

# Image processing and pattern recognition using complex valued images

## Project Leader

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## 1. Objective

This project is aimed at the development of effective image processing algorithms for images with complex values, such as those captured by a correlation image sensor [1]. In such images, each pixel has a complex value, not a real value like a conventional image sensor, so that the new methodology is required. It is expected that more information about the objects can be retrieved using the increased Degree-Of-Freedom available at each pixel. A complex-valued image processing library will be developed during this project.

## 2. Project Outline

**To that end, the project will consist of the following phases:**

- (a) Development of a signal processing algorithm for complex-valued images
- (b) Development of a wide range of applications using the algorithm
- (c) Development of a programming library

## 3. Expected Performance

**In this project, the successful candidate would be expected to:**

- (a) Work independently on a research topic and develop a program for experiments.
- (b) Read related international journal papers independently and discuss with senior researchers.
- (c) Understand the theory of image processing, computer vision, and machine-learning algorithms.
- (d) Publish research results in international journal papers, and present them at international conferences.

## 4. Required Skills and Knowledge

**The successful candidate for this project will have the following knowledge and skills:**

- (a) Mathematics, especially algebra and statistics.
- (b) Image Processing, Machine Vision, Signal Processing.
- (c) Programming skill (C/C++/Cuda)
- (d) Ability to communicate and discuss in English

## References

- [1] S. Ando and A. Kimachi, "Correlation image sensor: Two-dimensional matched detection of amplitude modulated light," IEEE Trans. Electron Devices, Vol. 50, no.10, pp.2059—2066, 2003.
- [2] S. Ando, T. Nara, and T. Kurihara, "Spatial filtering velocimetry revisited: Exact short-time detecting schemes from arbitrarily small-size reticles," Measurement Science and Technology, vol.25, no.8, 085001, 2014.
- [3] T. Kurihara, S. Ando and Y. Michihiko, "Temporal modulated deflectometry for painted surface inspection," Proc. SPIE(Optical Metrology 2015), Vol.9525, pp.952518, Munich, Germany, June.22-25, 2015.

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