



K|Lens

FROM RESEARCH TO MARKET

# Who we are

- K|Lens GmbH is a computer vision start-up founded in October 2016.
- We are a spin-off of Saarland university and MPI.
- We are a team of 7 professionals, mainly software developers.
- Our lens technology allows to record lightfield data with any standard camera.
- Our company is seed venture financed until market introduction of the first product.



# Development approach

- The development of the technology is funded under a BMBF project
- A consortium is working on different aspects:
  - K|Lens GmbH: Lead and software development
  - Fraunhofer IOF: Hardware development
  - K8, reallifefilm, MBF: user oriented co-development / testing
- Our tester community comprises over 1500 pro-photographers (constantly growing).

# Team



**Matthias Schmitz**  
**CEO**

Business Development  
10 years strategy consulting  
4 years management of start up companies

PwC  
European Value Partners  
European Capital Partners



**Dr. Klaus Illgner**  
**CTO**

15+ years R&D and executive management in the  
media sector

Texas Instruments  
Siemens  
Institut für Rundfunktechnik



**Dr. habil Ivo Ihrke**  
**Mentor**

Technical mentor and lightfield imaging pioneer  
15+ years research, teaching and practical  
implementation

Max-Planck-Institute for Computer Science  
Saarland University  
INRIA Bordeaux  
Carl Zeiss AG

## Team

Our team comprises 4 additional qualified computer vision software engineers and 2 part-time marketing employees.

An experienced team with complementary skills.

# Where is all began

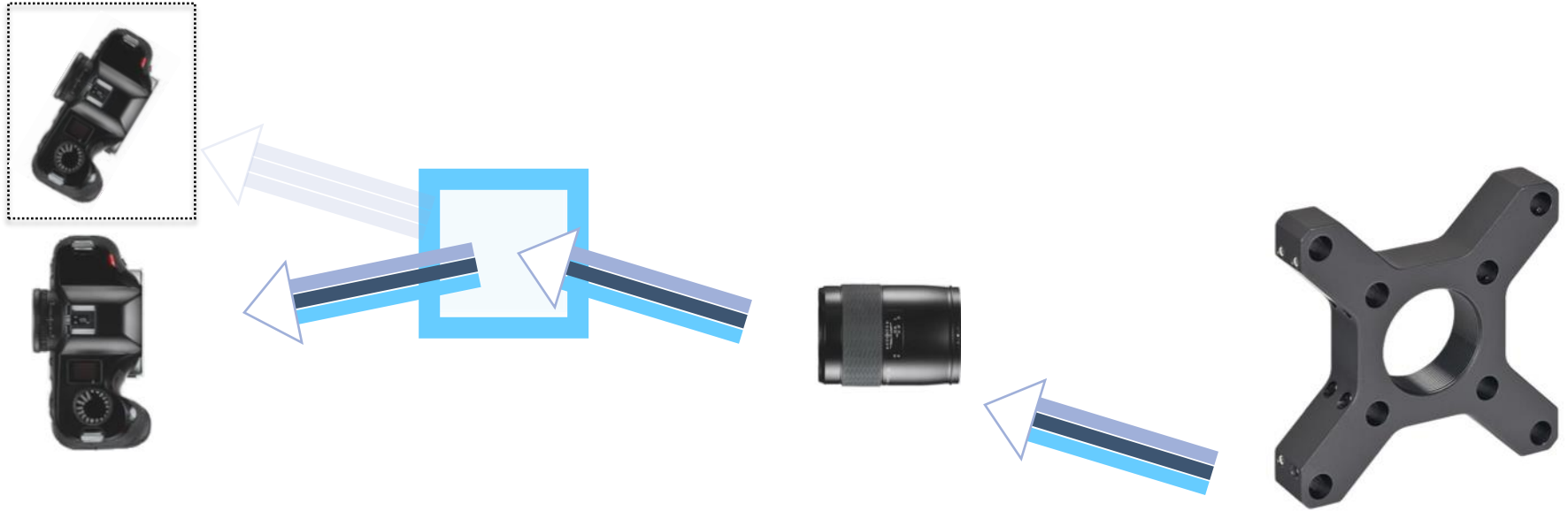
- 2013: Research Group of Ivo Ihrke at Saarland university and Max-Planck Institute for Computer Science
  - Reference: Manakov, A., Restrepo, J., Klehm, O., Hegedus, R., Eisemann, E., Seidel, H. P., & Ihrke, I. (2013). A reconfigurable camera add-on for high dynamic range, multispectral, polarization, and light-field imaging. *ACM Transactions on Graphics*, 32(4), 47-1.
  - Project website: <http://resources.mpi-inf.mpg.de/KaleidoCam/>
  - Results published at Siggraph 2013
- 2015 Project admitted to IT Inkubator
- 2016 Foundation of K|Lens GmbH
- 2017 Funding secured
- 2019 First professional prototype

