

Lein

Applied Diagnostics



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Diagnostics in the Eye





Lein Overview

Glucose – first target market

- Proof of concept
- Prototype meter

Other Diagnostic Opportunities

- Physiological parameters that can be measured via the eye

Biometry of Eye

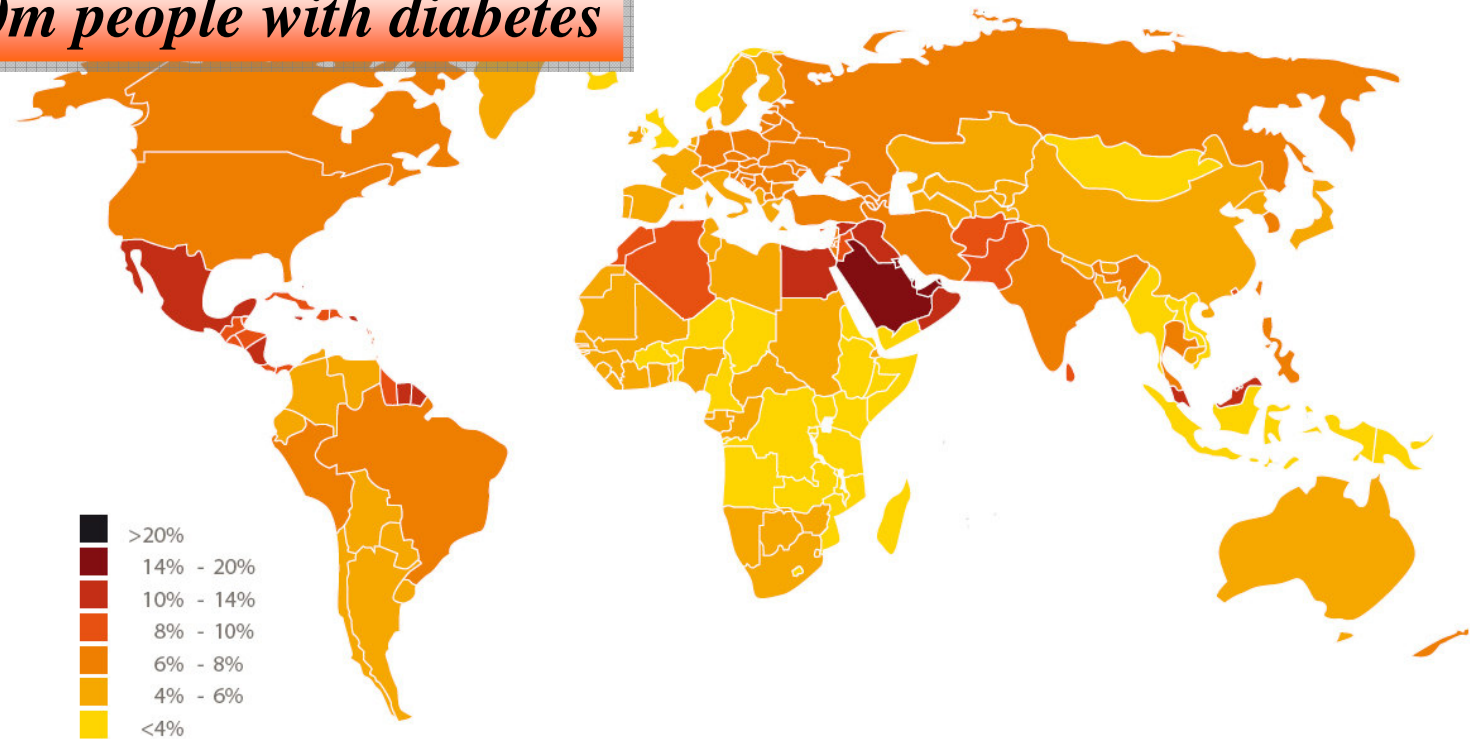
- Physical dimensions within the eye
- Corneal thickness, lens thickness and location



