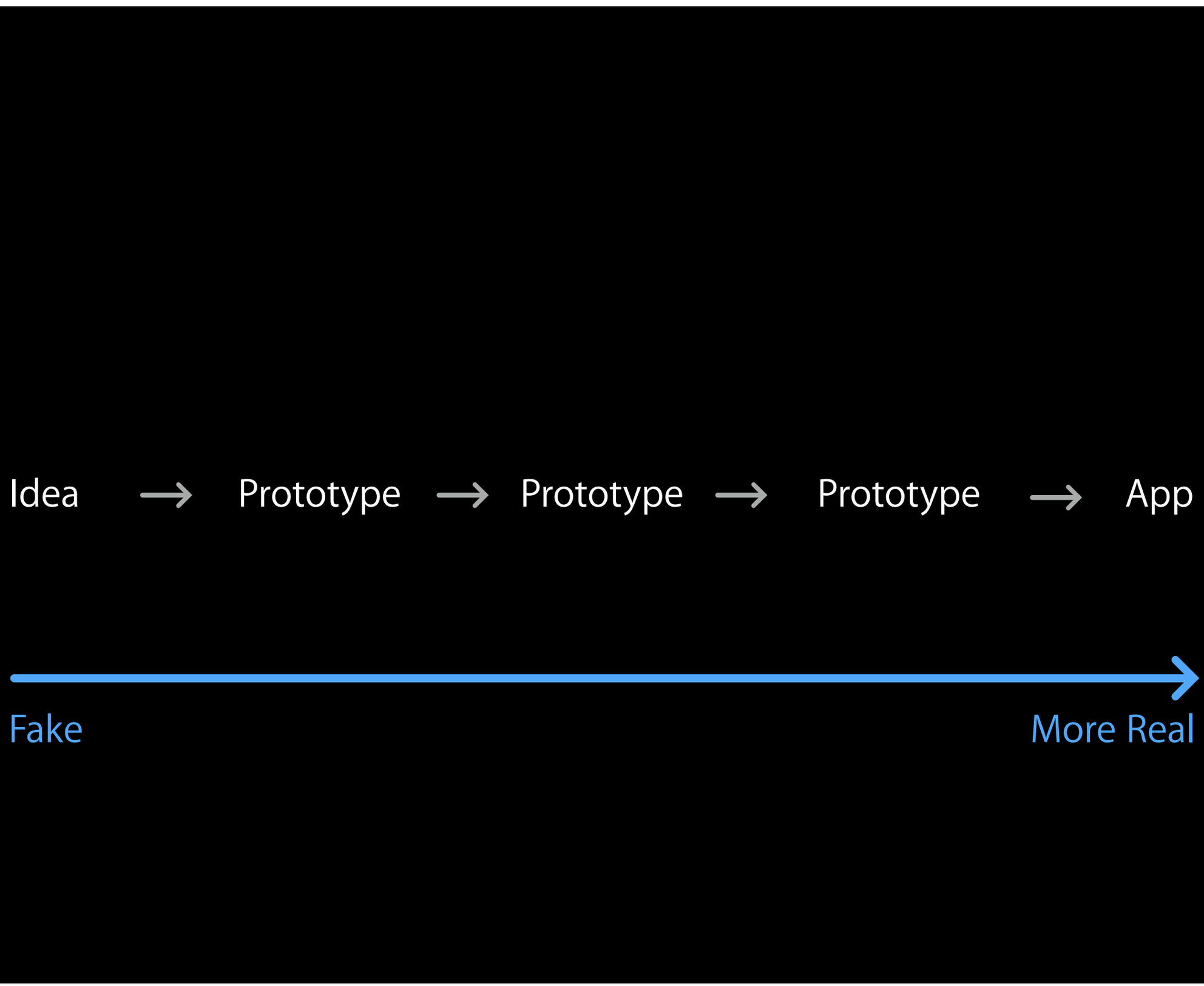
Idea → App → 

Sleep

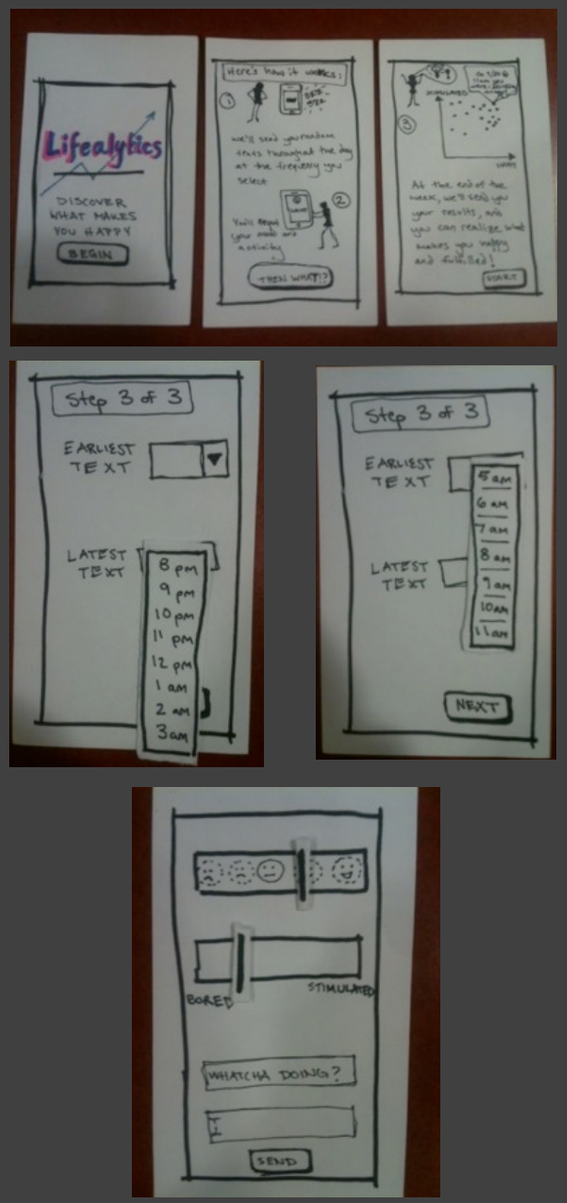
Typing

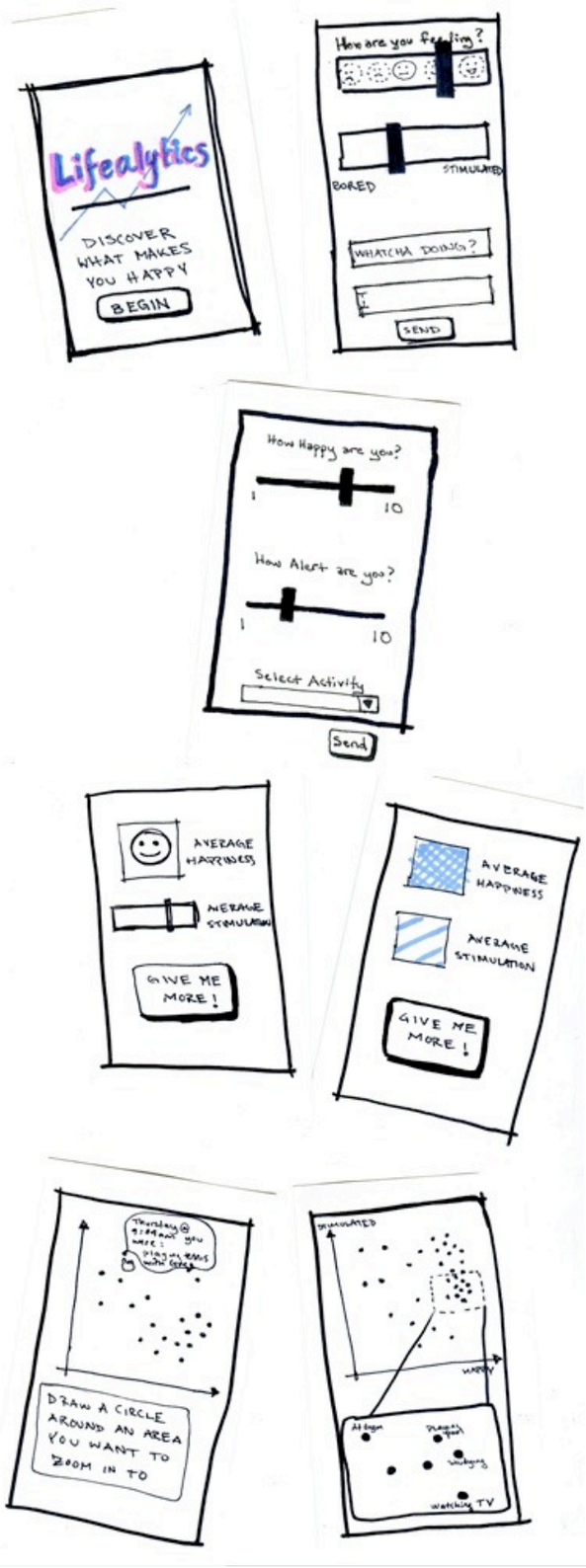
Heartache

Idea → Prototype → App


Idea
Prototype
Prototype
Prototype
App
Fake
More Real

Paper prototyping





Lifalyze: Greg Grenier, Luke Knepper, Alexandra Liptsey-Rahe, Vivian Shen

TOAST MODERN EXAMPLE (from Apple)