# Functioning of standard lenses



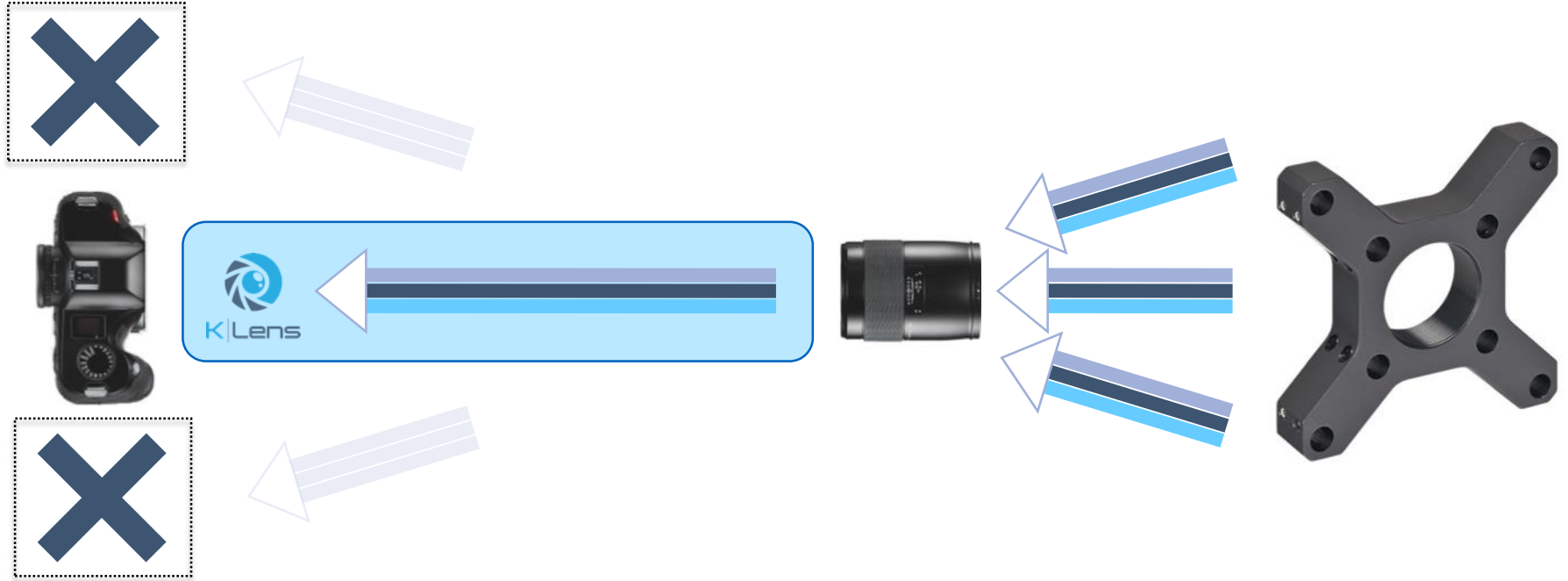
With today's lenses, light rays are captured from one perspective of the scene.

# Use of mirrors



Using a mirror system, light rays can be captured, which come from different perspectives (normally requiring the repositioning of the camera).

