3DC2 : a multiple view interactive platform

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RÉSUMÉ

Cet article présente un prototype de 3DC2[1], un système interactif multi-opérateur multi-vues. Ce système a pour principale caractéristique la possibilité de présenter deux vues 3D stéréoscopiques distinctes à deux opérateurs travaillant sur la même surface interactive. Il a pour cible applicative des contextes de travail coopératif pour lesquels la 3D est primordiale. Il est démontré sur un scénario de surveillance urbaine à base de drones aéroportés.

Mots Clés
Stereoscopic display, cooperative work, tactile interaction

ACM Classification Keywords

I.3.1 Hardware Architecture

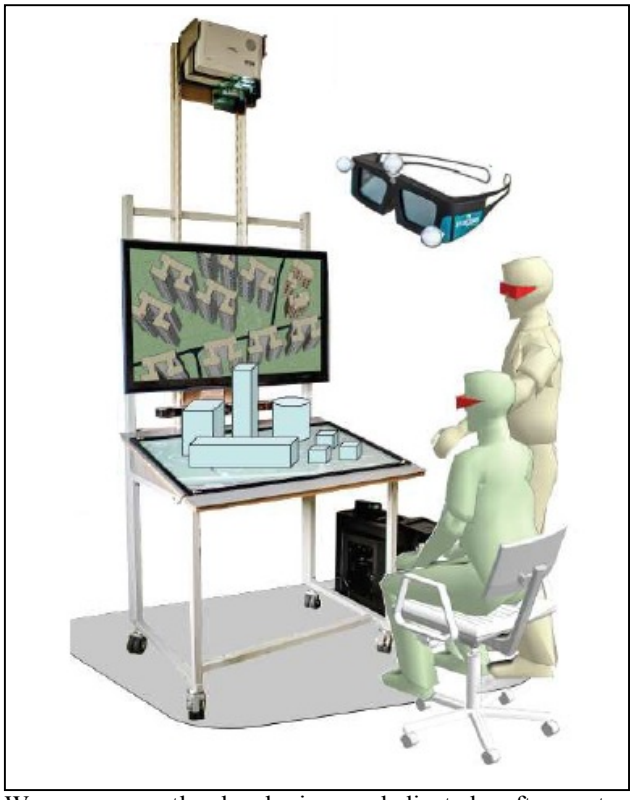
H.5.2 User Interfaces

H.5.3 Group and Organization Interfaces

DESCRIPTION OF THE SYSTEM

The system is made up of a PC, equipped with a Nvidia graphics processing unit, supporting various applications such as, a (PQ-labs) touch table, 3D viewers and interfaces, geolocation software tools etc.

Various display options are possible, such as HDTV or 3D ready TV, combined with a silver screen, serving as a common operating reference. The silver screen can be equipped with a touch frame and the HDTV with a touch screen. Two 3D triggered projectors complete the hardware. The channel selection is obtained by especially designed 3D glasses, enabling the encoding of various video streams in time and/or polarisation. A geo-location system enables the detection of the viewer positions around the table. Glasses can be optionally equipped with an accelemoter to select, w.r. to a given solid angle, 3D or 2D separated viewing modes. The system is capable of supporting 5 different views, at the video rate (60 Hz), which can be displayed separately or merged. Thanks to the viewer geo-location system and the touch screen, these views can be correlated, if mandated. For instance, 4 views can be encoded to provide a full 3D dual view, for two independent viewers (e.g. pilot for navigation and operator for weapon system). Another possibility is to provide 4 independent visual streams which can be displayed on the same screen and seen by four different operators



We are currently developing a dedicated software to mitigate the possible crosstalk between channels which can be a critical issue in configurations where the four pictures are different and displayed on the same screen. The 4 views are provided by two 3D DLP projectors. An additional visual reference (the 5th view) can be displayed on a common TV monitor thanks to the HDTV (active or passive) as illustrated on the picture above. We propose two examples of technical capabilities illustrating the concept of this new product :

a) 3D dual view: both operators can see two different 3D representations of a scene (or the same but with different angles of view). In addition, the computer determines the

