

Design Thinking in Healthcare

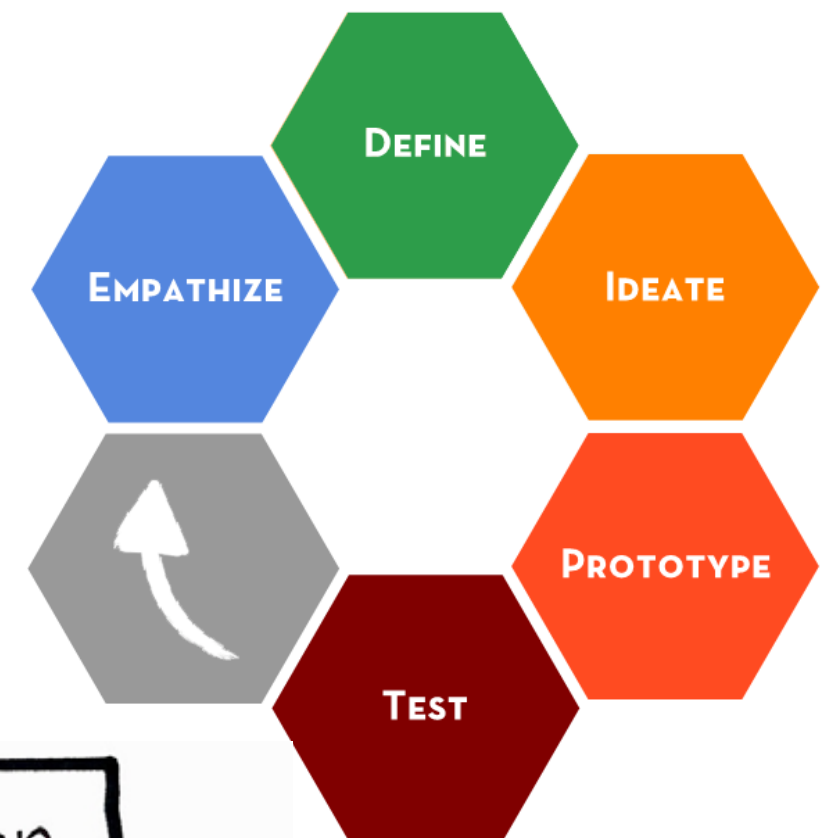
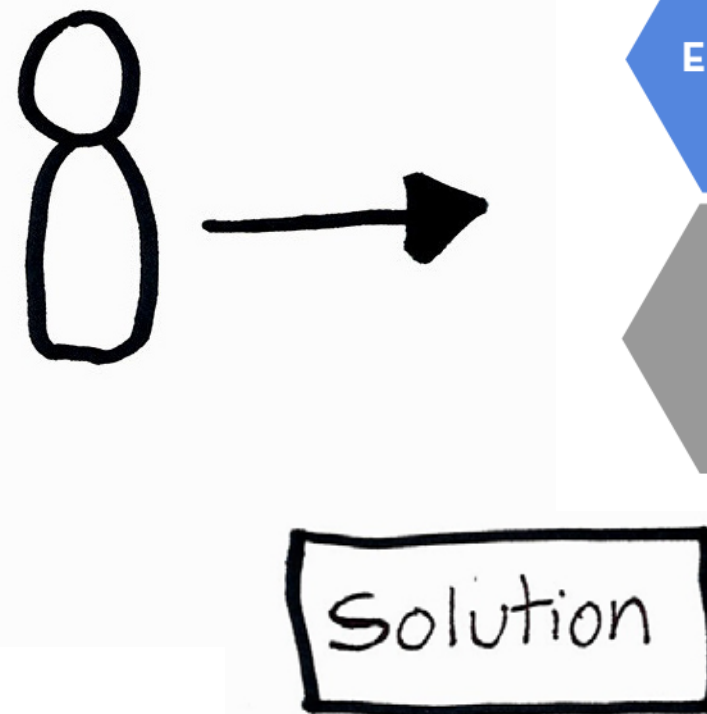
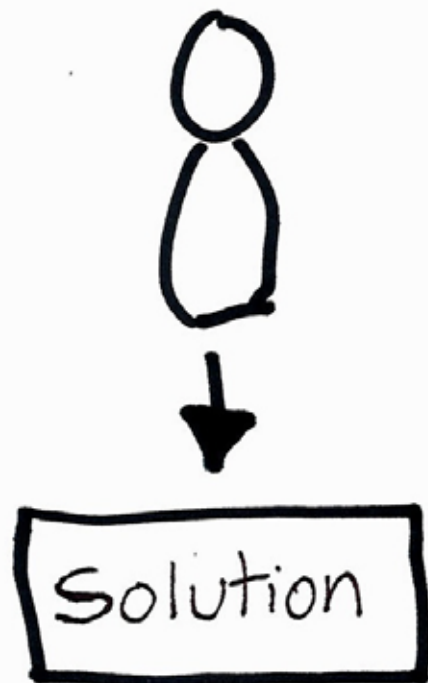


