This laboratory provides facilities for experimental research in optical and digital parallel information processing. It is well equipped with a complete line of fully compatible Newport Research Corporation optical components including an NRC PRS-58-8 honeycomb table with isolation supports, two He-Ne lasers, polarizing beam splitter, power meter, electronic shutter, two collimators, and three high quality Space Optics Research Laboratories Fourier transform lenses.

The laboratory is used together with solid state and image processing laboratories as well as the engineering computer network and parallel processing facilities at Purdue University. Diffractive optical elements (DOEs) generated by e-beam lithography and reactive ion etching in solid state laboratories are further processed in the laboratory. Analysis and design of DOEs and other optical subsystems and signals for use in optical information processing, optical communications and networking systems, fibers and integrated optics are carried out, especially using Fourier techniques, iterative global optimization, image processing tools and parallel processing facilities.

Signals and images can be digitized with a solid state CCD video camera and further processed in the image processing laboratory. Acquisition of a spatial light modulator will close the loop in the system, permitting digital signals and images to be converted to optical form for subsequent optical processing.

Current research activity in the laboratory includes investigation of novel techniques for Fourier optics and diffraction, synthesis of digital diffractive elements or computer-generated holograms, optical signal transforms, classification and recognition, simulation of optical subsystems in fibers and integrated optics for optical communications and networking, and investigation of a real-time camera system with onboard CPU and memory.

Comparative parallel digital and optical processing of signals and images are being investigated. This involves the use of a parallel processing system based on a Pentium PC equipped with a CNAPS parallel processing board with 128 processing nodes.

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