An Interactive Autostereoscopic Display Using a Holographic Optical Element

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A new 3D display has been developed at the Department of Production Engineering as a result of a three-year project finansed by VINNOVA and supported by Volvo Cars, SCA Packaging, SGI, and Opticore. The display has received excellent reviews by professional users of 3D images in the Swedish industry.
Some characteristics of the display are:

- It can be viewed without optical aides, such as glasses.
- It produces sharp and very bright images with high contrast.
- It can be build from comparatively cheap components.
- It does not need to be driven by high-end computers.
- It is real-time interactive.
- It is scalable in size.
- It can be adapted to use any 3D data format.

The central component in the display is a hologram which acts as an advanced projection screen. The hologram reflects the light from several projectors in such a way that the viewer sees a stereographic image. The number of projectors used determines the number of horizontal views and/or the width of the víewing zone. We usually mount the hologram as a table top while projectors illuminate it from above, although a vertical display would also be possible. Our current prototype has the following specifications:

Display area:	80cm x 60cm
Viewing angle	$<100^{o}$
Lateral pixel count:	XGA, 768 x 1024 (determined by the projectors used)
Color:	monochrome; ~ 600 nm wavelength (orange-red)
Contrast:	> 90:1 (limited by the projectors)
Crosstalk between perspective views:	0.7 %
Number of perspective views	4

Developments in progress:
Full color.
Haptic interaction.
Remote 3D video communication.
Multiviewer configuration and interaction.