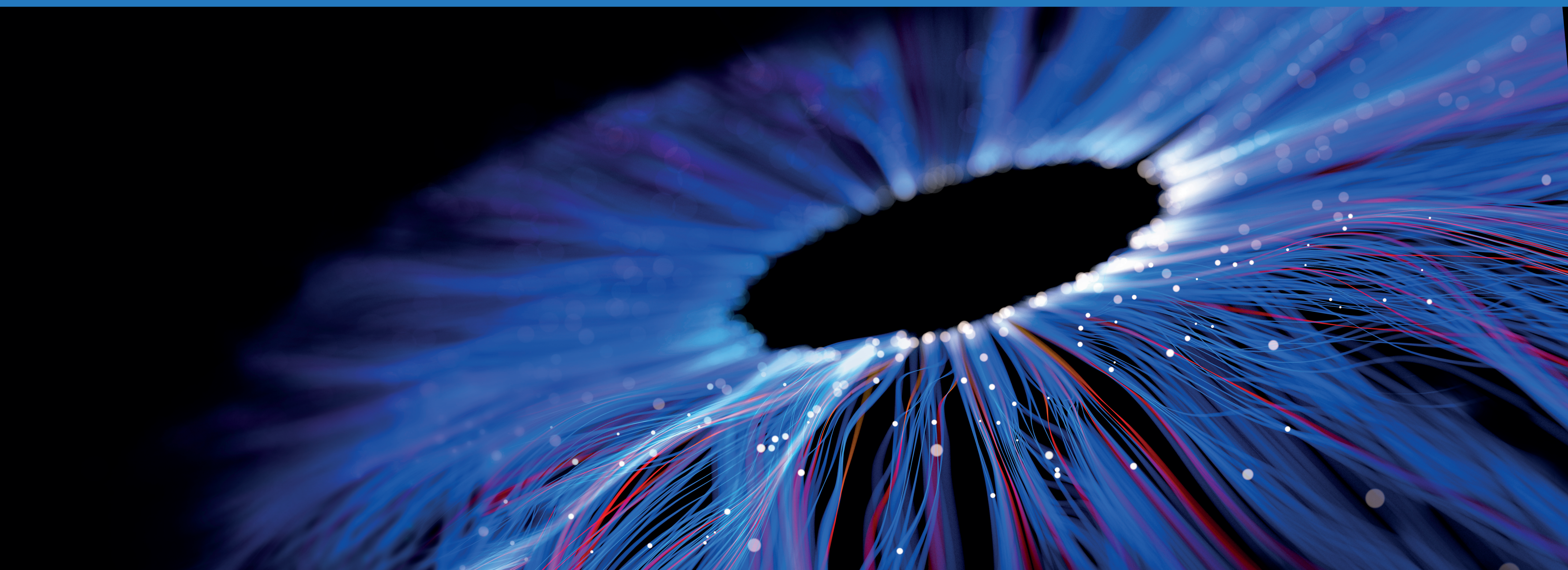




## INNOVATIONLAB

[i·nuh·vei·shn-lab]

Our community delivers simple answers to complex problems in the field of **wide-angle optics**, **sensor fusion** and **image processing**. Together, we create exponential value and strive to build the most innovative devices in the world.



## WELCOME TO THE IMMERSION INNOVATION LAB

We accelerate the emergence of new innovative solutions and help you build the next generation of intelligent vision systems for your device.

ImmerVision's Innovation Lab **creates invaluable intellectual property** for you by putting our community of **multidisciplinary and highly experienced** scientists, optical designers and image processing engineers to work with the innovative approach of **design thinking**.

## DEEP SEEING

[dep-seiNG]

Deep Seeing enables smart devices with augmented vision. By capturing high quality visual and contextual data in new ways, it unlocks the potential of Artificial Intelligence. Like superhuman eyes for your smart device.

# OUTSOURCING VISION SYSTEM R&D TO THE INNOVATION LAB

Whether you're looking to **complement an existing R&D team**, **hire experts to take on a complex challenge** or **develop a new innovative solution** in the field of wide-angle optics, sensor fusion or image processing, there are compelling reasons to outsource R&D to the Innovation Lab.

