Stereoscopic images database

Pierre Lebreton, Alexander Raake, Marcus Barkowsky, Patrick Le Callet

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Outline

- **Motivation**
- Design of the database
- Possible applications

Motivation
3D QoE is multi-dimensional

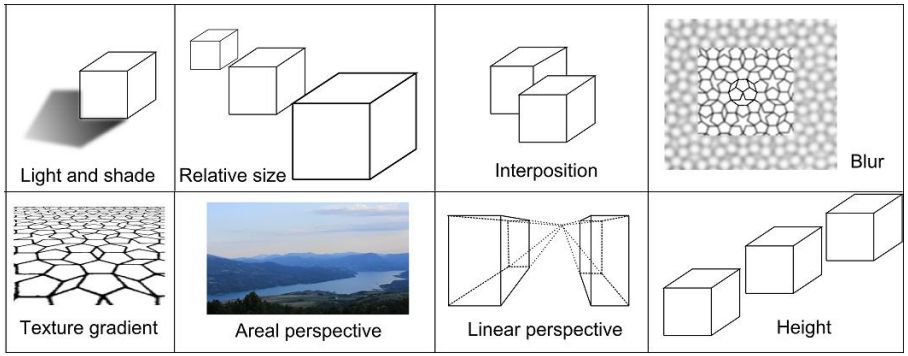
3D QoE is multidimensional. It depends on:

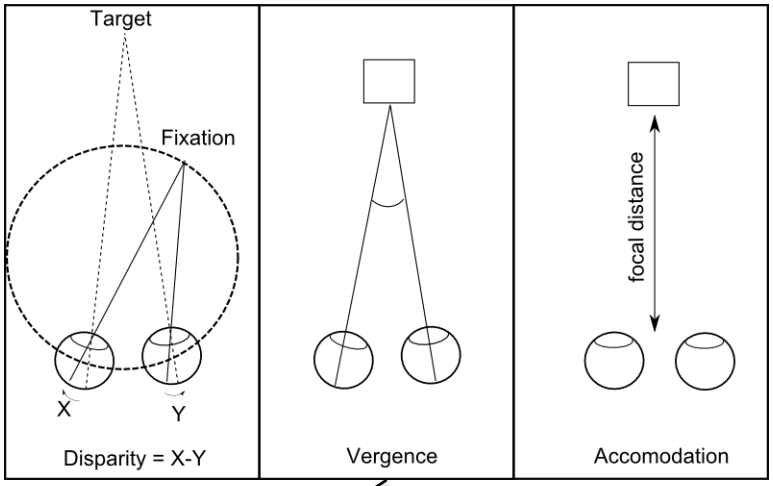
- Pictorial quality
- Depth
  - Quality
  - Quantity
- Visual (dis)comfort

➢ **Proposition of a database of images having different characteristics**

Motivation

The perception of depth





Outline

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- **Design of the database**
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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 dabase 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

[2] http://mmspg.epfl.ch/3diqa

[3] Karel Fliegel ; Stanislav Vítek ; Miloš Klíma and Petr Páta: "Open source database of images DEIMOS: high dynamic range and stereoscopic content", Proc. SPIE 8135, Applications of Digital Image Processing XXXIV, 81351T (September 23, 2011);

[4] http://www.deimos-project.cz/tag/stereo

[5] E. Cheng, P. Burton, J. Burton, A. Joseski, I. Burnett, "RMIT3DV: Pre-Announcement of a Creative Commons Uncompressed HD 3D Video Database," in Proc. 4th International Workshop on Quality of Multimedia Experience (QoMEX 2012), Yarra Valley, Australia, 5-7 July 2012

[6] http://www.rmit3dv.com/download.php

[7] Matthieu Urvoy, Jesús Gutiérrez, Marcus Barkowsky, RomainCousseau, Yao Koudota, Vincent Ricordel, Patrick Le Callet and Narciso García, "NAMA3DS1-COSPAD1 : Subjective video quality assessment database on coding conditions introducing freely available high quality 3D stereoscopic sequences", Fourth International on Quality of Multimedia Experience, Yarra Valley, July 2012.

