Handheld Texel Camera™

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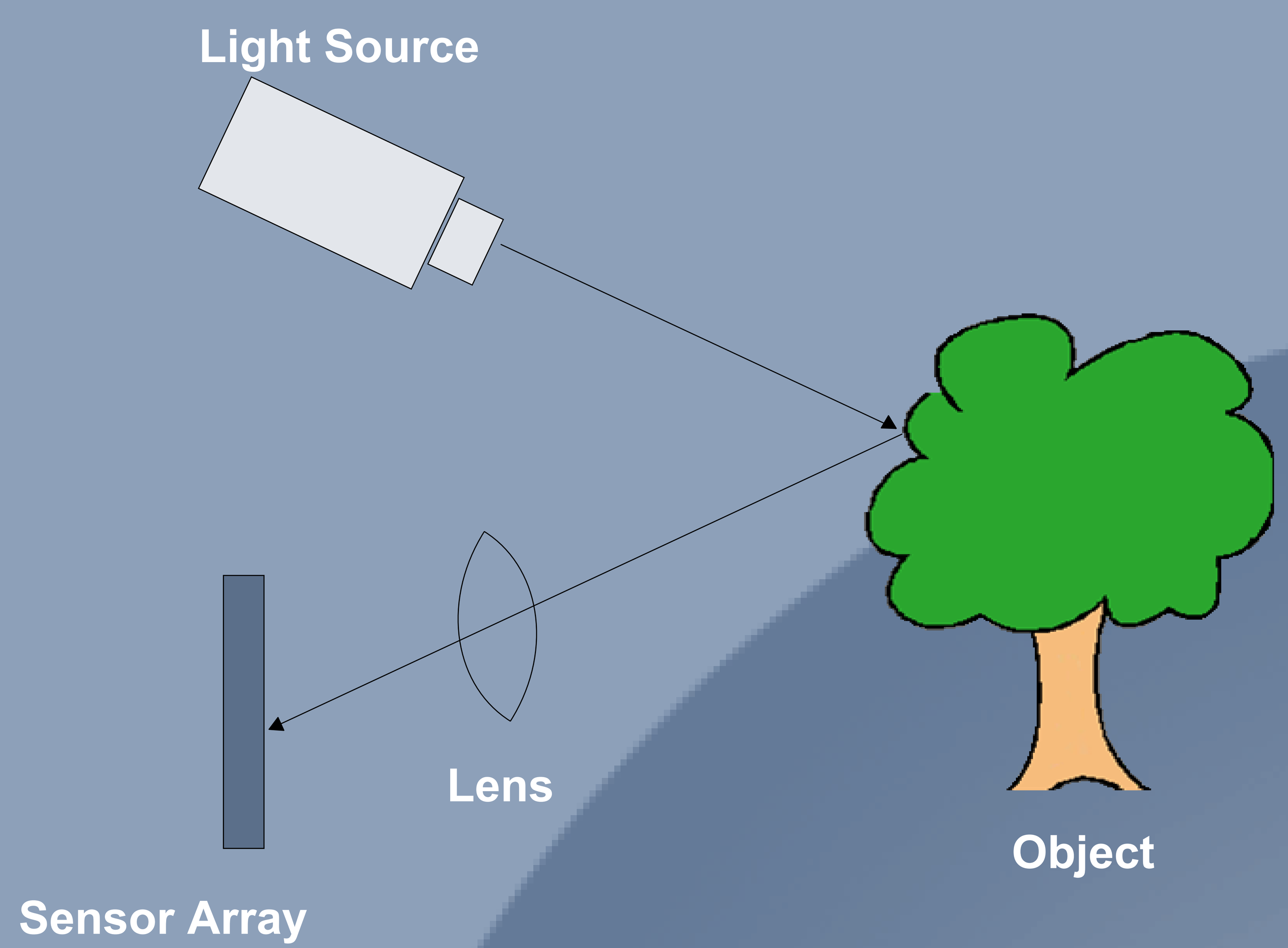
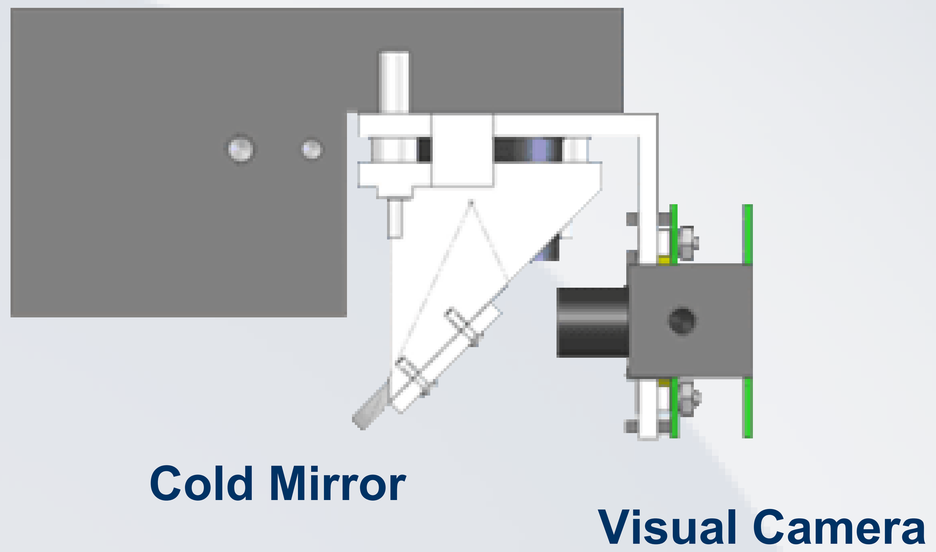


