Augmented Reality Applications Overlaid on Surgical Environments

Jacob Zeitzew
Cofounder of OnClass

This Past Year

- 2nd Annual Wearable Technology in Healthcare Society - keynote @ Academish Medisch Centrum in Amsterdam

- Wearables in Healthcare Pilot Challenge - finalist @ Google Cambridge

- 2015 Developer of the year - shortlisted @ The Technology Expo in London

Key Points

- The differences between Augmented Reality and Virtual Reality

- How hospitals can succeed by fostering innovation and technology

- How to promote to best possible practices for a new generation of surgeons

Introductions
AR vs VR
Optomechanical Engineering
Structures and Tumor Analysis
OnClass
Next Steps

Augmented Reality

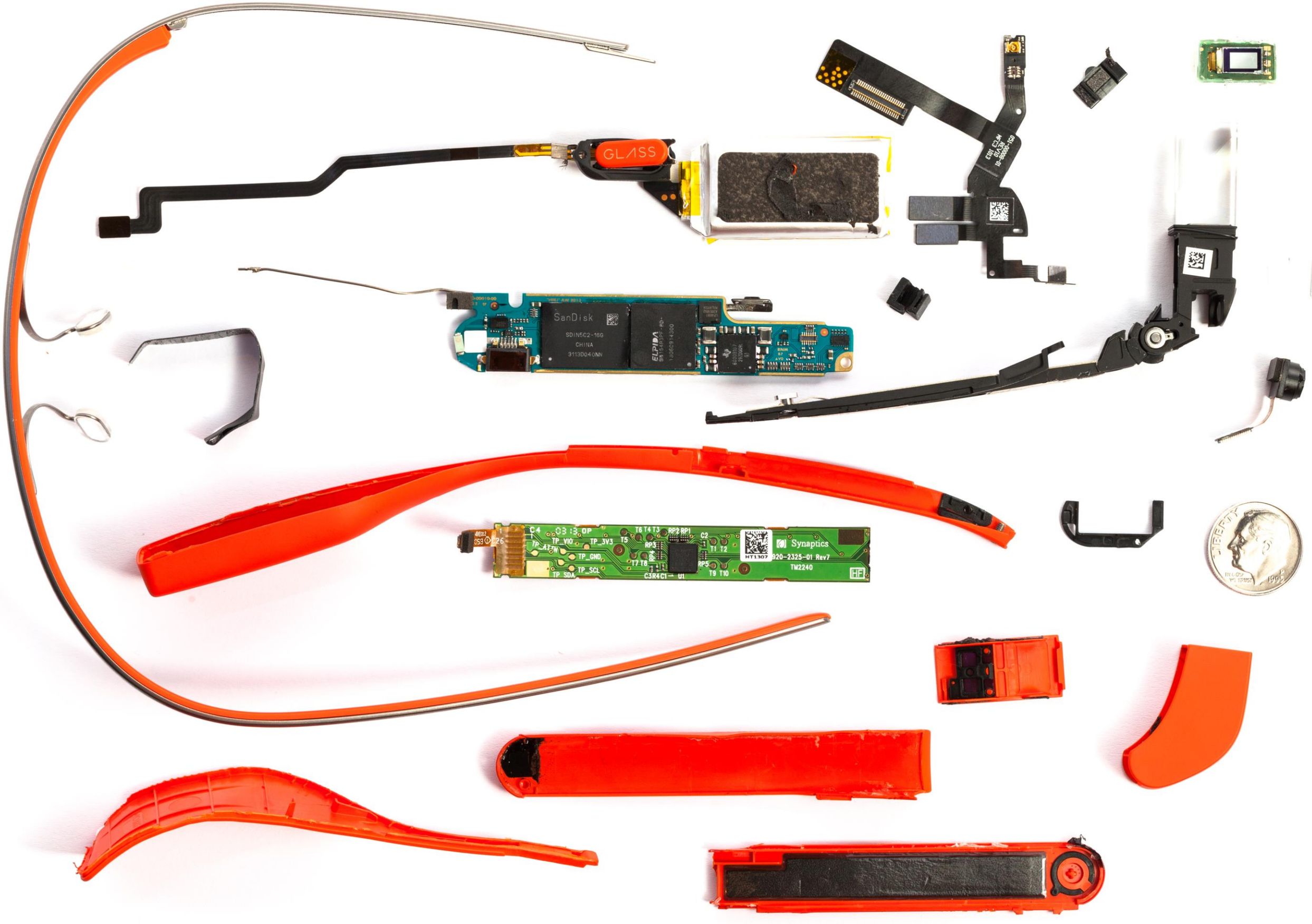
Heads-up Displays

Wearable Technology

Smart Glasses

Processing Power

- Graphic chips
    - Image processing
    - Encoding
- Computational chips
    - general purpose tasks and mathematical operations
    - RGB Analysis