## Accelerate product development

In a highly competitive market, time is of the essence. Outsourcing helps accelerate product development by resolving complex issues, helping out with the integration of existing technologies or simply by adding people with unique skills.

## Optimize your cost

The Innovation Lab offers various opportunities for R&D cost reduction. For example, avoid capital investment in expensive hi-tech equipment or lower human resources overhead cost.

## Benefit from the experience of our community

20 years in the making, the Innovation Lab community is comprised of highly experienced developers, wide-angle optical designers, image processing engineers, as well as corporate and institutional collaborators.

## Fuel creativity and innovation

The Innovation Lab is involved on a wide range of optic, camera, image processing, computer vision and AI projects across multiple industry verticals, therefore creating cross-pollination and promoting creative thinking.

## Own invaluable intellectual property

Intellectual property stemming from a project developed by the Innovation Lab is automatically transferred to the principal (*our client*).

## Concentrate on your core

A collaboration with the Innovation Lab is an opportunity for your team to concentrate on what they do best, but also gain insights, stimulate creativity and challenge internal team paradigms.



WE GIVE MACHINES 20/20 EYESIGHT AND ARE PERFECTING THE UNDERLYING VISION SYSTEM FOR YOUR DEVICE TO NOT ONLY SEE THE WORLD, BUT UNDERSTAND IT.

## DESIGN THINKING TO EQUIP YOUR DEVICE WITH INTELLIGENT VISION

We use Design Thinking to **brainstorm, develop and deliver innovative solutions** related to wide-angle optics, sensor fusion and image processing technology. This process puts our scientists, optical designers, image processing engineers, partners and clients to work with a clear understanding of users’ needs. The approach includes 6 steps going from a **clear understanding of the problem** to the **delivery of the proof of concept or market-ready solution**.

Design Thinking help us challenge assumptions, redefine problems and identify alternative strategies and solutions. Today, this **iterative and non-sequential approach** is used by highly innovative companies, such as *Apple, Google, IBM* and *GE*. The methodology is also taught at universities around the world, including *Stanford, Harvard* and *Massachusetts Institute of Technology (MIT)*.

# DESIGN THINKING PROCESS

We use Design Thinking to collaborate with our client and with other stakeholders at every stage of the research and development process.

## UNDERSTAND

### 1. Empathize

It starts with people. Understanding users’ needs and the problems they face is paramount to what we do. Usually, our client provides us with enough information to inspire our work.

### 2. Define

We use this information to frame the right questions and to define the problem in a way that will inspire others to search for creative solutions.

## EXPLORE

### 3. Ideate

We brainstorm on potential solutions. Generate innovative ideas. Gather inspirations. Move past the obvious toward breakthroughs.

### 4. Prototype

We build a minimum viable solution, a rough prototype to validate our assumption and learn how to make the idea even better.

## MATERIALIZE

### 5. Test

We conduct the necessary testing to learn from experimentation, refine ideas and iterate from feedback.

### 6. Deliver

We craft the story and deliver a documented solution, ready for implementation. The blueprint for putting the vision into action.

INNOVATIONLAB  
IMMERVISION

OUR MISSION IS TO IMAGINE THE  
FUTURE OF COMPUTER VISION  
AND THEN, TO BRING IT TO LIFE

## APPLYING DESIGN THINKING: THE CASE OF PI SOLO

Quanta Computer's Pi SOLO lifestyle camera for smartphones



# APPLYING DESIGN THINKING: THE CASE OF PI SOLO

Quanta Computer's Pi SOLO lifestyle camera for smartphones

## UNDERSTAND

### 1. Empathize

From their own observation, our client asked us to build a very unique high quality 187° wide-angle camera to connect to a smartphone.

### 2. Define

The team from the Innovation Lab prepared the technology specifications and used cases aligned with the necessary connectivity, performance and design expectations.

## EXPLORE

### 3. Ideate

A collaboration with our client led to potential solutions to manufacture the product, including: components, design and technology. At this stage, we also identified potential technical, financial and operational roadblocks for the delivery of the project.

### 4. Prototype

We worked on the development of a prototype with stakeholders, including: ODM (Quanta), chipset vendor (confidential), camera module vendor (Truly), lens vendor (Kolen) and the software provider (Quanta). Together, we defined and benchmarked the platform, worked on the UX, mitigated hardware, firmware and software risks.