Toast Modern Feature Set

Find toast to eat near me

Find top toast to eat

Post toast

Rate toast

Review and discuss toast with my fellow toast aficionados

Toast Modern Feature Set

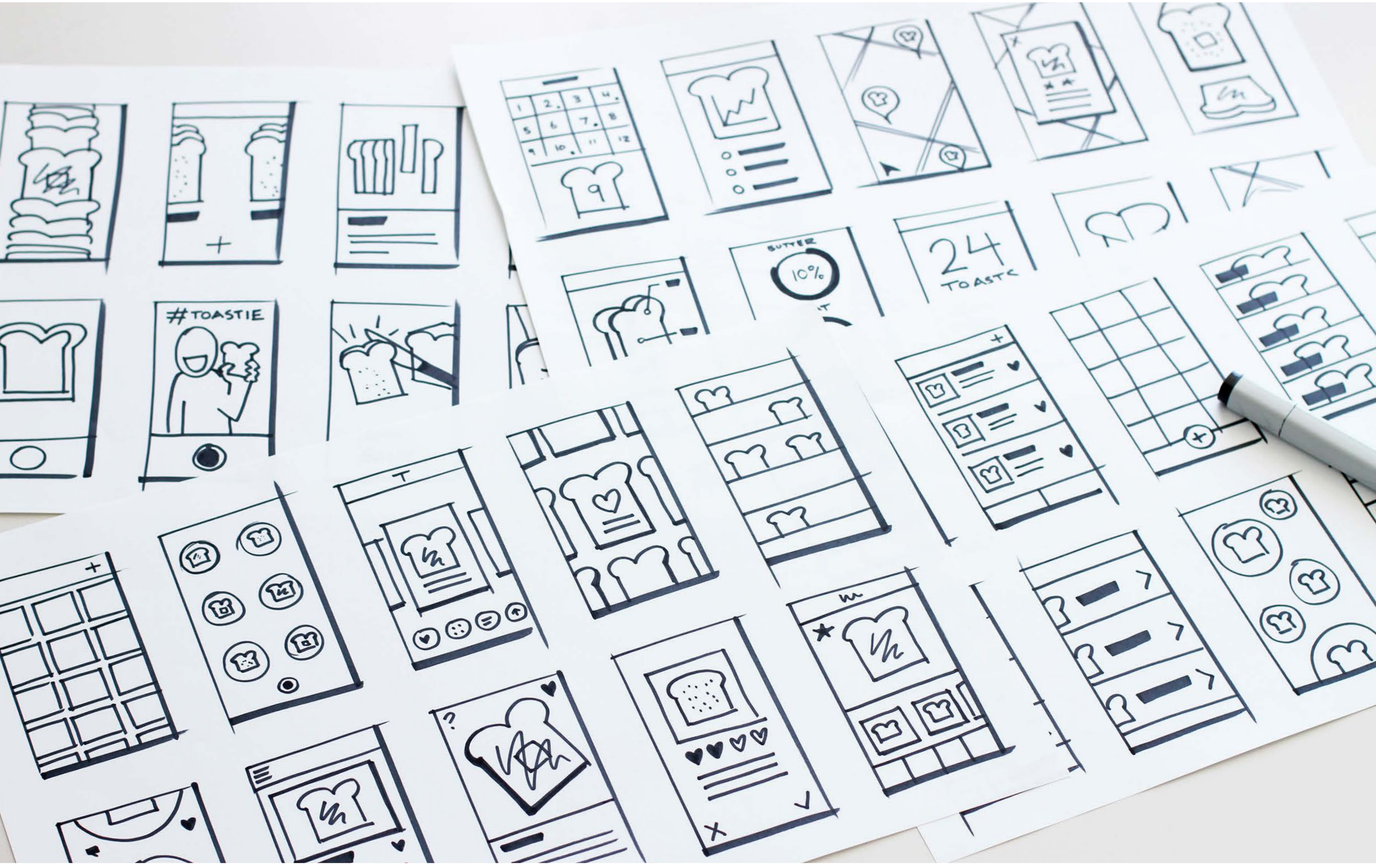
Find toast to eat near me

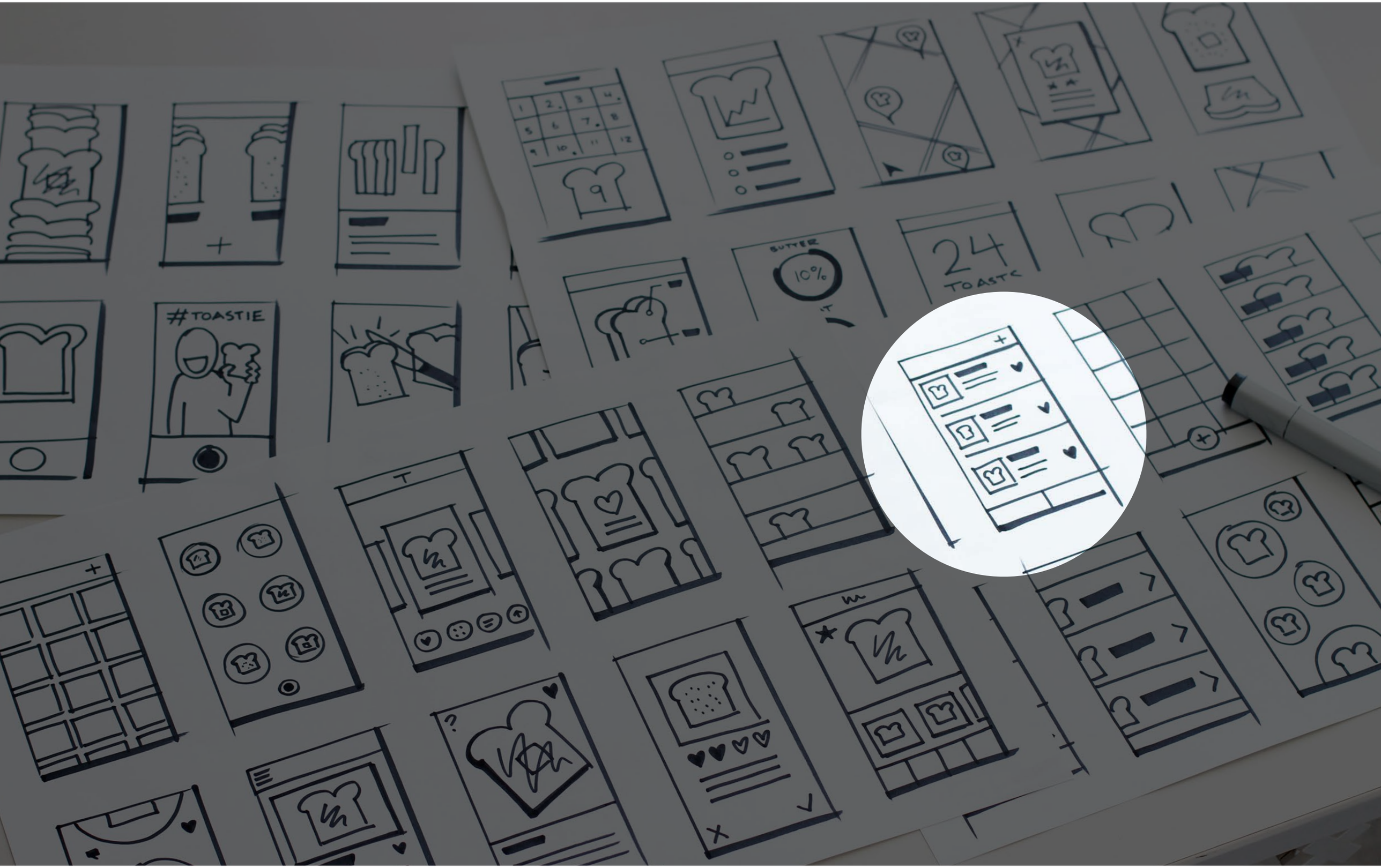
Find top toast to eat

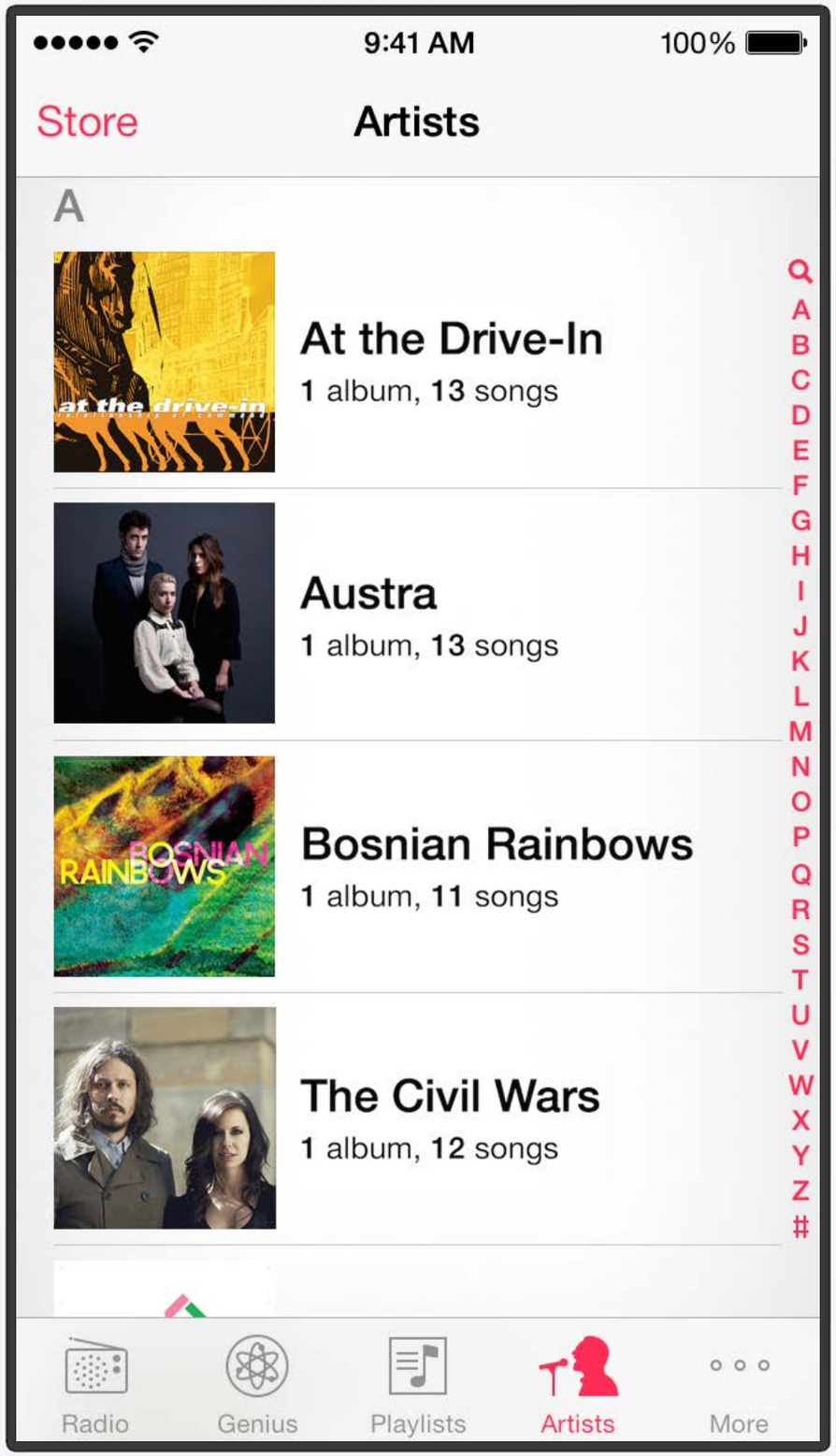
Post toast

Rate toast

Review and discuss toast with my fellow toast aficionados


#TOASTIE
BUTTER
10%
24
TOAST


#TOASTIE
24
TOAST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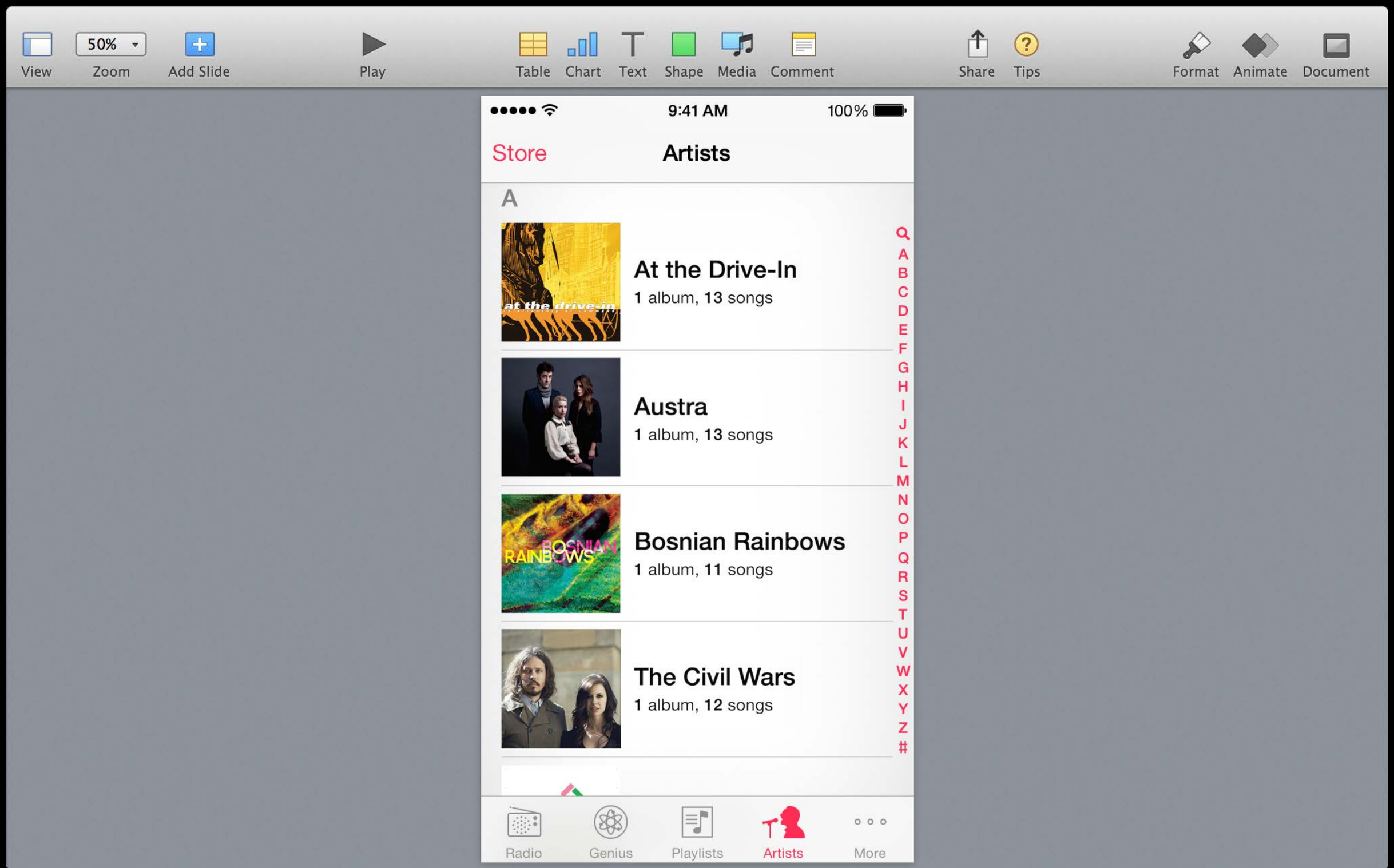
100%
Store
Artists
A
At the Drive-In
1 album, 13 songs
Austra
1 album, 13 songs
Bosnian Rainbows
1 album, 11 songs
The Civil Wars
1 album, 12 songs
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z #
