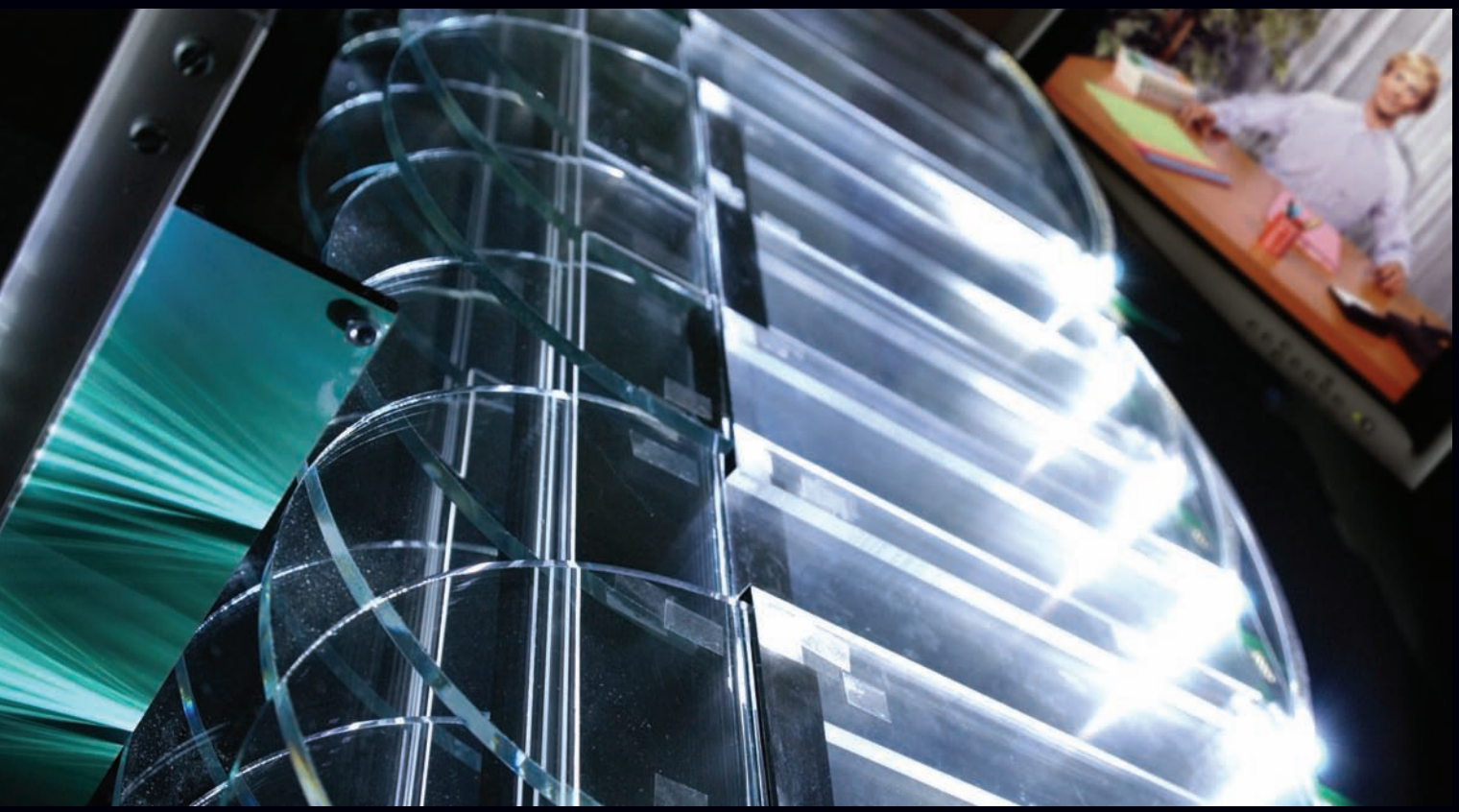
MUTED

Multi-User 3D Television Display



Contract number: 034099

Project acronym: MUTED

Project name: Multi-User 3D Television Display

Priority: Sixth Framework Programme, Micro/nano based sub-systems, IST-2005-2.5.2

PROJECT PARTICIPANTS:

De Montfort University, UK

Sharp Laboratories of Europe, UK

Heinrich Hertz Institute, DE

Technical University of Eindhoven, NL

University of West Bohemia, CZ

Light Blue Optics, UK

Total cost: €4,450,000

Commission funding: €2,925,000

PROJECT MAIN GOALS

The MUTED project will design and evaluate the next generation of 3D display, which will be:

- Relatively inexpensive
- 'Hang-on-the-wall'
- 3D without the need for glasses
- 3D for multiple mobile viewers
- 3D over a room-sized area

The MUTED project will significantly advance the required enabling technologies that will bring viable 3D display systems to market within the next 10 years.