University of Lübeck
15 September 2015

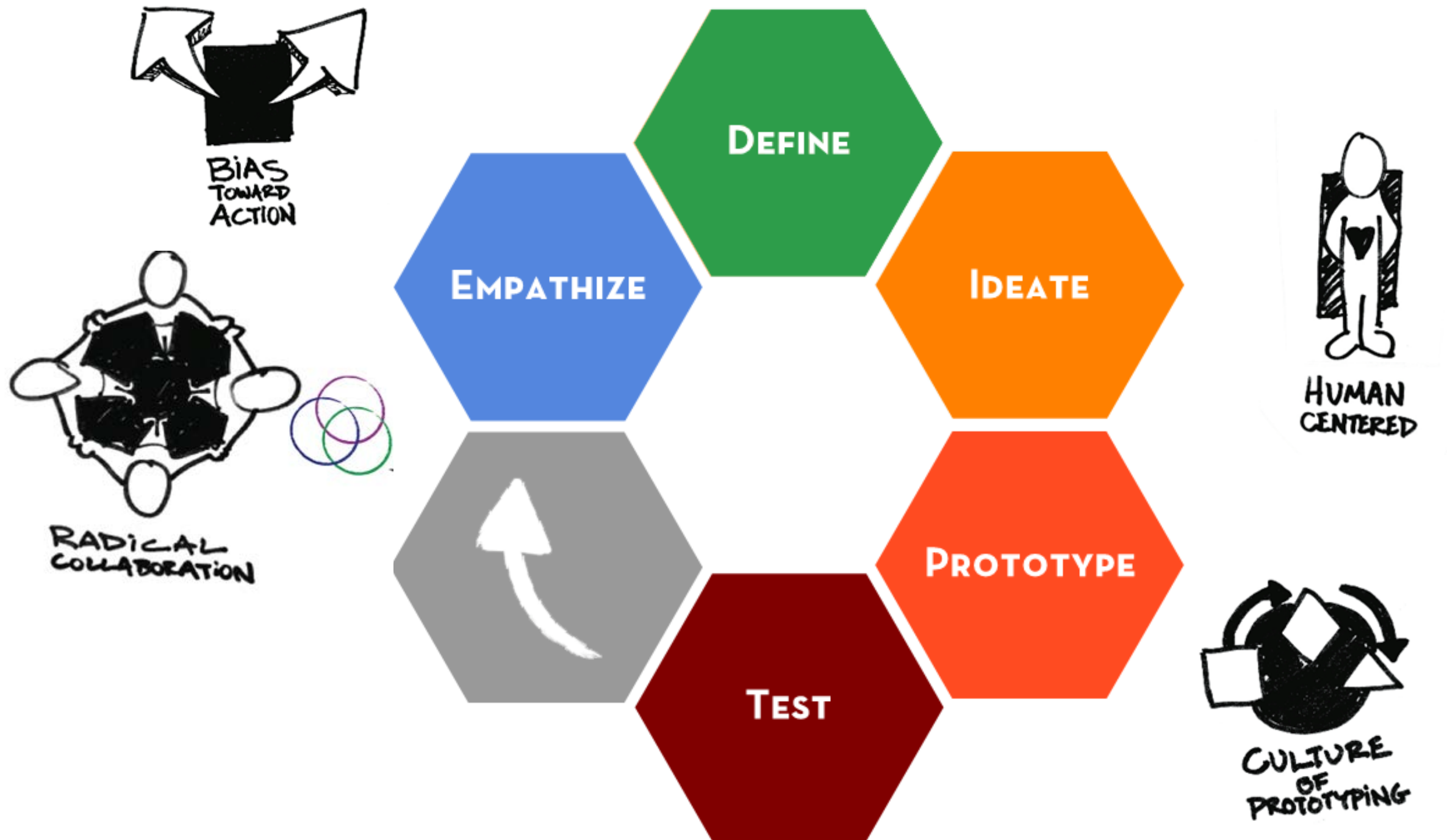
GABRIEL ALDAZ

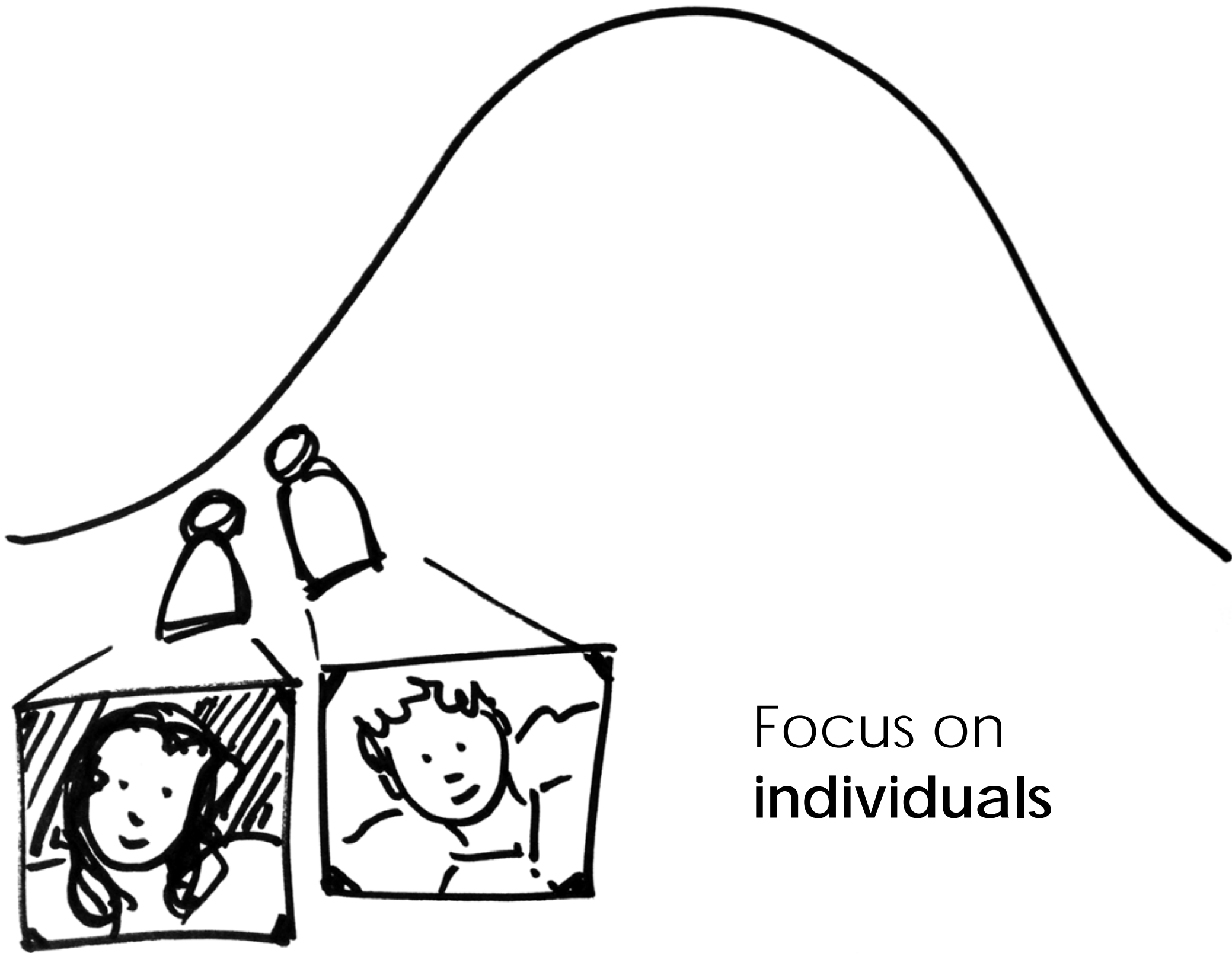
A **problem-solving**
approach to innovation

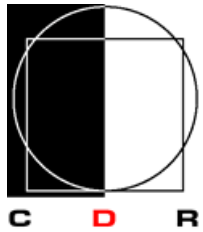
The **design-thinking**
approach to innovation



The Design Thinking Mentality

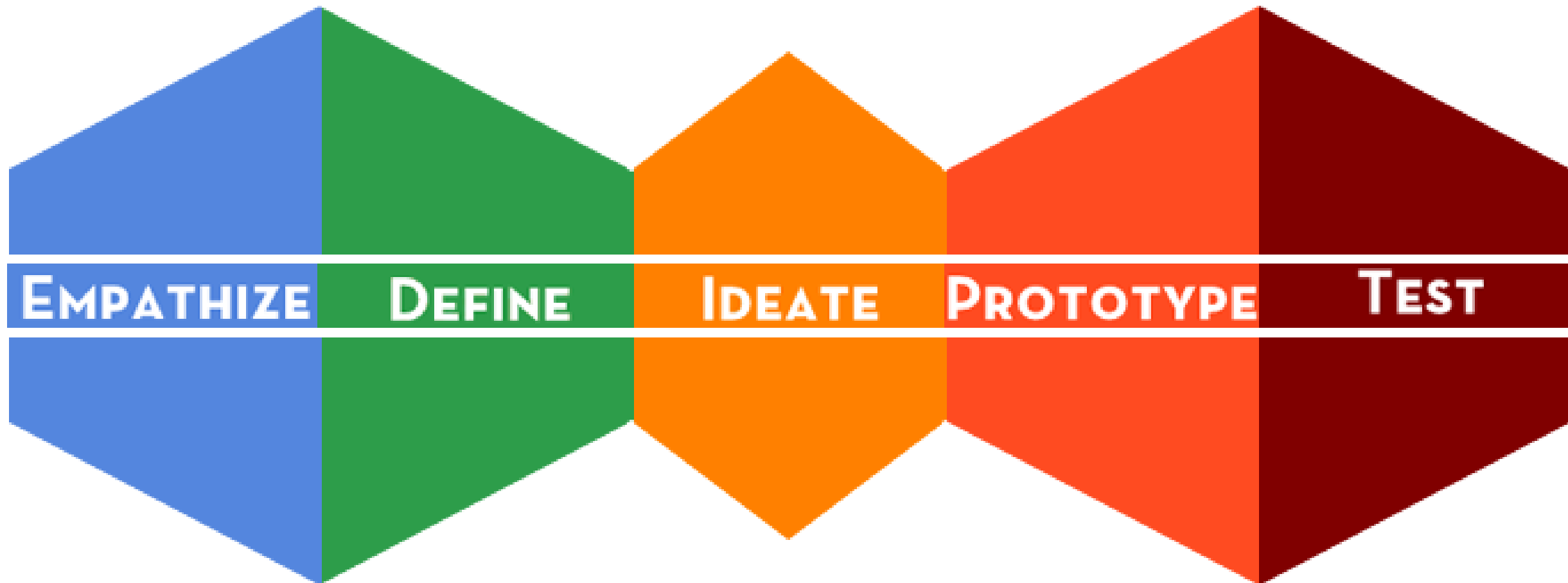


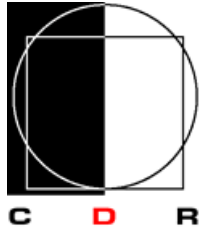




FLARE!
↑

FOCUS
↓





Case Studies

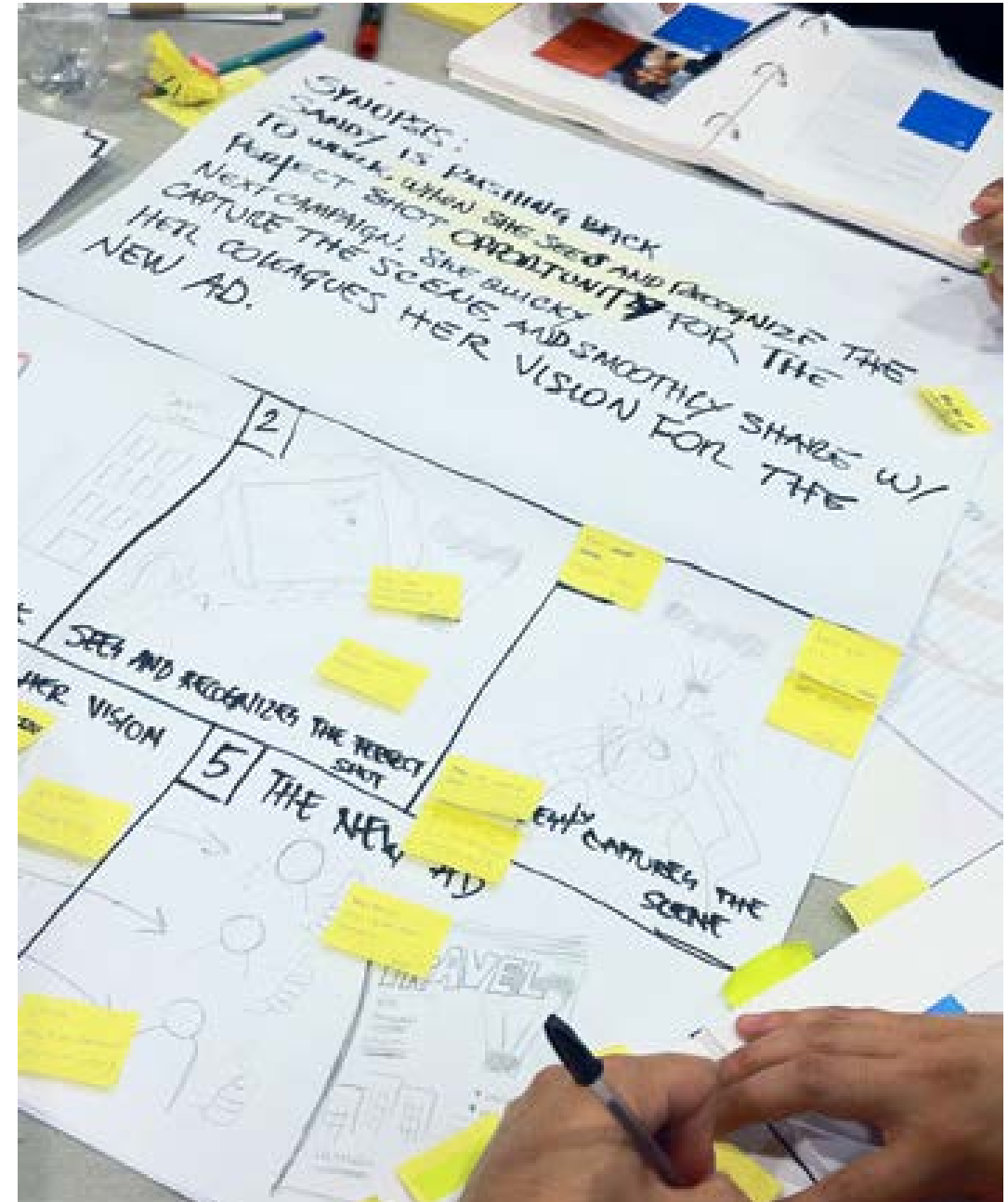
- ❑ Hands-Free Chronic Wound Photography
- ❑ Context-Aware Hearing System



