Digital Fringe Projection and Multi-Spectral Polarization Imaging for Rapid 3D Reconstruction

Title: Digital Fringe Projection and Multi-Spectral Polarization Imaging for Rapid 3D Reconstruction

Invention: The invention embodies methods, devices and systems that utilizes Digital Fringe Projection (DFP) to generate three dimensional (3D) images of an object based on measurement of polarizations and/or color light in a single shot. Unlike conventional techniques, which require sequential measurements, the novel systems acquire high dynamic range information in a single shot and can be applied to rapidly changing scenes and objects. It’s fast, portable, compact, and has low power consumption.

Background: Three dimensional (3D) imaging techniques have applications in industrial metrology, virtual and augmented reality, remote sensing, medical diagnostic, biometrics and homeland security. To achieve 3D imaging, existing techniques, such as light detection and ranging (LIDAR), stereovision, light field or plenoptics imaging, structured light illumination and digital fringe projection (DFP), have been developed. However, LIDAR, structured light illumination and DFP often require scanning and acquisition of multiple frames. Stereovision requires more than one camera at different locations to provide accuracy. Plenoptics imaging requires complex algorithms and computation hardware for 3D reconstruction; in addition, the spatial resolution is reduced.

Applications:

- industrial metrology
- Virtual and augmented reality
- Medical diagnostics, biometrics
- Homeland security
- Remote Sensing

Advantages:
Efficient/rapid ease-of-use
Requires only a single frame capture
Fast, compact, with high dynamic range
Provides information about material characteristics

Licensing Manager:
Amy Phillips
AmyP@tla.arizona.edu
Refer to case number UA18-085

Inventors
Rongguang Liang
Professor, Optical Sciences
Stanley Pau
Professor, Optical Sciences