GLASS
SanDisk
SDIN5C2-16G
CHINA
3113D04ONN
ELPIDA
Synaptics
TM2240
TP_VIO
TP_3V3
TP_GND
TP_SCL
TP_SDA
LIBERTY

The Debate

Augmented Reality	Virtual Reality
Enhances a given scenario	Places the user in a “new world”

Sensors: Accelerometer, Gyroscope, Haptics
Components: Camera, Input Controller, Display
Applications: Automotive, Education, Military, Gaming and Healthcare

Notable Overlap

Mixed Reality

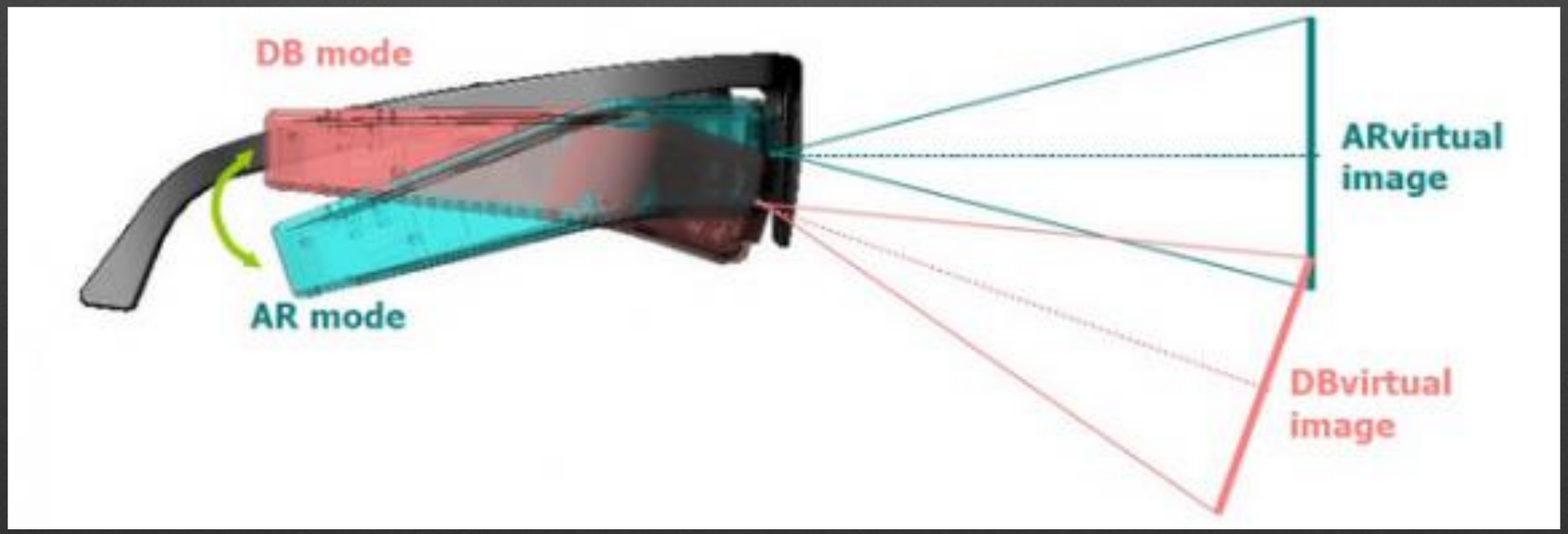
Microsoft Hololens - A combination of AR and VR

Working at Optinvent

- Optical mechanics Design
- CEO: Kayvan Mirza
- CTO: Khaled Sarayeddine
- HQ: Paris, France
- R&D Facilities: Rennes, France

