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Tunable Telecentric Lens

Student competition University of Arizona & Optotune

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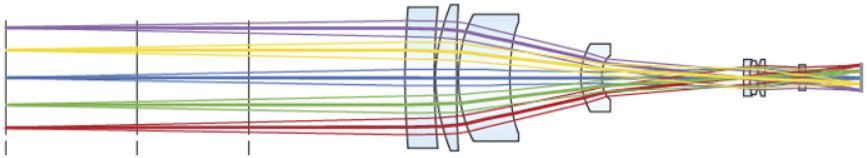
Design Competition
for University of Arizona Students

Optotune

Students of Arizona University



- **Design and build a tunable telecentric lens**
- **Win the Oculus Rift with your solution!**

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Idea and Goal

- Optotune provides the Zemax and CAD model of the large aperture tunable lens EL-16-40-TC-VIS-5D
- Find the best possible design of an object-side tunable telecentric objective
- “Tunable” means: The image is refocused at different working distances due to the tunable focal length of the EL-16-40-TC-VIS-5D
- The design has to be modeled with standard components from Edmund or Thorlabs
- Build design based on standard components
- A test report in pdf-format (summary of design and lens file) has to be sent via email to david.leuenberger@optotune.com and jose@optics.arizona.edu
- Deadline is 15th of December 2016
- The best design is awarded with an Oculus Rift!
- The winner will be announced January 31st 2017.
- Honorific mentions will be given to second and third place.

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Basic specifications as guideline for a tunable telecentric objective

- Telecentricity on object side
- Range of wavelength 400 – 700 nm
- Made for sensor diagonal of 16 mm
- 1x magnification
- Change of magnification over tuning range as small as possible
- Best possible MTF over tuning range (>50 lp/mm at 0.5 contrast or best possible, polychromatic)
- Nominal working distance (WD): 110 mm
- Change of WD of ~ 3 mm/dpt (or best possible). Note: the EL-16 has 5 dpt tuning range which would result in 15 mm change of WD
- Only use standard lens components from Edmund and Thorlabs
- Distortion as small as possible (~ 0.03% or best possible)

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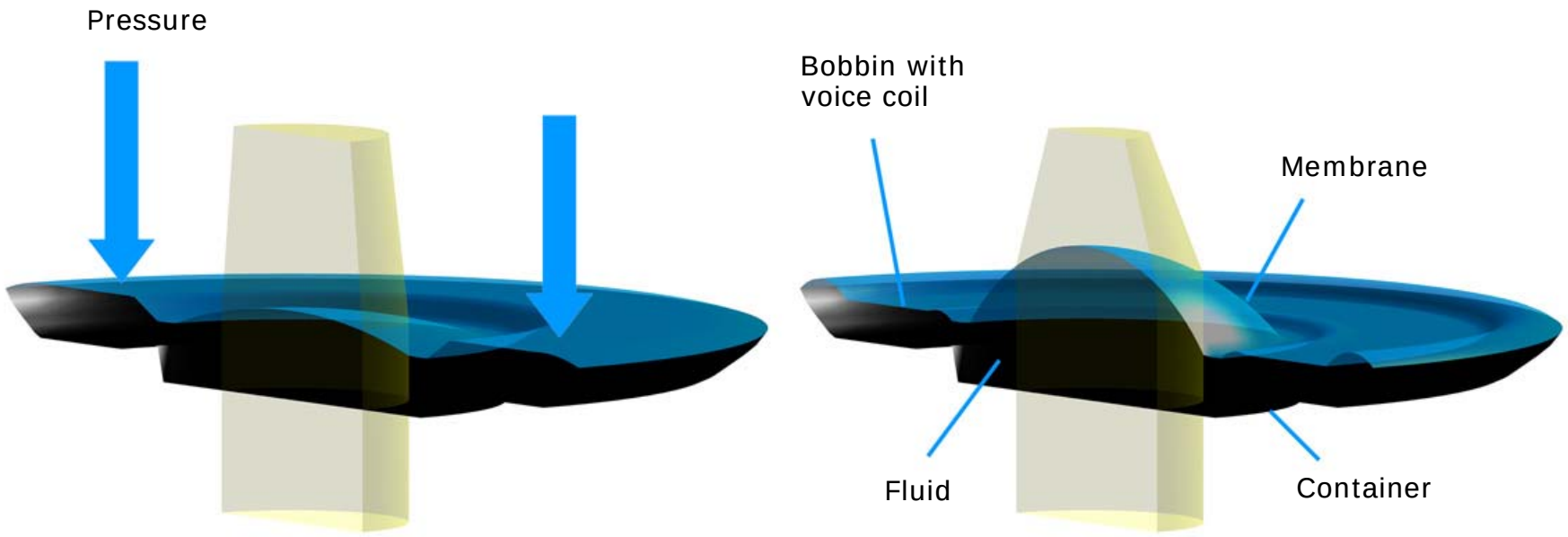
Working principle of the tunable lens



- By exerting pressure on the outer part via the lens shaper, fluid is transferred to the center
- The central part is deflected and forms a spherical lens
- By changing the pressure, the curvature and hence the focal length of the lens is tuned
- When combining the tunable lens with other fixed optics, a “tunable objective” is created
- This objective can refocus to different focal planes or working distances without any mechanically moving part!

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Example of a tunable objective (non-telecentric)

Fast autofocus solution

Containing Optotune EL-10-30 focus tunable lens technology

- 35mm focal length
- F5.6 to F32
- 250 – 500mm WD
- No orientation dependence
- Kowa lens design

Rated for 1” camera sensors

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shaping the future of optics

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