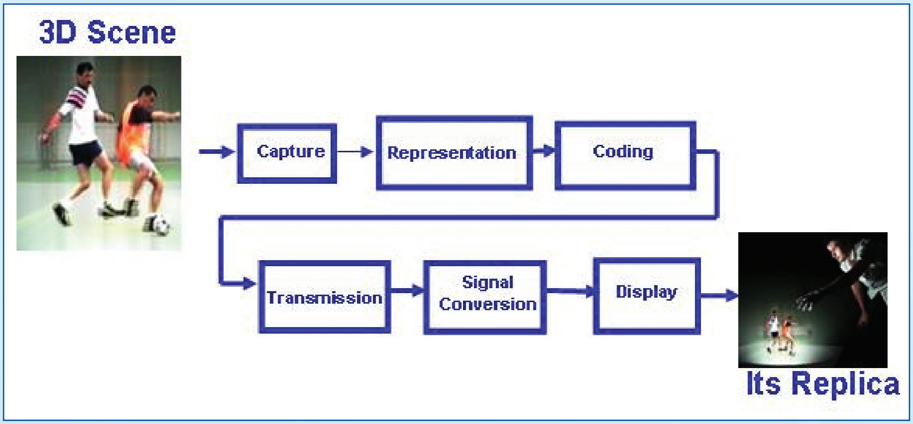
- 3DTV project is a Network of Excellence (NoE) whose primary objective is to align the interests and efforts of European researchers with rather diverse experiences and activities in distinct, yet related and complementary areas, so that a common effective research network for achieving full scale 3D visual signal handling capabilities is established and kept operational for a long time.
- The project consortium consists of about 200 contributors from 19 institutions. All technical building blocks of 3D television, including capture, transmission and display, are in the technical scope of the project.
- The broad technical scope of 3DTV is divided into the six major building blocks as shown in the diagram; in addition potential diverse application areas are also under investigation. The researchers are organized under five technical committees, encompassing seven joint research workpackages.
- Understanding consumer attitudes to 3D technology are important for successful applications. Applications in education, training, simulation, medicine, dentistry, game and entertainment industry, tele-presence and cultural heritage, as well as the main application of broadcast 3DTV are within the scope of the 3DTV NoE.

Some Intermediate results

It is already over 24 months since the 3DTV project has started. This 19 partner NoE has been focusing on all aspects of 3DTV, from capturing 3D scenes to displaying them and everything in between. Furthermore, applications of 3D video technology to many different areas are also investigated and some intermediate results are obtained.

Information Society Technologies



Capture:

- Many experimental multi-camera capture systems are designed and tested. Synchronization among the cameras is achieved.
- Many techniques are developed to generate automated 3D personalized human avatars from multi-camera video input.
- Image-based methods are developed for surface reconstruction of moving garment from multiple calibrated video cameras.
- A method, based on synthetic aperture radar techniques is developed to increase the resolution of CCD based holographic recording.
- Signal processing methods are developed for automated detection of face, facial parts, facial features and facial motion in recorded video.
- A method for generating and animating a 3D model of a human face is developed.

Representation:

- A method to represent 3D objects using multiresolution tetrahedral meshes is developed.
- A technique is developed to recognize head and hand gestures; the method is then used to synthesize speech-synchoronized gestures.
- A method for representing scalable 3D image-based video objects is developed.
- Software tools for easy description of 3D video objects are developed.

3D TV THE TRUE VISION

Coding and Compression:

- A technique to automatically segment stereo 3D video sequences is developed.
- A full end-to-end multi-view video codec is implemented and tested.
- A storage format for 3D video is developed.
- A proposal submitted to MPEG for multiview video coding by a Partner of our project was performed best in subjective tests among eight other proposals from different parts of the world.
- Multi-view test data sets using arrays of eight camera have been produced and made available to MPEG and general scienific community.
- Various 3D mesh compression, watermarking, hologram compression techniques, and methods for coding and rendering free-view point video are developed.

Transmission:

- An optimal cross-layer scheduling for video streaming is developed.
- An optimal streaming strategy under rate and quality constraints are developed.
- Different approaches for error concealment in stereoscopic images are developed.
- Color and depth representation based end-to-end 3DTV is further developed and tested.