Radio
Genius
Playlists
Artists
More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Austra
1 album, 13 songs
Bosnian Rainbows
1 album, 11 songs
The Civil Wars
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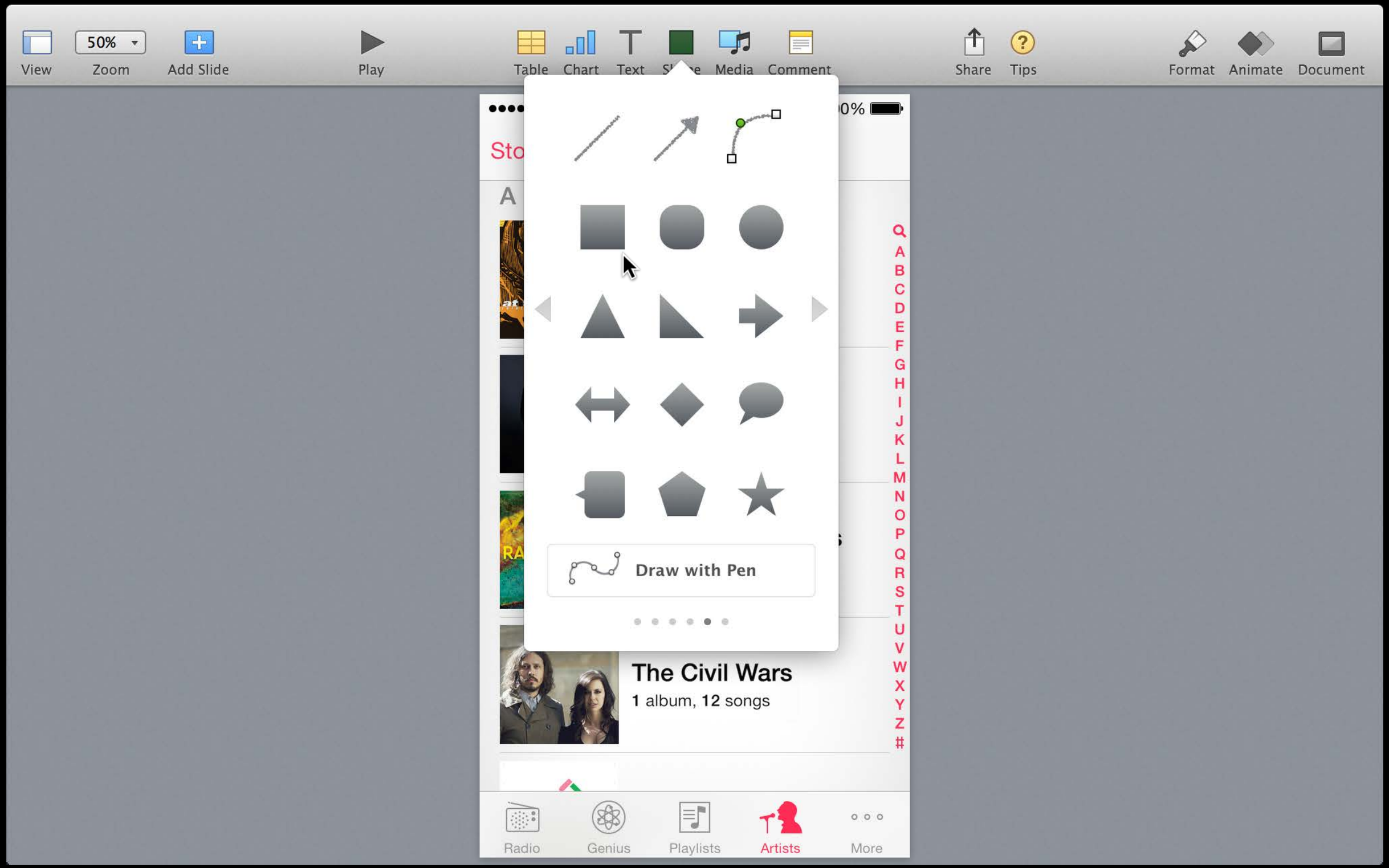
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z #
Radio
Genius
Playlists
Artists
More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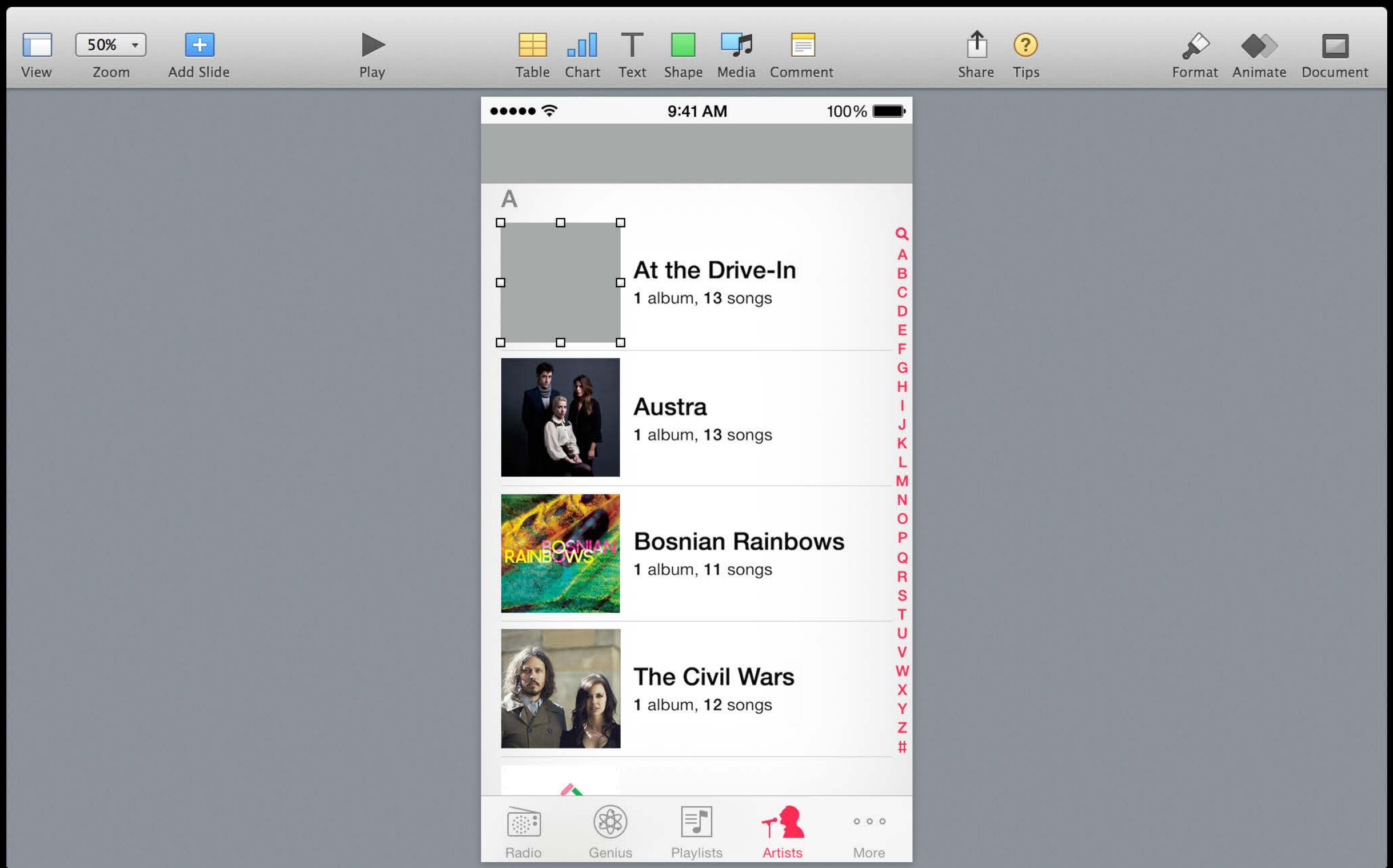
The Civil Wars
1 album, 12 songs
Radio
Genius
Playlists
Artists
More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1 album, 13 songs
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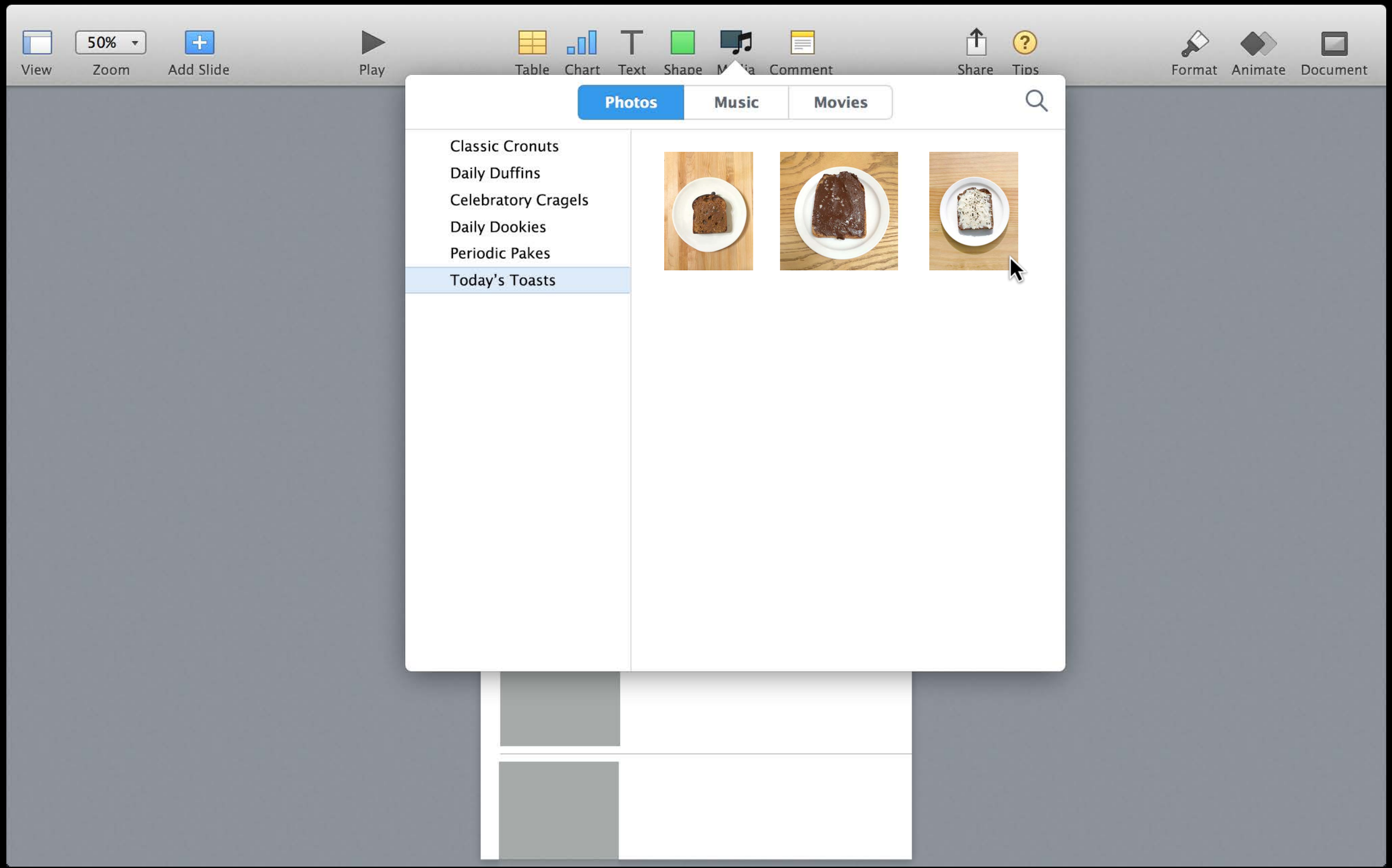
The Civil Wars
1 album, 12 songs
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z #
Radio
Genius