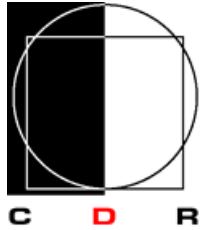
Objective:
Applications for
Google Glass
in the hospital



Clinical Immersion



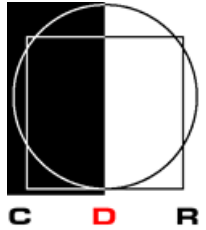
Observe & Interview



Identified over **135 needs** at Stanford Hospital in these areas:

1. Remote operation, emergency responders
2. Training
3. Improving Live Visualization
4. Documentations (Checklists)
5. Documentation (Overlays)
6. Documentation (EHR Data)
7. Documentation (Decision Support)
8. Documentation (Video Recording / Photographs)
9. Communication
10. Scheduling and Coordination
11. Alert Fatigue
12. Privacy
13. Administering medications
14. Spatial recognition for remote monitoring

User Needs Evaluation



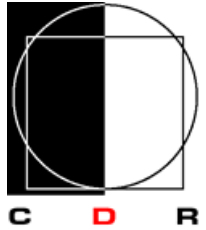
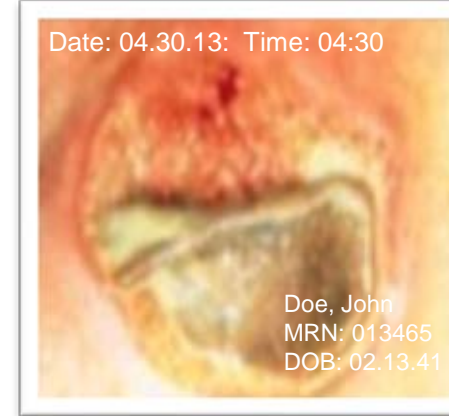
Needs filtered based on

- ☐ Degree of pain
- ☐ Fit for Google Glass
- ☐ Study feasibility

Top score:

Wound & skin care photography





Historical image retrieval

- ☐ Check healing progress
- ☐ Wound staging



Hands-free navigation

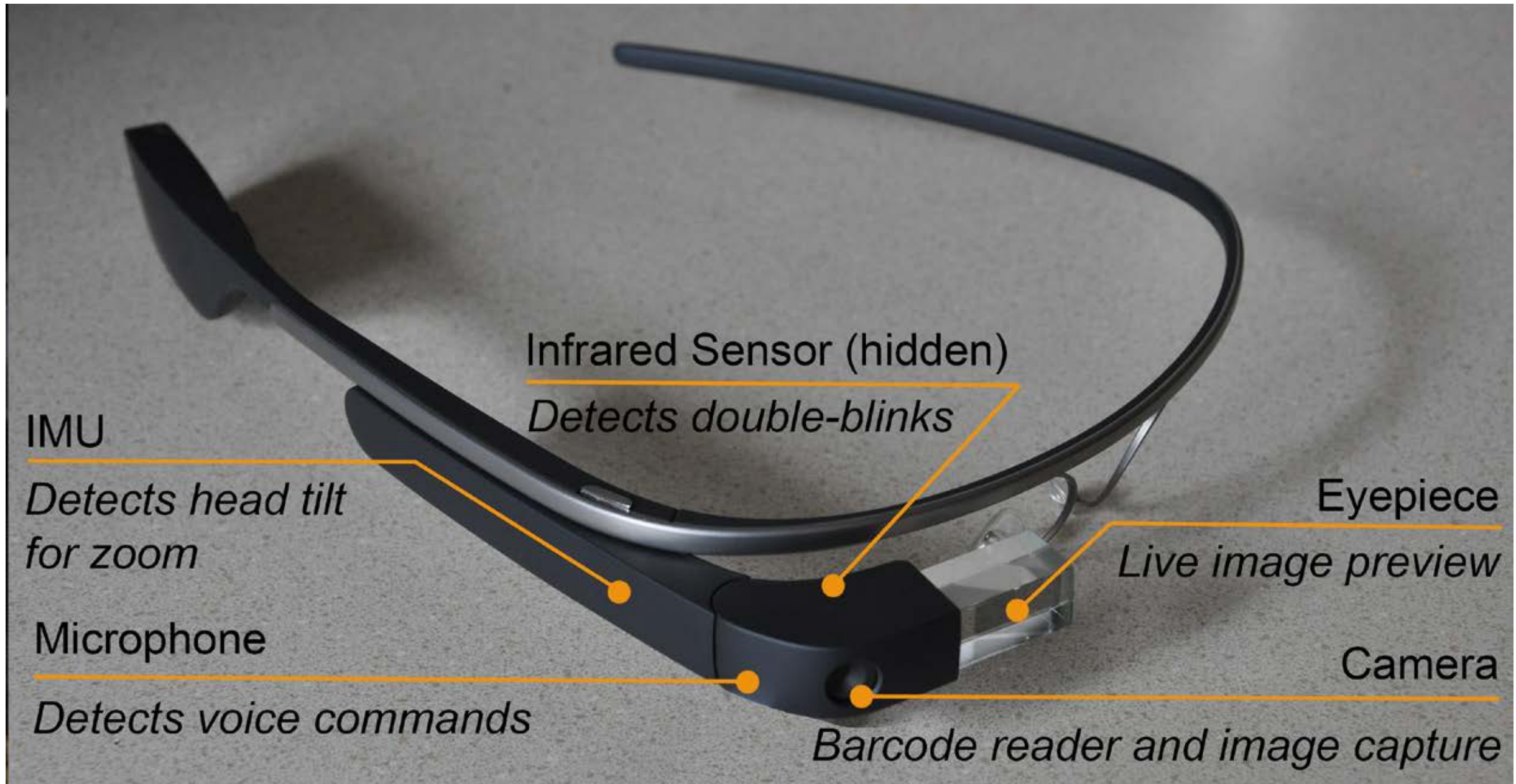
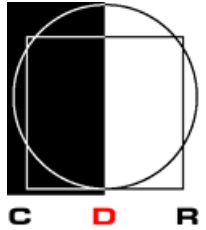
- ☐ Sterility
- ☐ Voice control
- ☐ Head tilt
- ☐ Double blink
- ☐ Hand gestures



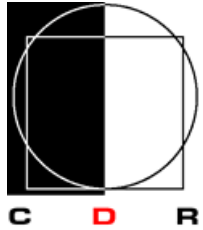
Scan patient barcode

- ☐ Name
- ☐ Medical Record Number
- ☐ Tag photos

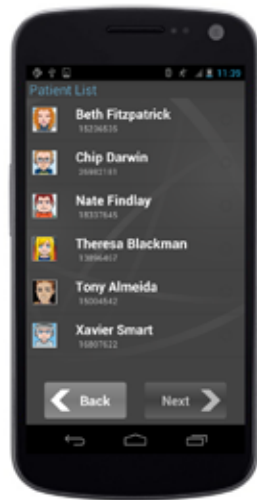
Google Glass



Mockup Electronic Medical Record



SnapCap smartphone app



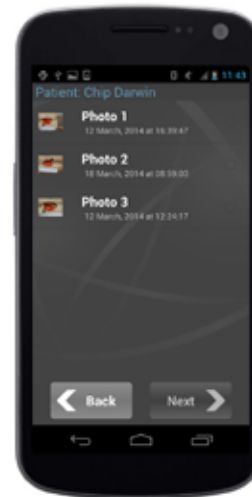
1. Select patient from list



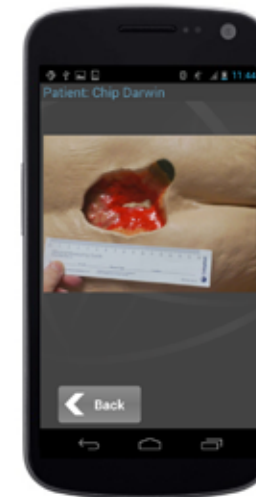
2. Choose to
(i) Take clinical image
(ii) View media file



(i) App is ready to receive data from Glass via Bluetooth

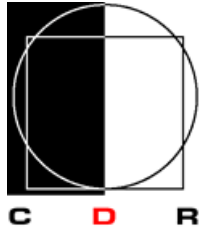


(ii) The media file contains all the photos taken of the patient



TEST

Pilot Study



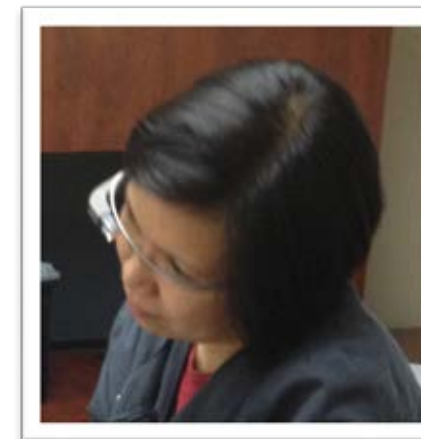
Hands free? Not quite!