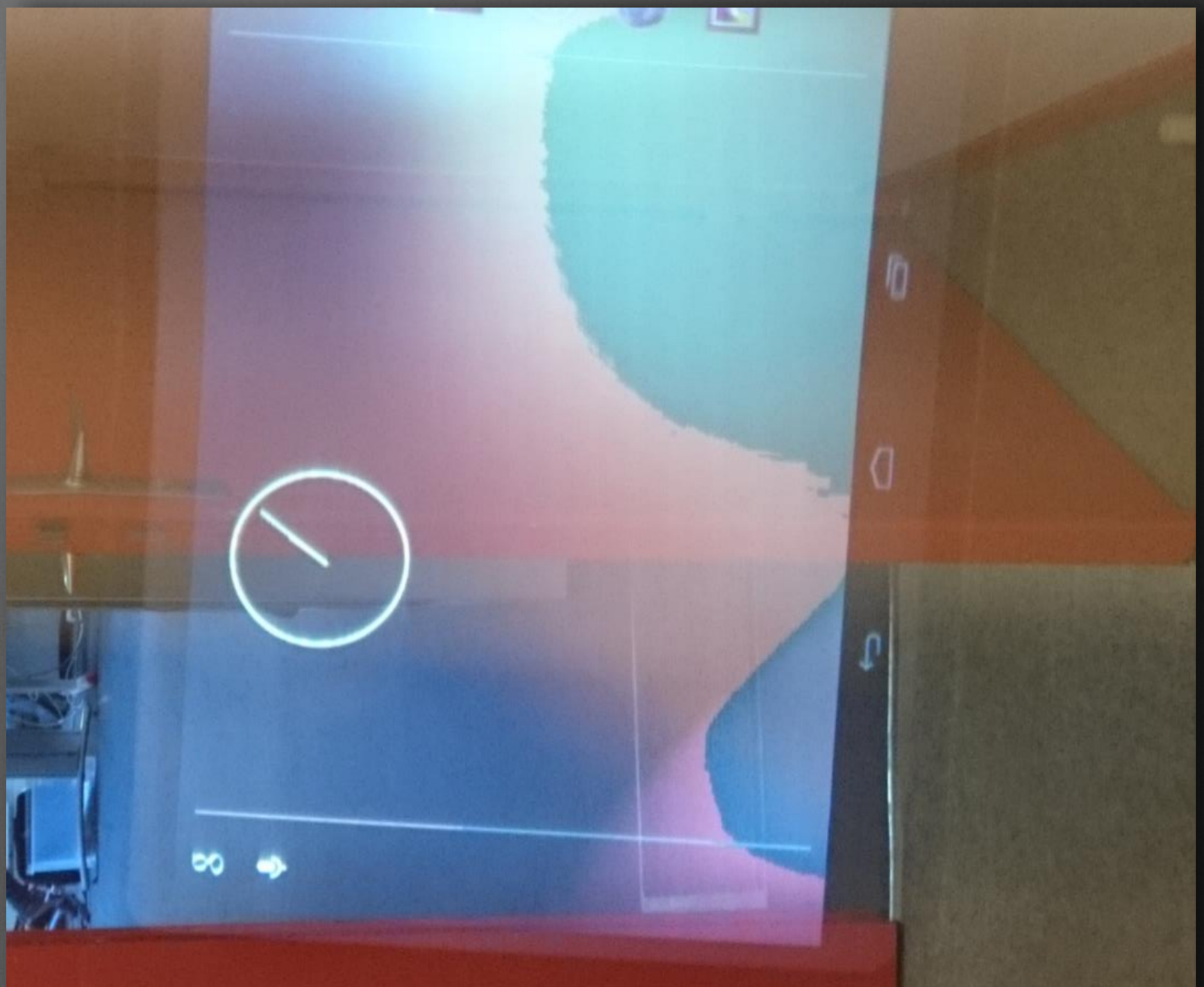
Optinvent ORA-1 Functionalities

- AR mode
- Glance mode



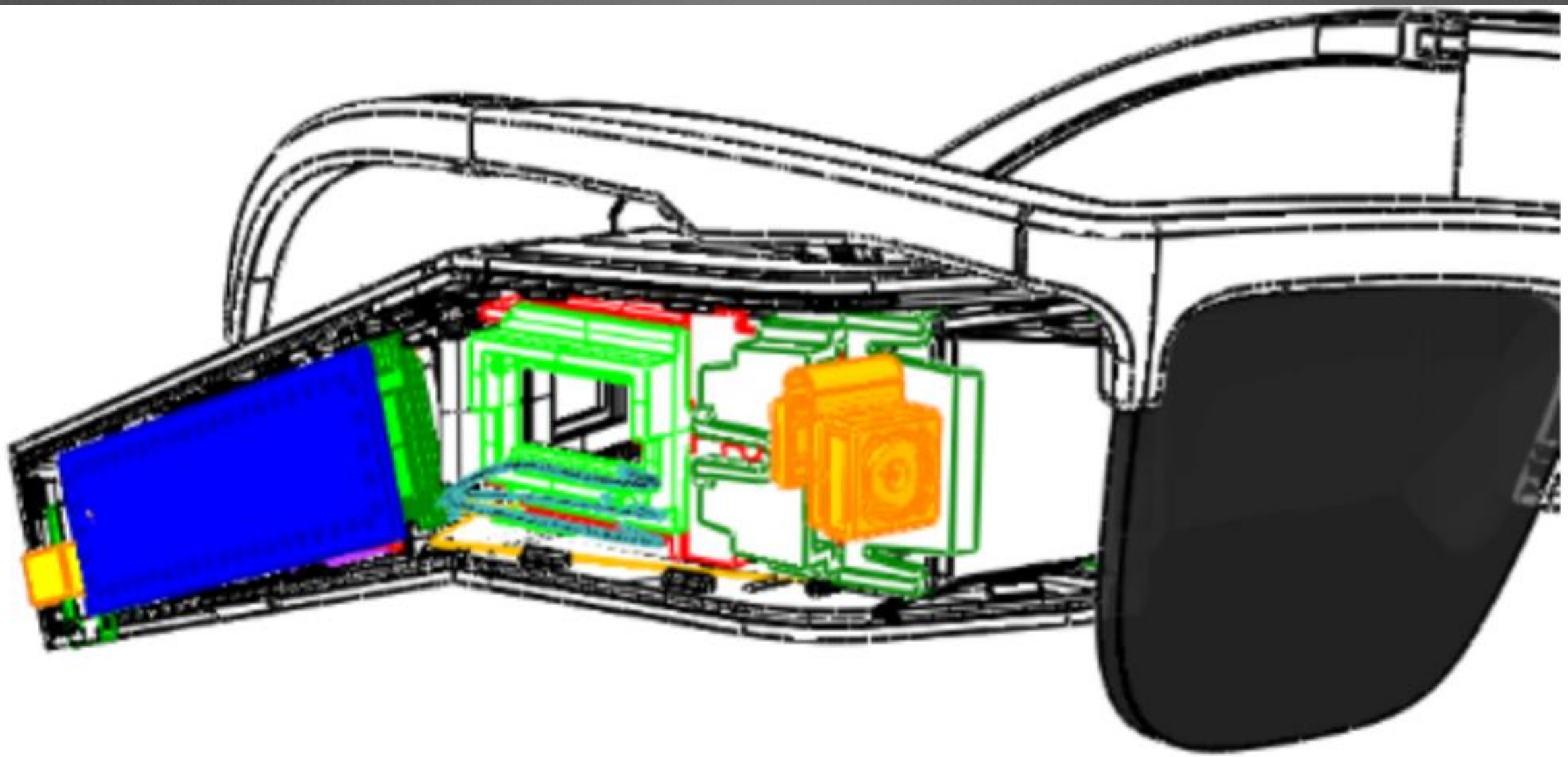
AR mode

Glance mode



Daqri and Smart Helmets

- Their design (above)
- My design (right)



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Smart Glasses Civil Engineering Uses

- On and Offsite consulting with a foreman or engineer
- Streamlined pre-work checklist
- Easier product ordering

Remote Structural Analysis Utilizing Optical Heads up Displays And Unmanned Aerial Vehicles

Dr. I. Bartolli
Dr. A. Kontsos
Dr. A. Pradhan
Jacob Ze
Eric Heg
Andrew
Shi Ye

uction

methods and techniques of Civil Infrastructure
re out of date. We're creating Google Glass
to detect cracks and erosion over time with high
y comparing pictures taken at specific places looking
ngles with pictures taken at the same place looking at
gle at a later point in time, we're now more accurately
he effect time has taken at the joints and connections of
rently, the field of Bridge Inspection requires the use
chinery, which puts trained professionals in danger, to
o view, analyze, and record data. We're able to collect
in real time by the use of Aerial Vehicles, GoPros,
gle Glass, unreachable viewing angles and
It was established and proven that the Parrot AR
ed with a GoPro3+ Silver Edition Camera could detect
arable to current visual inspection. The final
ision allows Inspectors to more accurately log
formation and allow inspectors to guide technicians at
he location.

ives

uring