[8] http://www.irccyn.ec-nantes.fr/spip.php?article954

[9] http://www.elephantsdream.org/

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

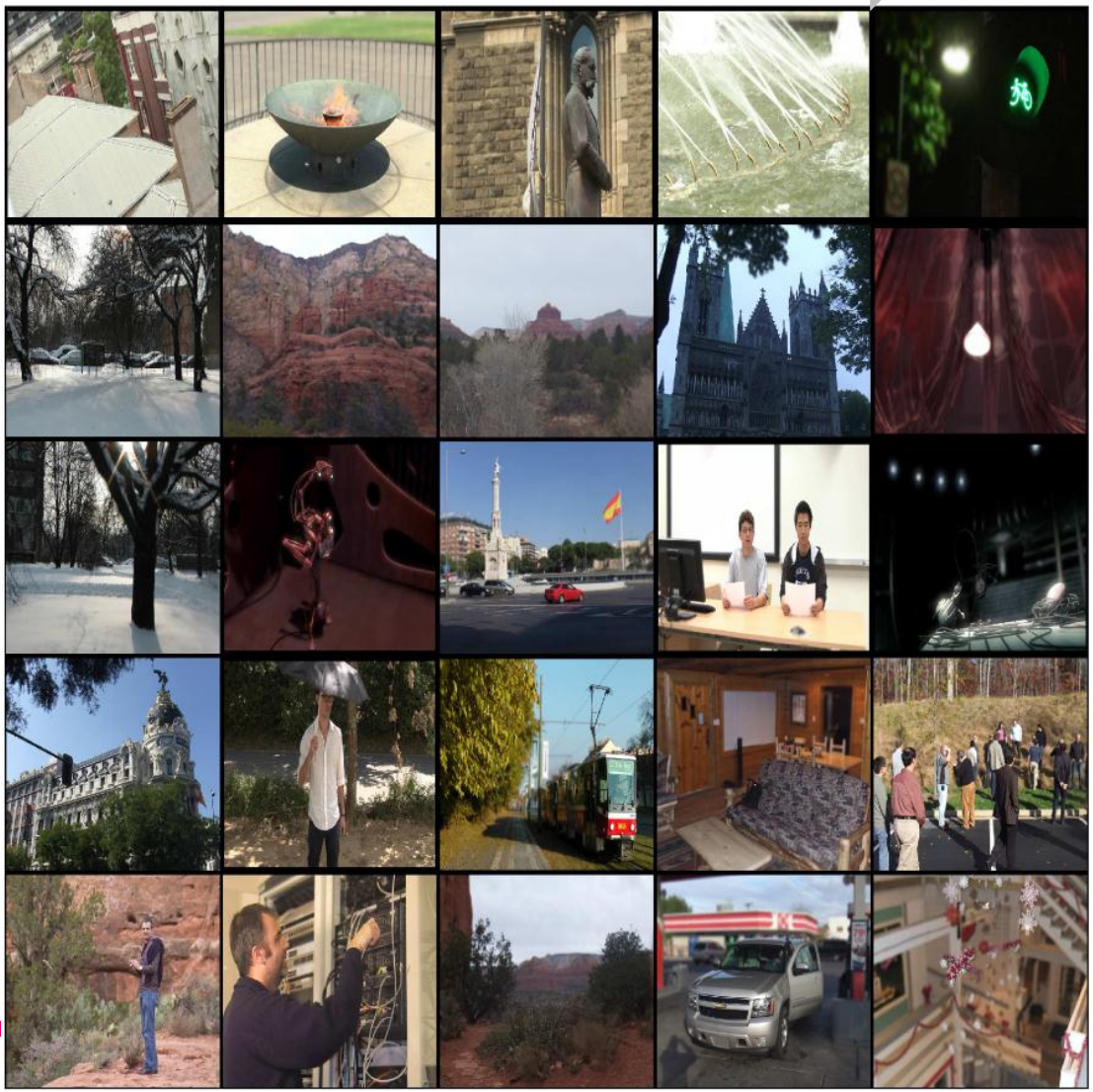
Image format: 1920x1080

Selection of the images

Matrix of images characteristics

Increase of monocular depth cues (in this case, defocus blur)

Increase of binocular depth cues



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):

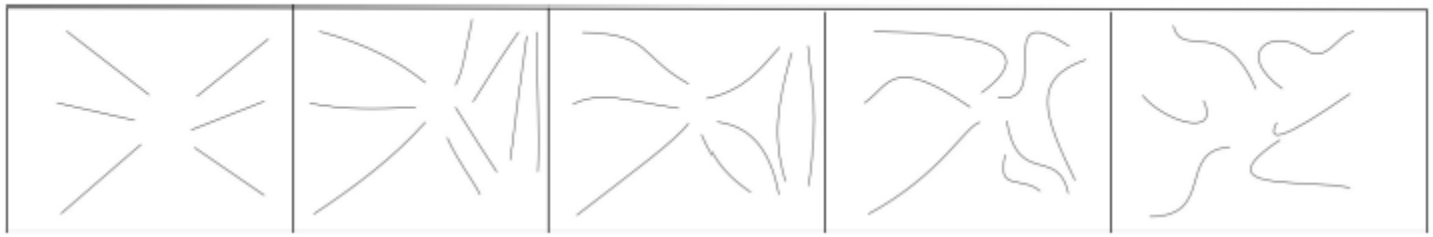
  - select images with desired amount of monocular & binocular depth

  - attempt to minimize other depth cues

Evaluation of the monocular depth cues

Linear perspective

Strong Low

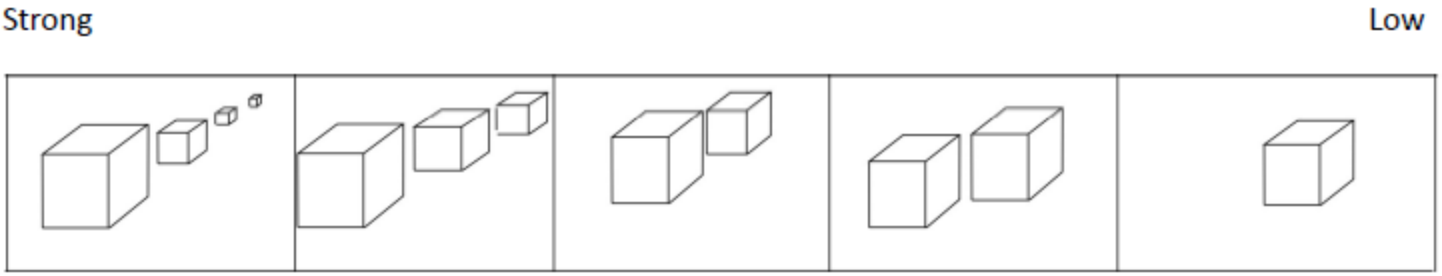


Please evaluate **the linear perspective** taking into account if there are clear visible vanishing lines within the image and if these vanishing lines contributes to the perception of the different depth layers in the scenes. This depth cues is stronger as clear linear perspective is visible