Signal Processing Issues in Difraction and Holography:

- Analytical solutions for complex coherent light field generation by a deflectable mirror array device are developed.
- Fast methods to compute diffraction between tilted planes are developed and tested.
- Algorithms to compute 3D optical fields from data distributed over 3D space are developed and tested.

Display:

- Autostereoscopic displays for 3DTV are further developed.
- Viewer tracking autostereoscopic displays are further developed.
- Characterization and calibration techniques for various spatial light modulator based holographic displays are developed.

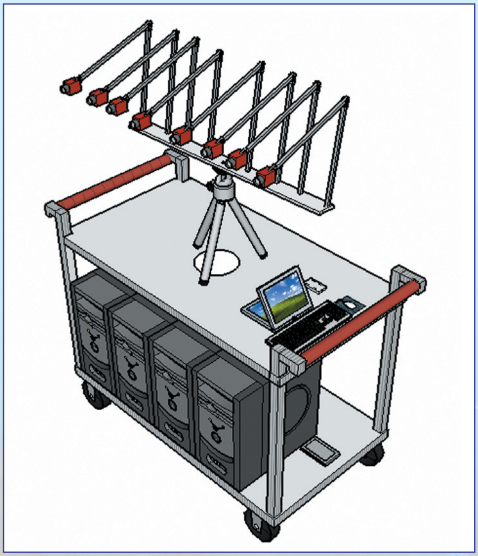
Information Society Technologies

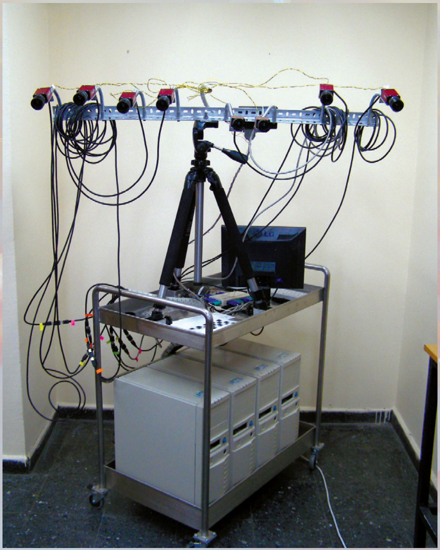
Bilkent's Multi Camera Capture System

by Bilkent University

Multi camera capture system developed by Bilkent University, Turkey is used for supplying test data sets to the members of 3DTV. Some of the data sets are also made available to general scientific research community.

The system is composed of 4 PCs running Microsoft® Windows® XP with any compiler for Win32 platform; e.g., Microsoft® Visual C++.





Specifications:

- Captures synchronized video
- Analog synchronization (up to 8 cameras)
- Robust video capture (@30fps in RGB24 format with frame resolution 640x480 and @50fps in RAW8 format with frame resolution 780x582)
- Easy to adjust camera parameters
- Modular design and easily expandable system

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KOC 3DLAB

by Koç University

KOC 3DLAB at Koç University, Turkey hosts an 8 camera multi-view video capture system and a Bumblebee stereo camera rig for 3D video acquisition and a large silver screen projection system with 2 synchronized projectors with polarization filters. To experience the 3D, the viewer requires to wear special glasses with similar polarization filters. In addition, 17 inch lenticular sheet which supports displaying 8 views without any glasses, and a Sharp 3D laptop which supports auto-stereoscopic display is hosted by the lab.

Stereowall

by Plzen University of West Bohemia

Stereowall in Plzen University of West Bohemia, Czech Republic:

- The size of the wall is 2,5 x 1,8 m
- The system uses the stereoscopic principle - different images for left and right eyes, passive polarized glasses, 120 Hz for switching left/right images
- The setup is used for experimental purposes in visualization and computer graphics fields
- Standard OpenGL and Microsoft® DirectX® interface is available.