essing and Photogrammetry
eature identification
metry and Deformation Analysis

logies used

Google Glass

ary transparent heads-up display. The first wearable
produced by a corporation providing augmented

Parrot AR 2.0

n the market QuadCopter with the load capacity of
st a video camera with a long battery life.

GoPro

ition robust camera which provides a direct feed to the
s in real time through wifi.

Current Methods

Current civil infrastructure analysis tools include; Cleaning tools, Inspection Tools (pocket knife, chipping hammer, visual aid tools (magnifying glass, mirror), Basic measuring equipment (thermometer, tape measurer), Recording instruments (paper, pencil, camera, flash drive, laptop), Safety/Miscellaneous (harness, insect repellant, markers). These tools are used for qualitative and quantitative on sight measurement and general recordings.

Fig. 1
A land based bridge tracker that operates in water depths up to 9ft.

Fig. 2
Boats with working heights up to 88ft with shallow water capabilities of less than a foot

Fig 3.
Structure based access on tensioned cables. Not limited to bridges, rigging is available to inspect piers, towers, dams and tall buildings.

Future Challenges

Drones have a limited payload, there are current public usage regulations, and they can only be flown during a time without heavy winds. Neither drones nor Glass have been accepted as a part of modern society yet and both systems do not have a long enough battery life.

Fig 4 and 5.
The view of and from the system.