The 2½ year MUTED project which started mid 2006 will bring together 30 person-years of proven competence in the fields of display, head tracking and human factors components that were most recently demonstrated in the successful EC funded Advanced Three-Dimensional Television Systems Technologies Project and the current 3DTV Network of Excellence.

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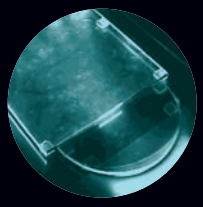

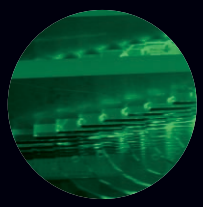

KEY ISSUES

The MUTED display will be autostereoscopic – that is viewers will not need to wear special glasses to view 3D. The other key issues for the display are:

- Support for multiple viewers
- Allow for viewer freedom of movement
- User-centred design, ensuring that future products are "fit for purpose" in terms of perception and usability.

To fulfil these aims, the project will build on and advance the state of the art in displays, viewer tracking and human factors, and will use and extend components of the FP5 IST ATTEST; Advanced Three-dimensional Television System Technologies project. In addition MUTED will exploit knowledge and expertise from the FP6 IST 3DTV Network of Excellence. MUTED will model and construct LCD displays that are suitable for 3D use, and will develop a new laser illumination system suitable for 3D display. In addition MUTED will create test content and will conduct trials in user applications, and formulate new standards for 3D display.

One important advantage of the MUTED display will be that it is potentially extremely versatile. For example, it has an inherent ability to switch from standard resolution to high-resolution 3D without any hardware modification. Also, when viewers are outside the usable 3D viewing region, the system will adapt and viewers will see the image in 2D. In addition, the MUTED display can display motion parallax (the ability to 'look around' 3D objects) at standard resolution to a single viewer, again without any hardware change. Also, when sufficiently high-resolution LCD displays are available in the future, the optics could provide motion parallax to several viewers.

TECHNICAL APPROACH

DISPLAY OPTICS

The MUTED display consists of three basic components: a screen assembly whose principal components are a direct-view LCD; optical arrays that direct light to the rear of the screen assembly in a way such that images are projected to the viewers' eye positions in space; and a laser illumination source that provides light in controlled positions that are determined by the output of the MUTED head tracker.

The optical arrays will transform information from the two-dimensional projected illumination domain to the viewer eye positions in the viewing field in front of the screen. Illumination will be from a diffractive projector that utilizes a laser light source and a phase-modulating LCOS micro-display.

MULTI-USER HEAD TRACKING

The MUTED autostereoscopic display will use robust detection and real-time tracking of the multiple users' head/eye positions so that the display can direct left and right eye views to the corresponding eyes. Computer-vision based tracking of multiple eye-pairs over a wide range in three dimensions and under conditions of low and fluctuating illumination will be used. This will employ a novel hybrid approach with multiple passive video cameras in combination with active depth-measuring methods. The resulting multiple reference eye patterns will allow the tracker to find the viewer's eyes in live video images.

HUMAN FACTORS

The impact of unwanted side effects or poor image quality may hamper a successful introduction of any new display technology aimed at the consumer market. It is vital to have a clear understanding of the perceived benefits and drawbacks of 3D technology. The impact of novel 3D display technology on a typical person's viewing experience, as well as the interaction between viewing behaviour, ease-of-use and technology, can only be realistically addressed through human factors studies.

These experiments will inform and guide the technology developed within MUTED to optimise the 3D viewing experience and minimise potential negative side-effects. The result will be user requirements and perceptual guidelines that will give a 3D subjective preference model for assessing and solving human factors problems in a way that may be applied to many 3D displays.

EXPECTED ACHIEVEMENTS

There is a strong belief in the industry that 3D viewing will be a major feature in mobile displays (short-medium term) and in TV broadcast (medium term). The requirements of any future TV system, based on numerous market and human factor studies, indicate that the form factor must be similar to current flat panel displays and that 2D-3D 'switch-ability' is key.

From the expertise and track record of its participants MUTED will enable development of a 3D display closer to a commercial product by developing a more effective and compact form, developing a non-intrusive multi-user head tracker, and obtaining a fuller understanding of the human factors considerations of 3D display. MUTED will facilitate commercialisation by addressing barriers to mass manufacture.

By placing Europe at the forefront of 3D display technology the outcomes of MUTED will greatly enhance the competitiveness of the European display and content generation industries and address the future needs of these industries to move into the next generation of technology. This work will reinforce European strengths in areas where it has an established leadership.

For the first time we will realise a high resolution multi-viewer, autostereoscopic flat-panel "hang on the wall" 3D display system that can also be seamlessly switched to 2D mode. The realisation of such display hardware will create the seed for future 3D content creation and broadcast within Europe.

COORDINATOR CONTACT DETAILS

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Information Society Technologies

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