PANORAMIC 3D MODEL ACQUISITION AND ITS 3D VISUALIZATION ON THE INTERACTIVE FOGSCREEN

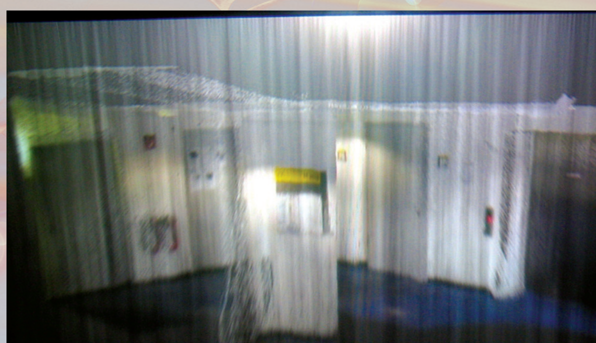
by University of Tuebingen

Top: Outdoor car scene. Bottom: Renderings of our whole institute's hallway.

For 3D model acquisition we developed a mobile platform ("The Wägele") that offers a flexible sensor setup. It is moved around manually to acquire sensor data. However, it could also be mounted on a mobile robot to acquire environments in a teleoperated way or on a pickup truck for outdoor acquisitions.

Our platform comprises an 8 Mpixel omnidirectional camera in conjunction with three laser scanners, no odometry is necessary. In our system, 3D models are acquired just by moving the platform around and recording all sensor data. The camera yields the texture for the 3D models.

To cover both the acquisition part and the visualization part of the 3DTV pipeline, we developed an interactive visualization on a novel walk-through 3D display that is based on the 2D FogScreen mid-air projection screen. The interactive FogScreen system in action is shown in Fig. 10, displaying our 3D model of the institute's hallway.



FogScreen Visualization: 3D Visualization of our 3D model on the Interactive FogScreen

ViPiD - Virtual 3D Person Models for Intuitive Dialog Systems

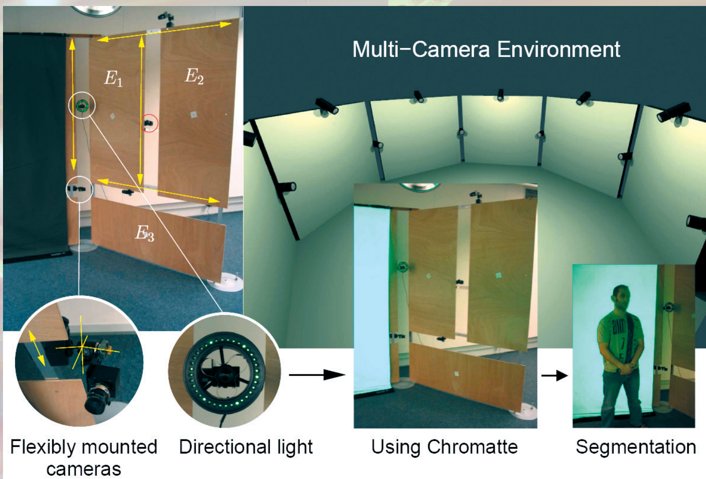
by University of Hannover

ViPiD developed by University of Hannover, is a complete framework for audio and 3D video capturing of one or several moving persons as well as the creation of 3D person models for intuitive dialog systems.Therefore a multi-camera environment for 3D scene analysis is setted up for incorporating aspects such as 3D/4D reconstruction, motion estimation, virtual camera integration, coding of time variant 3D meshes and free viewpoint video.

The system essentially consists of a multicamera system of 24 cameras and a stereoscopic display. The motion capturing process, which is concentrated on one or more moving foreground objects, is done in a markerfree fashion.

Such a multi-camera enviroment must be flexible, in order to arrange several different setups. The system consists of twelve wall segments. The segments can be configured e.g. enclosing a rectangle with 3 panel x 3 panel (5m x 5 m) segments or another setup can be circular arrangement of the cabin with approximately 5 m diameter. Cameras can be mounted flexibly in different positions. Also camera mounts have all three rotatory degrees of freedom.

Segmentation is an important issue in 3D reconstruction. To deal with this problem the cabin elements are covered with a special clothing called ChromatteTM. Illumination of the ChromatteTM with green LEDs causes reflection only in the direction of the incoming light. Therefore, each camera is equipped with a ring of LEDs (seeen on the figure) to yield optimal background reflection.