Conclusion

It's a crucial aspect of Civil Engineering to maintain the
civilians. By the use of the Google Glass, Quadcsopters
signal emitting cameras, we were able to create android
applications to promote safety, communications, and ea
important data about infrastructure after a period of tim
natural disaster. Structural analysis has been performed
With access to revolutionary technology our team has b
connect current bridge status to experienced inspectors
otherwise be unable to view those specific vantage poin
making civil infrastructure analysis easier and safer wh
transforming the collection of data into an educational e
through guidance from experienced inspectors who hav
potential of being thousands of miles away from the bri
focus.

Future Applications

Educational tool, turning a potentially dangerous
position to an opportunity to log flight hours.

Longer work life, giving experienced inspectors th
to work from home.

Better training for the new generation of bridge i

Acknowledgements

Professor Richard Primerano

Theoretical and Applied Mathematics Group at Drexel

Literature cited

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Apr. 2014
"Bridges & Structures." National Bridge Inspection Sta
"Bridge Inspection Equipment." Bridge Design. N.p., n
Apr. 2014.rds. N.p., n.d. Web. 08 Apr. 2014.
Chen, Shen-En, Edwin W. Hauser, and Charles G. Boyl
Integrated Aerial Photography for Bridge, Structure
Environmetal. Shen-En Chen, Edwin W. Hauser, Ch
Boyle, assignee. Patent US 2012/0033851 A1. 9 Feb
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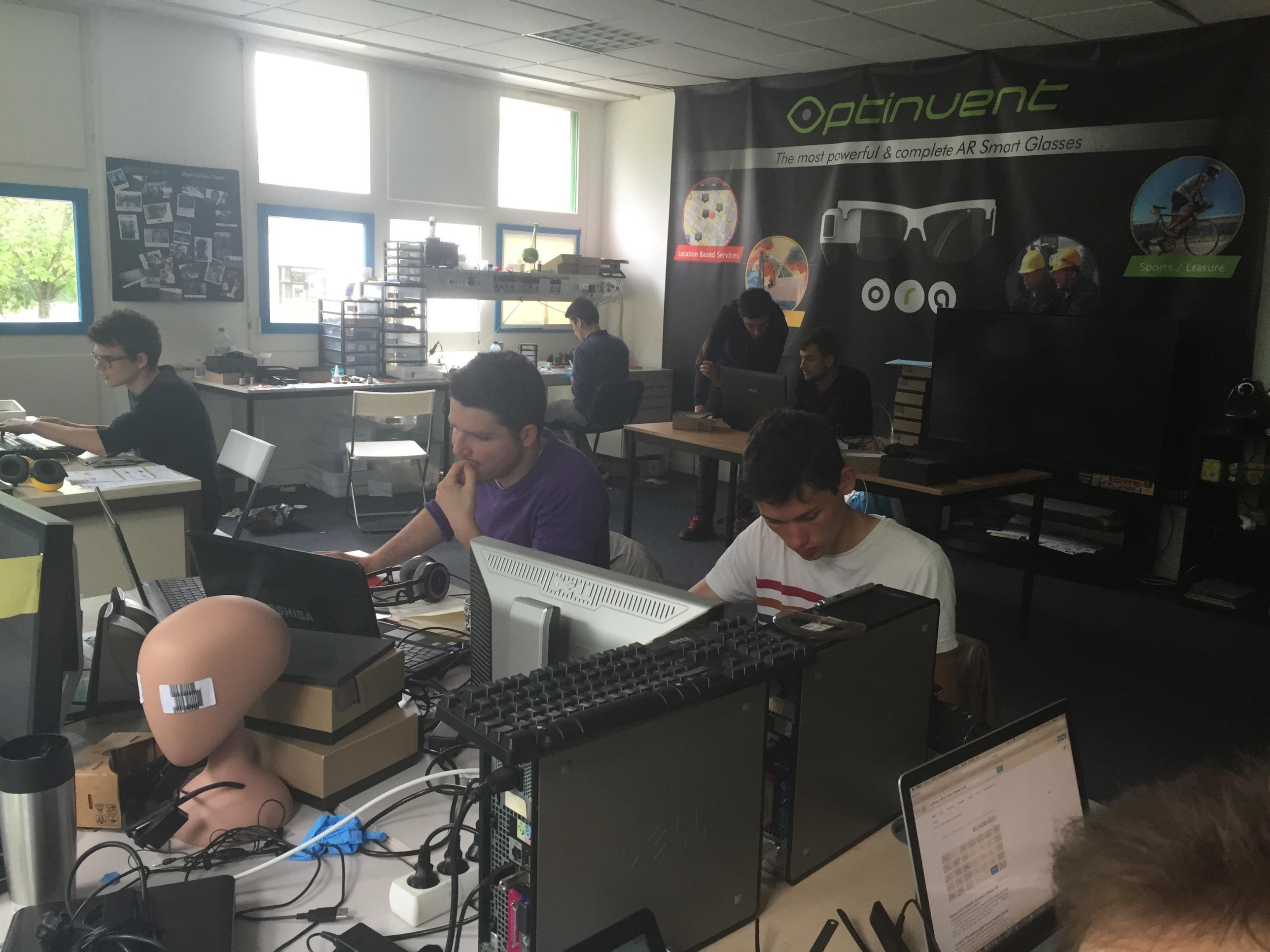
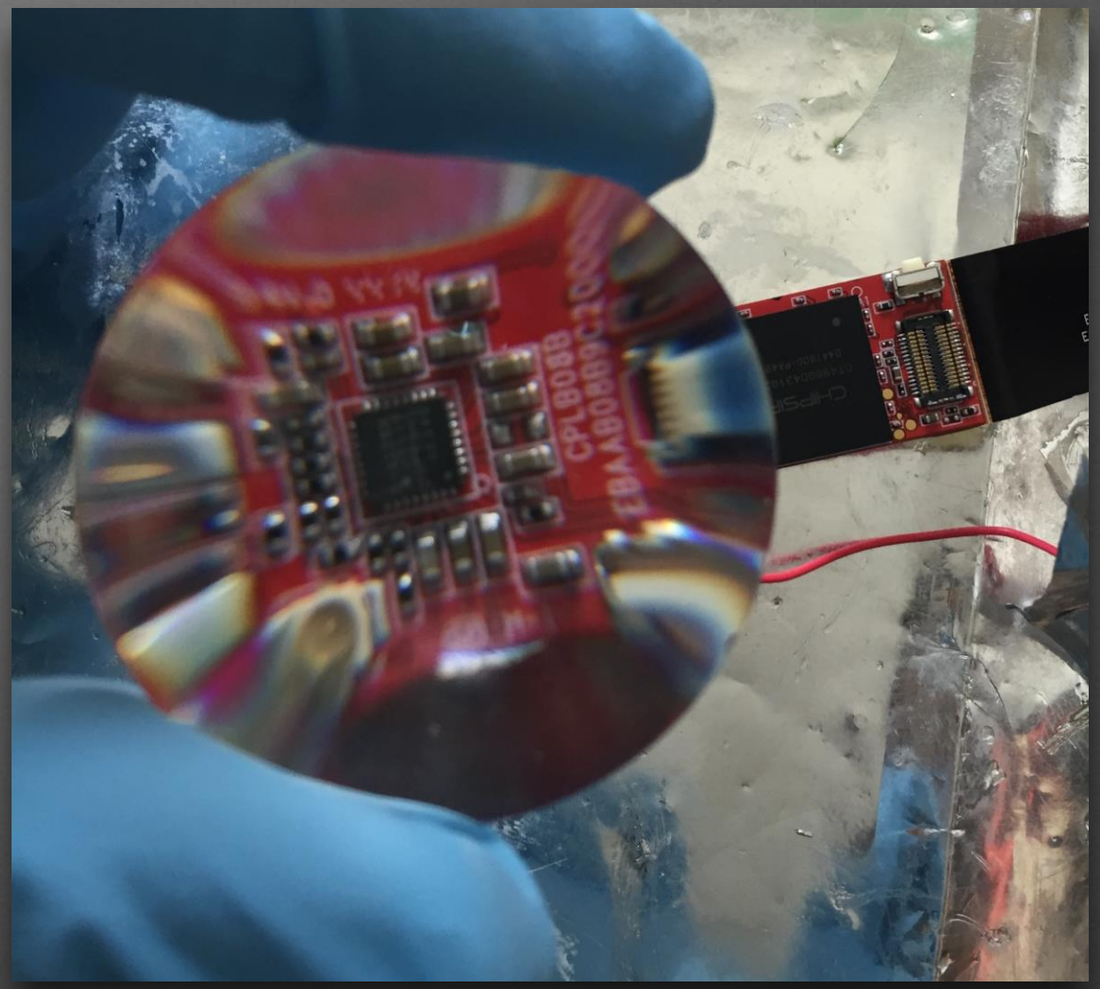
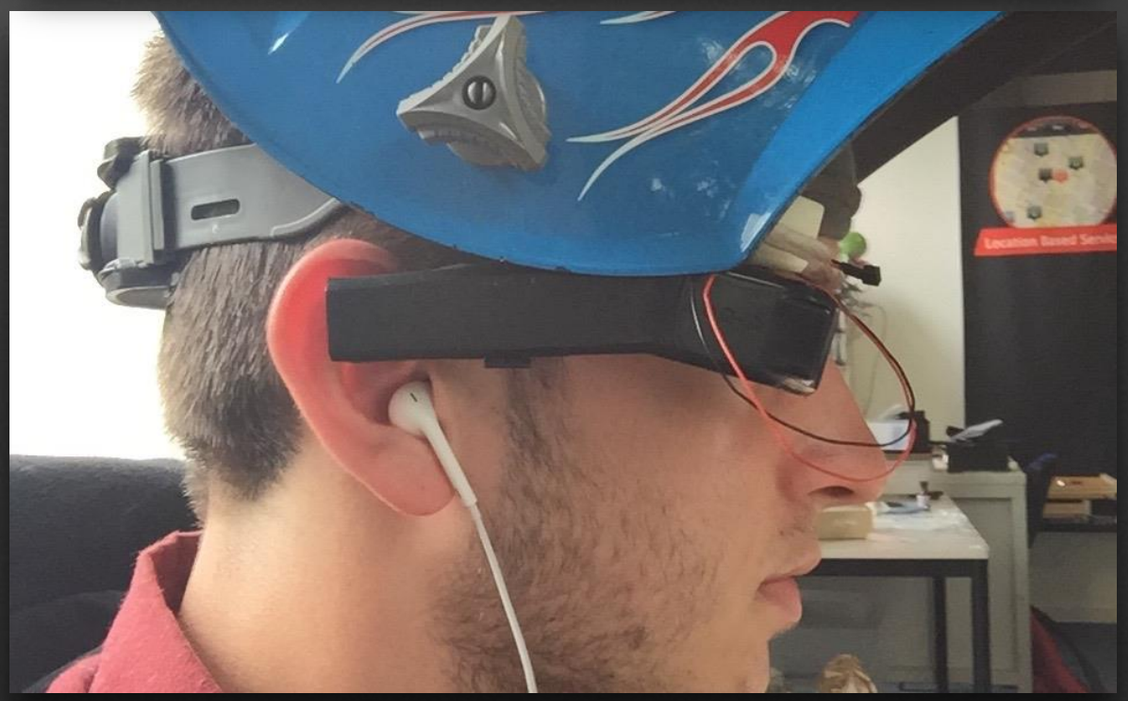
https://www.youtube.com/watch?v=MIgFf95aBpI