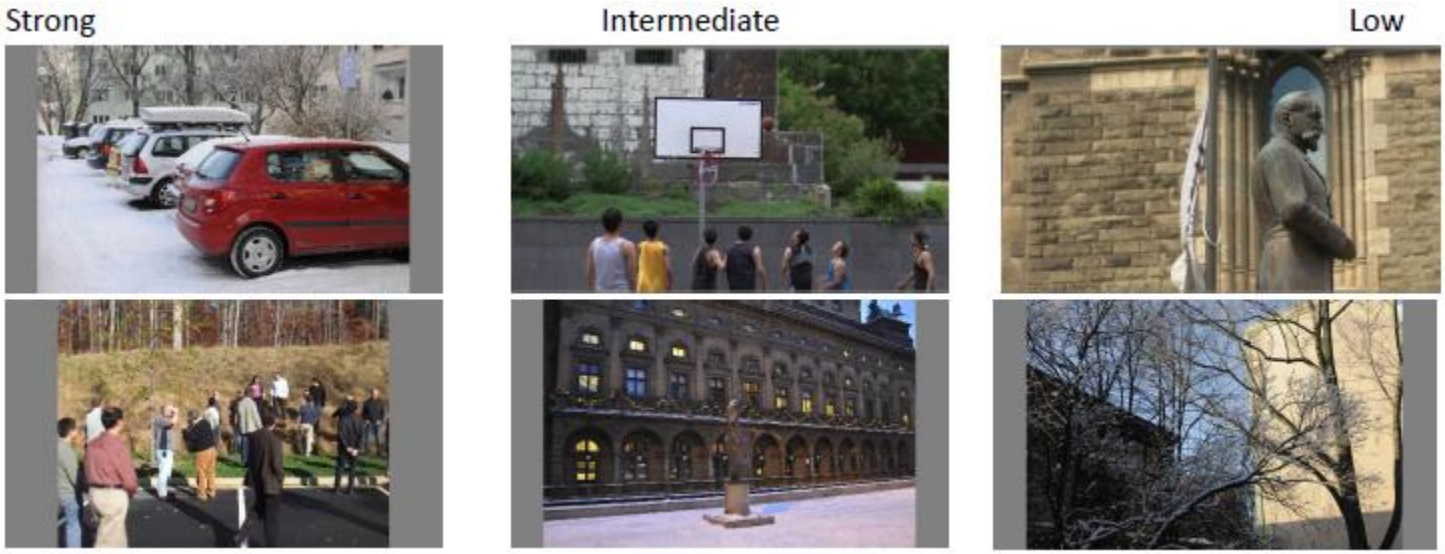
Strong Intermediate Low

Evaluation of the monocular depth cues

Relative size

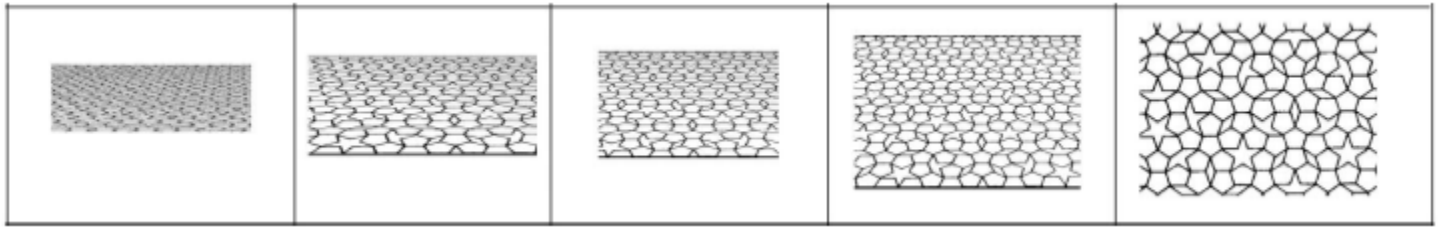


Please evaluate **the relative size** by considering if there are repeating objects in the scene which appears with difference size. You should also use your knowledge about the size of the individual objects for the rating. The rate should depend on the number of occurrence an object appears with different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