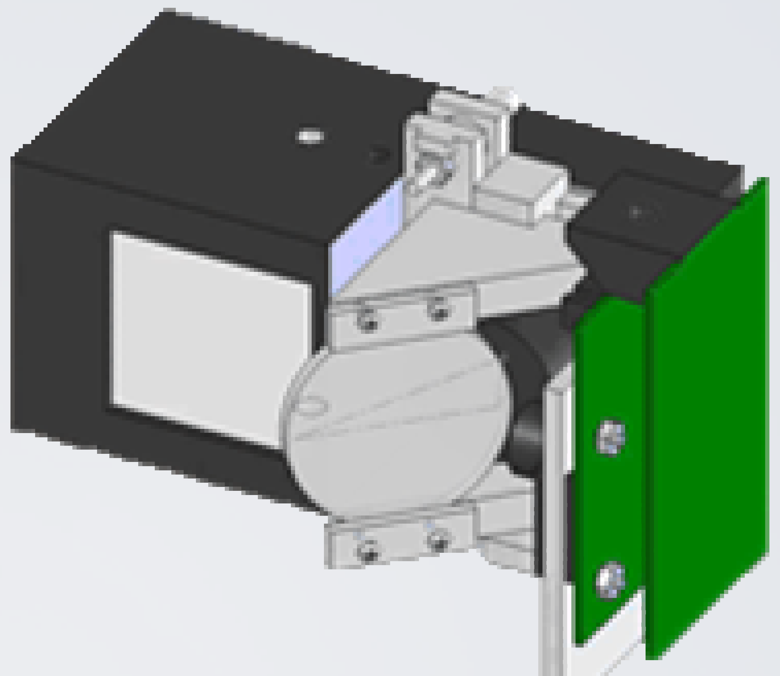
What is Flash Ladar?

A Flash Ladar system consists of a modulated light source, such as a laser or LED, an array of sensors capable of detecting the phase of the incoming light, and an optical system which focuses the light onto the sensor array.

The light is modulated to a particular frequency by turning the light source on and off rapidly. The distance is determined by measuring the phase offset from the light received from the sensor array.

Flash Ladar Device





Handheld Texel Camera ™ System

How do you make a Texel Camera™ out of Flash Ladar?

A Texel Camera™ is a device which captures ladar information at about the same time the visual information is taken. The two cameras are co-boresighted, as well, to eliminate any parallax issues.

At USU, we have integrated a Canesta Flash Ladar development system and a Micron CMOS camera development board to produce a Handheld Texel Camera™ system. The Canesta system is mounted 90 degrees from the Micron camera and a cold mirror is placed in their optical paths, such that the two nodal points of the cameras are aligned.