Optinvent
The most powerful & complete AR Smart Glasses
Location Based Services
Sports / Leasure
World Class Team





St. Gregoire Hospital

- EMT use case
  - Sharing perspective
  - Preparing hospital staff
  - Ensuring a well-timed arrival
  - Minimizing chaos

https://www.youtube.com/watch?v=UH-bEqMJaQ8

Brain-Power by Ned Sahin

- Using Google Glass as a Neuro-assistive device
- Staying connected without being distracted
- Based in Boston
- Currently producing 12 different applications to help augmate an easier life for children with autism

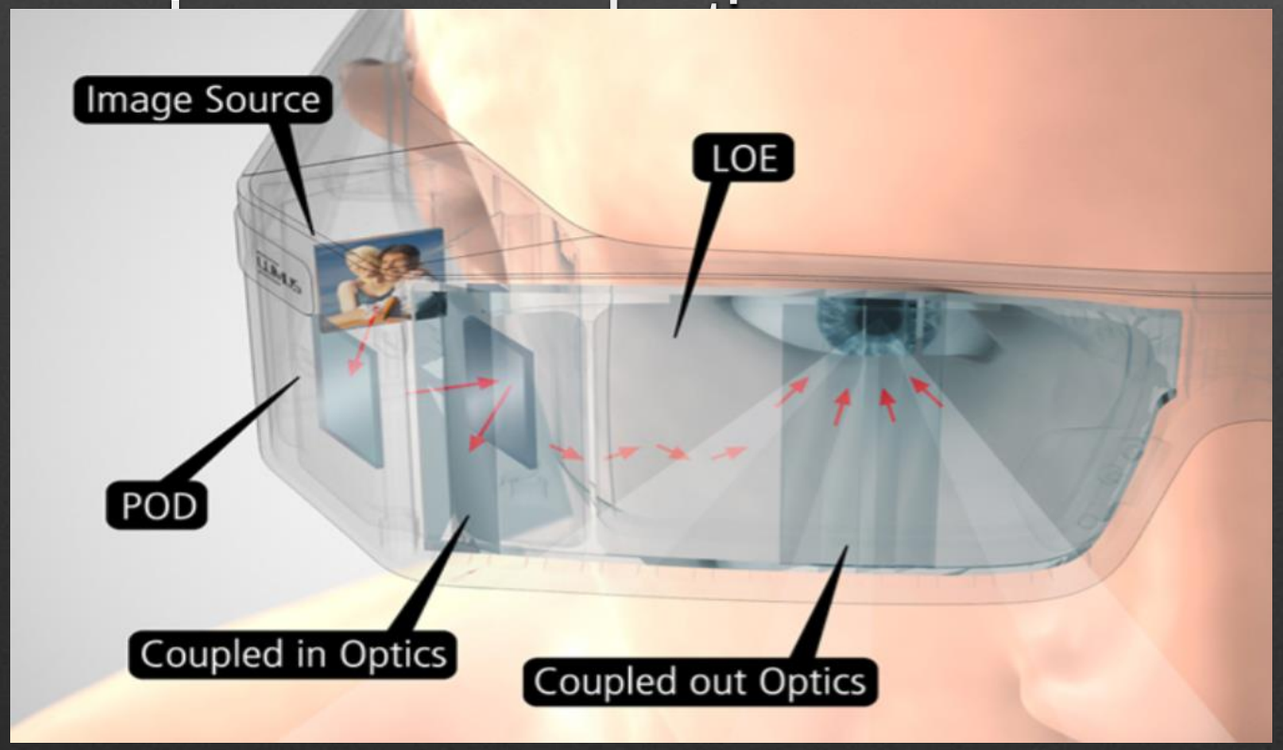
Project Glass

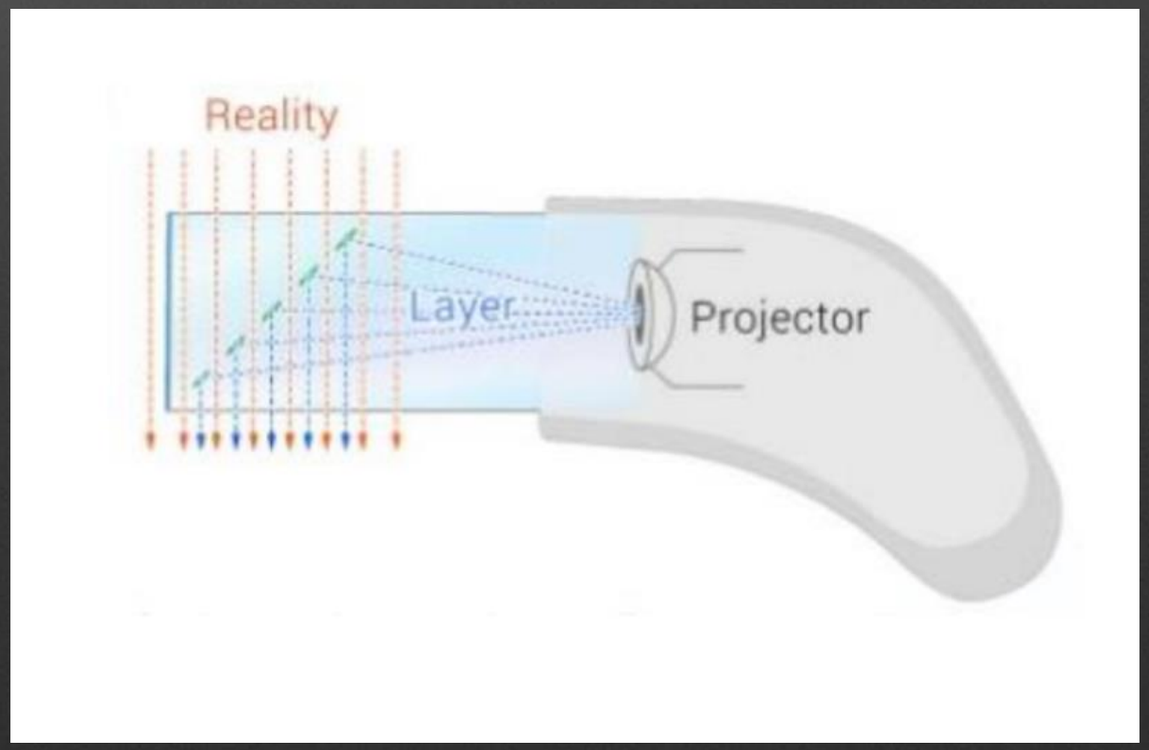
- Explorer Edition was awarded “Best Invention of 2012” by TIME magazine
- Project Glass was cancelled in 2015
- Project Aura is now led by Tony Fadell known for his design of the iPod

- Epson Movario
- Google Glass
- Atheer Labs
- Optinvent ORA-1
- Intel Recon Jet
- 21st Century Fox ODG

The Technology

- Sensors: accelerometer, gyroscope, magnetometer, altitude and humidity sensors
- Communication radios: Bluetooth 4.0, Wi-Fi, and GNSS receiver





The Onclass Team

Purposes

- Cancer Staging
- Intraoperative Oncological Consultations

What do we do?

We act as a digital bridge between an operating room and an analytics lab

Pathology and Surgery dependencies

Survival Rates (in Overian Cancer)

- 60% with no residual disease
- 35% with 0.1cm - 1cm of residual disease
- >20% with 1cm-2cm of residual disease

IRB Study at the Hahnemann Hospital in Philadelphia:

Prospective Randomized Clinical Trial Staging Tumors using Onclass in Gynecological, Breast, and Colorectal Cancer Surgery

Thank you for listening!

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