

The University of Queensland - IIT Delhi Academy of Research Joint PhD Project

Project title	Computationally efficient hardware architectures for multidimensional light field signal processing
Project code	UQIDAR 00205
Project description	<p>Light fields provide a higher dimensional abstraction of a visual scene by taking into account both position and directional information of light rays. In contrast to lower dimensional abstractions of a visual scene (such as 2-D images or 3-D videos), 4-D light fields and 5-D light field video signals provide an information-rich representation, paving the way for functionalities such as post capture refocusing, depth based enhancement, occlusion suppression and low light imaging. Light fields, which are commonly captured by special light field cameras or an array of standalone cameras, contain a large volume of discrete samples of image data, which should be processed to achieve numerous functionalities mentioned above. Thus, low complexity signal processing algorithms and computationally efficient, parallel processing hardware architectures are of common interest to exploit the full potential of light field imaging techniques in mobile and resource constrained embedded applications. The proposed research is aimed at investigating low-complexity and massively parallel custom computing hardware architectures for light field signal processing and compression algorithms on FPGAs. Recently proposed light field processing and compression algorithms will be examined both at the algorithm level and data/signal flow levels to derive novel low-complexity processing architectures and ways of enhancing the processing throughput will be examined using parallel processing techniques. Application of machine learning algorithms to high-dimensional light field signals will also be examined in applications such as robust object detection and classification in the presence of partial occlusions and low-light conditions. The designs will be tested using both existing light field databases and light fields acquired through custom made camera arrays.</p>
Project outcomes	<p>A portfolio of new hardware designs for light field signal processing and prototype FPGA implementations. Comprehensive analysis of performance of the hardware architectures in terms of their area, time, and power complexities.</p>
Advisory team	<p>UQ Principal Supervisor Dr Chamith Wijenayake Information Technology and Electrical Engineering c.wijenayake@uq.edu.au http://researchers.uq.edu.au/researcher/25435</p> <p>IITD Principal Supervisor Associate Professor Smruti Sarangi Computer Science & Engineering srsarangi@cse.iitd.ac.in http://www.cse.iitd.ac.in/~srsarangi/</p>
Type of student	Applications are open to: I or q students who meet eligibility criteria .
Discipline background of student	Ideally, this project requires students with a background in: Electrical/Electronic Engineering Computer Engineering Electrical and Computer Engineering
Ideal candidate	Essential Capabilities: Knowledge of digital systems.

Application
process

Desirable Capabilities: Familiarity with hardware implementation of signal processing algorithms.

Expected qualifications (Courses/Degrees etc.): Bachelors in Computer Science or Electronics Engineering.

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