Wavefront-guided Contact Lens Toward Commercialization II

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Grant Support

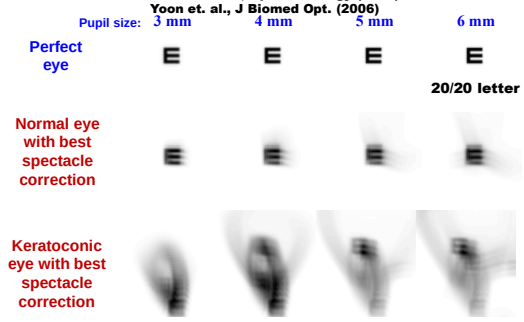
- NIH/NEI Small Business Innovation Research (SBIR) Fast-track grant

Commercial Relationships

- Aldenex Vision, LLC
- Ovitz Corporation

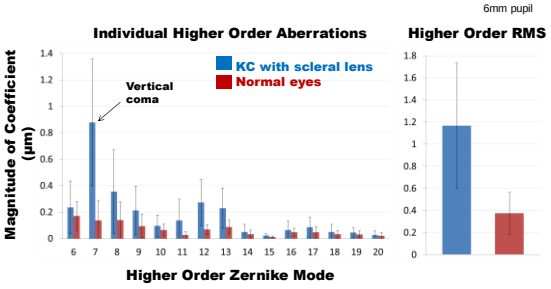
Potential visual benefit of individualized vision correction

Pantanelli et. al., Ophthalmology (2007)
Yoon et. al., J Biomed Opt. (2006)



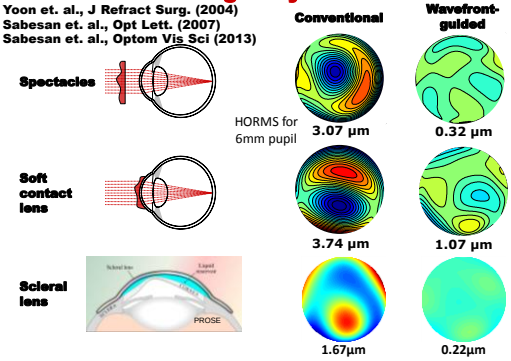
Current most popular solutions i.e. corneal (RGP) and scleral lenses do not provide sufficiently good optical quality compared to normal eyes.

Sabesan et. al., Optom Vis Sci (2013)



Wavefront-guided ophthalmic lenses are technologically feasible.

Yoon et. al., J Refract Surg. (2004)
Sabesan et. al., Opt Lett. (2007)
Sabesan et. al., Optom Vis Sci (2013)

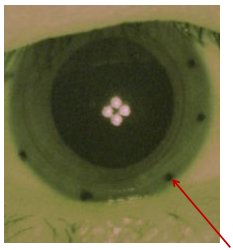


Current Barriers to Commercialization

- Instability of Lens Position and Rotation
- Implementing Higher Order Aberration Design onto the Lens Surface: Software-Hardware Interface
- Low-cost Commercial Wavefront Sensor