## MATERIALIZE

### 5. Test

From the proof of concept to mass production, a wide-range of tests (EVT, DVT, PVT) were performed at every stage to minimize risks of errors and identify problems early on. Options were constantly corrected, adjusted and optimized to match expected results.

### 6. Deliver

At this stage, a production-ready technology was released, including: SDK, documentation and engineering support. We also introduced the product across social media and opened the discussion for potential improvement.



Crosscall's Trekker-X4

## FROM THE INNOVATION LAB

- Use case study and design ID review
- Study and project definition
- Optical system simulation
- Custom case study
- Optical system performance analysis
- Support for manufacturing and mass production
- Lens testing
- Camera modules testing
- Complete device testing
- Performances and comparison report
- Imaging pipeline definition and design
- Imaging HD/SW benchmarks
- Coordination of different 3rd parties to implement image processing pipeline
- IQ and analysis of image processing pipeline
- Immervision Imaging IPs integration and support
- Immervision Imaging IPs tuning and customization

## FROM THE INNOVATION LAB

- Use case study and design ID review
- Study and project definition
- Optical system simulation
- Custom case study
- Optical system performance analysis
- Support for manufacturing and mass production
- Lens testing
- Camera modules calibration bench and testing
- Complete device testing
- Performances and comparison report
- Imaging pipeline definition and design
- Imaging HD/SW benchmarks
- Coordination of different 3rd parties to implement image processing pipeline
- IQ and analysis of image processing pipeline
- Immervision Imaging IPs integration and support
- Immervision Imaging IPs tuning and customization
- Immervision Imaging IPs porting on embedded platform (Intel Movidius)

Motorola's Moto  
360 camera

*acer*



ACER'S HOLO360

## FROM THE INNOVATION LAB

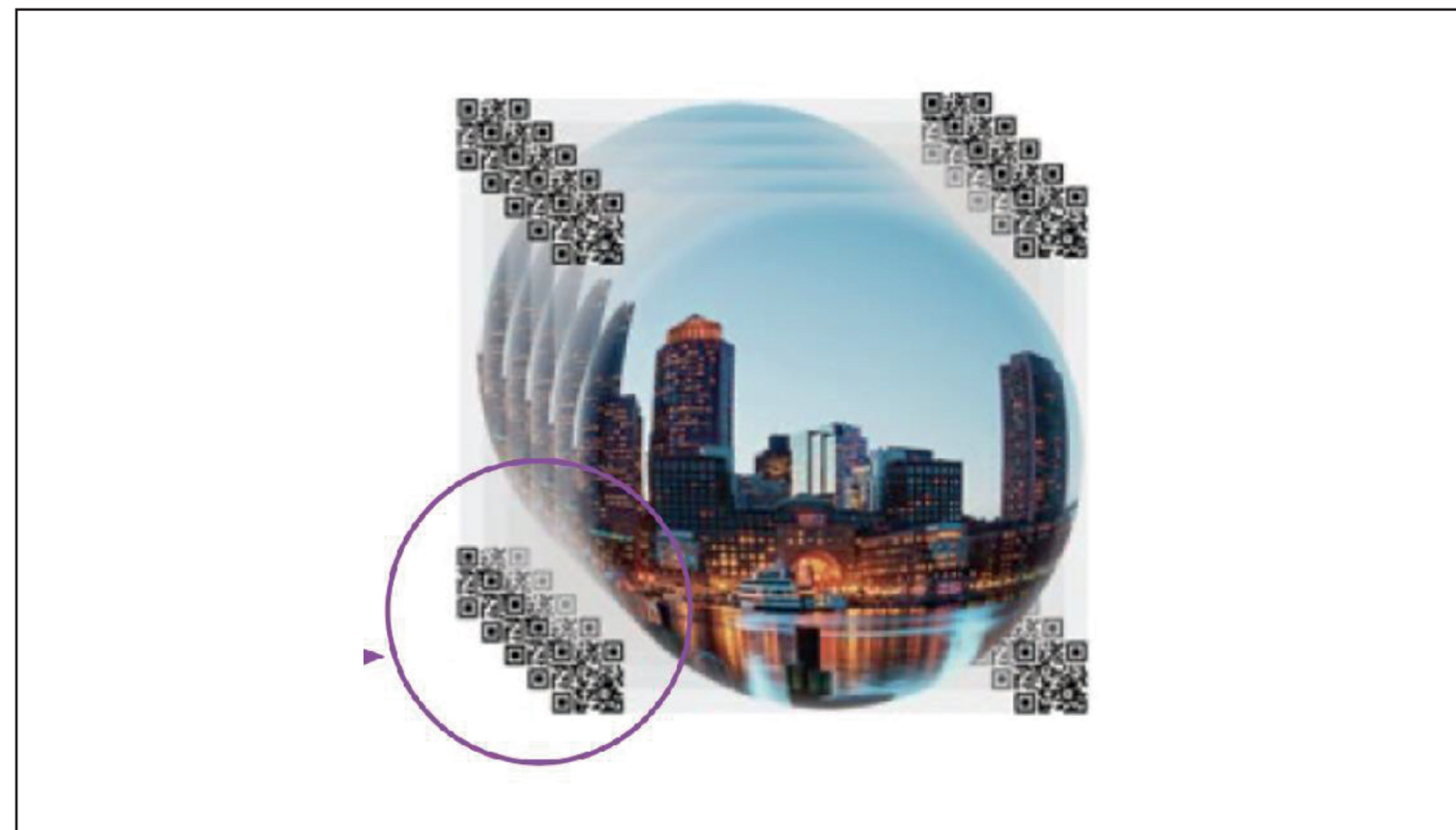
- Use case study and design ID review
- Study and project definition
- Optical system simulation
- Custom case study
- Optical system performance analysis
- Support for manufacturing and mass production
- Lens testing
- Camera modules calibration bench and testing
- Complete device testing
- Performances and comparison report
- Imaging pipeline definition and design
- Imaging HD/SW benchmarks
- Coordination of different 3rd parties to implement image processing pipeline
- IQ and analysis of image processing pipeline
- ImmerVision Imaging IPs integration and support
- ImmerVision Imaging IPs tuning and customization
- ImmerVision Imaging IPs porting on embedded platform (Intel Movidius)