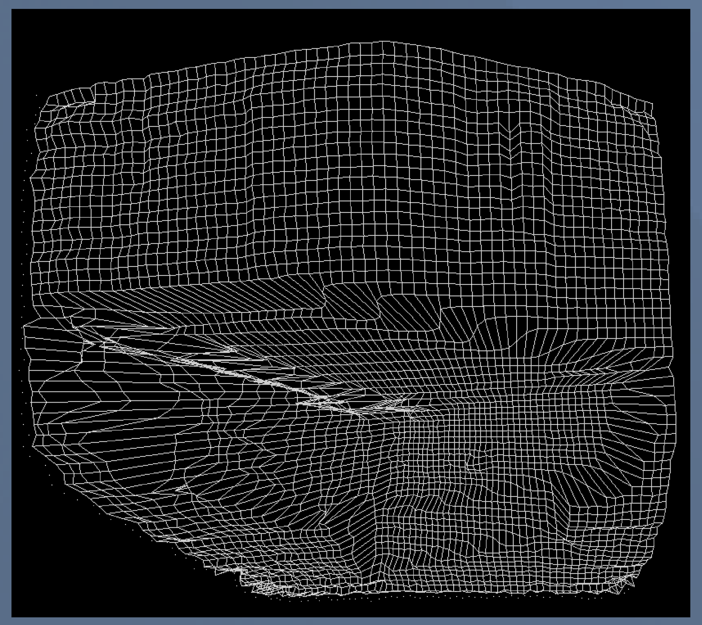
The cold mirror allows infrared light to pass through it while reflecting visible light. Since the Canesta system transmits and receives infrared and the micron only needs visible light, the system allows both cameras to receive the same optical scene simultaneously. Essentially the two camera appear to be looking from the very same point.

Preliminary Results

The following shows the data taken from the Micron Camera, the Canesta System, and the integration of the two systems.

The Micron Image is the actual image, whereas the other images are screenshots from a 3-D viewer.

Image taken from Micron Camera



Wireframe of Canesta Data

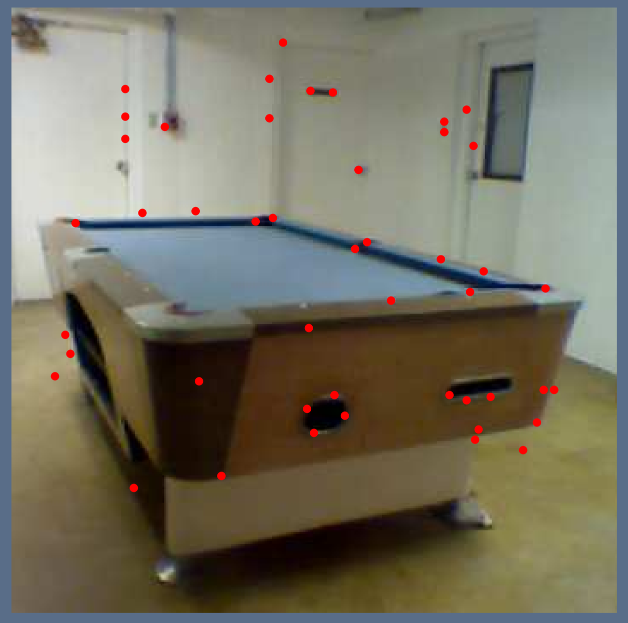
Preliminary Results from Texel Camera™

Current Work

Work is being done on merging scenes from several shots taken at different locations into one model.

Because each ladar shot captured by the Texel Camera™ is spatially and temporally aligned with a corresponding visible image, estimation of motion between the visible images can be used to estimate motion between the ladar measurements. This is accomplished by detecting common features in two images which can be merged together and calculating the transformation needed to accomplish a rigid model which projects onto the two images given.

In our setup, the Micron camera has more resolution than the Canesta system, so using this method allows the 3D point-cloud to be matched more accurately than using point-cloud techniques alone.



Pool table from one viewpoint

Pool table from another viewpoint

Mosaic of the two viewpoints