Evaluation of the monocular depth cues

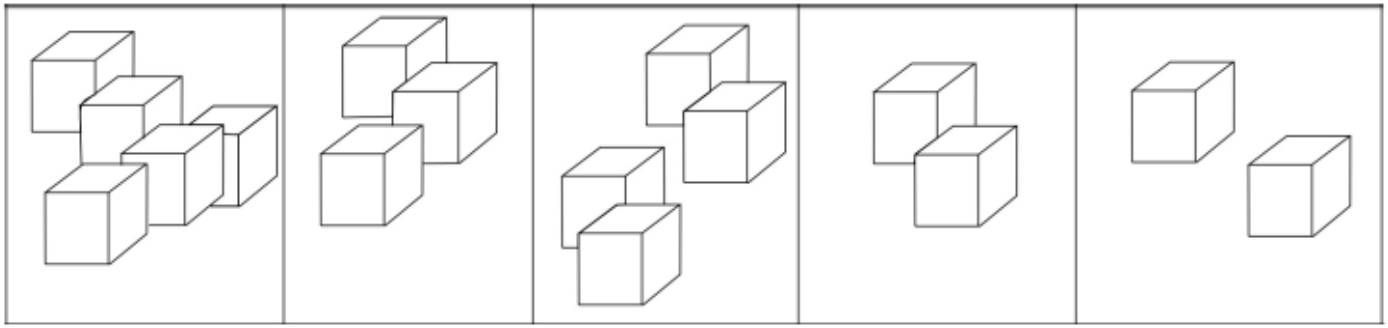
Texture gradient



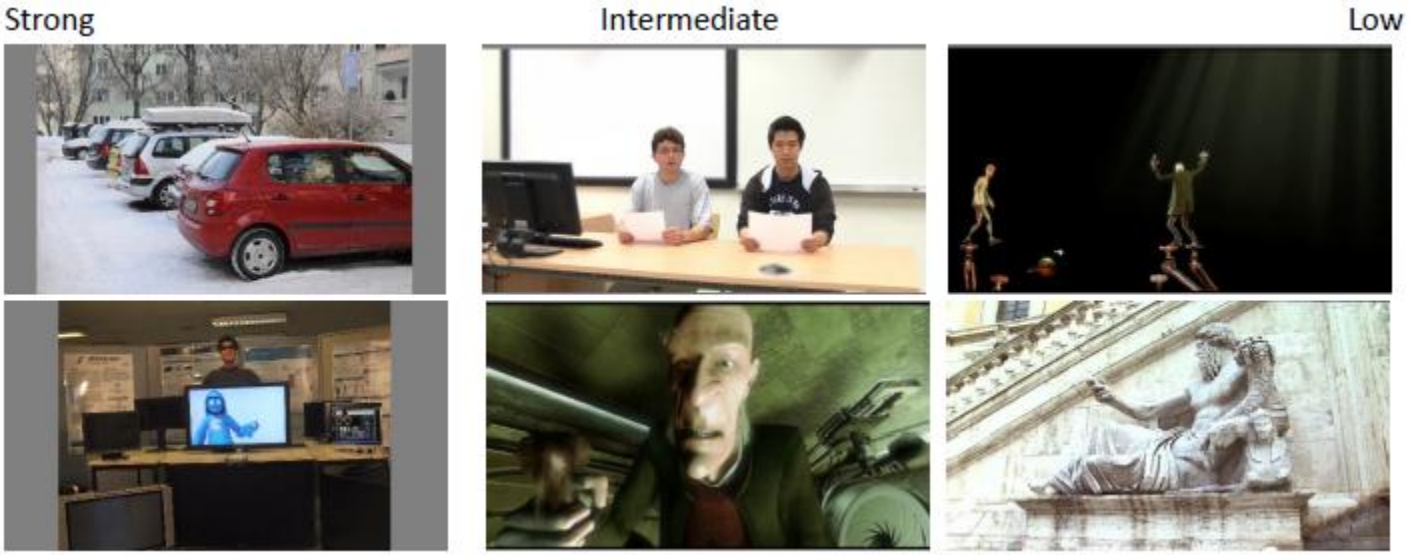
Please evaluate **the texture gradient** based on the fact that there is a texture within the image (more generally you can consider the repetition of patterns) which become finer when the distance to the camera increases. This depth cues is stronger when there is a strong variation of the granularity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

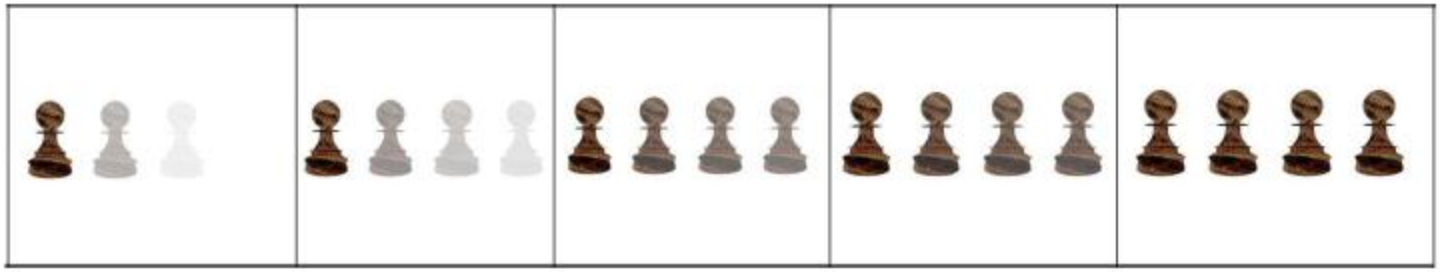
Light and shades

Please evaluate **the light and shades** based the presence of a light source and the resulting shades which helps to apprehend the shape of the objects. This depth cue is stronger when there is a light source which enable to see the real shape of the object which would have appeared flat otherwise .