## INTELLIGENT VISION SYSTEM TECHNOLOGY INTEGRATION

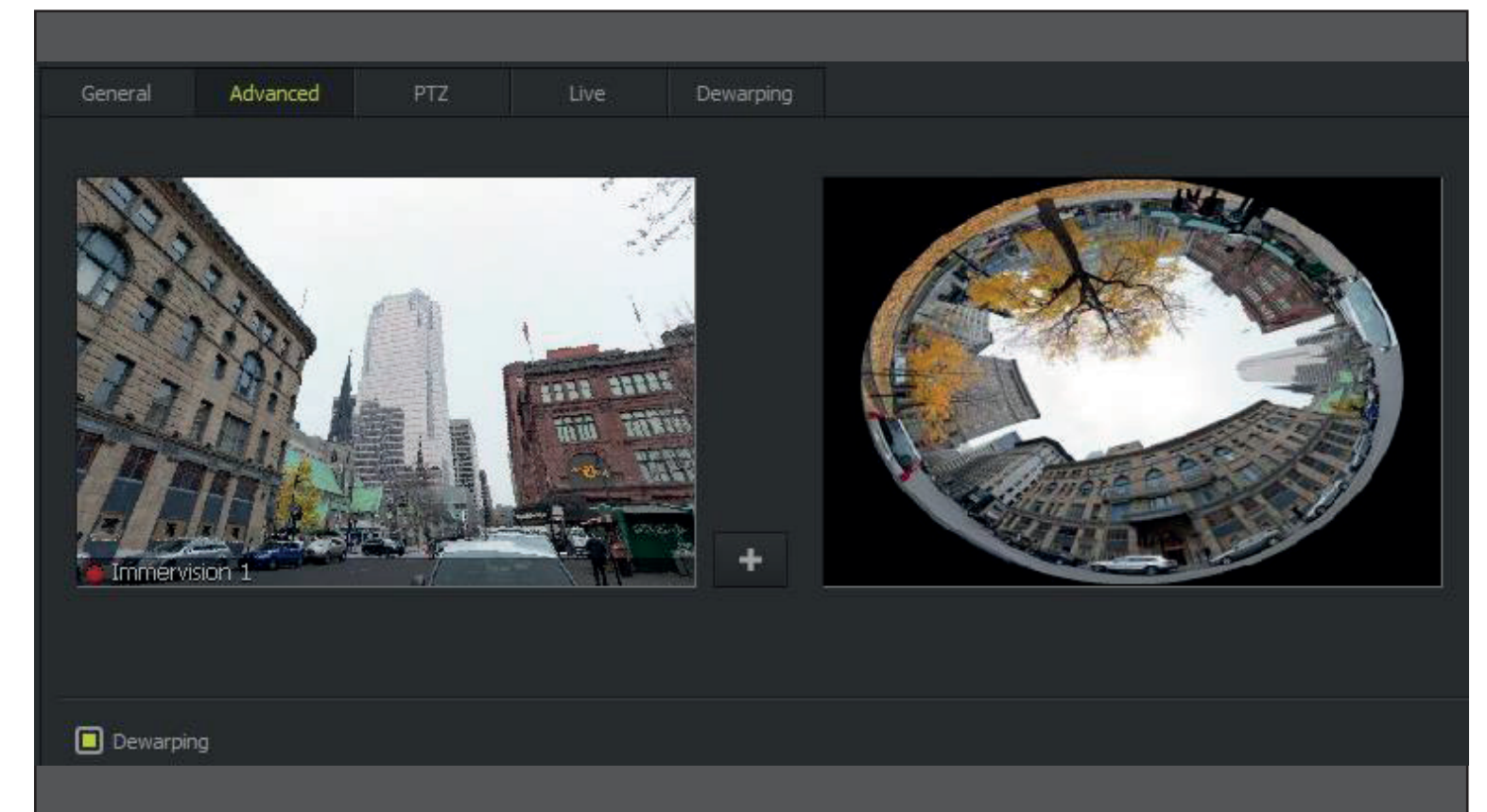
The Innovation Lab also integrates and adapts Immervision's cutting-edge wide-angle optics, sensor fusion and image processing technology providing OEM and ODM with readily available intelligent vision systems.