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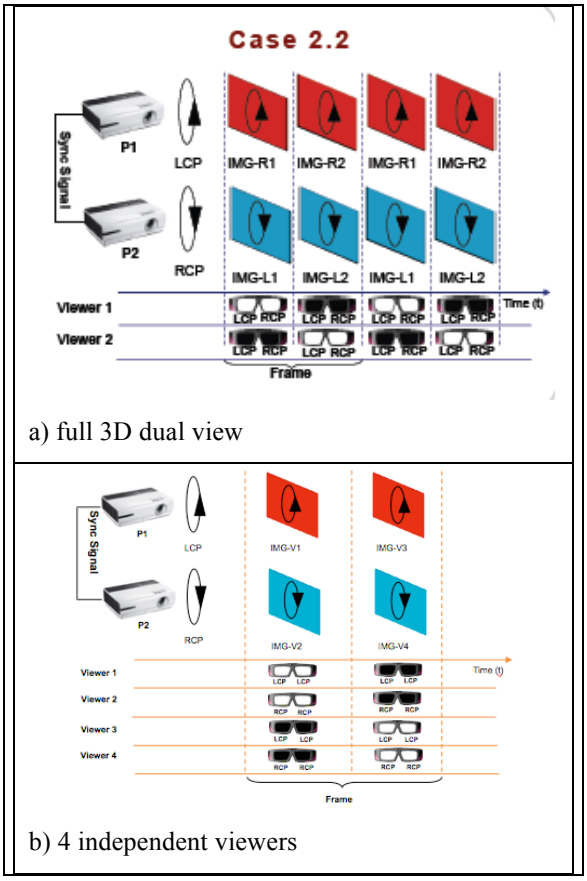
orientations of this view, with respect to the operator location so that he can move with respect to the objet, either by using the touch screen, being himself steady and moving the objet or the object being steady and the operator moving around the table. Both views can be linked or not. A third operator can be, for instance, a mission moderator, supervising the mission on the HDTV (with or without a touch screen) and pointing out some forbidden actions or motions. The glasses are potentially usable for a 3D dual view mode, or in a multiple operator configuration by a simple programming, and the operator can also switch them between 3D and 2D mode, thanks to the accelerometer, if necessary.

b) Multiple viewers (here 4) can operate around the same table displaying various complementary functions or independent views. The glasses do not operate in this case in alternated mode (left and right). Both eyes are open or closed at the same time but always at the satisfying video rate (60 Hz). Channel separation is obtained by mixing orthogonal time and polar sequences. 4 different views are displayed on the same common screen. Some of these views can be correlated or not. A common reference on a fifth view can be used as previously. In this case a dedicated ghost-busting algorithm should be used to prevent possible image crosstalk, in particular when the views are different.

The table below shows how the glasses are used according to user cases a and b:



a) full 3D dual view

b) 4 independent viewers

APPLICATIONS

We propose two examples of functional uses to illustrate the concept :

a) The multiple-view system can be used, for instance in an urban warfare context for mission preparation. It could allow two specialized operators to collaborate in order to prepare the entry of a friendly force in a hostile urban zone. Such zones are very dense in terms of interconnections, hidden underground passages, high-rise buildings, intelligence about enemy positions and objectives. The system allows two operators to navigate in a 3D-stereoscopic-rendered model of the urban zone, with a common geographical reference to allow interaction between operators. All the while maintaining this common reference, each operator observes different aspects of the information available, e.g. underground networks versus aerial geometry of the buildings. This would allow the intuitive exploitation of the full gamut of intel available while using the 3D, for example to check angles of view for the friendly or enemy forces.
b) The system could be used in a similar way for Signal Intelligence, Electronic Intelligence, etc., to allow several expert operators (2 or 4) to work on a common display reference, in order to maintain situational awareness and cooperation, all the while giving them access to the complex data visualization and processing interfaces that they need. In addition, in a 2-operator configuration, the depth cues could be used in novel ways to represent information such as the threat level of tracks or staleness. Above applications concern mainly the defence domain, but can be easily extended to other fields such as Industry (especially *Process Industry* with *control-command rooms*), Logistics and Transport (with *supervision platforms*), Corporate (with *sophisticated show-rooms*), etc…

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