Stereoscopic images database

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Outline

- Motivation
- Design of the database
- Possible applications
Motivation
3D QoE is multi-dimensional

3D QoE is multidimensional. It depends on:

- Pictorial quality
- Depth
  - Quality
  - Quantity
- Visual (dis)comfort

➢ Proposition of a database of images having different characteristics
## Motivation

The perception of depth

<table>
<thead>
<tr>
<th>Light and shade</th>
<th>Relative size</th>
<th>Interposition</th>
<th>Blur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texture gradient</td>
<td>Areal perspective</td>
<td>Linear perspective</td>
<td>Height</td>
</tr>
</tbody>
</table>

- **Disparity** = X - Y
- **Fixation**
- **Vergence**
- **Accomodation**
- **Focal distance**

![Brain diagram](image)
Outline

- Motivation
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Selection of the images

Sources

Images comes from different open sources:

- EPFL – “3D Image quality assessment” (3DIQA) [1][2]
- MMTG – “Open source database of images DEIMOS” [3][4]
- RMIT University and Alex and Jono Films – “RMITV” [5][6]
- IRCCyN / IVC – “NAMA3DS1-COSPAD1” [7][8]
- IRCCyN / IVC - New images (Panasonic AG-3DA1E twin-lens Camera / Fujifilm FinePix Real 3D)
- Elephants Dream [9]

[1] Lutz Goldmann, Francesca De Simone, Touradj Ebrahimi: "Impact of Acquisition Distortions on the Quality of Stereoscopic Images", 5th International Workshop on Video Processing and Quality Metrics for Consumer Electronics (VPQM), Scottsdale, USA, 2010
Selection of the images
Objective of the database

- Study the contribution of monocular & binocular depth cues to the general construction of depth perception in images

Images have:
- Different amount of binocular depth
- Different level of monocular depth cues
  - Linear perspective
  - Relative size
  - Texture gradient
  - Defocus blur

Image format: 1920x1080
Selection of the images
Matrix of images characteristics

Increase of monocular depth cues (in this case, defocus blur)
Selection of the images
Matrix of images characteristics

Selection process:

- Evaluation of images on monocular & binocular depth (2 expert observers)
  - monocular on 7 scales: linear perspective, relative size, texture gradient, interposition, light and shades, areal perspective, defocus blur.

- For each monocular depth scale (linear perspective, relative size, texture gradient, defocus blur):
  - select images with desired amount of monocular & binocular depth
  - attempt to minimize other depth cues
Evaluation of the monocular depth cues

Linear perspective

Please evaluate the linear perspective taking into account if there are clear visible vanishing lines within the image and if these vanishing lines contributes to the perception of the different depth layers in the scenes. This depth cues is stronger as clear linear perspective is visible.
Evaluation of the monocular depth cues

Relative size

Please evaluate the relative size by considering if there are repeating objects in the scene which appears with difference size. You should also use your knowledge about the size of the individual objects for the rating. The rate should depend on the number of occurrence an object appears with different size. This depth cue is stronger when objects are repeated with a lot of time at different size.
Evaluation of the monocular depth cues

Texture gradient

Please evaluate the texture gradient based on the fact that there is a texture within the image (more generally you can consider the repetition of patterns) which become finer when the distance to the camera increases. This depth cues is stronger when there is a strong variation of the granularity of the texture or pattern.
Evaluation of the monocular depth cues

Interposition

Please evaluate the interposition based on the number of overlapping objects in the scenes. The overlapping of one object over another provides the ability to order the position in depth of the objects. Please evaluate the interposition considering how the number of overlapping object helps to be aware of the absolute position in depth of the objects using all the interpositions. This depth cues is stronger when there is a lot of objects overlapping at different absolute position in depth.
Evaluation of the monocular depth cues
Light and shades

Please evaluate the light and shades based on the presence of a light source and the resulting shades which help to apprehend the shape of the objects. This depth cue is stronger when there is a light source which enables to see the real shape of the object which would have appeared flat otherwise.
Please evaluate the areal perspective based on the effect of the atmosphere in the image. For example, objects which are far away will have a color close to the color of the sky. This depth cue is as strong as there is a smooth transition of the color of the sky to the elements in the background which usually do not have this particular color of the sky.
Evaluation of the monocular depth cues
Areal perspective

Please evaluate the defocus blur based on the variation of the sharpness at different location of the image explicating variation of the distance of the object to the focal point of the camera. This depth cue is as strong as there are strong variations between the sharp and blurred area in the images.
Selection result
Selection of the images
Linear perspective (50 images)
Selection of the images
Relative size (50 images)
Selection of the images
Texture gradient (50 images)
Selection of the images
Defocus blur – processing

Blurring based on depth map
Gaussian blur / Circle of confusion based on depth
Selection of the images
defocus blur (50 images)
Selection of the images
Distribution of sources

Distribution of sources

- EPFL: 47%
- MMTG: 27%
- RMIT: 12%
- IRCCyN: 4%
- New Images: 7%
- Elephants Dream: 3%
Outline

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Possible applications

- Evaluation of perceived depth based on monocular/binocular depth cues
- Evaluation of effect of coding on 3D QoE depending on content characteristics
- Study of comfort & link with monocular depth cues
- Evaluation of depth rendering quality
- ...
What is provided

- 200 stereoscopic images
- Estimated depth map