Panomorph Lens Technology



Data-In-Picture



Adaptive Dewarping Algorithms

# LATEST DESIGN WINS

INNOVATIONLA  
B  
IMMERVISION



**Lenovo:** First 3D camera with a human like vision



**Crosscall Trekker-X4:** First action camera smartphone



**Orbi:** The first 360 Video Recording Eyewear



**Quanta Computer:** First pocket-size 180 FoV live streaming camera



**Insta360 GO:** Smallest wearable camera with 180 FoV

# LATEST DESIGN WINS



Vantrix PRO25: ultimate 180



Vantrix PRO25-AQUA: underwater horizontal



eBee visteon : Automotive Ultra Wide back camera reference design

Acer Holo360: First Android  
LTE connected 360 camera



Vantrix PRO100-360: 10K full sphere



Latécoère LATvision™ Landscape Camera System: Connected to In-Flight Entertainment and Cabin Management systems for aircraft



Samsung Electro-Mechanics: Ultra Wide Anamorphic Free-Form automotive camera module

RESEARCH, DEVELOPMENT AND INTEGRATION SERVICES

The Innovation Lab provides a wide range of services to its clients and has already delivered many optics project from concept to mass production. Our design techniques leverage the latest technology such as anamorphic lens, free from diffractive element and meta-lens from super miniature lens for smartphone to very large optical system for cinema and space exploration.










OPTICAL SERVICES

| Study and Simulation  | Optical Design  | Prototyping and Manufacturing Support  | Testing and Metrology  |
|---|---|--|--|
| <ul style="list-style-type: none"><li>• Study and project definition</li><li>• Optical system simulation</li><li>• Custom case study</li><li>• Optical design</li><li>• Optical system performance analysis</li><li>• Cost estimation</li></ul> | <ul style="list-style-type: none"><li>• Parameters evaluation and recommendation</li><li>• Optical solution space exploration</li><li>• Preliminary optical design</li><li>• Final optical design for production</li><li>• Tolerance and sensitivity analysis</li><li>• Performance analysis</li><li>• Stray light and ghost analysis</li></ul> | <ul style="list-style-type: none"><li>• Collaboration with manufacturers for production</li><li>• Lens prototyping</li><li>• Lens mechanical assembly</li><li>• Lens certification</li><li>• Prototyping</li><li>• Support for manufacturing and mass production</li></ul> | <ul style="list-style-type: none"><li>• Measurement protocol creation</li><li>• Lens testing</li><li>• Camera modules testing</li><li>• Complete device testing</li><li>• Performances and comparison report</li></ul> |

# RESEARCH, DEVELOPMENT AND INTEGRATION SERVICES

The Innovation Lab provides a wide range of services to its clients. The team is using the latest techniques in imaging, computer vision and AI to constantly innovate.