1. Barcode scan with Glass



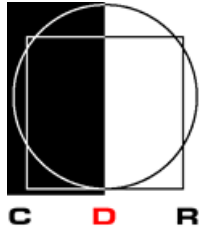
2. Voice-based documentation



3. Head tilt (zoom in and out)



4. Double blink (take photograph)

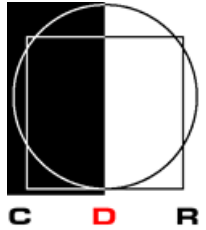


Sound or light emitter; bi-directional communication between the external microprocessor and Glass

d

Object

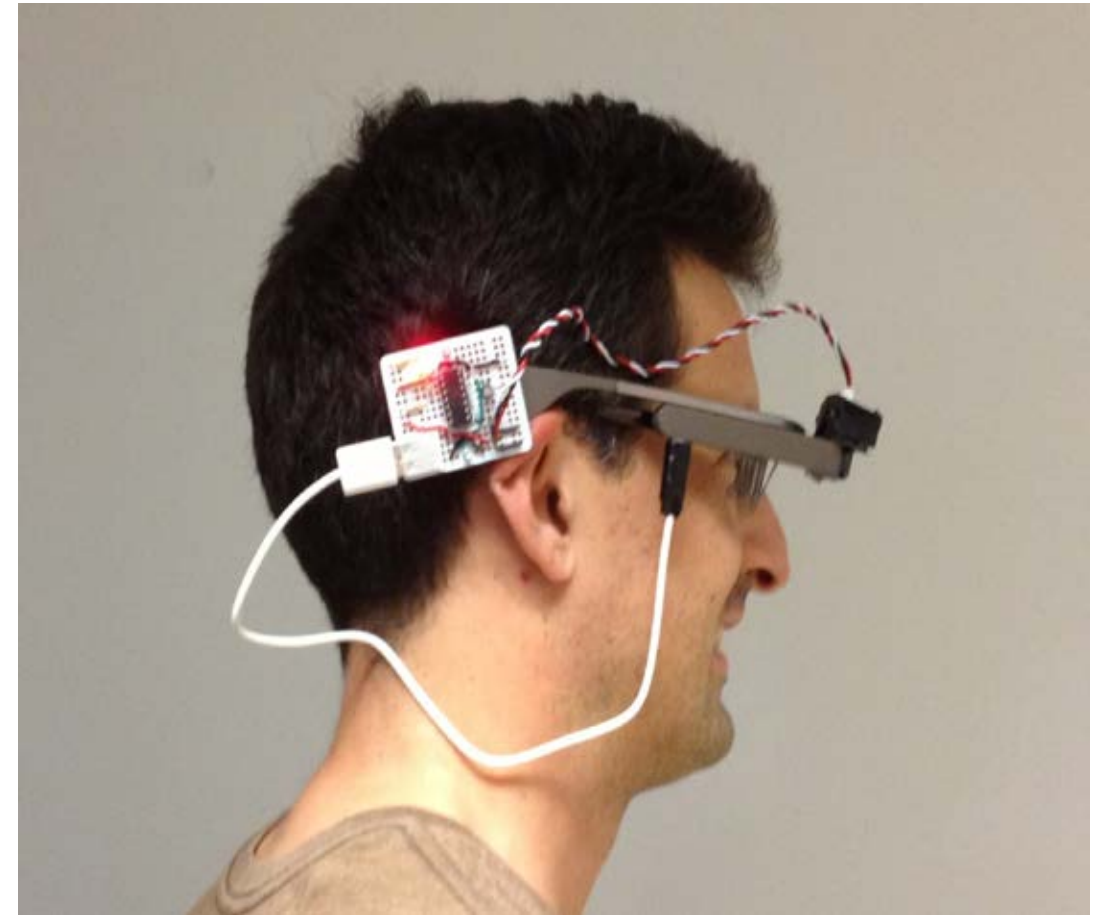
Dynamic Digital Ruler (Version 1)



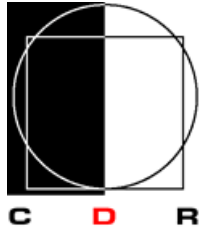
- ☐ Infrared distance sensor
- ☐ USB microcontroller
- ☐ Distance displayed in Glass eyepiece

TEST

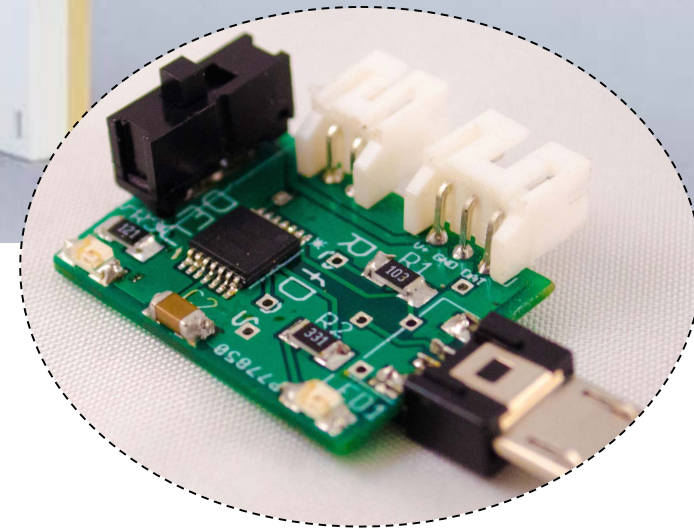
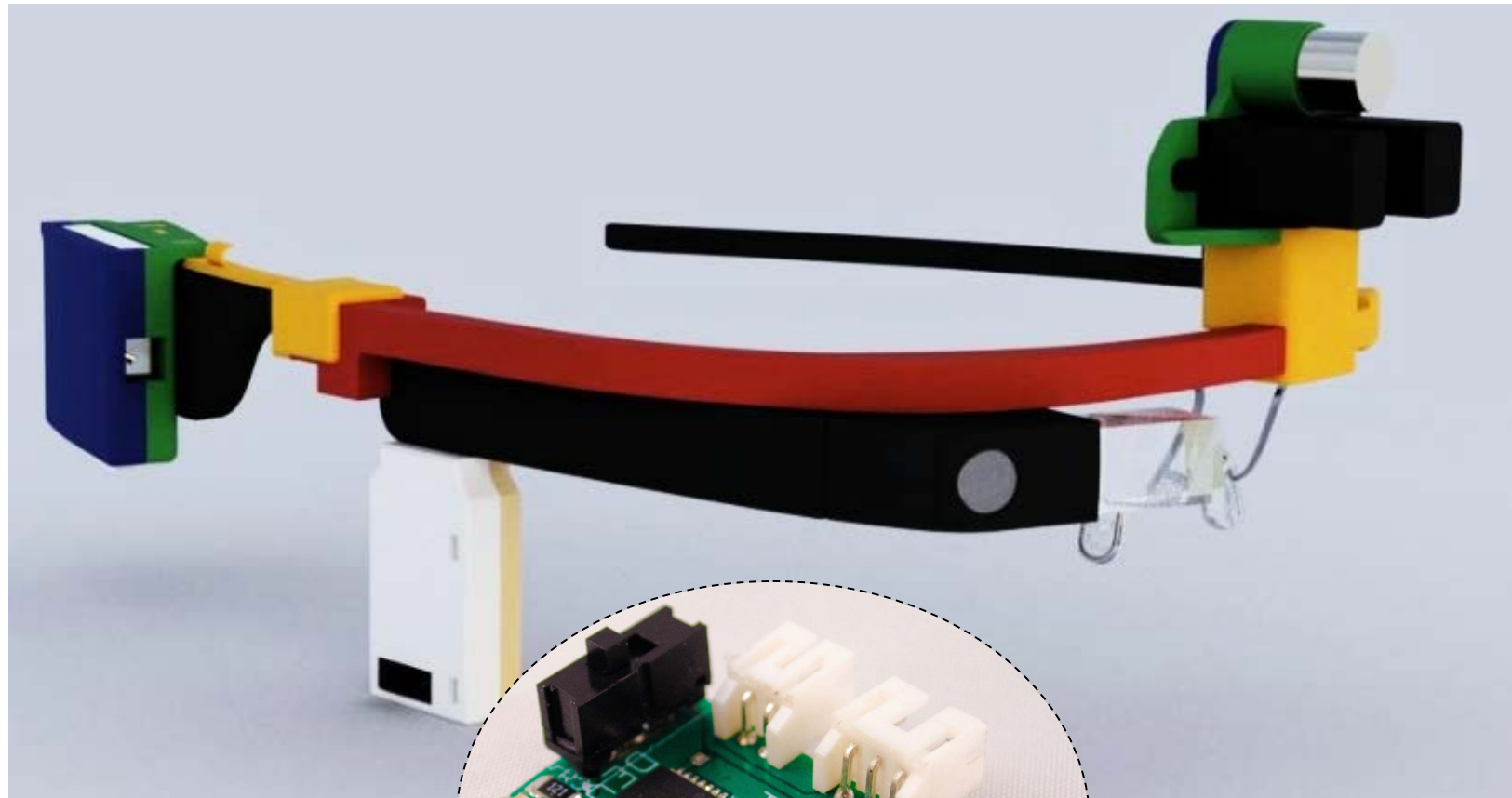
- ☐ Distance displayed as text
- ☐ Poor accuracy
- ☐ Microcontroller drains Glass battery quickly



Dynamic Digital Ruler (Version 2)



- ☐ External battery
- ☐ Better calibration
- ☐ Custom PCB
- ☐ Zoom by voice
- ☐ Dynamic scale on Glass eyepiece