Evaluation of the monocular depth cues

Areal perspective

Strong Low



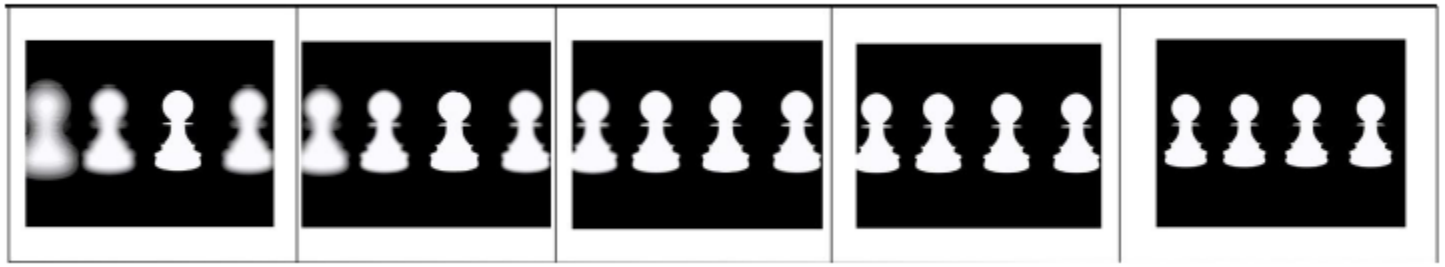
Please evaluate **the areal perspective** based on the effect of the atmosphere in the image. For example, objects which are far away will have a color close to the color of the sky. This depth cue is as strong as there is a smooth transition of the color of the sky to the elements in the background which usually do not have this particular color of the sky.

Strong Intermediate Low

Evaluation of the monocular depth cues

Areal perspective

Strong Low



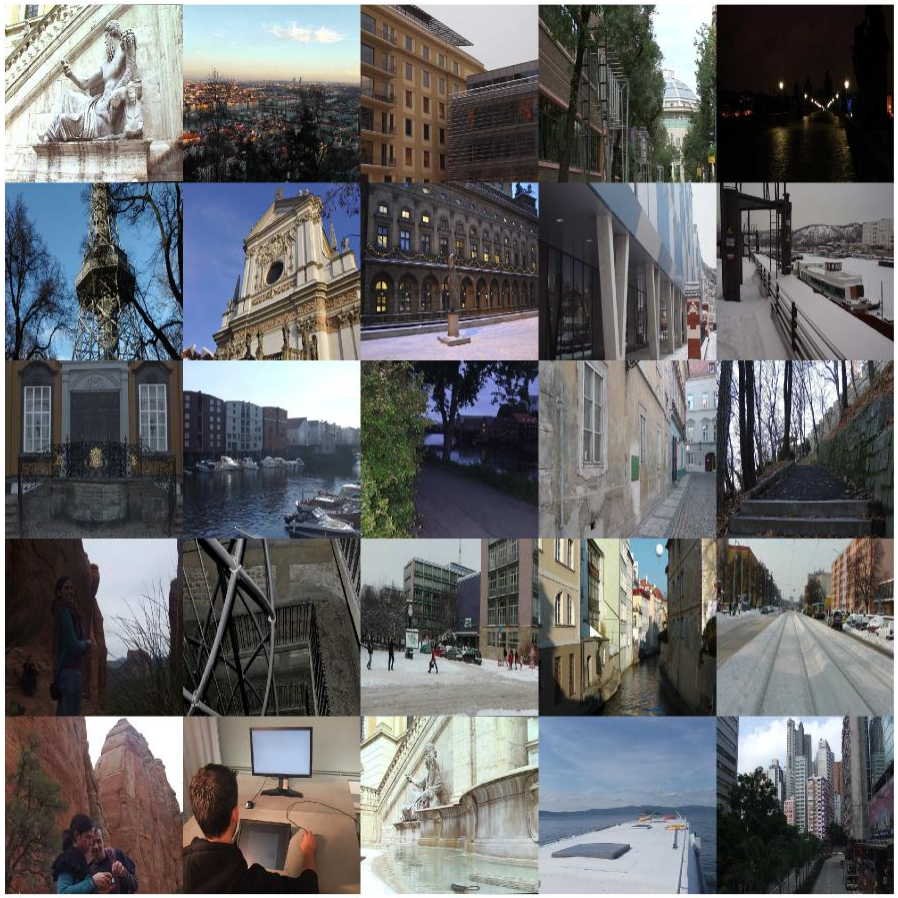
Please evaluate **the defocus blur** based on the variation of the sharpness at different location of the image explicating variation of the distance of the object to the focal point of the camera. This depth cue is as strong as there are strong variations between the sharp and blurred area in the images.

