UNIVERSITY OF GENOA
DEPARTMENT OF INFORMATICS, BIOENGINEERING, ROBOTICS AND SYSTEMS ENGINEERING
MASTER'S PROGRAM IN BIOENGINEERING

Thesis Project Form

Title (tentative): Disentangling visual cues contribution during 3D interactive perception

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Description

Motivation and application domain

The adult visual system uses a variety of strategies to optimally combine the available visual cues (e.g., binocular disparity, texture gradient, motion, shading â€¦) to obtain robust estimation of object properties in the 3D world. This combination of sensory information is so efficient that it works even if the component cues are noisy and/or conflictual. In the last years, cue combination processes have been mainly studied under static conditions.

General objectives and main activities

Humans are active observers in the environment, and are constantly engaged in sensorimotor interaction with it that can modify their perception, reinforcing or weakening component cues of the visual stimulation. Understanding the processes of cue integration in more natural and dynamic context allow us to identify the necessary features that can lead to perceptual learning processes thus enable the development of efficient visual rehabilitation protocols.
The specific goal of this project is to design and develop experimental set up and procedure to investigate cues integration when the observer has the possibility to dynamically interact with the visual stimulation. The visual stimulation will be contingent to the subject action in order to allow the experience of new sensorimotor contingencies. The reliability of the visual information could be modified to analyses how the sensorimotor integration influence perceptual processes.
The project will be mainly divided in three parts:
- Implementation: design of experimental procedure and visual stimulation
- Data collection: experiments with healthy subjects
- Data analysis: MATLAB/Python

Training Objectives (technical/analytical tools, experimental methodologies)

The student will learn to employ an array of methodologies and instrumentation, including:
- Graphic Engines (Unity3D) and Shaders
- Virtual Reality (VR) technologies, 3D monitor/projectors
- Stereoscopic rendering
- Psychophysics methodologies
- Task design and data collection with subjects

Place(s) where the thesis work will be carried out: Bioiengineering Lab (PSPC), via Opera Pia 13

Additional information

Maximum number of students: 2