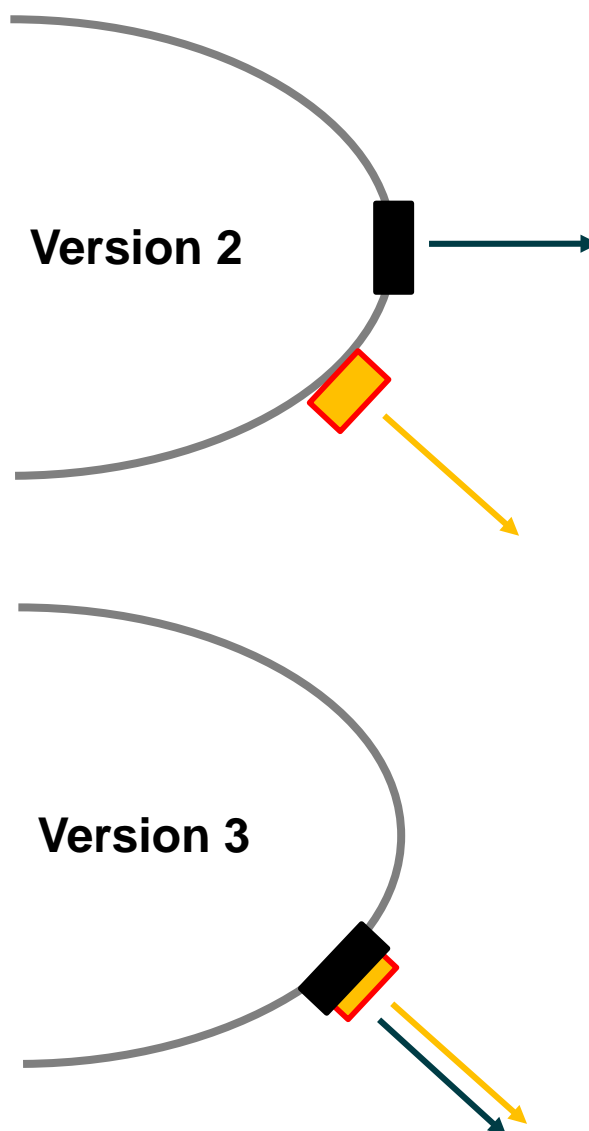
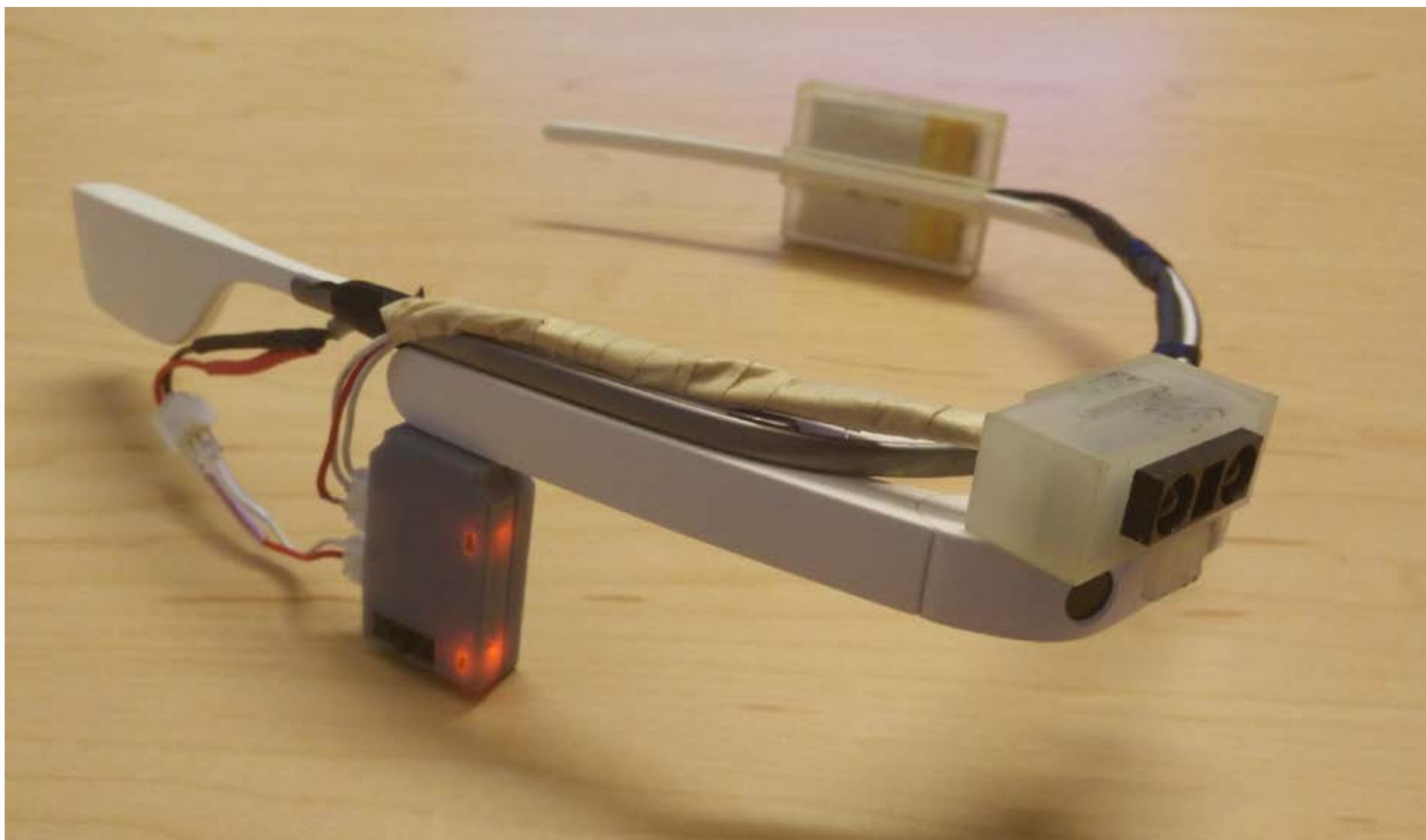


TEST

- ☐ Improved accuracy, but can do better

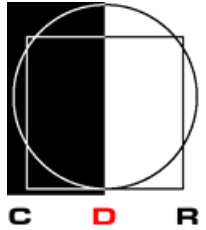
PROTOTYPE

Dynamic Digital Ruler (Version 3)





Finally, hands-free
chronic wound
and skin care
photography



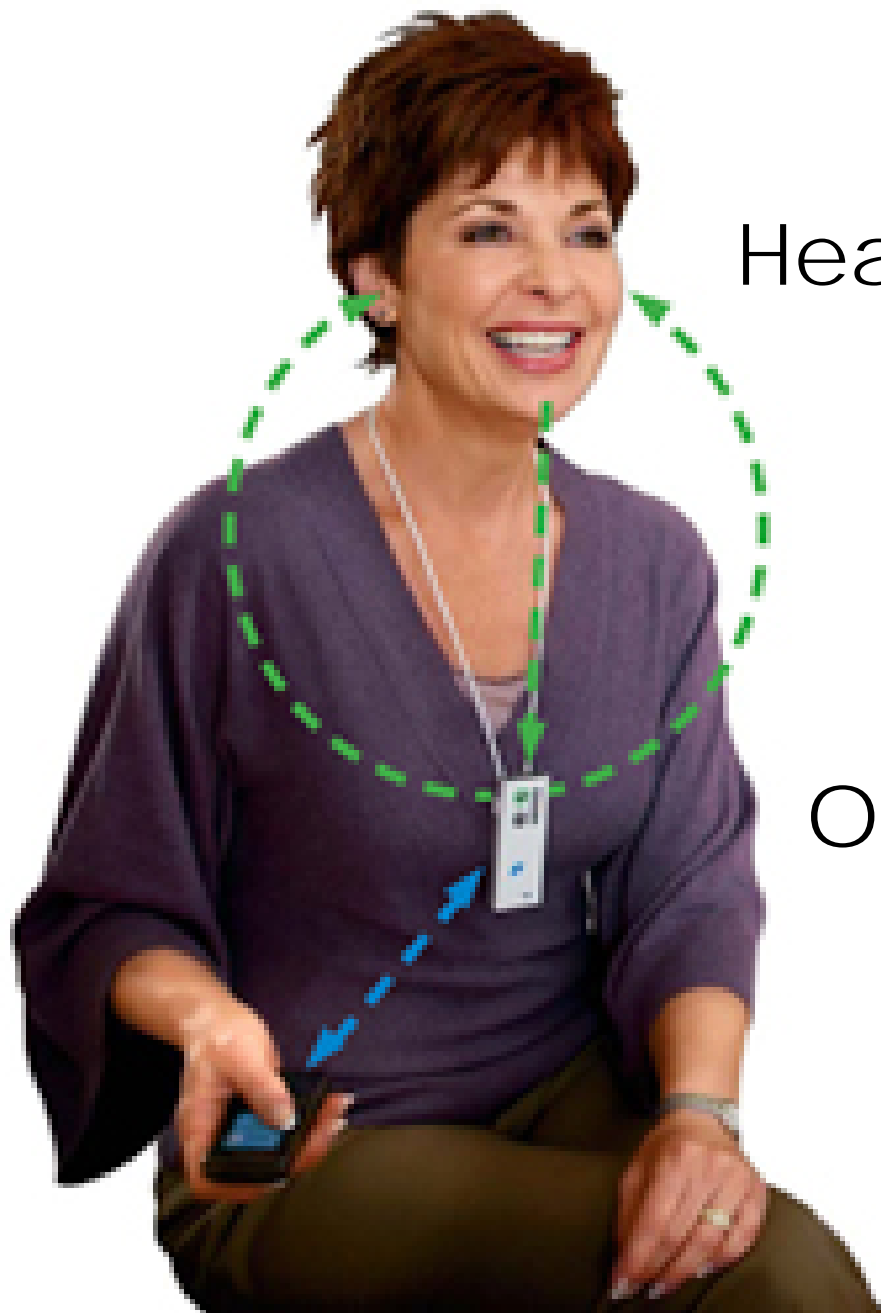
Case Studies

- ✓ Hands-Free Chronic Wound Photography
- Context-Aware Hearing System

Objective:
The next big thing
in hearing aids



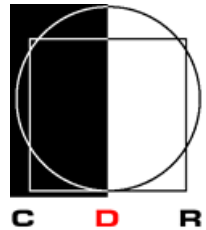




Hearing Aids

Oticon Streamer

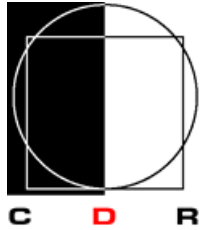
Interviews



What we heard about the Streamer....