## SOFTWARE SERVICES

| Platforms   | Imaging Pipeline Consulting   | Imaging Algorithm Customisation  | Production and Testing Tools   |
|---|---|--|--|
| <div><br/><br/><br/><br/><br/><br/><br/><br/></div> | <ul style="list-style-type: none"><li>• Imaging pipeline definition and design</li><li>• Imaging HD/SW benchmarks</li><li>• Coordination of different 3rd parties to implement image processing pipeline</li><li>• IQ and analysis of image processing pipeline</li><li>• Immervision Imaging IPs integration and support</li><li>• Immervision Imaging IPs tuning and customization</li><li>• Immervision Imaging IPs porting on embedded platform</li></ul> | <ul style="list-style-type: none"><li>• Distortion Correction</li><li>• Adaptive Dewarping</li><li>• Adaptive Image Fusion</li><li>• Adaptive Stitching</li><li>• Adaptive Distortion Conversion</li><li>• Data-In-Picture</li><li>• Lens Shading Correction</li><li>• Color Correction</li><li>• Fusion Masking</li><li>• Electronics Image Stabilization</li></ul> | <ul style="list-style-type: none"><li>• Wide angle lenses testing software</li><li>• Camera calibration software</li><li>• Creation of custom bench for camera metrology</li><li>• Custom metrology algorithms</li></ul> |

## HI-TECH OPTICAL EQUIPMENT IN A SPECIALIZED SETTING

To help reduce your capital investment, the Innovation Lab has access to a wide range of cutting-edge optical technology equipment as well as specially customized settings to conduct tests and experiments.

| Description                      | Manufacturer               | Model                                  |
|----------------------------------|----------------------------|--|
| Optical test bench               | Optikos                    | LensCheck VIS                          |
| Optical test bench               | Trioptics                  | OptiSpheric<br>OptiSurf<br>OptiCentric |
| Point source microscope          | Optical Perspectives Group |  |
| Interferometer                   | Zygo                       | Mark GPI-XPS                           |
| Interferometer                   | Zygo                       | Verifire HD                            |
| Interferometer                   | ESDI                       | Intellium H2000                        |
| Stylus contact profilometer      | Veeco                      | Dektak 150                             |
| Inspection microscope            | Olympus                    | STM6                                   |
| SEM/FBI microscope               | FEI                        | Quanta 3D FEG                          |
| Scanning probe microscope        | Veeco                      | Dimensions V                           |
| Thin coating system              | Leybold                    | SYRUS-PRO-710                          |
| Thin coating system              | Intlvac                    | Nanochrome                             |
| Prism coupler                    | Meticon                    | 2010/M                                 |
| Spectrometer                     | Agilent Technologies       | Cary 5000 Vis-Nir                      |
| Spectrometer                     | Stellarnet                 | GW-VIS                                 |
| Spectrometer                     | Ocean Optics               | Flame-S-XR1-ES                         |
| Ultra precision machining system | Precitech                  | Nanoform 250                           |
| Surface profiler                 | Taylor Hobson              | Talysurf PGI Freeform                  |
| Ultra precision polishing system | Zeeko                      | IRP200                                 |

## HI-TECH OPTICAL EQUIPMENT IN A SPECIALIZED SETTING



Inspection microscope – Olympus STM6



Zeeko IRP200 Ultra -Precision Polishing Machine



Point source microscope – Optical Perspectives Group



Optical test bench - Trioptics



Interferometer Zygo Verifire HD



Optical test bench – Optikos LensCheck VIS

# DEVELOPING YOUR OWN PATENT PORTFOLIO

Our approach led to the development of unique innovative concepts in the field of wide-angle optics, sensor fusion and image processing. Over the years, we have developed a robust and comprehensive patent portfolio. This is a strong statement of our commitment to advance the science of Computer Vision. Now, the Innovation Lab can act as an extension of your team to help evolve your own intellectual property.

