Virtual laboratory experiments for an internet-based photonics course

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In connection with the bachelor study program at FernUniversität Hagen the ONT group started to develop a virtual lab course on photonics in 2001 [1, 2]. It is intended to exploit the various new possibilities for distance-teaching provided by the internet. Students can download Java applets that invite them to explore the working principles of important optical and photonic setups, and to test and observe the influence of basic experimental parameters so that they can acquire a feeling for the underlying physical phenomena. Thus the course prepares students for real laboratory work in a rather realistic environment.

The virtual lab course has recently been expanded by two new applets dealing with the characterization of a communication system by means of an eye diagram and the coupling of optical signals into fibers.

Fig. 1 shows the control window of the first applet. Pressing the start button sets off three processes: A random signal is generated and displayed in the center window; its transmission through a communication channel is simulated and the emerging eye diagram shown in the top window; the transmitted and AD-converted signal is depicted in the bottom window. By means of control bars system parameters like signal level, noise level, or detection threshold can be modified.

Fig. 2 shows the control window of the second applet. It simulates the coupling of light from a LED or a LD into a fiber on the basis of ray tracing. Control buttons allow one to change various geometrical and optical parameters such as the distance between light source and fiber, its core diameter, or N.A.; in addition, a lens with variable focussing power and size can be added to the basic setup. The coupling efficiency is continuously monitored.