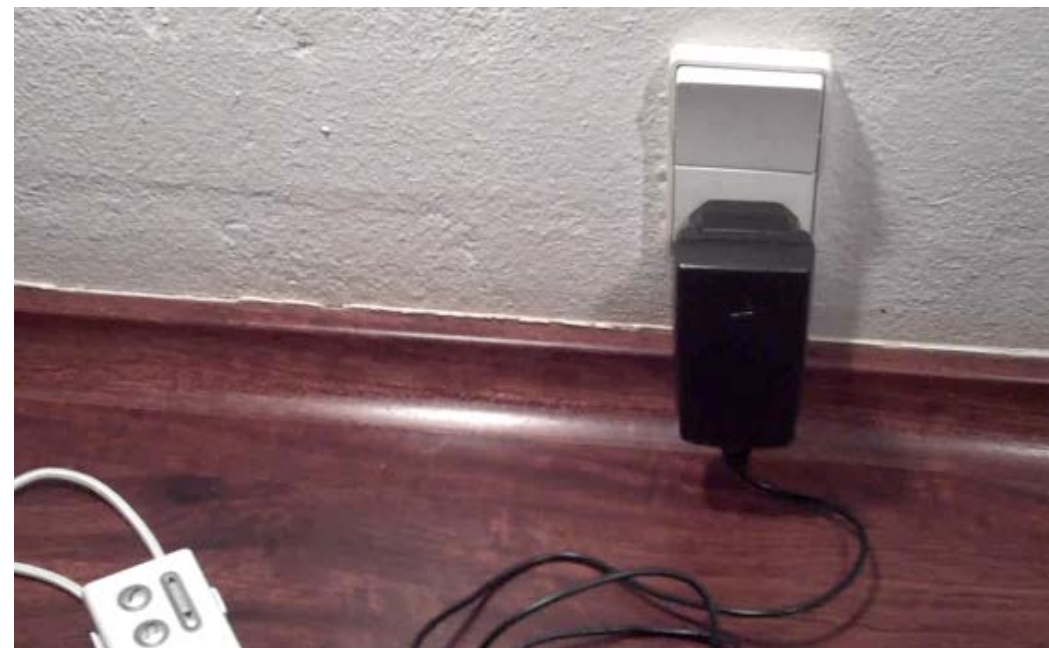
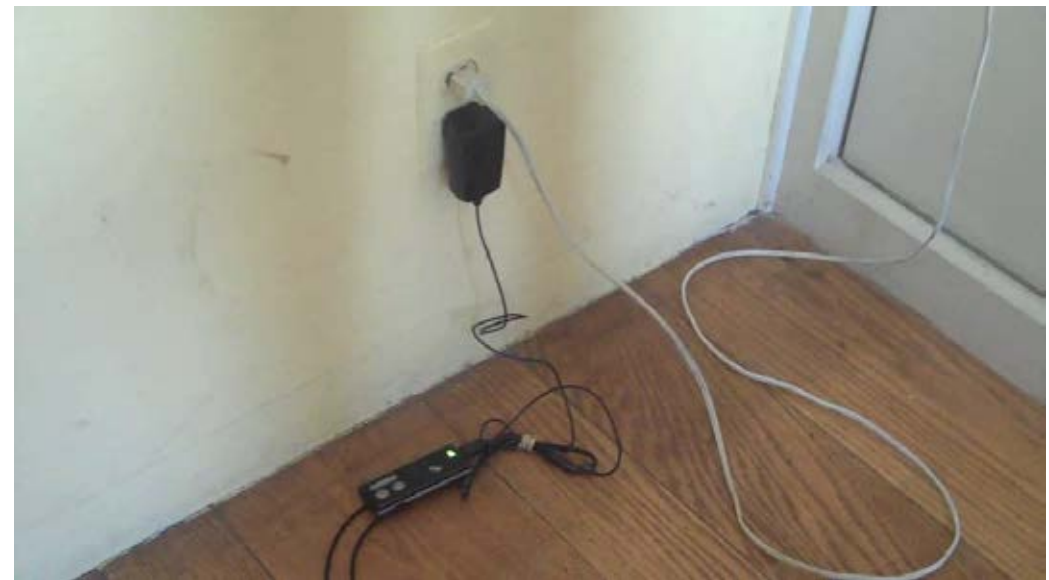
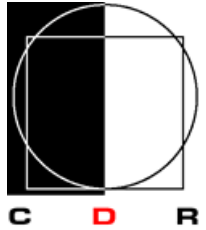
Anthropological Study



5 hr

Anthropological Study

How we saw the Streamer used (or not)



☐ Interviews:
Listen to what **people say**



NOW

☐ Anthropological studies:
Observe what **people do**

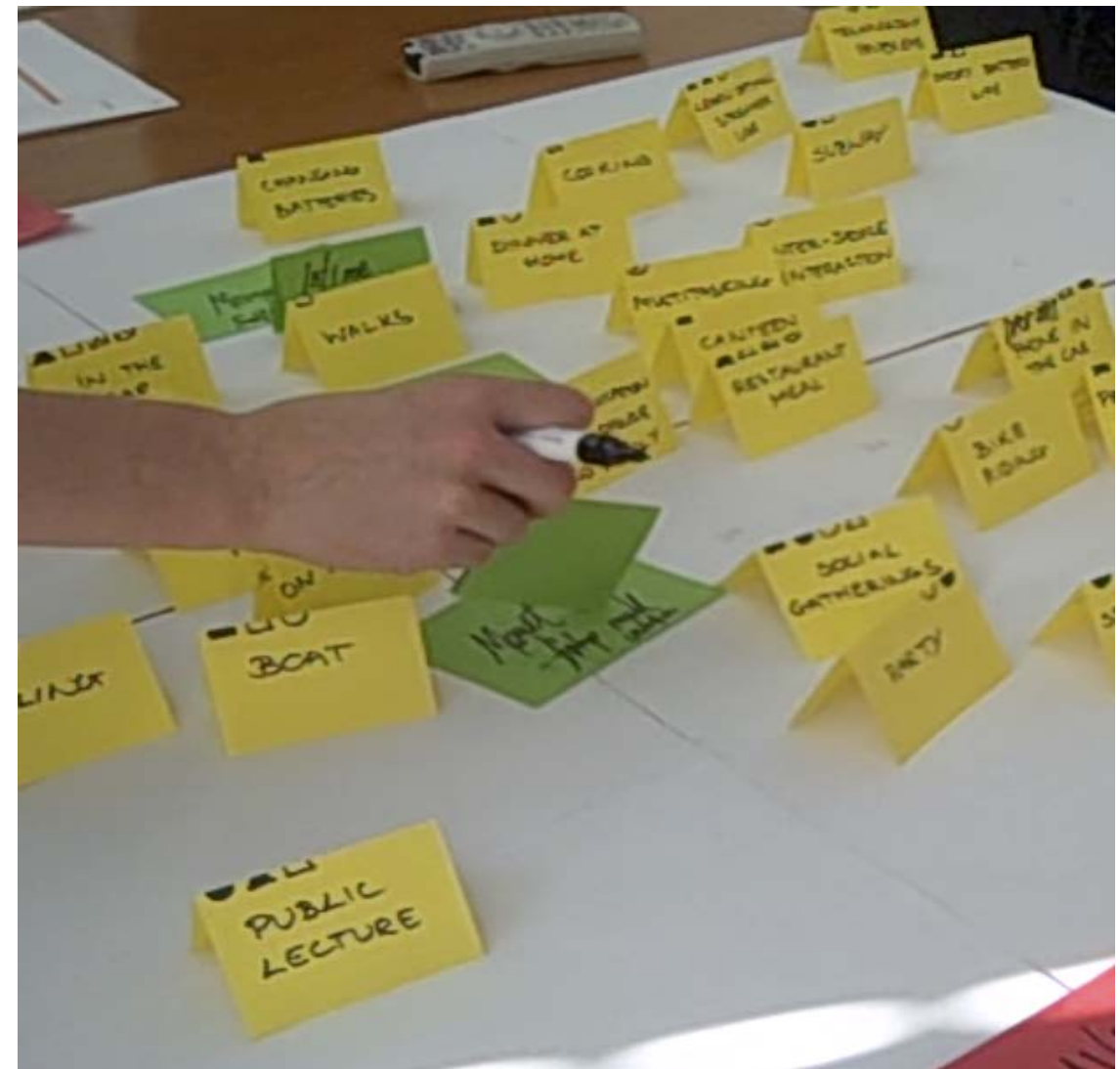


1 DAY

☐ How do we find out how
people behave in
different situations?



WEEKS



Wearable Data Logging



Log data on
Streamer,
which many
people have
with their
hearing aids



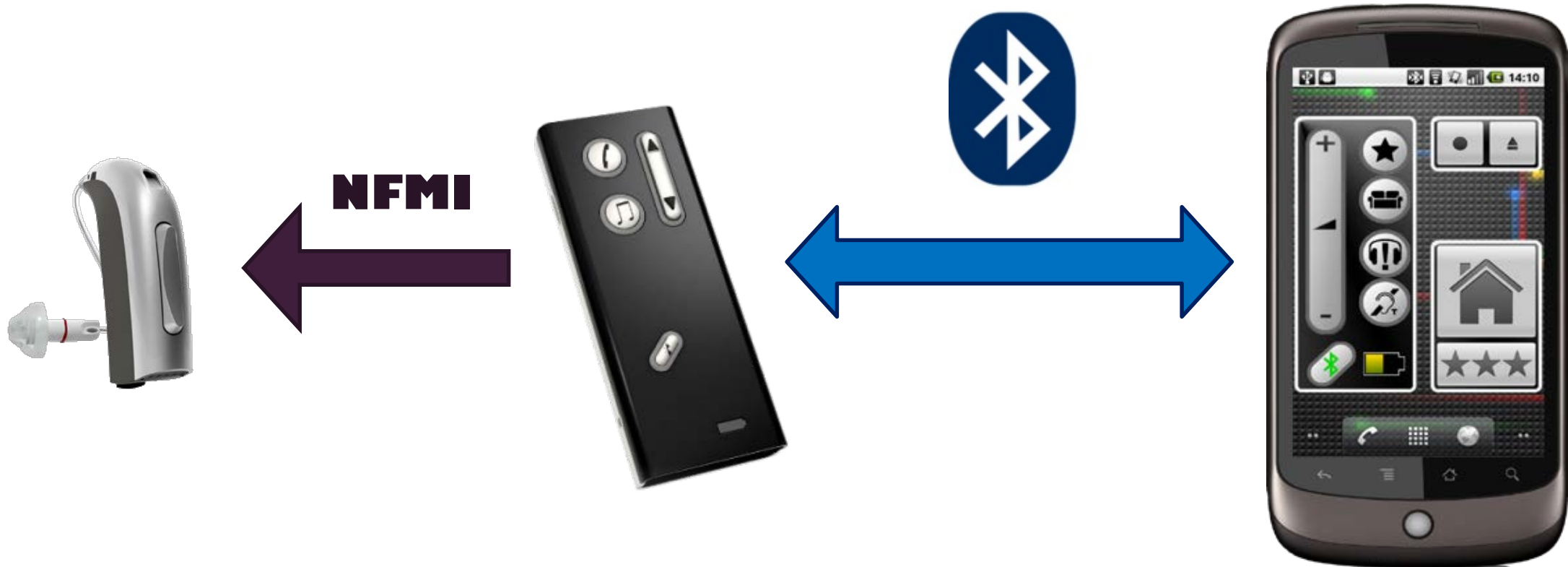
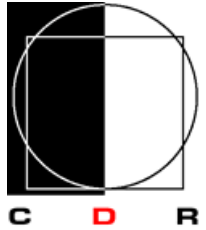
But people don't use the Streamer!

