

# Three-dimensional musical instrument

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12 décembre 2013

## 1 Introduction

## 2 Écrans 3D

- Two-view 3D displays
- Horizontal parallax multiview 3D displays
- Full parallax multiview 3D displays
- Second categorisation
- Second categorisation : Visual cues
- Second categorisation : 3D Display definition
- Second categorisation : 3D Display taxonomy
- Second categorisation : Novel points

## 3 Le DRILE

## 4 Implémentation

## 5 Conclusion

- **Context** : Conceiving a modern musical instrument that can be used in conjunction with a 3D display.
- **Goals** :
  - Understand 3D displays technologies
  - Implement 3D-enabled visualization methods for two new musical instruments : DRILE and the Aerial Percussion
- **Problem** : There are numerous kind of 3D displays. What is the most adapted to the situation ?

# Écrans 3D

## Two-view 3D displays

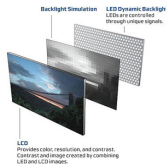
- Wavelength Selective Displays :
  - Each eye receives the image intended for it
  - Images are filtered
- Advantages :
  - Any color display device can be used to present the stereoscopic
- Inconvénient :
  - Each eye is seeing a different color stimulus



- Time-Sequential Two-View Displays :
  - Time-Sequential Polarization :
    - Pair of passive polarizing glasses
    - Each lens is polarized in one direction
    - The image displayed on the screen is actually composed of two images



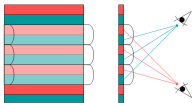
- Time-Sequential Two-View Displays :
  - Time-Sequential Backlight :
    - Auto-stereoscopic technology
    - Backlight technique
    - Having a light source in each side of the screen with a waveguide surface between them.



# Écrans 3D

## Horizontal parallax multiview 3D displays

- Parallax Barrier Displays :
  - This is an autostereoscopic technique.
  - It provides a terrain vision without wearing glasses.
- the disadvantages :
  - It must be placed precisely in relation to the screen.
  - Must be stable.
  - It does not allow viewing of the stereoscopic image at the same time several viewers.



- Multi-Projector Displays :

This technique involves a position in a circle several video projectors displaying all an angle different image after these images are projected on a special screen.

- Advantage :

- Size of the 3D image can be much larger it is no limit.

- the disadvantages :

- Multiple projectors are needed (projector view)
- Headlamps must be accurately aligned.



# Écrans 3D

## Full parallax multiview 3D displays

This type of display allows viewers to view a 3D scene from any angle.

- Integral Imaging Displays :
  - It is a way of auto-stereoscopic 3D display, which was originally proposed by Lippmann in 1908.
  - This technique consists in using a network of micro-lenses in front of each lens where the image is different depending on the viewing angle.

# Analyse

- For a 3D display :
  - Eye position
  - Resolution (pixels) display area
  - Constraints on the position of the head
- Application :
  - cinema
  - reporting and advertising
  - 3D for mobile devices
- The Stereoscopic Stereoscopic technologies and
- holography

- Based on "A Comprehensive Taxonomy for Three-dimensional displays".
- Paper problematic :

Profusion of technologies  $\implies$  Classification difficult.

- 1 First part : visual cues used by the human brain to define 3D vision.
- 2 Second part : Definition of the properties of 3D screens.
- 3 Third part : Presentation of the taxonomy created in this article.

## Physiological cues

Binocular disparity

Convergence

Accommodation

## Psychological cues

### Static cues

Shades and nuances

Occlusion

Perspective

### Dynamic cues

Movement parallax

Cinetic depth

A 3D display makes use of at least one physiological cue.

Hence, it cannot be emulated strictly on the software side.

- Two axes
  - Number of views : Duoscopic, multiscopic, omniscopic
  - Depth : Flat, deep
- Two novel points in the article :
  - Multi-directional display : deep multiscopic.
  - Virtual volume display : flat omniscopic.

## 1 Virtual volume display

- Either adaptative optics and Pepper Ghost derivatives or holographic systems :  
<http://www.youtube.com/watch?v=Y1m7xEzlhWA>.
- Only method that is able to present every single physiological cue.

## 2 Multi-directional display

- Finite number of subdivisions but up to a 360 deg FoV.
- Two possibilities :
  - Rotative screen
  - Multiple anisotropic screens. Light has to go in a single direction.

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## Implémentation ici

C'est cool le per