The diabetes pandemic

Prevalence estimates of diabetes, 2007

Over 240m people with diabetes



SOURCE: DIABETES ATLAS THIRD EDITION, © INTERNATIONAL DIABETES FEDERATION, 2006



The Need

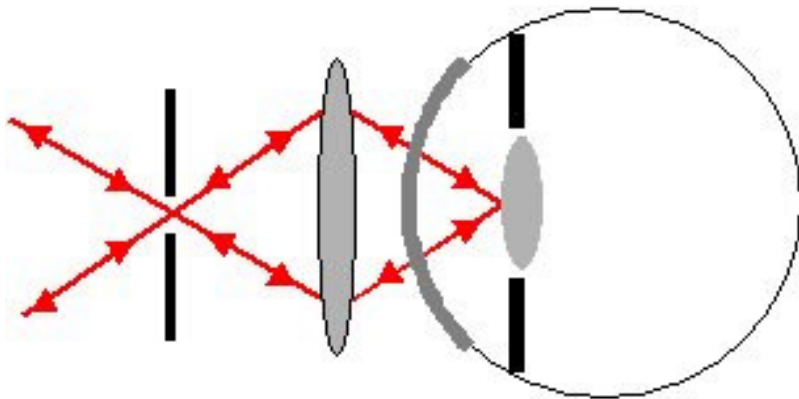


- Disruptive change
 - No pain, no nerve damage, no infection
 - Reduced point of care costs
 - Greater compliance

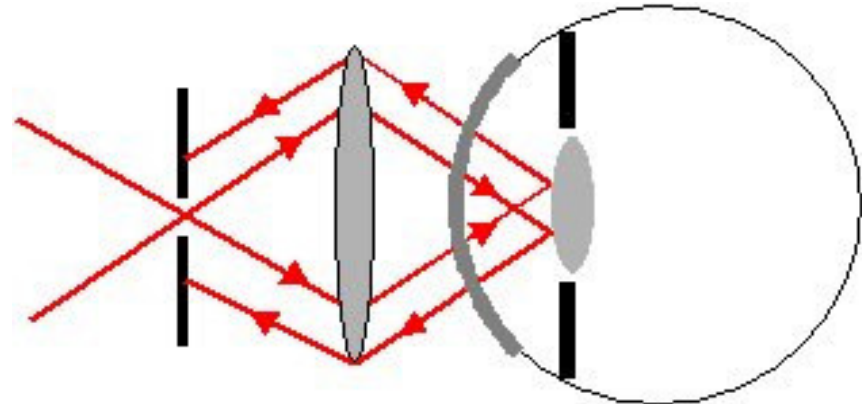


Lein's Technique

- We are concentrating on the anterior chamber
 - using confocal principle to perform measurement