Instead, use a device like a smartphone to log data (sound environment, location, time of day...) over a period of weeks

(Not so obvious in 2009!)

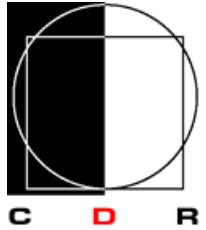


Wearable Data Logging



Data-logging device:
Google Nexus One
smartphone

Wearable Data Logging



Data collected

- ☐ Sound samples
- ☐ Locations
- ☐ Key presses
- ☐ Subjective feedback



SoundBuffer

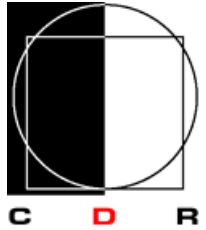
User program change
based on location

Extended control over
the HA and the
Streamer

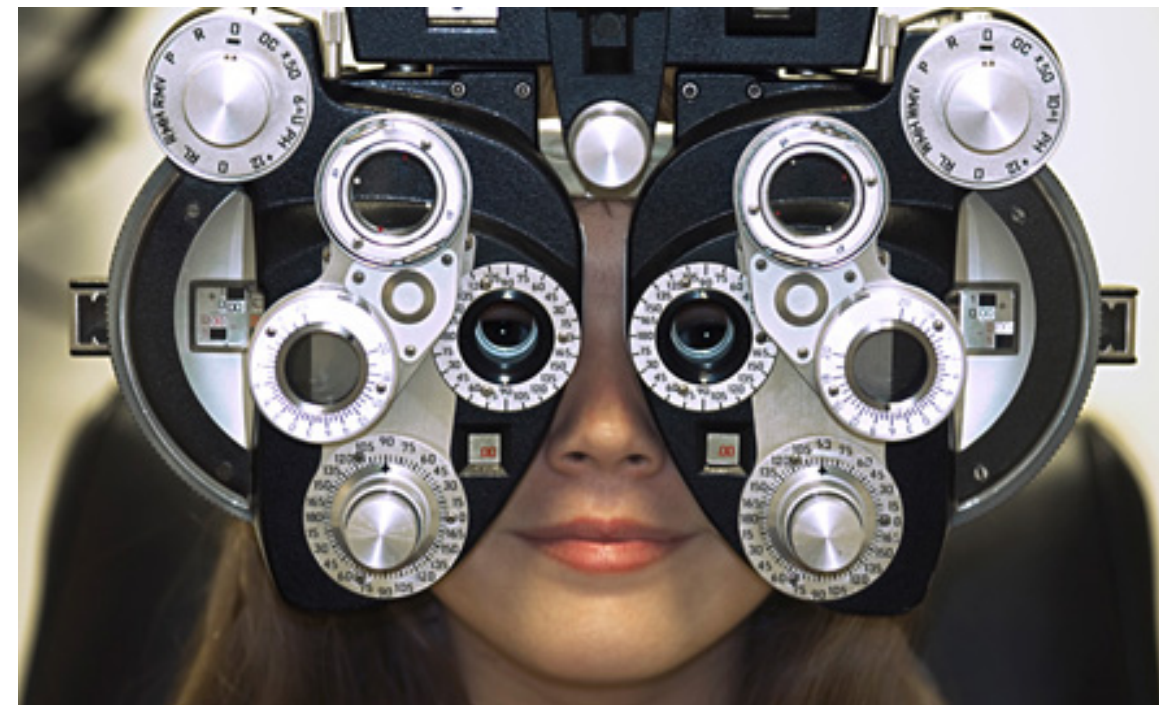
Alpha Test

2 Oticon employees

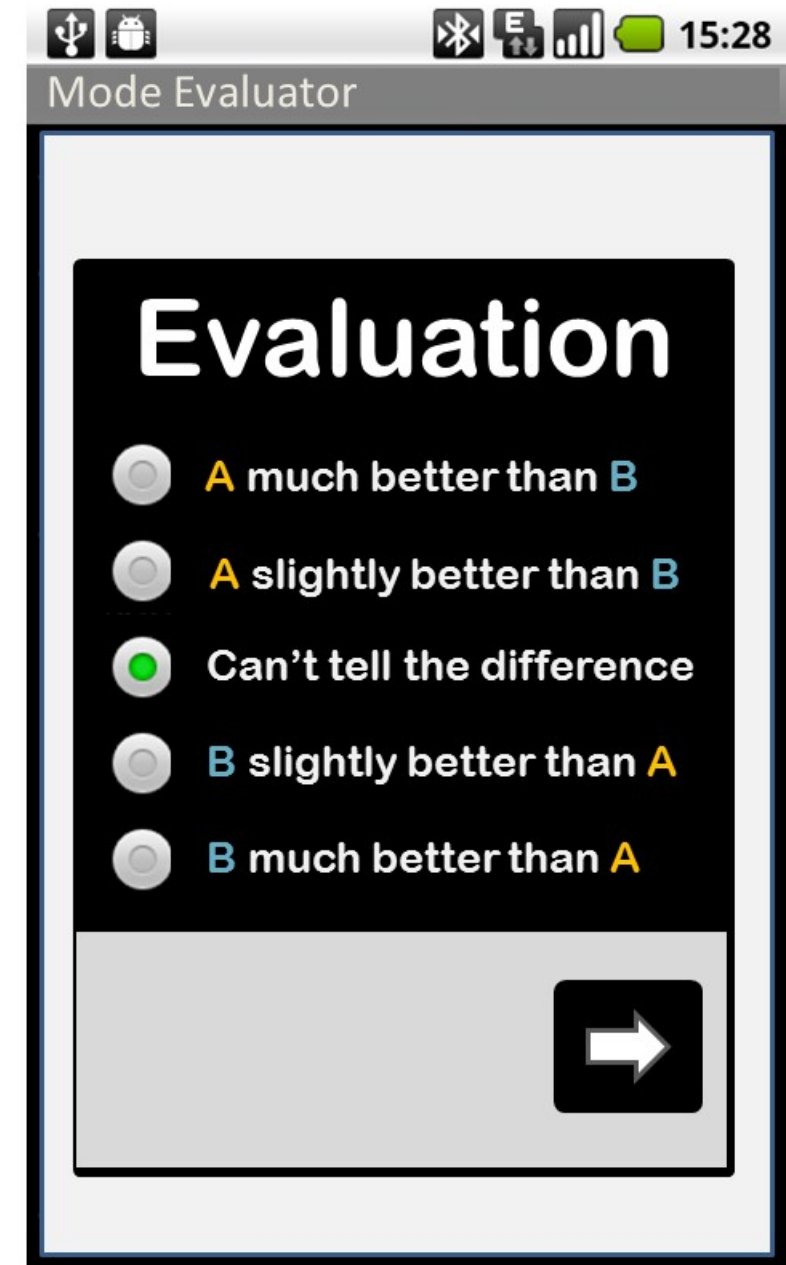
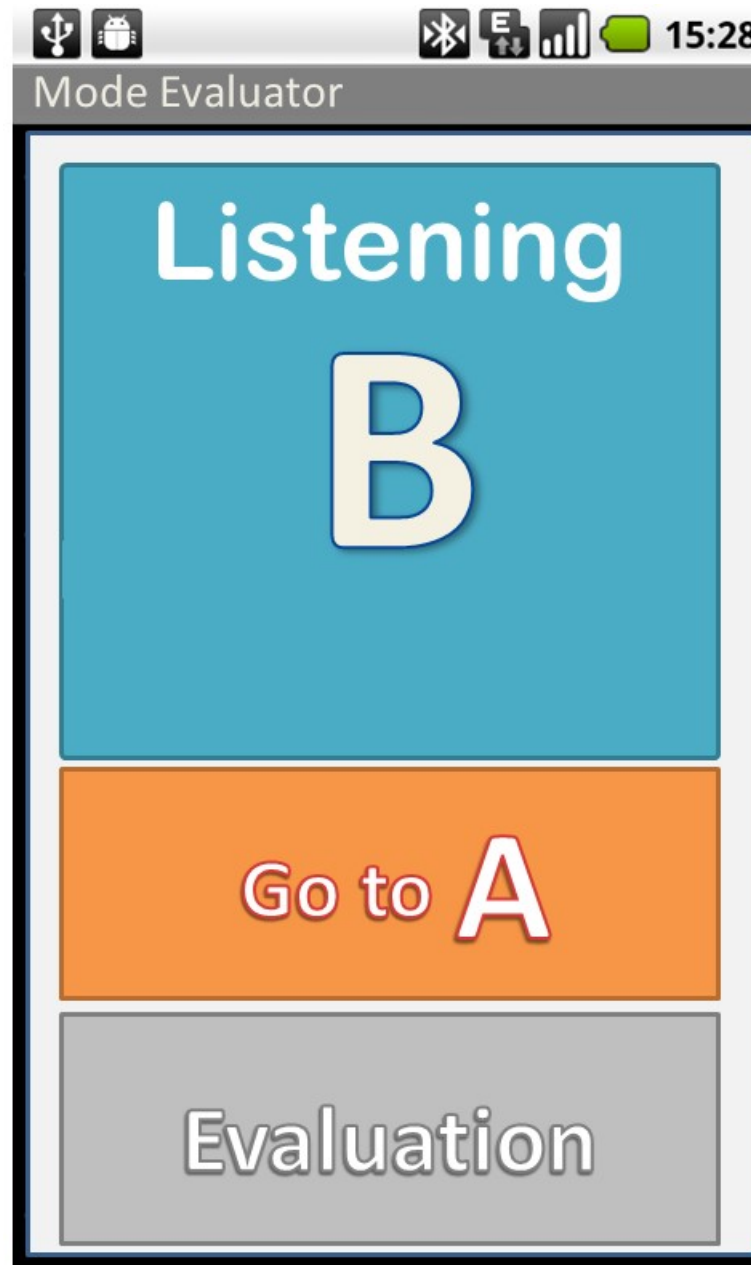
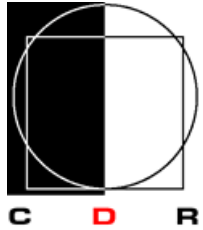
Obtaining User Input



- ❑ Correlate collected data with hearing aid settings to find out what settings a user prefers under given conditions.
- ❑ Present two settings, A and B
- ❑ User states preference
- ❑ Analogous to visiting the optician.