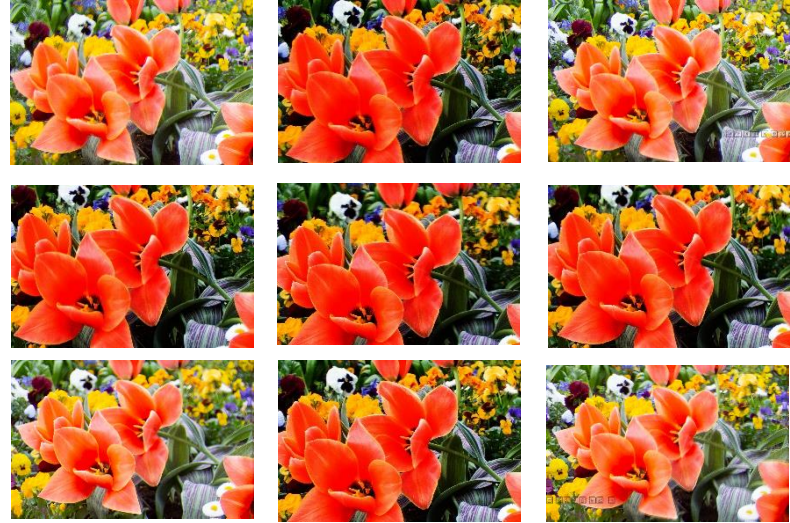
# Concept of the K|Lens



The K|Lens captures 9 perspectives simultaneously using a multi mirror system.

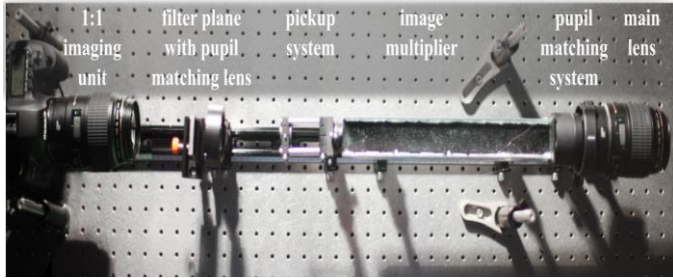


# Image processing



Sensor view and 9 perspectives after pre-processing.

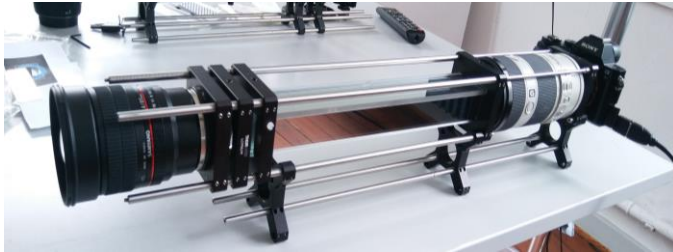
# Evolution of the hardware



2013: first manually assembled mirror box



2015: Hexagonal glass prism experiments



2017: First stabilized mirror system



2018: First professionally made prototype

# Where we stand today

- We have a fully functioning hardware prototype.
- It fits to full frame DSLRs/ DSLMs of all producers
- Fully mechanical 80mm prime lens
- Adaptable to macro mode with macro ring
- <25 cm, 1000g
- It comes with our post-processing software which is first developed in darktable
- And then transferred to Photoshop as a plug-in.

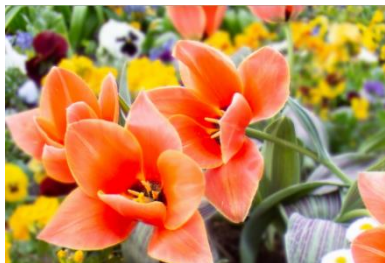


# Applications (pro-imaging)

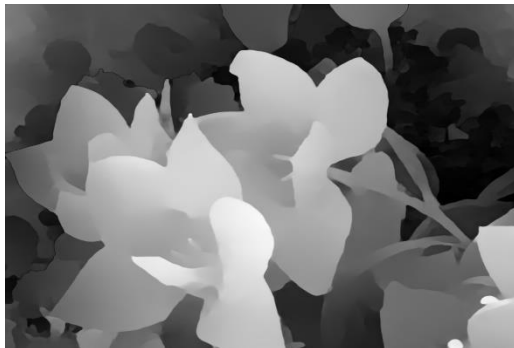
Our software allows for several new functionalities, such as:

- Post focus setting
- Aperture simulation
- Depth assisted post-processing e.g. for tone mapping or color grading
- Depth assisted image segmentation
- Setting of a second focus plane
- Virtually shifting the focus plane
- More is under development