Strong Intermediate Low

Selection result

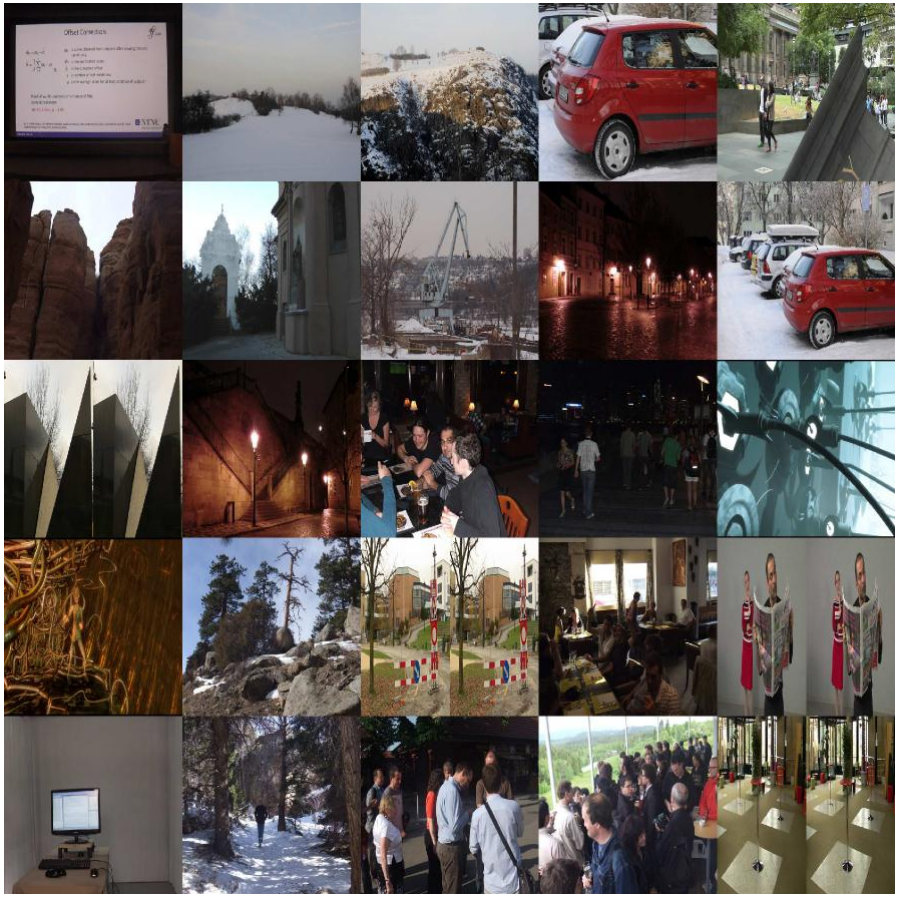
Selection of the images

Linear perspective (50 images)



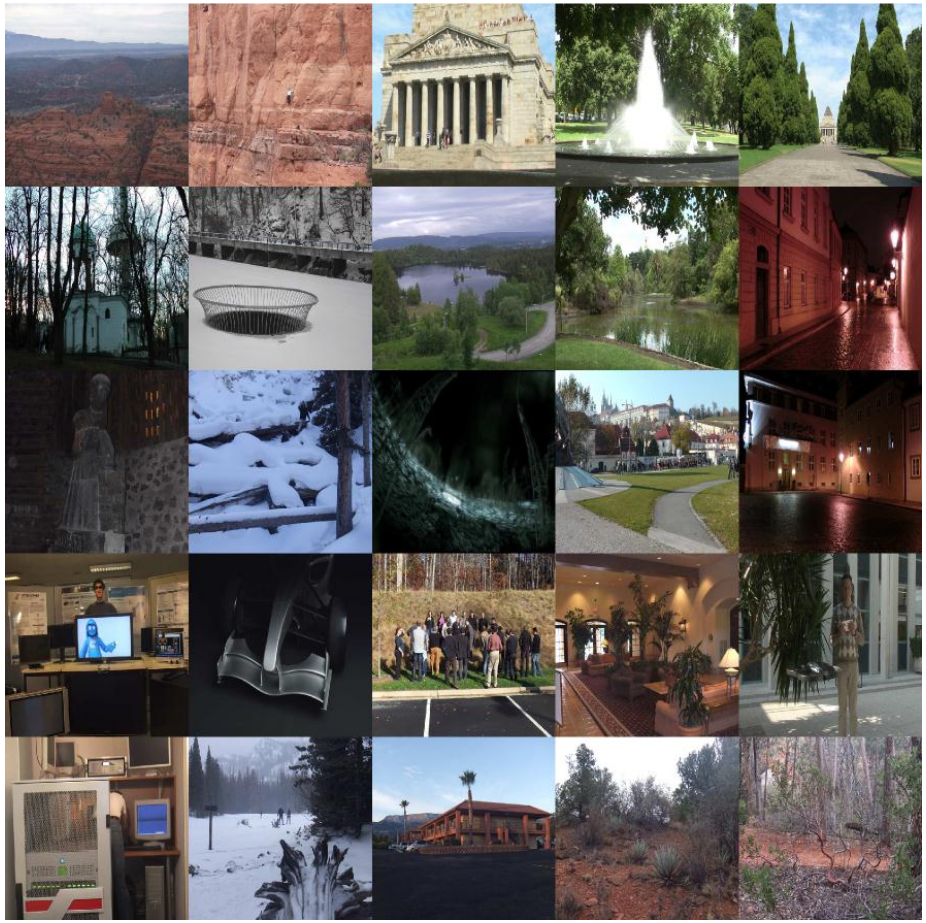
Selection of the images

Relative size (50 images)



Selection of the images

Texture gradient (50 images)