Obtaining User Input



3 hard of hearing Oticon employees

- ☐ Loved the A/B Test.
- ☐ 5 choices too many.
- ☐ Keep to 3 choices: A Better, B Better, No Difference.
- ☐ Using open domes, often could not tell difference.
- ☐ Use micro molds instead.



open domes

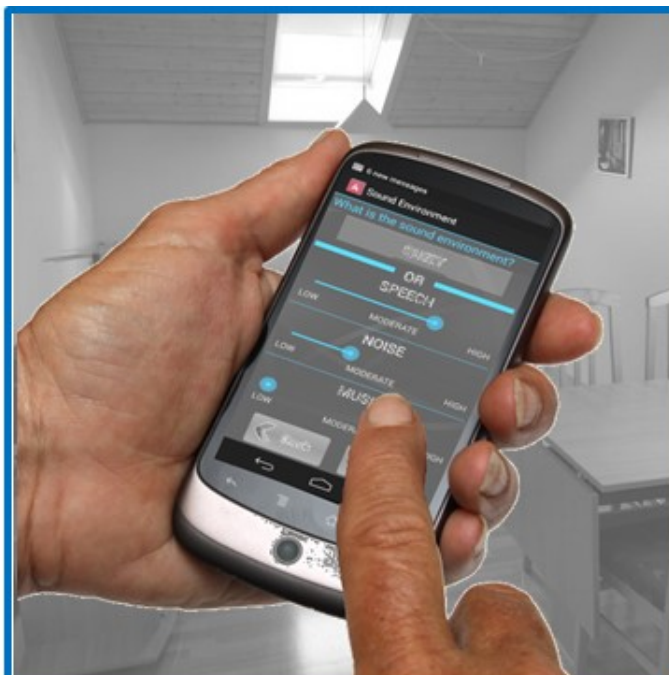


micro molds (more closed fit)



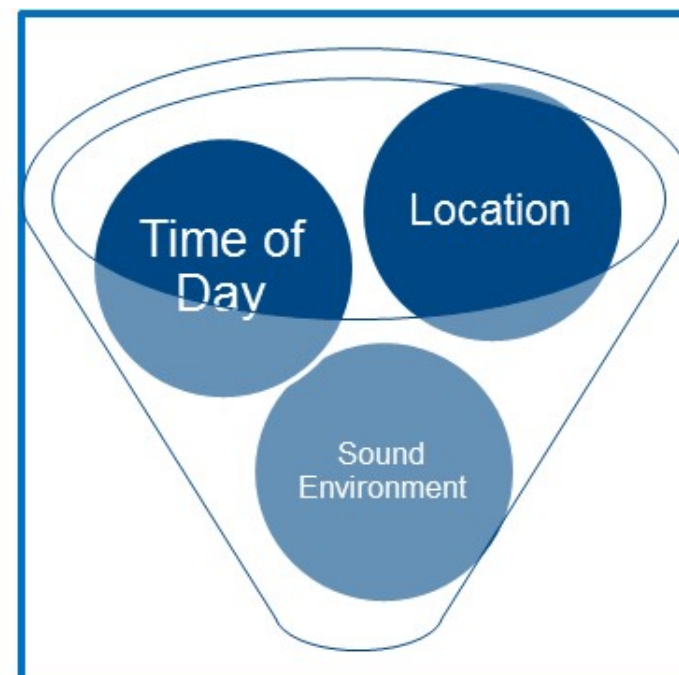
BUILT-IN SENSORS

- Wearable
- Continuous data logs



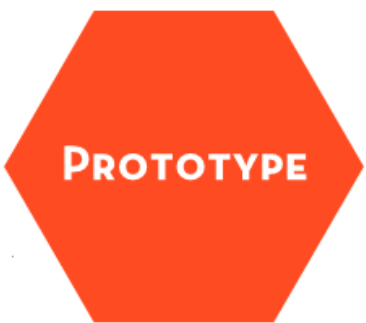
LISTENING EVALUATIONS

- A/B Test
- Self-Adjustment Screen

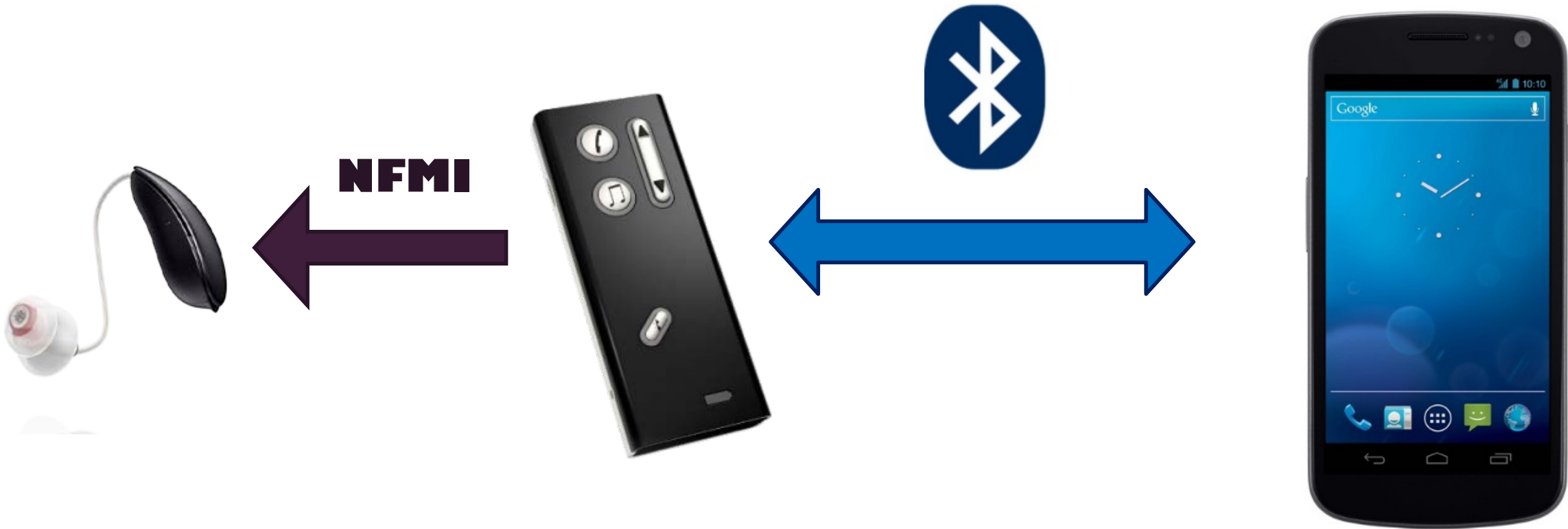
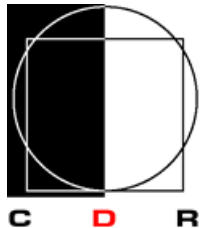


KNOWLEDGE-BASED AGENT

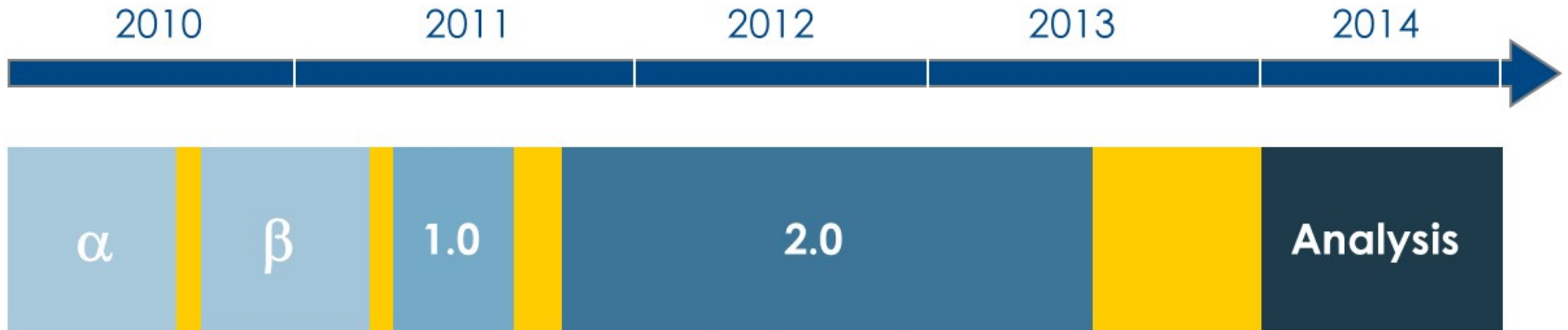
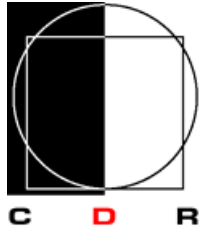
- Knowledge Base
- Inference Engine



Context-Aware Hearing System



Development Timeline



Prototype	Development	User Test
Alpha	Basic Functionality	2 (DK)
Beta	A/B Test	3 (DK)
1.0	Sound Environment Classification 1.0 Location Algorithm	5 (pilot, DK)
2.0	Sound Environment Classification 2.0 Self-Adjustment Screen Knowledge-Based Agent	16 (full, USA)

Thank You

STANFORD CENTER FOR DESIGN RESEARCH

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