Playlists
Artists
More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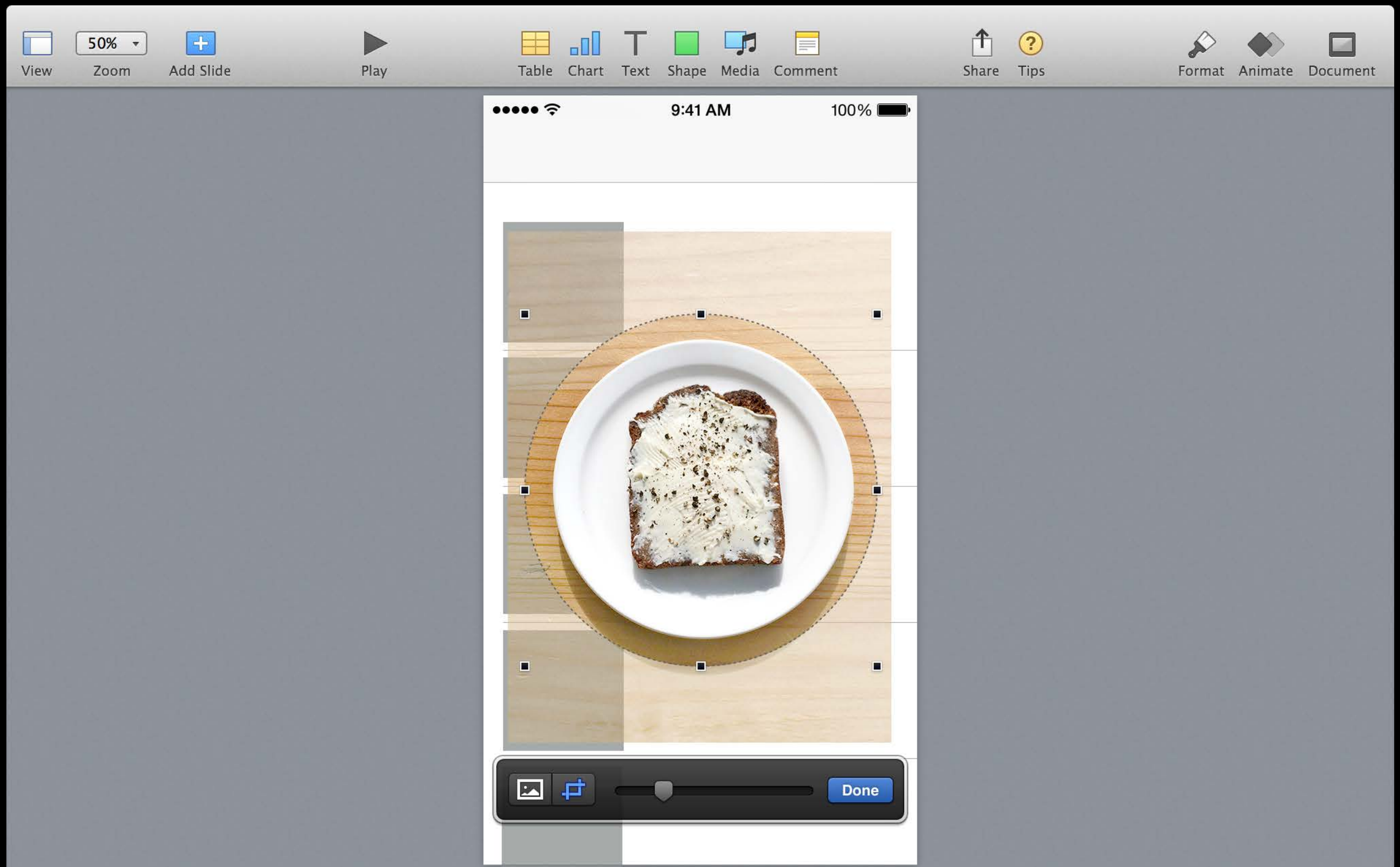
Classic Cronuts
Daily Duffins
Celebratory Cragels
Daily Dookies
Periodic Pakes
Today's Toasts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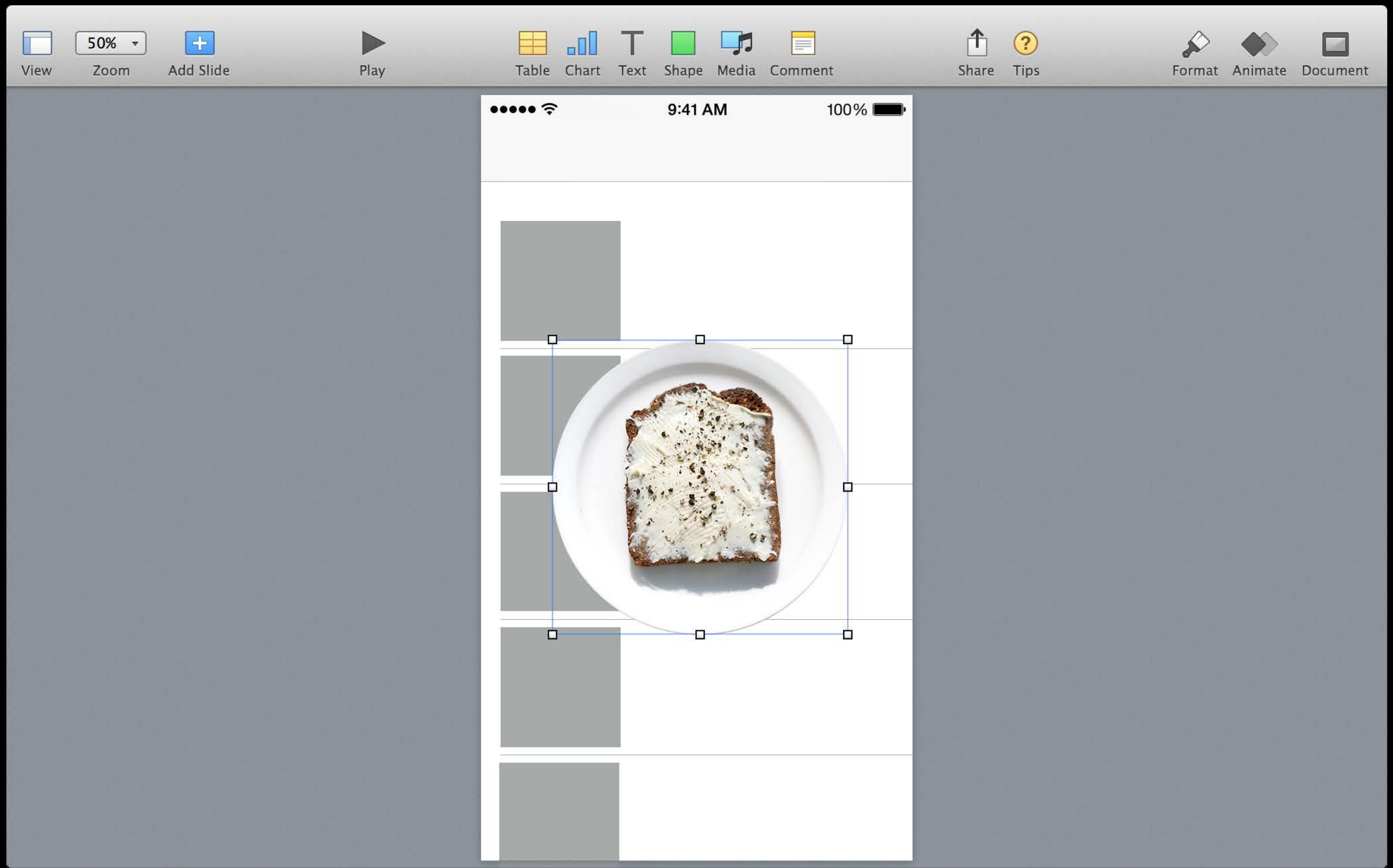
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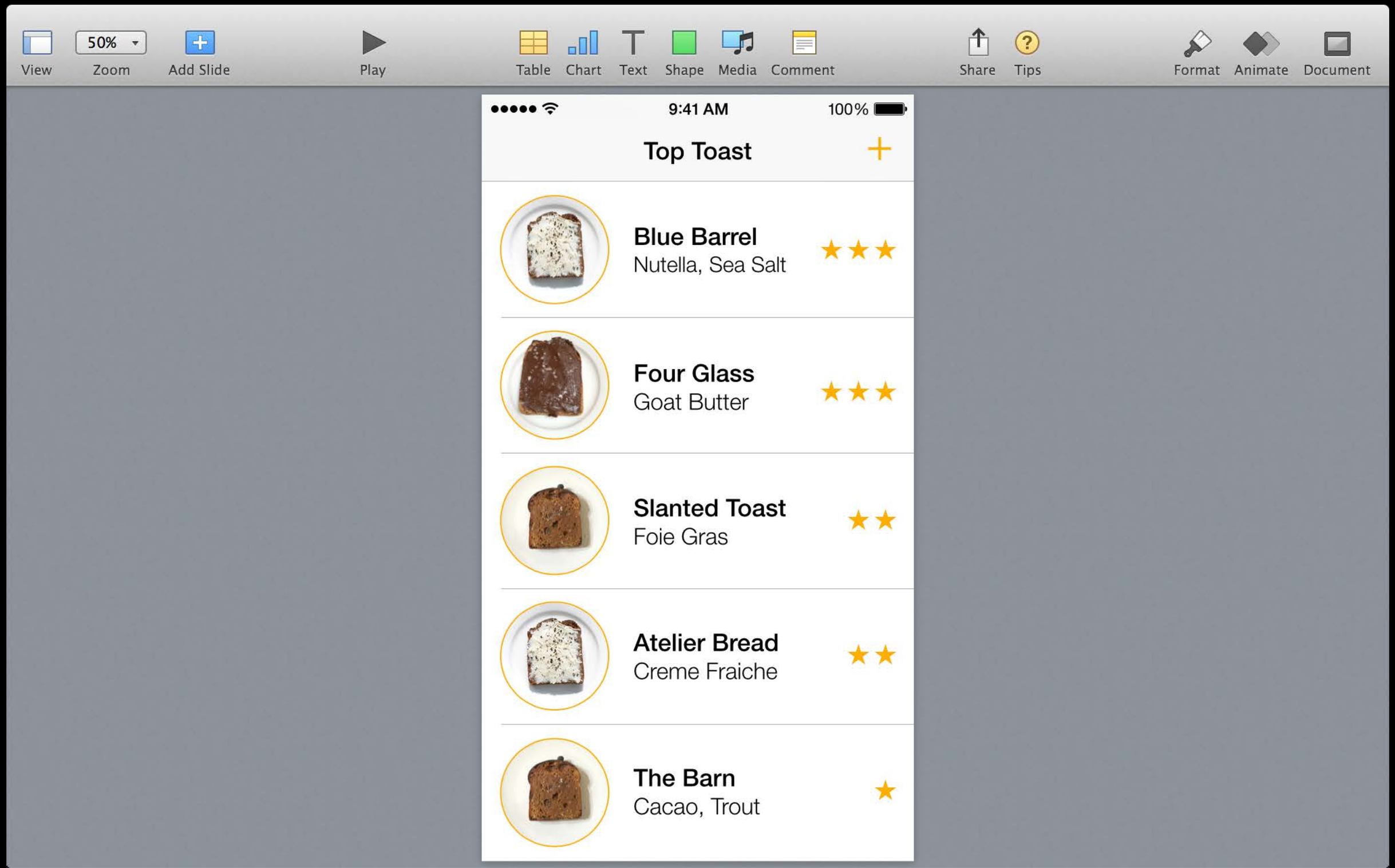
View
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Add Slide
Play
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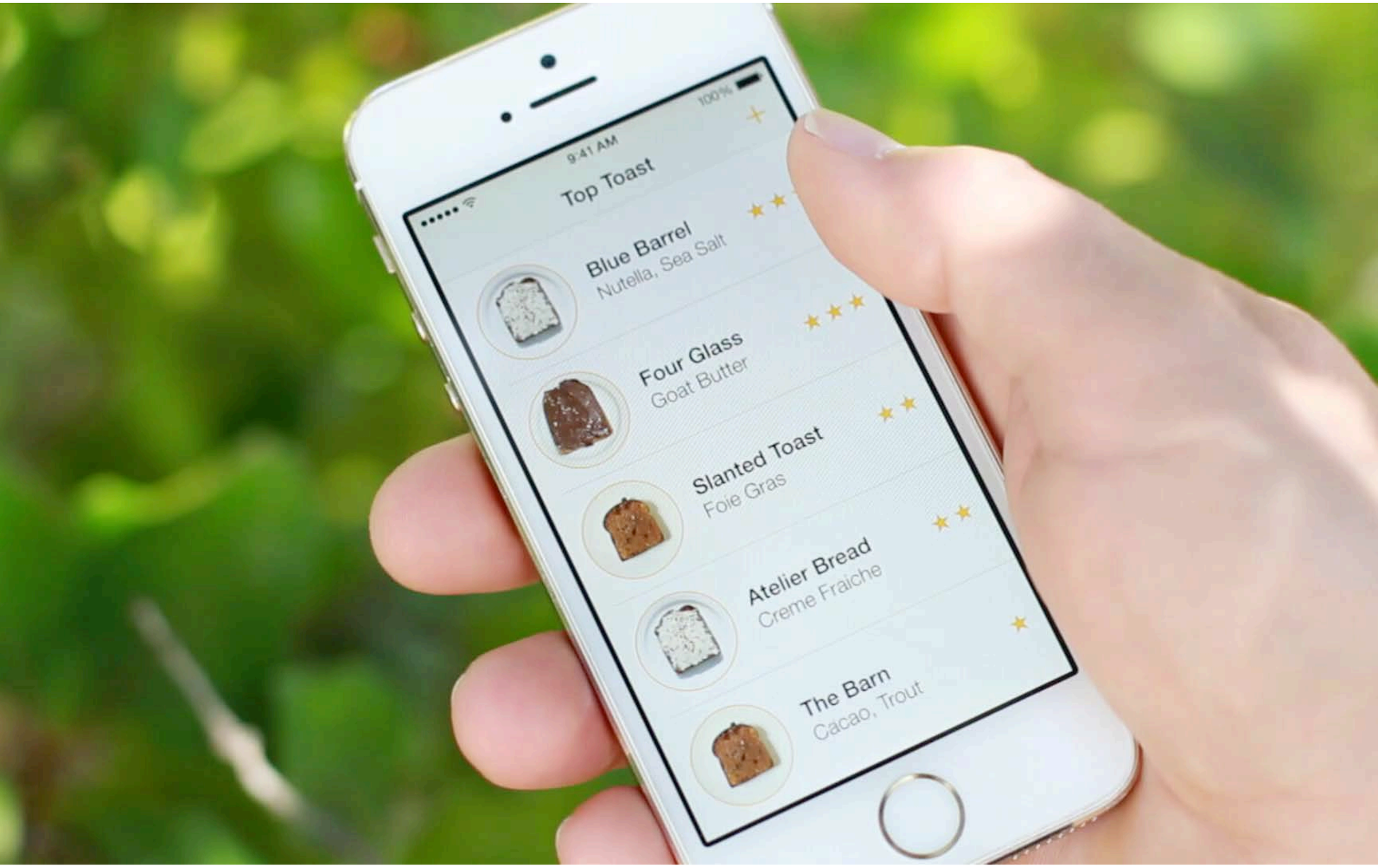
Chart
Text
Shape
Media
Comment
Share
Tips
Format
Animate
Document
9:41 AM
100%
Top Toast
Blue Barrel
Nutella, Sea Salt
Four Glass
Goat Butter
Slanted Toast
Foie Gras
Atelier Bread
Creme Fraiche
The Barn
Cacao, Trout