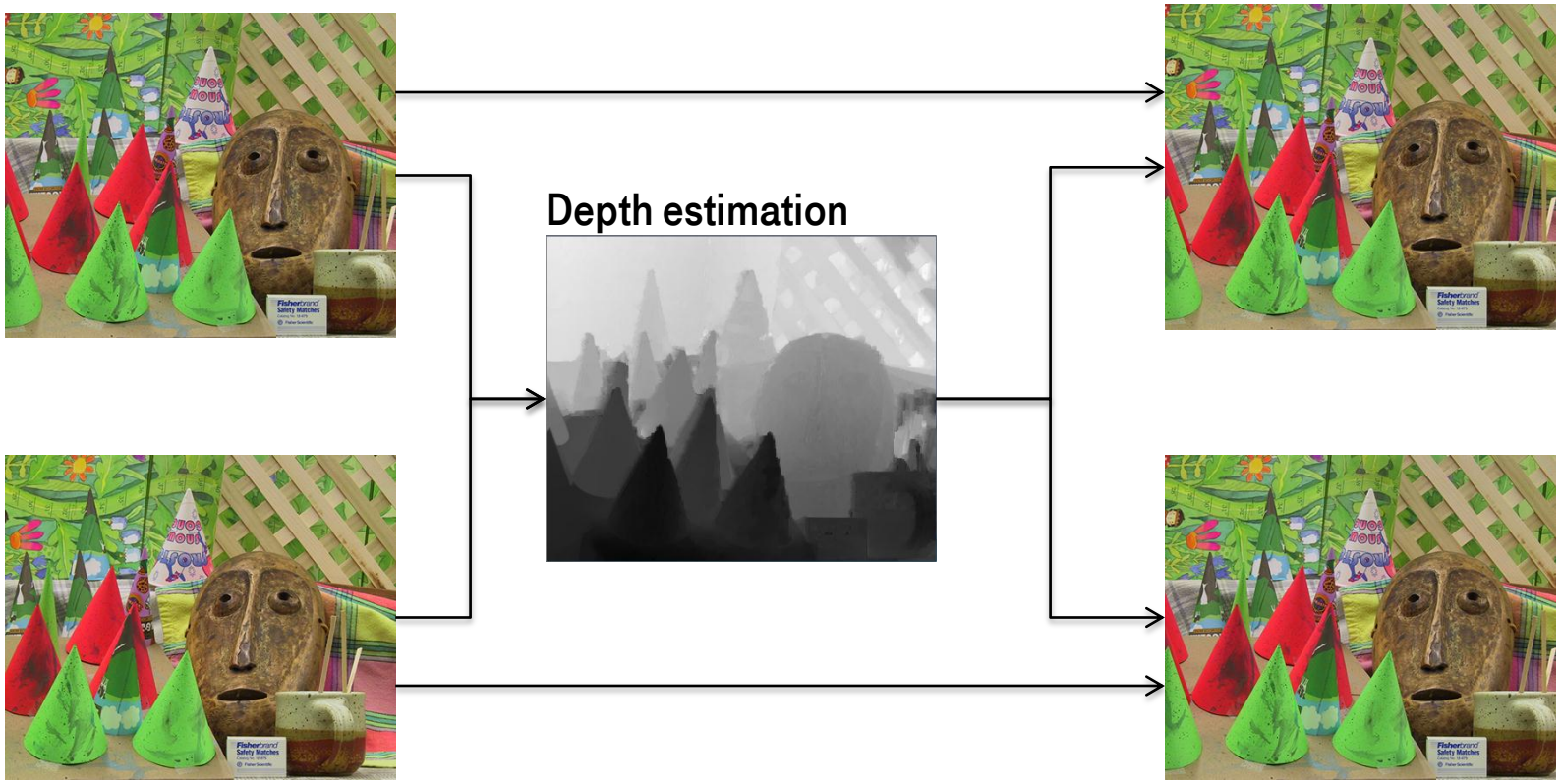


Selection of the images

Defocus blur –processing

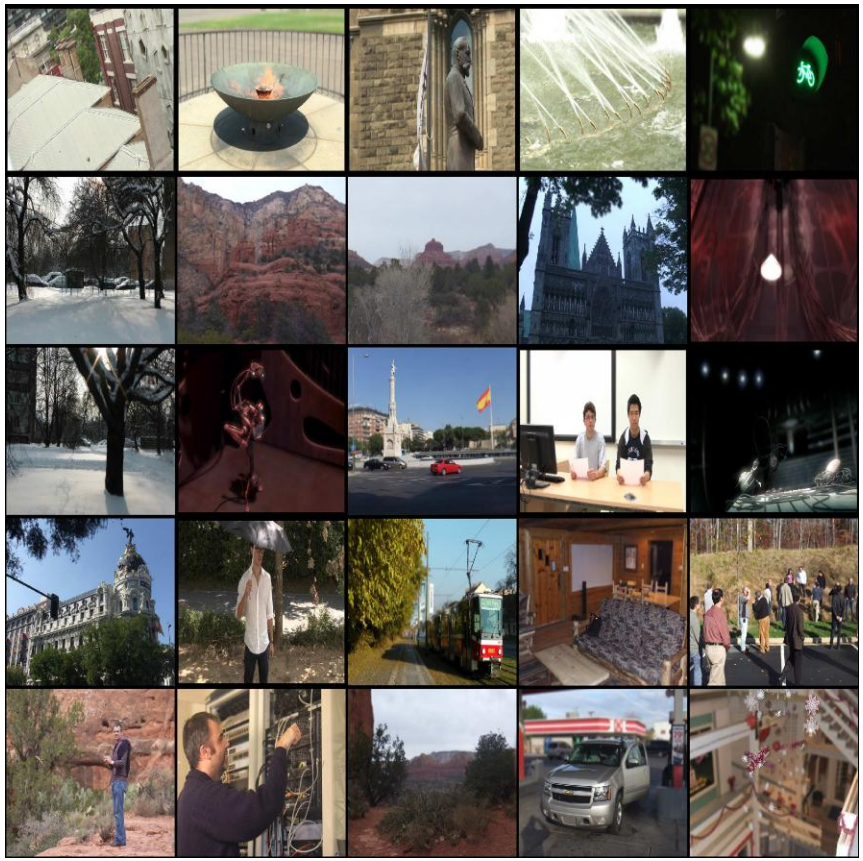
Blurring based on depth map

Gaussian blur / Circle of confusion based on depth

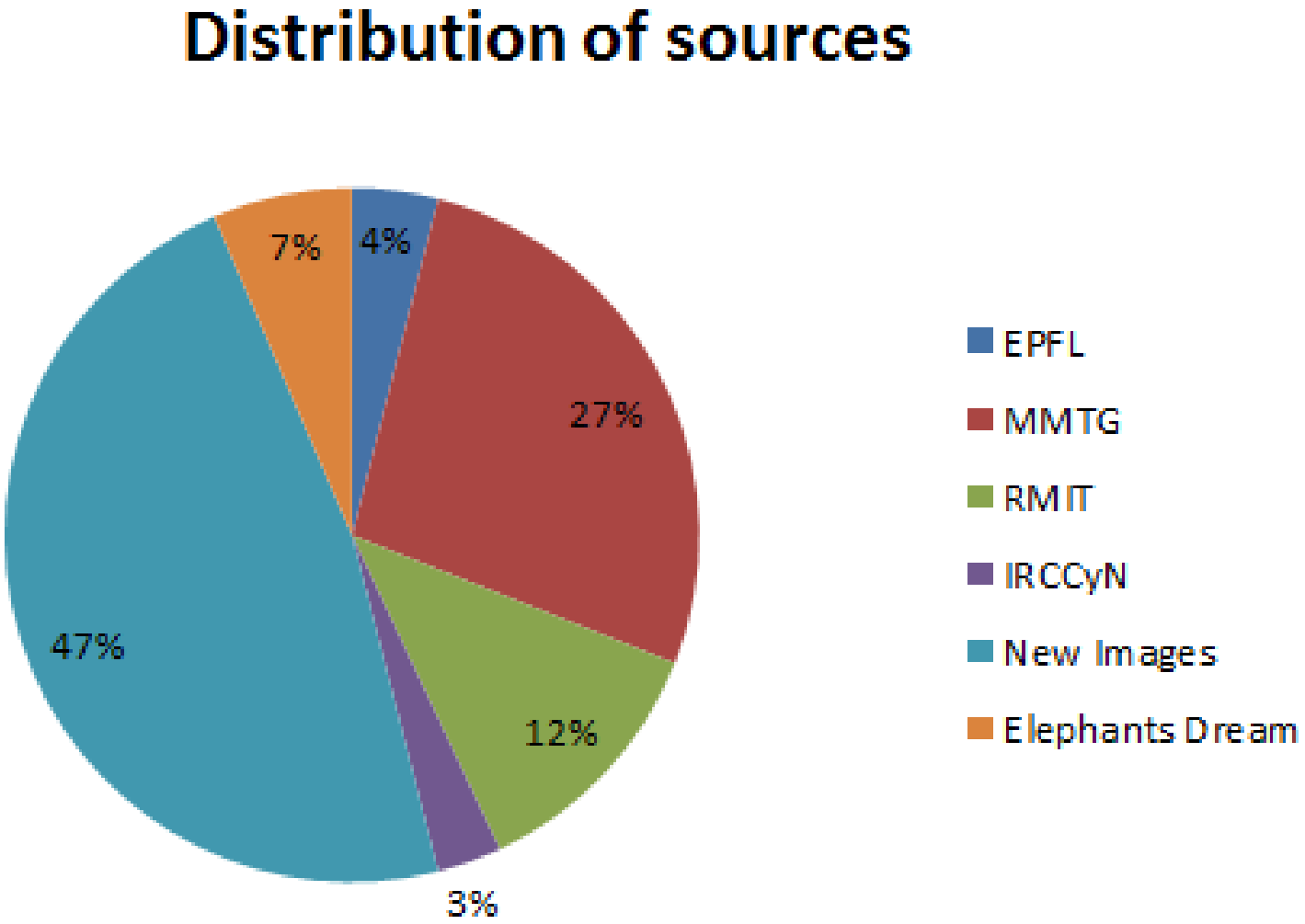


Selection of the images

defocus blur (50 images)



Selection of the images
Distribution of sources



Outline

- Motivation
- Design of the database
- **Possible applications**

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