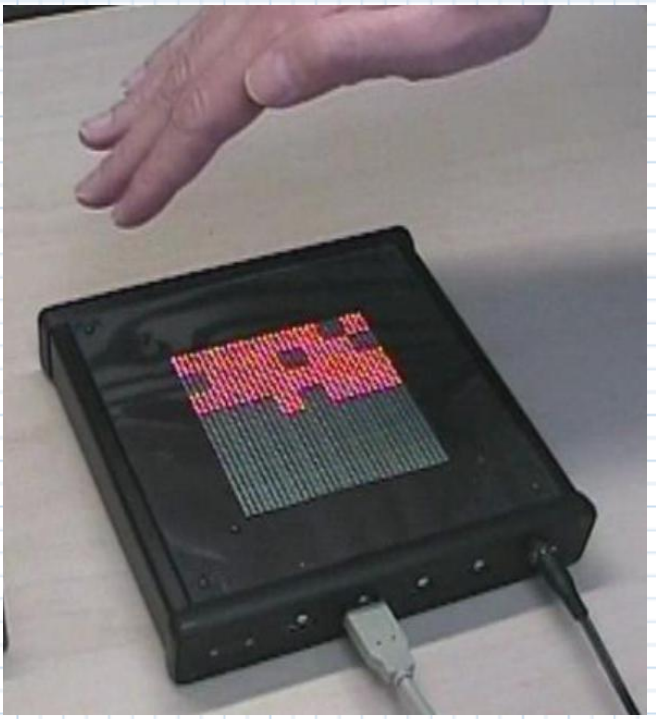
Non-Confidential Description

Extensible Light-Sensing LED Array

Technology Case: RFT-295



Invention Summary

This NDSU-developed technology describes the use of an extensible array of light-emitting diodes (LEDs) as a means of sensing incident light levels. This light-sensing LED array can be used to construct highly-dynamic backlights for displays and large-format synthetic aperture cameras.

Figure: *A hand casts a shadow on elements of a prototype light-sensing LED array. Elements in the shadow are illuminated, and those in the light are off.*

Benefits

- Using an LED array that both emits and senses light allows the construction of a large-format display backlight that automatically adjusts to changing ambient lighting conditions.
- The LED array can be used to sense reflected light and construct an image of objects passing in front of the array, allowing the creation of a large-format synthetic aperture camera.
- The construction of the LED array is extensible to virtually any size, meaning that an entire billboard, information display, or wall can be covered with the light-sensing array.

Invention Premise

The principle behind sensing light with an LED is to drive the LED as a capacitor, the discharge from which can be accelerated by light. The LED is reverse-biased, then the bias is removed and the LED is allowed to discharge. By measuring the time it takes for the LED capacitor to fully discharge, the level of light incident on that LED can be calculated. By alternating between modes, the LED array can be used to both display (emit light) and sense light.

A light-sensing LED array can be placed behind a liquid crystal display (LCD) to provide a highly-dynamic backlight. In sensing mode, the array can create a "light map" for the entire display, and then command individual LED elements to glow brighter where more backlight is needed and dimmer where little backlight is needed.

Also, the LCD elements in front of each LED in the array can be used as shutters, controlling the angle and amount of light that is allowed to pass through. By using these LCD "shutters", a software-controlled synthetic aperture camera can be created.

Patents

This technology is patent pending and immediately available for licensing/partnering opportunities.

The Inventor

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Senior Research Scientist

Dr. Mark Pavicic received a B.S. in both Electrical Engineering, and Physics and Mathematics in 1974 from Iowa State University. He then earned an M.S. in Electrical Engineering in 1976 from the University of Illinois, and in 1985 received a M.Ph. and Ph.D. in the same field from Columbia University. Before coming to the Center for Nanoscale Science and Engineering (CNSE) in 2006, Pavicic began his career at Texas Instruments and moved on to hold positions at IBM, North Dakota State University (NDSU), Microsoft and Dakota Technologies. During his years at Texas Instruments and IBM, he received three U.S. patents for his work on processors and computer displays. He later received three more while working with digitizing chips at Dakota Technologies. While at NDSU, Pavicic became an Associate Professor in the Computer Science department and taught a broad range of subjects.
Pavicic joined CNSE as a Senior Research Scientist in 2006. He is currently the NDSU PI for the Conformal Computing Program, a DoD-sponsored collaboration between NDSU and MIT to investigate a new computational paradigm.

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