9:41 AM
100%
Top Toast
Blue Barrel
Nutella, Sea Salt
Four Glass
Goat Butter
Slanted Toast
Foie Gras
Atelier Bread
Creme Fraiche
The Barn
Cacao, Trout

Show People

Do you know how to find top rated toast? Nearby toast?

"I'm looking at star icons so this list must be sorted by rating"

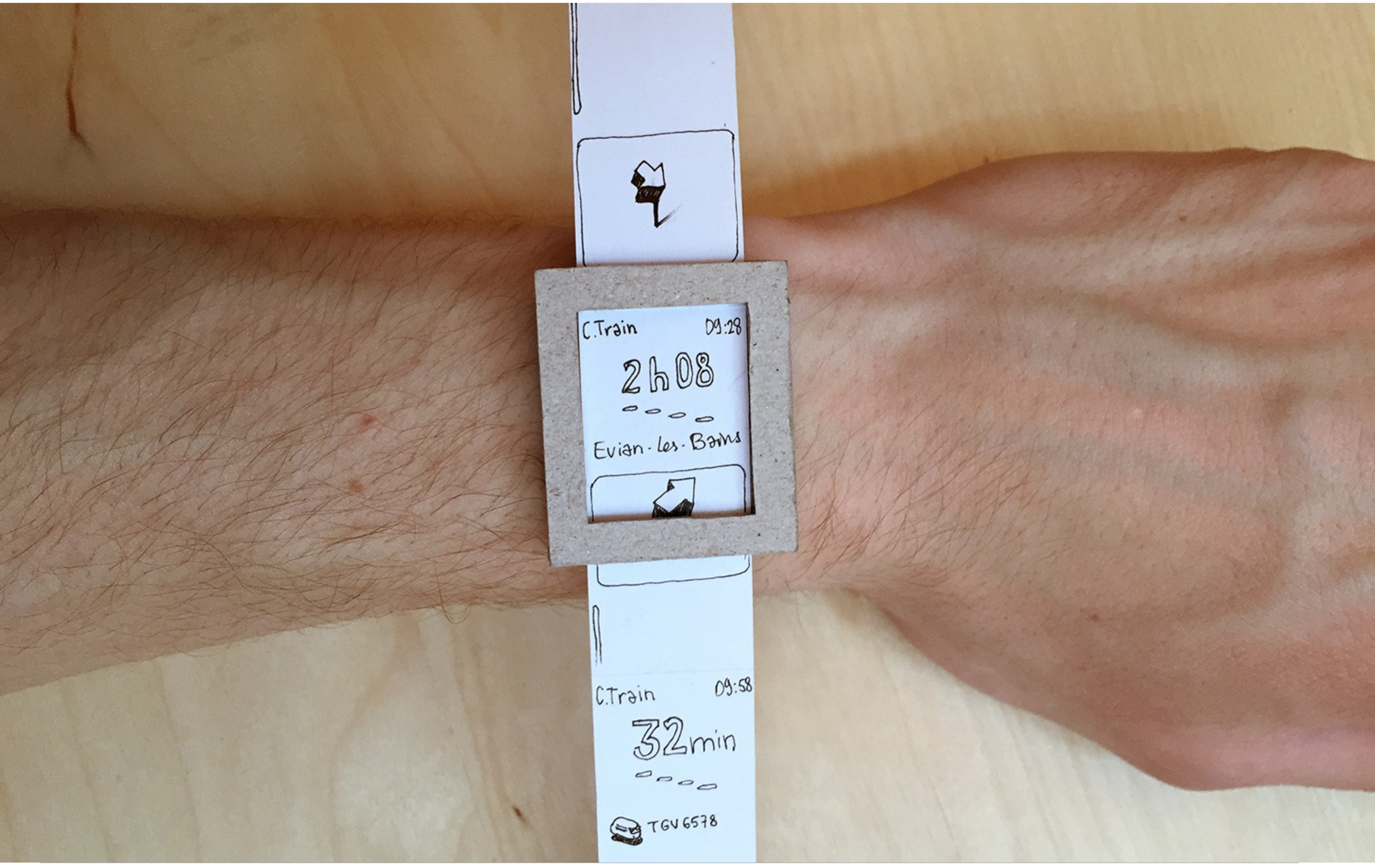
"I don't understand how to find nearby toast when there's no map"

Is it easy to browse through toast?

"Ow, the grid view hurts my retinas…"

How can we make this better?

