

Abstract

Projection displays have been widespread use in large-screen TVs, large computer monitors, advertising, simulators, and other applications. When these displays utilize lasers as the sources of the three primary colors, speckle appears as a disturbing noise that must be dealt with for a satisfactory viewing experience. The observance of speckle in laser images is caused by the interference of the coherent source.

The design and implementation of a despeckle element based on Mie scattering theory has been proposed in this work. Based on an inorganic nano-sized particle, speckle reduction in laser projection systems has been achieved. The dynamics of Zinc Oxide nano-particles with radii of 10, 15 and 20 nm and various concentrations ranging from 5×10^{-3} to 30×10^{-3} Molar with step of 5×10^{-3} suspended in pure deionized water by magnetic stirrers device has been studied using the technique of Mie scattering theory with a charge coupled device [CCD] camera as a detector.

Experimental results show that the speckle contrast mainly depends on the radius of nano-particles, and their concentration and can be reduced down to 0.22% at a concentration of 25.6×10^{-3} Molar at a nano-particle radius of 20 nm. To obtain the lowest speckle contrast in laser projection displays, the larger size and the higher concentration of nano-particles are required.