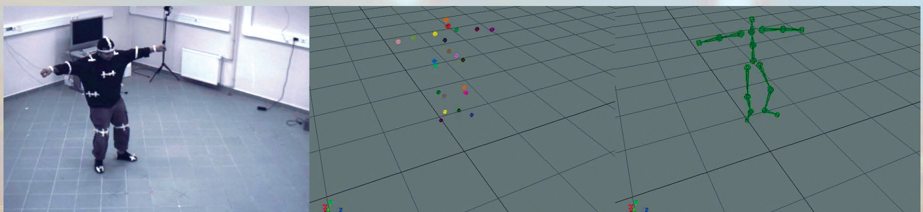


Yoğurt

by Yoğurt Technologies

An automated multi-camera motion capture system for articulated human body model animation has been setup at Yoğurt Technologies, Turkey. The multi-view video of a moving actor is acquired using 8 synchronized cameras.

The markers attached to the person's body using stereo color information are tracked without the need for an explicit 3D model. The 3D point cloud is mapped to a skeleton structure. Then this structure is used to animate a skeleton-based 3D human body model.



3D Display Systems of HHI

by Fraunhofer - Institute for Telecommunications, Heinz-Hertz-Insitute (HHI)

Next generation 3D interactive displays have been developed at HHI.

Free2C 3D-Display (High-Resolution Autostereoscopic Displays for Desktop Applications)

- No stereo viewing glasses needed
- Free positioning of a single viewer within an opening angle of about 60 degrees
- Excellent stereo separation (extremely low crosstalk)
- Very high spatial resolution (1200 x 1600)

Typical Applications

Appealing presentations in kiosk enviroments (trade shows, museums,etc)

Medical applications (endoscopy and minimally invasive surgery)

Design and engineering (similation and visualization)

Architecture (simulation and visualization of planned buildings)

Education and simulations (flight/drive simulators, training of complex operations)

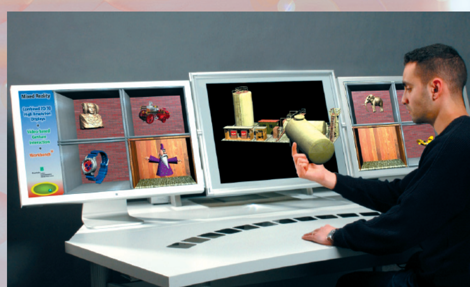
Entertainment (3DTV,PC games)

Free2C Kiosk (A 3D Kiosk for High-Tech Showrooms)

The Free2C Kiosk presents any kind of interactive content on a large display in photorealistic 3D quality (1600 by 1200 RGB pixels; 21.3" screen). Viewers don’t need 3D glasses to watch the content. A computer-vision system which recognizes hand gestures is integrated into the front panel. Displayed 3D objects floating in front of the screen can be rotated by simple gestures; virtual buttons can be pressed by pointing at them (virtual 3D touch screen)

Desktop Mixed Reality (Interactive workstation with combined 2D/3D displays and gesture interpretation)

The modular display system consists of a special stereo video projector flanked by two large LCD displays, an array of multiplebaseline stereo video hand trackers and three small desktop PCs, with all components integrated into a workbench.



Fogscreen

by Fogscreen Inc.

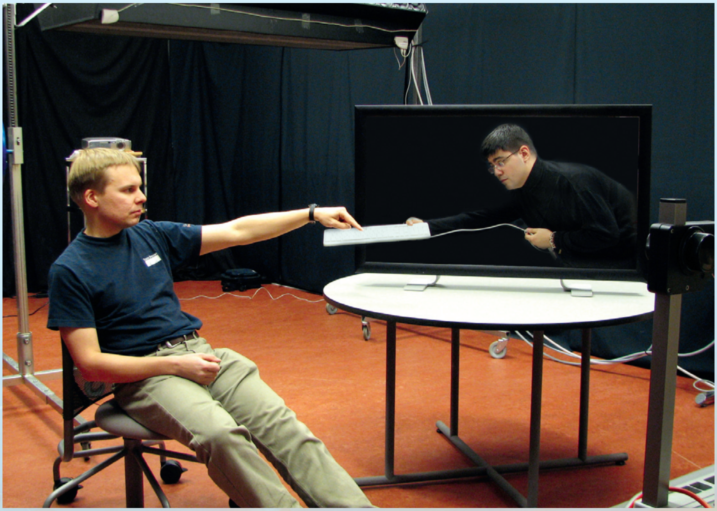
The breakthrough: A thin curtain of "dry" fog that serves as a floating, translucent projection screen, showing images that literally float in the air. FogScreen™ machines employ a patented technology to create a smooth foggy airflow from pure tap water and ultrasonic waves – no chemicals needed. Any image or video projected onto FogScreen™ is spectacular in normal daylight, the darker the room, the more opaque the image.