## Post focus

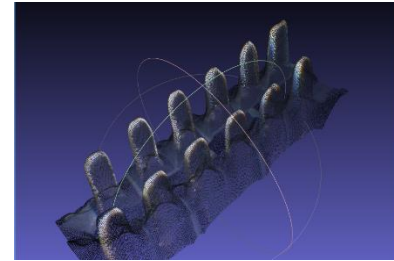


## Depth-based editing





# Applications (industrial inspection)

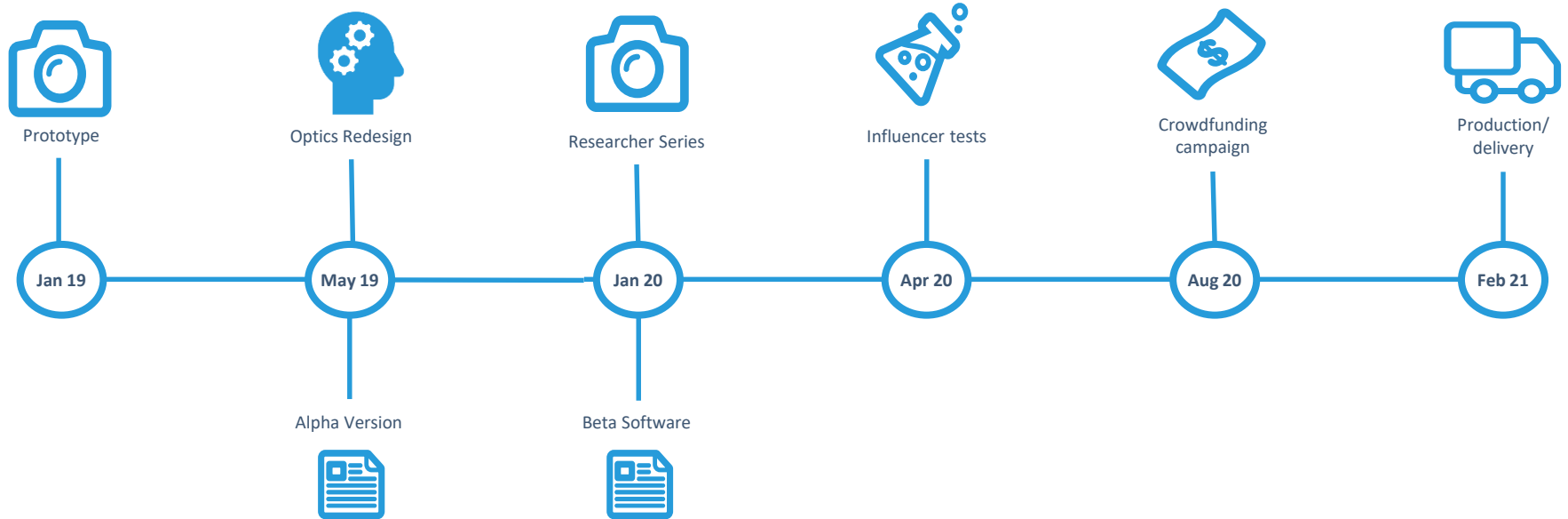


Inline control of small objects, where close working distance is required, eg electronics manufacturing

Advantages:

- auto-calibrated,
- no physical limitation in reaching smallest possible baselines
- potential to suppress reflections through multiview algorithms

# Timeline



20 months until delivery of the product.

# Current topics of research

- Depth estimation:
  - Optimization of common approaches to our camera model
  - Fusion of different depth candidates
  - Scene independent high quality assessment
- Super resolution beyond 2 x 2 improvement on a stable basis
- Reflection independent depth estimation / defect analysis

# Researcher Pre-Series

- To foster the exchange with the research community, we have launched last week a pre-series, which is exclusively offered to the universities and research institutes
- We are putting our current status-quo in terms of hardware and software at your disposal
- We are looking forward to any declarations of interest until end of June 2019
- Target: production of a small series of max 40 pieces
- This series will already contain improvements compared to today's prototype
- Delivery: January 2020

Please come by for a demo just nextdoor !!!



# Thank you for your interest!



Matthias Schmitz

Founder

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