# Understanding Designing and Analyzing Computational Cameras

## Fact Sheet

Project Information

**COMPCAMERAANALYZ**

Grant agreement ID: 259091

Project closed

**Start date**
1 December 2010

**End date**
30 November 2015

**Funded under**
Specific programme: "Ideas" implementing the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007 to 2013)

**Total cost**
€ 756 845,00

**EU contribution**
€ 756 845,00

**Coordinated by**
WEIZMANN INSTITUTE OF SCIENCE
Israel

## Objective

Computational cameras go beyond 2D images and allow the extraction of more dimensions from the visual world such as depth, multiple viewpoints and multiple illumination conditions. They also allow us to overcome some of the traditional photography challenges such as defocus blur, motion blur, noise and resolution. The increasing variety of computational cameras is raising the need for a meaningful comparison across camera types. We would like to understand which cameras are better for specific tasks, which aspects of a camera make it better than others and what is the best performance we can hope to achieve.

Our 2008 paper introduced a general framework to address the design and analysis of computational cameras. A camera is modeled as a linear projection in ray space. Decoding the camera data then deals with inverting the linear projection. Since the number of sensor measurements is usually much smaller than the number of rays, the inversion must be treated as a Bayesian inference problem accounting for prior knowledge on the world.

Despite significant progress which has been made in the recent years, the space of computational cameras is still far from being understood.
Computational camera analysis raises the following research challenges: 1) What is a good way to model prior knowledge on ray space? 2) Seeking efficient inference algorithms and robust ways to decode the world from the camera measurements. 3) Evaluating the expected reconstruction accuracy of a given camera. 4) Using the expected reconstruction performance for evaluating and comparing camera types. 5) What is the best camera? Can we derive upper bounds on the optimal performance?

We propose research on all aspects of computational camera design and analysis. We propose new prior models which will significantly simplify the inference and evaluation tasks. We also propose new ways to bound and evaluate computational cameras with existing priors.

## Fields of science (EuroSciVoc)

engineering and technology > electrical engineering, electronic engineering, information engineering > electronic engineering > sensors > **optical sensors**

natural sciences > mathematics > applied mathematics > statistics and probability > **bayesian statistics**

## Programme(s)

FP7-IDEAS-ERC - Specific programme: "Ideas" implementing the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007 to 2013)

## Topic(s)

ERC-SG-PE6 - ERC Starting Grant - Computer science and informatics

## Call for proposal

ERC-2010-StG_20091028
See other projects for this call

## Funding Scheme

ERC-SG - ERC Starting Grant

## Host institution

**WEIZMANN INSTITUTE OF SCIENCE**

EU contribution

**€ 756 845,00**

Total cost

**No data**

Address

**HERZL STREET 234**
**7610001 Rehovot**
**Israel**

Activity type

**Higher or Secondary Education Establishments**

Principal investigator

**Anat Levin (Dr.)**

Links

Contact the organisation Website
Participation in EU R&I programmes
HORIZON collaboration network

## Beneficiaries (1)

**WEIZMANN INSTITUTE OF SCIENCE**

Israel

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Total cost

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