Focused on lens surface

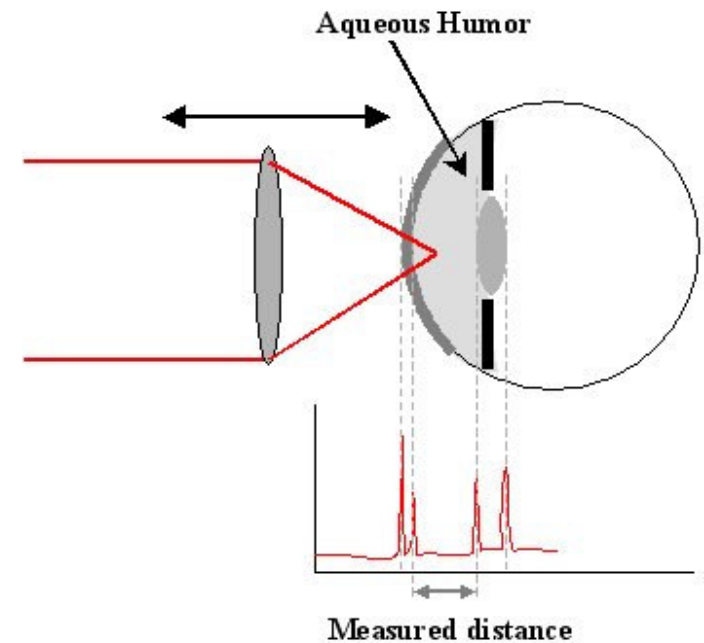


Not focused on surface



Confocal Scan

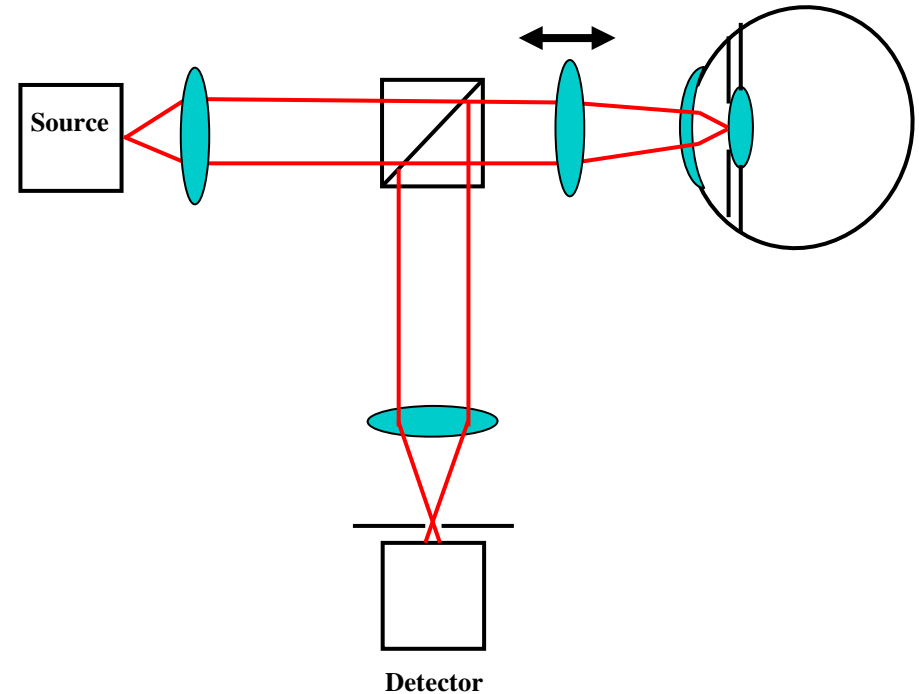
- Highly localised
- Scan focus towards cornea
- Signal reflected from each surface





Basic System Design

- Light source
- Photodiode/pinhole combination
- Simple lenses





Accuracy - Mechanical

- Linear encoder with high accuracy
- Scales use reflective strips/gratings
- Sub-micron resolution
- Distance moved by scanning lens known to within $1 \mu\text{m}$



Current Prototype

Laboratory unit

- Mounted on ophthalmic stage
- Patient self aligns
- Very consistent results

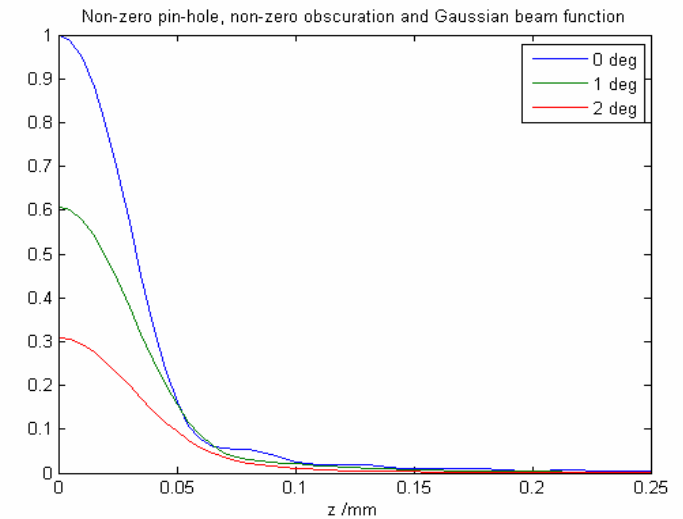




Alignment process

3 aspects to alignment

- Meter insensitivity to misalignment
- Data processing
- Feedback to subject





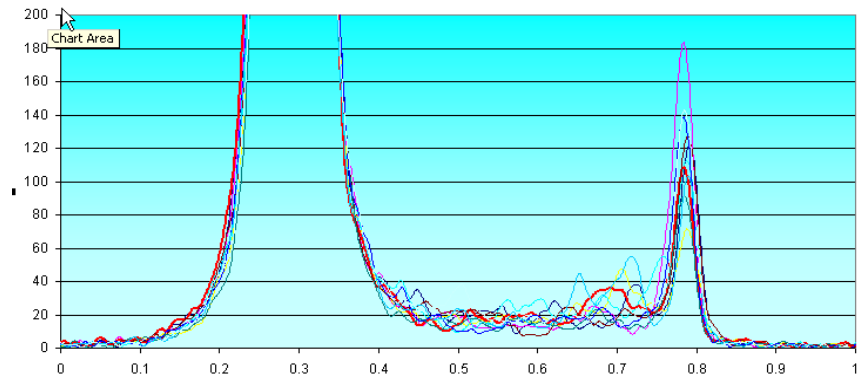
Repeatability of Results

➤ Meter very consistent

- Scanning a fixed object gives distance measurements with a variation of $0.3\mu\text{m}$