"Keep going with the list and the map ideas!"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09:28
2h08
Evian-les-Bains
C.Train
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32min
TGV6578


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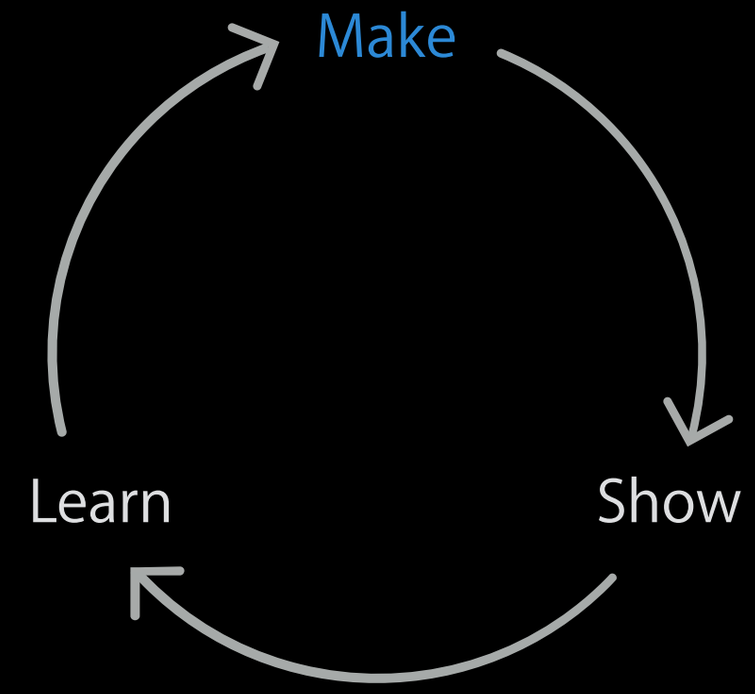
Make Fake Apps

Three Questions

What needs to be more real?

What can we fake?

Where will they use it?



Show People

Three Questions

Do you know how to _____?

Is it easy to _____?

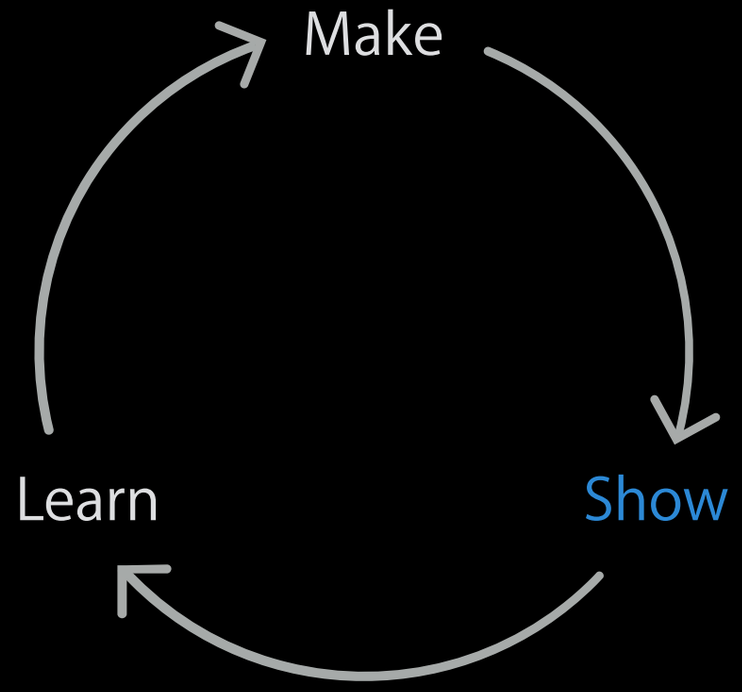
How can we make this better?

Who?

The people your app is for

Don’t

Argue, defend, dismiss



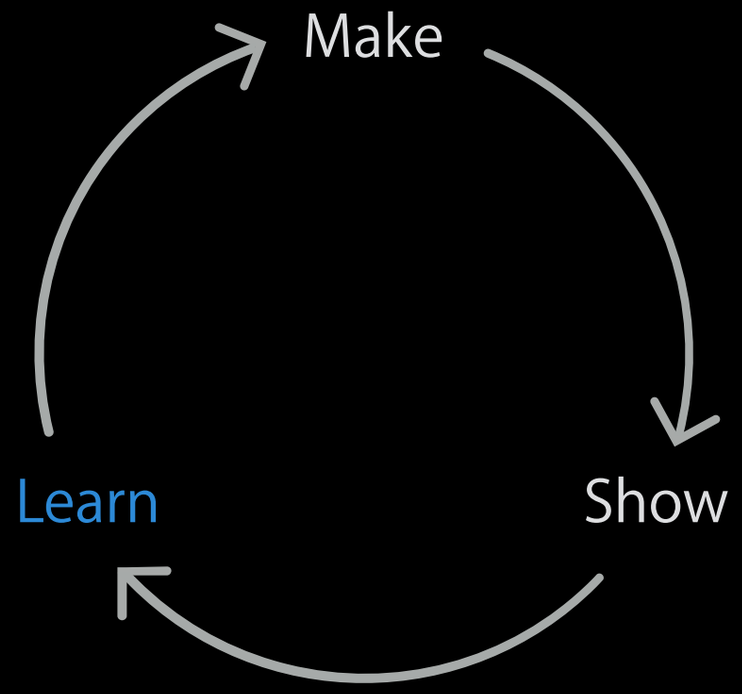
Learn from Their Feedback

Three Questions

What's working?

What's not working?

What other ideas does this give us?



task selection

real maintenance task representative of the subjects' daily work

comparable complexity and duration

complexity high enough that some kind of manual is necessary

3 modalities -> 3 tasks to avoid learning effects

process over 6 months: 3 tasks bellow (~ 20 min. each)

installing ygears

installing xmotor

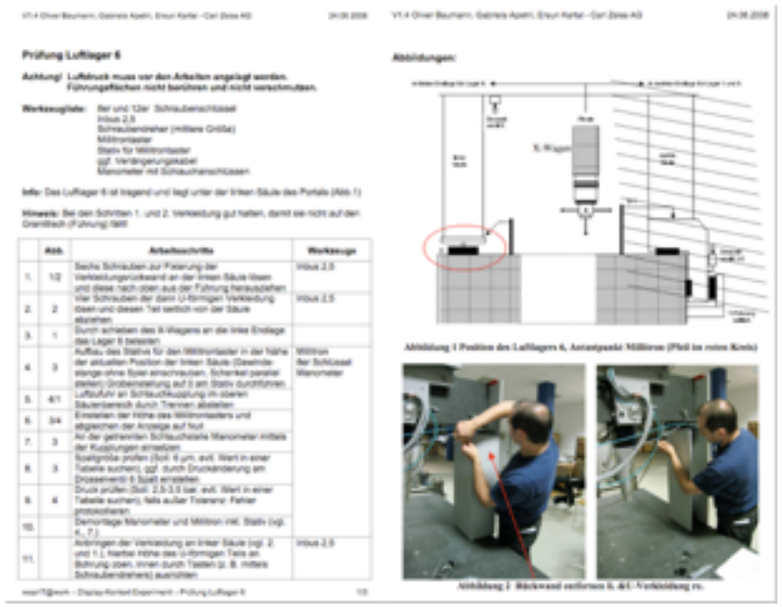
bearing test

subjects

18 participants no volunteers
employees during work hours
work experience: ~14 years
age: 17-56 years (mean 38 years)

important requirement
subjects repair similar machinery
on everyday basis,
yet unfamiliar with
the machine in question.

interaction modalities



Prüfung Luftlager 6

Achtung! Luftdruck muss vor den Arbeiten angelegt werden.
Führungsflächen nicht berühren und nicht verschmutzen.

Werkzeuge: Ser und 12er Schraubenschlüssel
Inbus 2,5
Schraubendreher (mittlere Größe)
Militrontester
Stativ für Militrontester
ggf. Verlängerungskabel
Manometer mit Schlauchanschlüssen

Info: Das Luftlager 6 ist tragend und liegt unter der linken Säule des Portals (Abb.1)

Hinweis: Bei den Schritten 1. und 2. Verkleidung gut halten, damit sie nicht auf den Granittisch (Führung) fällt!

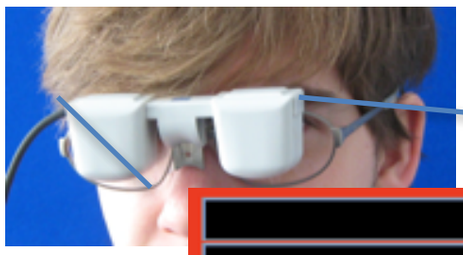
	Abb.	Arbeitsschritte	Werkzeuge
1.	1/2	Sechs Schrauben zur Fixierung der Verkleidungsrückwand an der linken Säule lösen und diese nach oben aus der Führung herausziehen.	Inbus 2,5
2.	2	Vier Schrauben der dann U-förmigen Verkleidung lösen und diesen Teil seitlich von der Säule abziehen.	Inbus 2,5
3.	1	Durch schieben des X-Wagens an die linke Endlage das Lager 6 freilegen.	
4.	3	Aufbau des Stativs für den Militrontester in der Nähe der aktuellen Position der linken Säule (Gewinde-stange ohne Spiel einschrauben, Schenkel parallel stellen). Grobeinstellung auf 0 am Stativ durchführen.	Militron der Schlüssel Manometer
5.	4/1	Luftzufuhr an Schlauchkupplung rh.-oberen Säulenbereich durch Trennen abstellen.	
6.	3/4	Einstellen der Höhe des Militrontesters und abgleichen der Anzeige auf Null	
7.	3	An der getrennten Schlauchstelle Manometer mittels der Kupplungen einstellen	
8.	3	Spaltgröße prüfen (Soll: 6 µm, evtl. Wert in einer Tabelle suchen), ggf. durch Druckänderung am Drosselventil 6 Spalt einstellen.	
9.	4	Druck prüfen (Soll: 2,5-3,5 bar, evtl. Wert in einer Tabelle suchen), falls außer Toleranz: Fehler protokollieren.	
10.		Demontage Manometer und Militron inkl. Stativ (vgl. 4., 7.)	
11.		Anbringen der Verkleidung an linker Säule (vgl. 2. und 1.), hierbei Höhe des U-förmigen Teils an Bohrung oben, innen durch Tasten (z. B. mittels Schraubendreher) ausrichten	Inbus 2,5

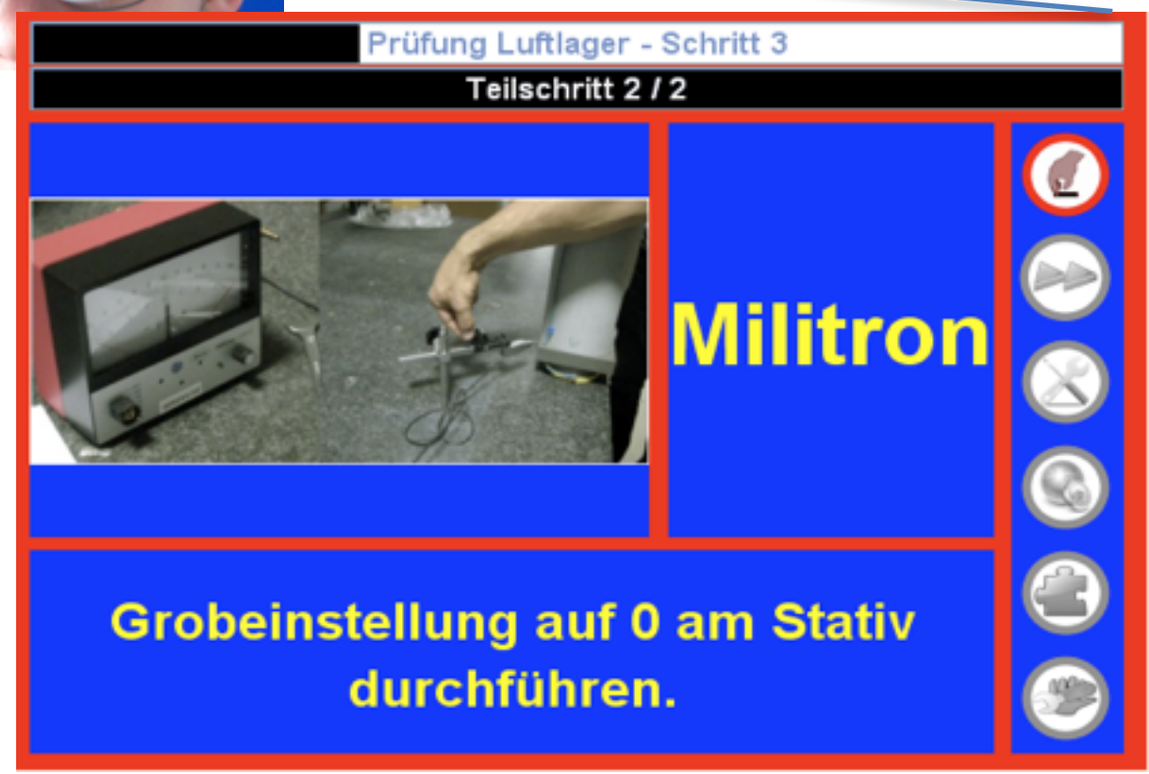
Abbildungen:

Abbildung 1 Position des Luftlagers 6, Ansatzpunkt Militron (Pfeil im roten Kreis)

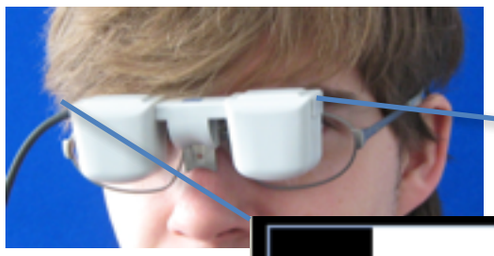
Abbildung 2 Rückwand entfernen li. der U-Verkleidung rs.

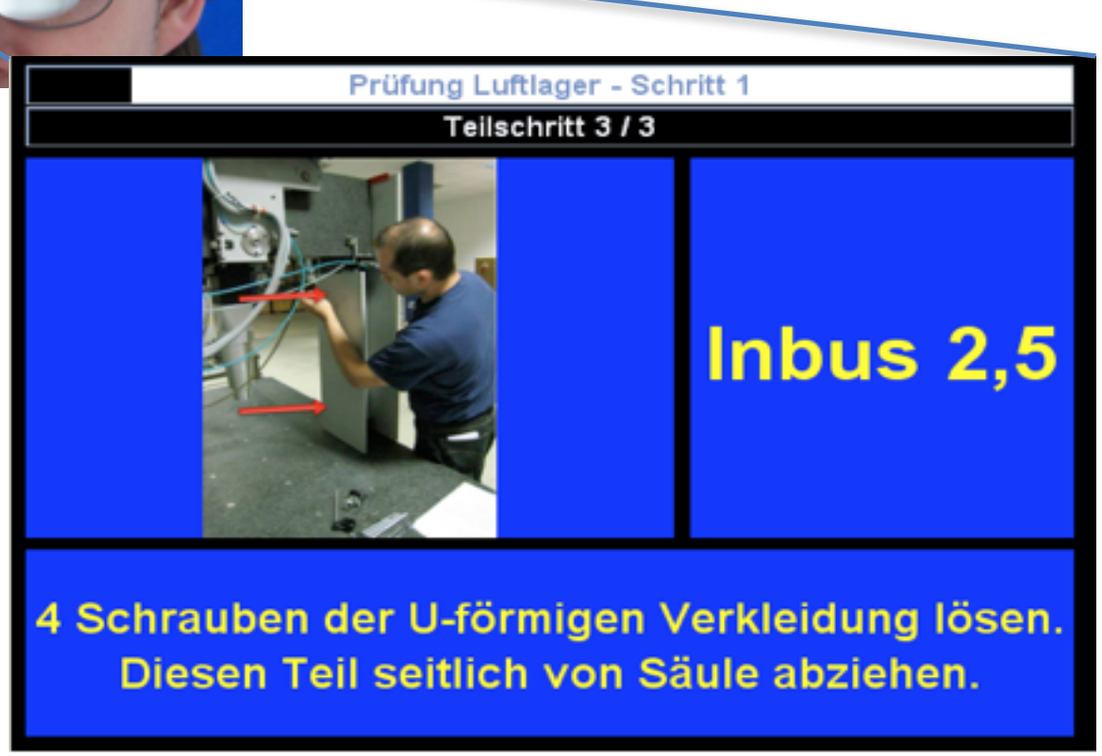
paper manual





hmd with ‘context’
(and ‘speech’ recognition)





head mounted display with ‘speech’ recognition

paper manual

Prüfung Luftlager 6

Achtung! Luftdruck muss vor den Arbeiten angelegt werden.
Führungsflächen nicht berühren und nicht verschmutzen.

Werkzeugliste: 8er und 12er Schraubenschlüssel
Inbus 2,5
Schraubendreher (mittlere Größe)
Millitrontaster
Stativ für Millitrontaster
ggf. Verlängerungskabel
Manometer mit Schlauchanschlüssen

Info: Das Luftlager 6 ist tragend und liegt unter der linken Säule des Portals (Abb.1)

Hinweis: Bei den Schritten 1. und 2. Verkleidung gut halten, damit sie nicht auf den Granittisch (Führung) fällt!

	Abb.	Arbeitsschritte	Werkzeuge
1.	1/2	Sechs Schrauben zur Fixierung der Verkleidungsrückwand an der linken Säule lösen und diese nach oben aus der Führung herausziehen	Inbus 2,5
2.	2	Vier Schrauben der dann U-förmigen Verkleidung lösen und diesen Teil seitlich von der Säule abziehen	Inbus 2,5
3.	1	Durch schieben des X-Wagens an die linke Endlage das Lager 6 belasten	
4.	3	Aufbau des Stativs für den Millitrontaster in der Nähe der aktuellen Position der linken Säule (Gewinde-stange ohne Spiel einschrauben, Schenkel parallel stellen) Grobeinstellung auf 0 am Stativ durchführen	Millitron 8er Schlüssel Manometer
5.	4/1	Luftzufuhr an Schlauchkupplung im oberen Säulenbereich durch Trennen abstellen	
6.	3/4	Einstellen der Höhe des Millitrontasters und abgleichen der Anzeige auf Null	
7.	3	An der getrennten Schlauchstelle Manometer mittels der Kupplungen einsetzen	
8.	3	Spaltgröße prüfen (Soll: 6 µm, evtl. Wert in einer Tabelle suchen), ggf. durch Druckänderung am Drosselventil 6 Spalt einstellen	
9.	4	Druck prüfen (Soll: 2,5-3,5 bar, evtl. Wert in einer Tabelle suchen), falls außer Toleranz: Fehler protokollieren	
10.		Demontage Manometer und Millitron inkl. Stativ (vgl. 4., 7.)	

V1.4 Oliver Baumann, Gabriela Apetrii, Ersun Kartal - Carl Zeiss AG 24.06.2008

Abbildungen:

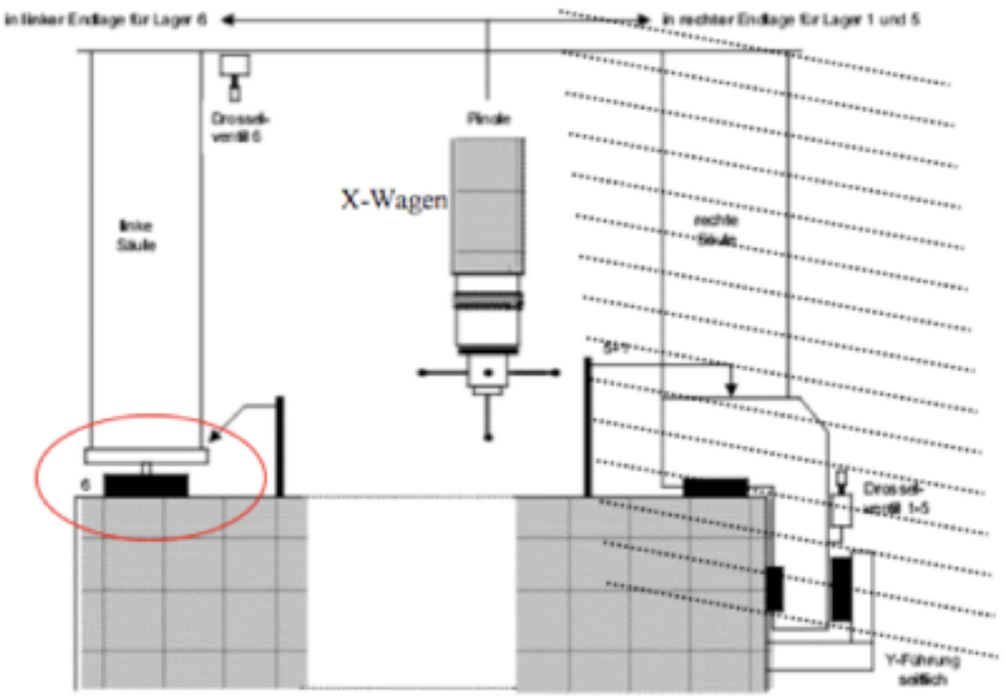


Abbildung 1 Position des Luftlagers 6, Antastpunkt Millitron (Pfeil im roten Kreis)