|           |   |
|-----------|---|
| 2001      | Method for capturing and displaying a variable resolution digital panoramic image   |
| 2001      | Camera support device   |
| 2001      | Method and device for orienting a digital panoramic image   |
| 2001      | Method and device for obtaining a constant-hue digital panoramic image  |
| 2001      | Method for capturing a panoramic image by means of a rectangular image sensor   |
| 2005      | Method and device for identification and calibration of panoramic optic systems   |
| 2008      | Method and device for projecting a panoramic image with a variable resolution   |
| 2014      | Splitting of elliptical images  |
| 2014      | Panoramic camera  |
| 2014      | Direct environmental mapping method and system  |
| 2014      | Panoramic image viewer  |
| 2014      | Automated definition of system behavior or user experience by recording, sharing, and processing info associated with wide-angle images   |
| 2015      | Designing an optimization apparatus for a camera having a lens with non-uniform parameters to be imaged as a lens with uniform parameters |
| 2015      | Miniature wide-angle imaging lens   |
| 2016      | Image distortion transformation method and apparatus  |
| 2016      | Method to capture, store, distribute, share, stream, and display panoramic image or video   |
| 2017      | Wide-angle stereoscopic vision with cameras having different parameters   |
| 2018      | Constant resolution continuous hybrid zoom system   |
| 2019-2020 | To be published (confidential)  |

# INNOVATION LAB COMMUNITY

20 years in the making, the Innovation Lab Community helps us stay at the cutting edge of computer vision. Our experienced team draws its knowledge, creativity and inspiration from a strong ecosystem of corporate and institutional partners.

## INTERNAL

### R&D Team

Our signature results-oriented approach is rooted in a tight collaboration between scientists, optical designers and image processing engineers.

## CORPORATE PARTNERS

### Components and Suppliers

Close collaboration for the manufacturing of Panomorph lenses, camera modules, sensors, processors and semi-conductors.

### Software

Close collaboration for the integration of image processing technologies.

### Hardware

Close collaboration for the integration of wide-angle optic technologies.

## INSTITUTIONAL PARTNERS



### Center for Optics, Photonics and Lasers

COPL is the Quebec cluster of recognized experts in optics and photonics. Its research excellence, state-of-the-art facilities and comprehensive scientific program position them among the best centers in the world for optics and photonics training and research.

### The Computer Vision and Systems Laboratory (CVSL)

CVSL regroup professors, graduate students, post-doctoral fellows working together on computer vision and its industrial and biomedical applications. Belonging to the REPARTI strategic network, it hosts two research chairs at Laval University Quebec. Immervision collaborates with CVSL on research thematic at the convergence of machine learning, deep learning, computational photography and computer vision.

# COMPONENTS & SUPPLIERS

## Panomorph lenses



## Camera modules



## Sensors



## Processors/SoCs



## Semiconductor IPs



# HARDWARE



# SOFTWARE



INNOVATIONLAB  
IMMERVISION

WE ARE NOT ONLY BUILDING VISION  
SYSTEMS FOR SMART DEVICES BUT ALSO  
A NATION OF INNOVATORS

Montreal, Canada



# INDUSTRY EXPERIENCE

The mandate of the Innovation Lab is to advance wide-angle optics, sensor fusion and image processing technology across 12 industry verticals where it leads with key innovations.



Communication and Mobile



Automotive



Security



Virtual Reality



Video Cameras & Photography



Broadcast & Live Streaming



Aerospace



Healthcare & Science



Robotics



Home Devices, Wearables & Other IoT Devices



Defence



IP Architects

# DEEP SEEING

[dep-seiNG]

Deep Seeing enables smart devices with augmented vision. By capturing high quality visual and contextual data in new ways, it unlocks the potential of Artificial Intelligence. Like superhuman eyes for your smart device.



## GET IN TOUCH WITH US

2020 Robert-Bourassa Blvd.  
Suite 2320  
Montreal, Quebec  
H3A 2A5, Canada  
+1 (514) 985-4007

INNOVATIONLAB

IMMERVISION 