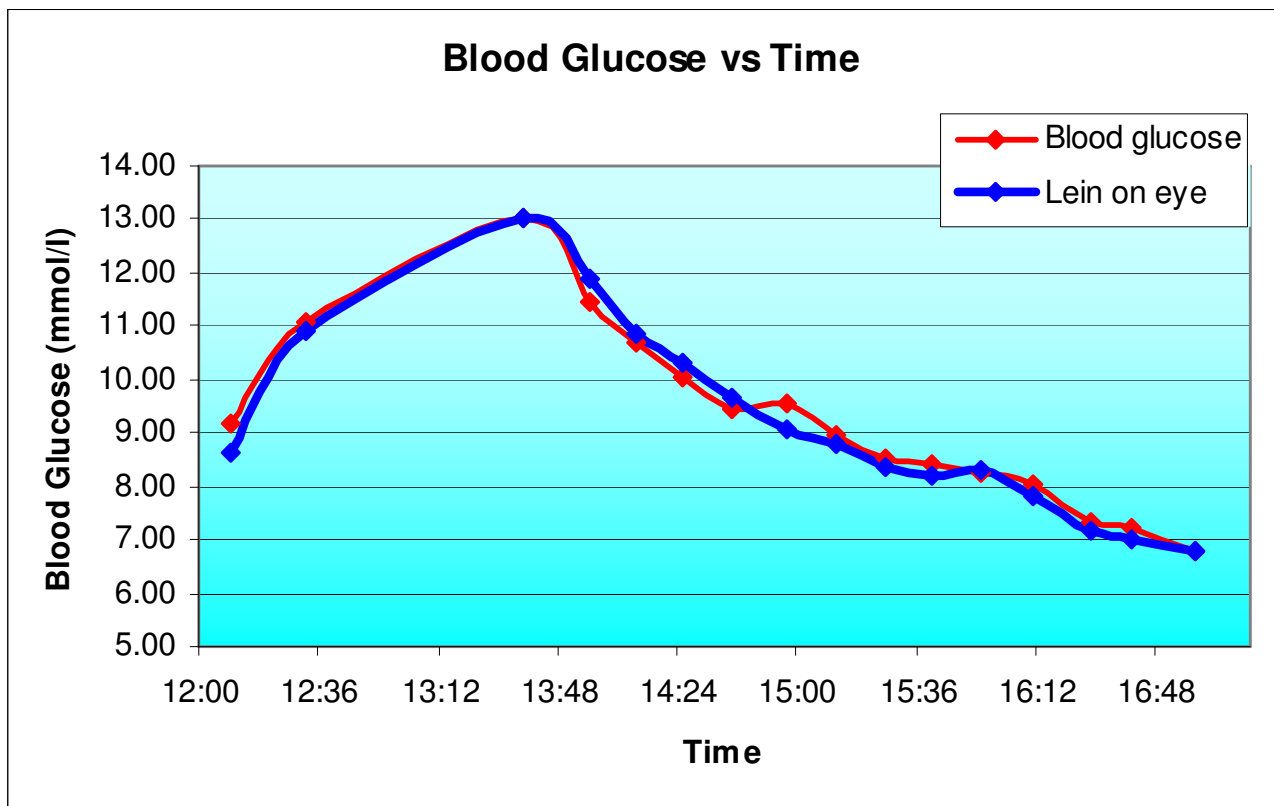
➤ Measurement on eye

- 30 sequential scans
- Measure corneal thickness
- Standard deviation of $3\mu\text{m}$