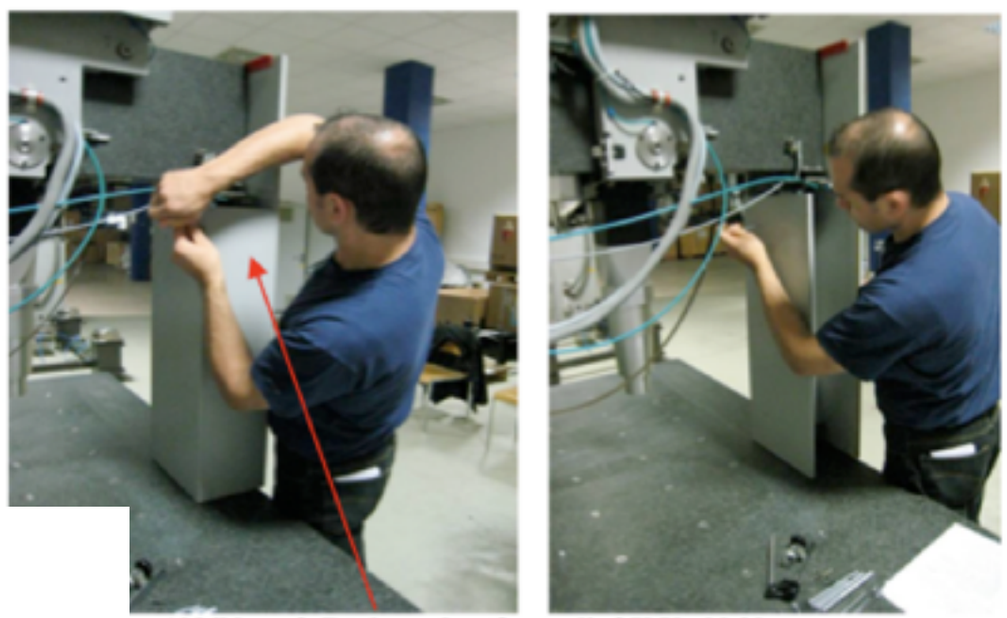
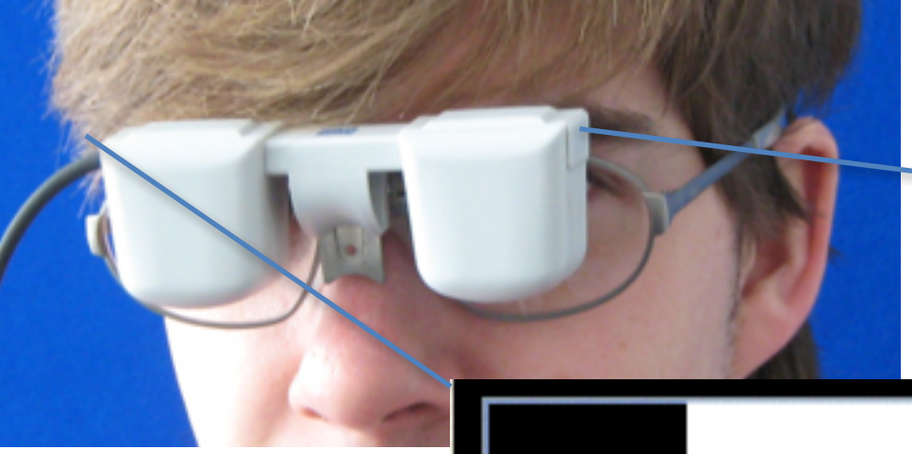
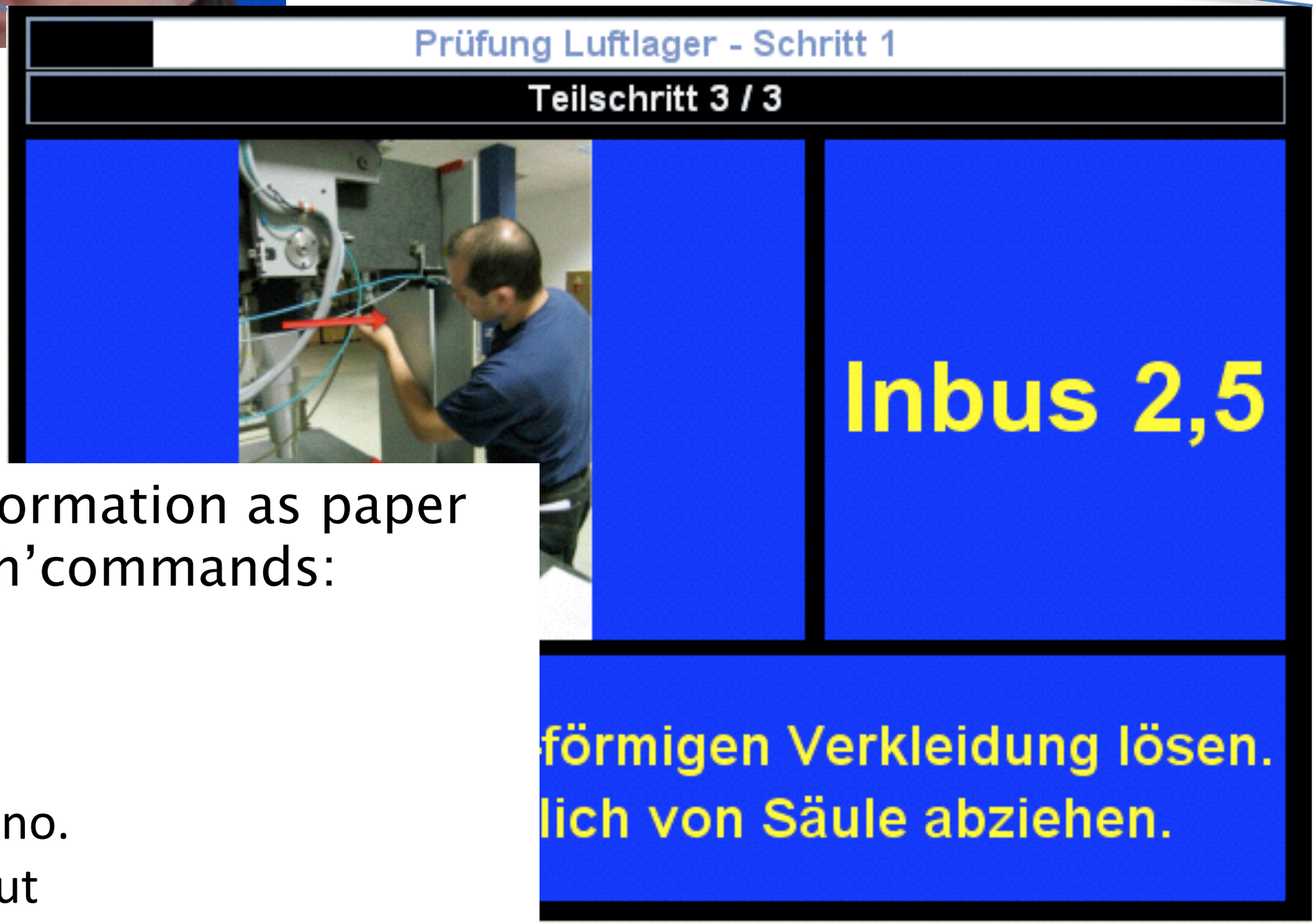


Abbildung 2 Rückwand entfernen li. &U-Verkleidung re.

compiled from a 500+ page manual

hmd with speech





same information as paper

6 ‘speech’commands:

next

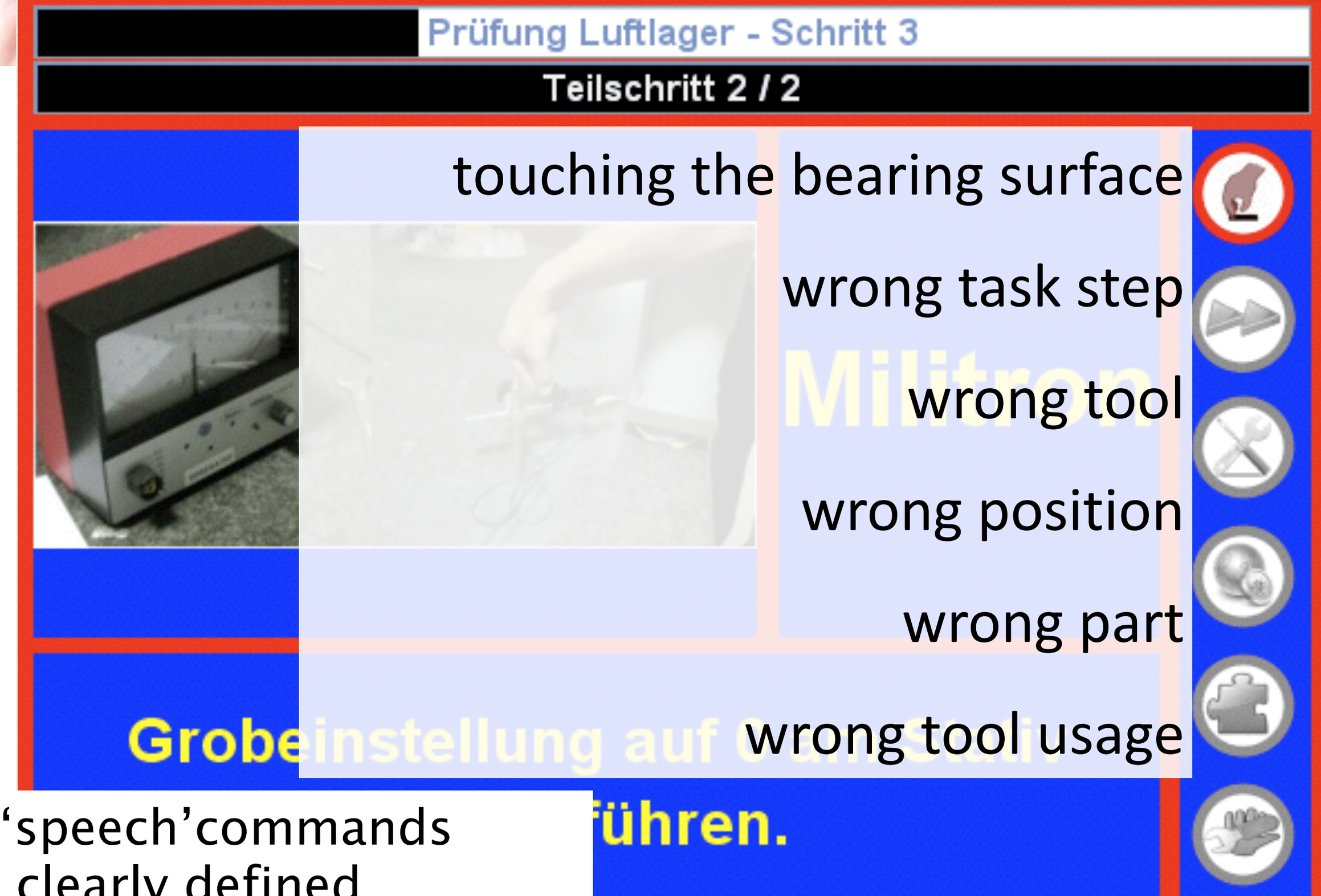
previous

index

go to step no.

zoom in/out

hmd with context



touching the bearing surface

wrong task step

wrong tool

wrong position

wrong part

wrong tool usage

same ‘speech’commands
errors clearly defined

experimental setup

additional:
- technical support
- interviewer
- mockup conductor
- camera

infrared location system

wizard of oz

testsubject

observer

wizard of oz

will be opensourced http://jwoz.sf.net/

experimental procedure

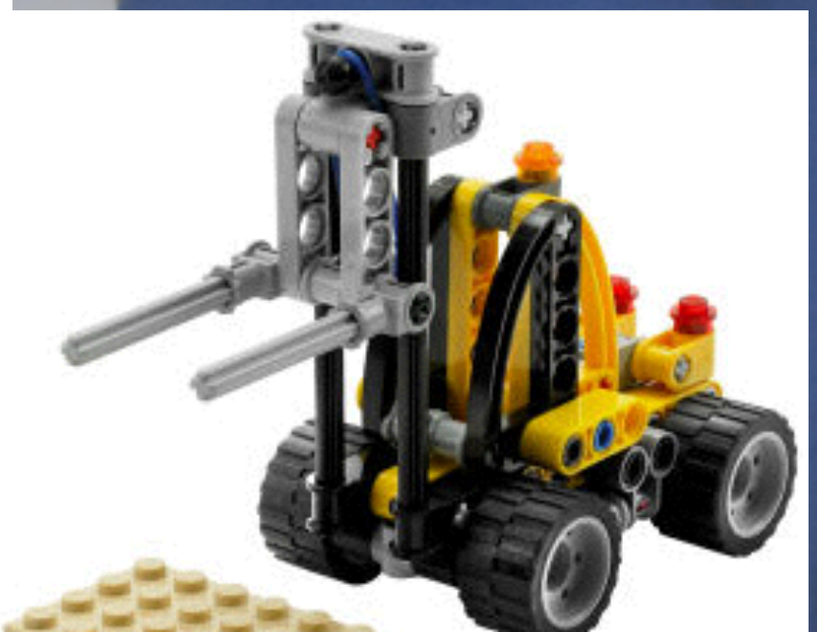
mockup training

experimental setup

interview session

mockup session

LEGO
 detached from actual tasks
 complex enough to explore ui interactions



Further Infos

Paper Prototyping

http://groups.csail.mit.edu/graphics/classes/6.831/lectures/L9.pdf

Prototyping Future Hardware

https://developer.apple.com/videos/wwdc/2015/?id=803

Designing with Animations

https://developer.apple.com/videos/wwdc/2015/?id=803

Prototyping: Fake It Till You Make It

https://developer.apple.com/videos/wwdc/2014/