The beauty of FogScreen™ is that anything you can see on a computer screen can now float in the air. At some shows, for example, designers create "doors" to displays that don't have to be opened – you simply walk through them.

FogScreen Inc. I Tammasaarenkatu 1 I 00180 Helsinki I Finland
Tel. +358 20 7118 610 I fax. +358 20 7118 611
www.fogscreen.com

TUT-ISP: Partner at the 3DTV NoE

by Institute of Signal Processing of Tampere Univeristy of Technology

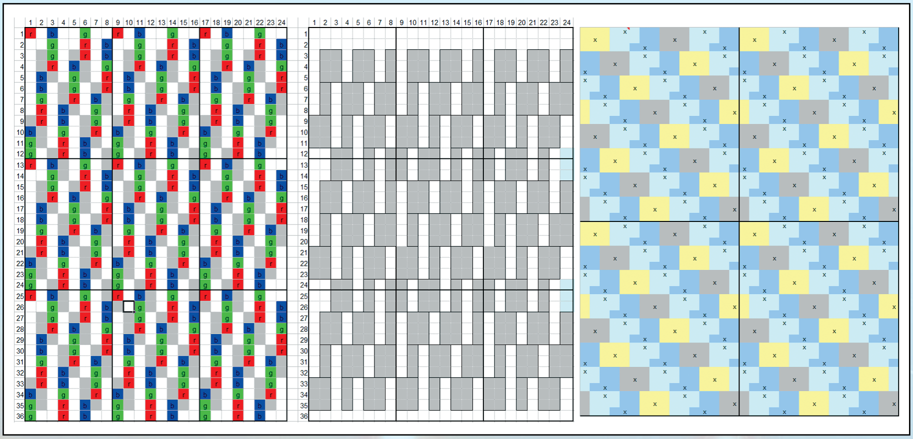


Within the European 3DTV NoE, TUT-ISP team has been specializing in the areas of fast transform-based methods for processing of optical signals, advanced filtering for autosterescopic displays, multiple description coding of stereoscopic video and 3D geometry, and assessment of perceived quality of 3D video content.

Cross-talk measurements and perceptually-driven antialiasing filtering and cross-talk compensation for multi-view displays.

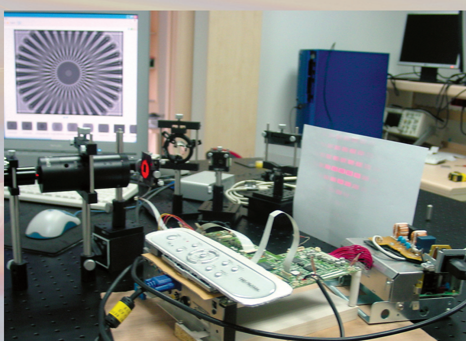
A methodology for measuring inter-channel cross-talk in multi-view displays has been developed.

An optimized filter, based on the lenticular sheet topology, simultaneously performs interzigging, antialiasing, and perceptually-driven cross-talk compensation to deliver a best quality picture to the viewer.

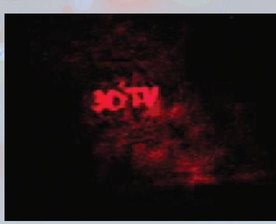


SLM based Holographic Display

by Bilkent University



- SLM data: 0,7" diagonal, 1280x720 pixel matrix, 12x12 µm pitch
- Max diffraction angle: 1,5 degree
- Hardware driver – build in projector
- Semiconductor laser 635 nm, 35 mW



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