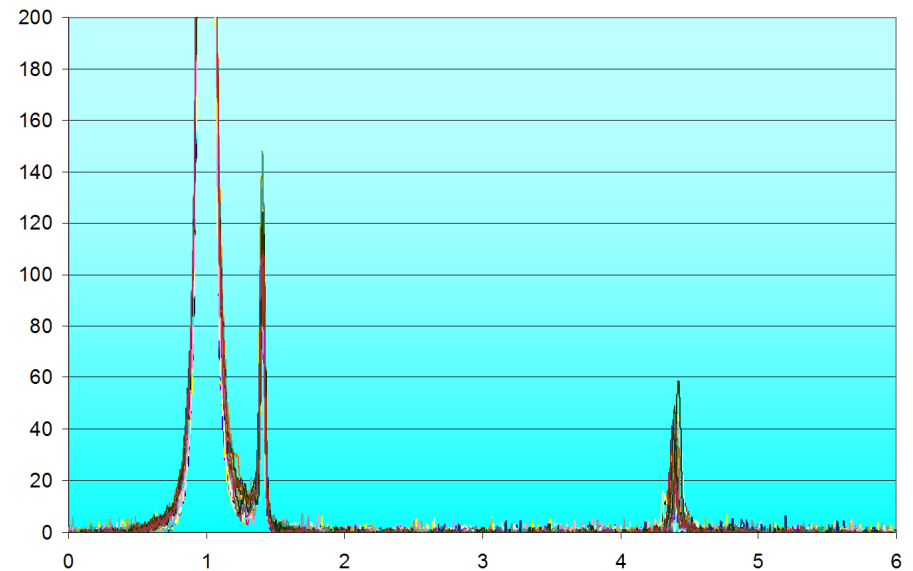
Glucose correlation





Dimensions of eye

- Locations of corneal and lens surfaces
- Thickness of components





Ophthalmic Biometry

Ophthalmic biometry

- Strong interest from ophthalmic community
- Applications in:
 - Glaucoma testing
 - Laser refractive surgery
 - Cataract surgery



Next Steps

3 requirements for performance

Axial resolution

- Stage specifications

Intensity resolution

- Electronic design

Alignment

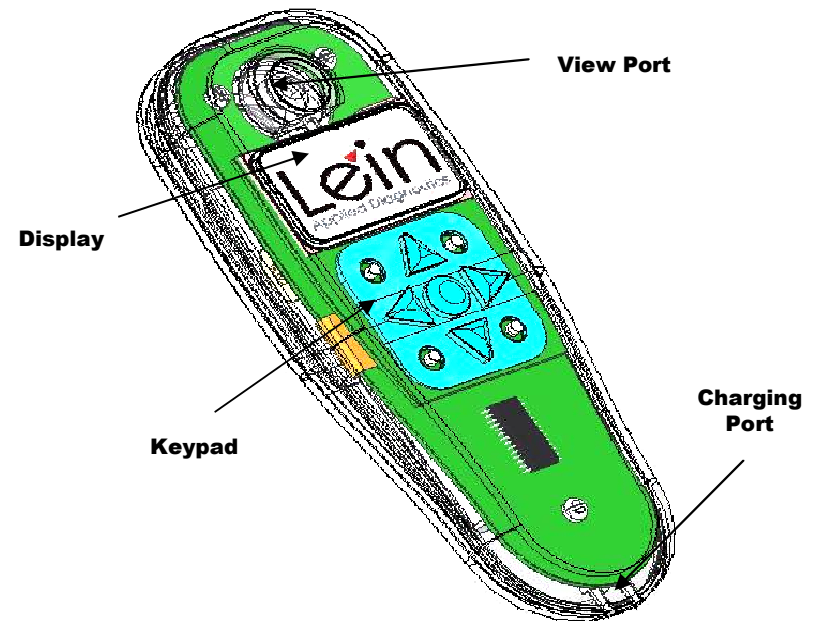
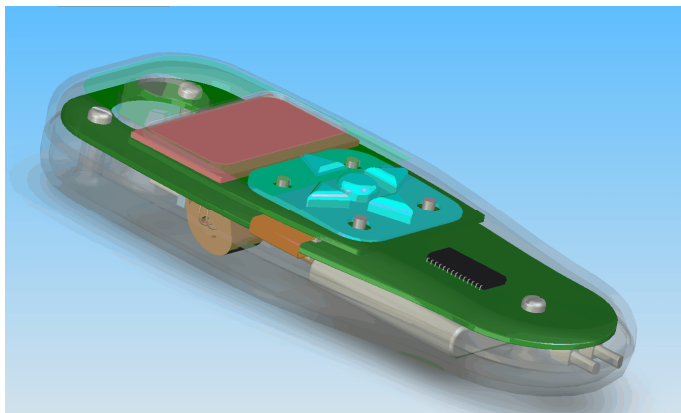
- Techniques as for lab system





Miniaturisation

- Goal is pocket sized meter
- For glucose, very large volumes
- Price point must be low
- Initial designs for handheld unit





Miniaturisation

Mini-optical components

- Few mm in size
- Diffraction limited quality
- Cheap – moulded?

Miniature motion stage and encoder

- Small
- Cheap
- Robust



Conclusion

- Large, growing markets
- Platform technology
- Need to miniaturise
- Need to remove cost





Contact

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