Instability of Lens Position and Rotation

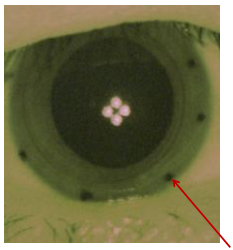
Soft Contact Lens



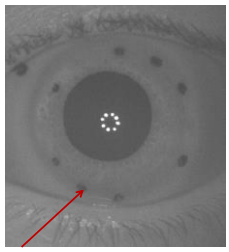
Centration and rotation marks

Instability of Lens Position and Rotation

Soft Contact Lens



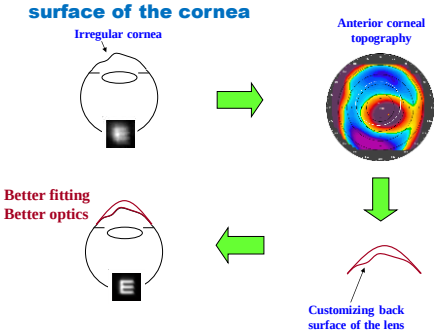
Scleral Lens



Centration and rotation marks

Stabilization of Soft Contact Lens Movements

Back surface customization to the anterior surface of the cornea



Back Surface Customized Soft Contact Lens Improves Lens Stability

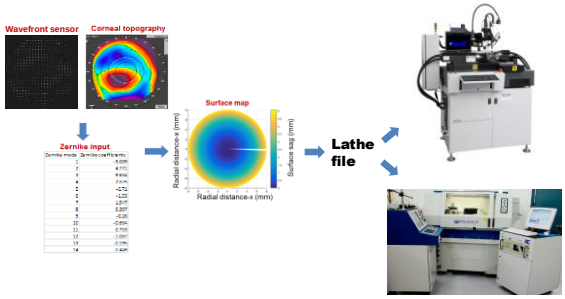
Chen et. al., Opt Lett. (2007)

co: conventional lens
bcu: back surface customized lens
imp (%): % improvement

Subjects / Stability	KC#1			KC#2			KC#3		
	co	bcu	imp (%)	co	bcu	imp (%)	co	bcu	imp (%)
decent_x (μm)	109	47	57	36	27	25	52	20	62
decent_y (μm)	133	35	74	26	26	0	68	47	31
rotation (deg)	21.2	5.1	76	5.8	0.9	84	9.4	2.5	73

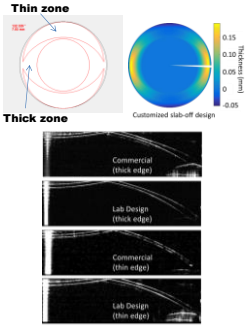
Implementation of Higher Order Aberration Design

Matlab based lens design software interfacing directly to advanced lathe machines

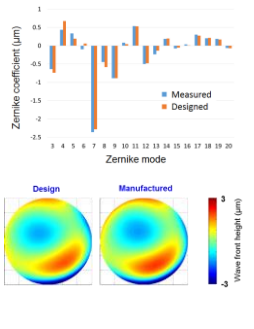


Implementation of Higher Order Aberration Design

Double Slab-off Design

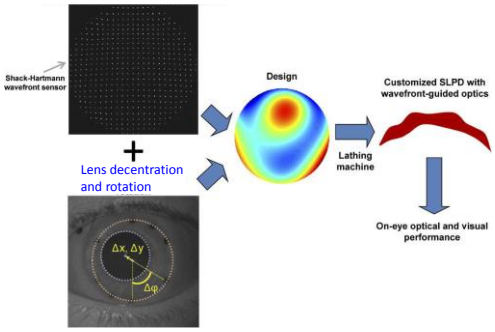


Higher order aberration generation



Manufacturing Wavefront-guided Contact Lens

Eye's aberration wearing back-surface customized soft contact lens or conventional scleral lens



Clinically Viable Low-cost Wavefront Sensor

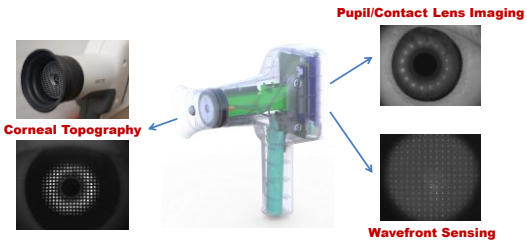
Eye Profiler by OVITZ Corp.

Shack-Hartmann Portable/Handheld Wavefront Sensor

Han et. al., Invest Ophthalmol Vis Sci. (2016) Abstract# 6248.

Clinically Viable Wavefront Sensor

- **Low cost**
- **Higher order aberrations**
- **Anterior surface topography**
- **Pupil camera: Relative decentration and rotation between the lens and eye's pupil**



Take Home Message

Wavefront-guided ophthalmic Lenses are feasible technologically as well as clinically and provide highly aberrated eyes with normal level of visual quality.