



## Thesis Project Form

**Title (tentative):** Investigating perceptual adaptation mechanisms in simulated maculopathy conditions

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### Description

#### Motivation and application domain

Age-related macular degeneration (AMD) progressively damages central vision, with a progressive loss of the foveal and parafoveal visual field. Patients affected by AMD have to learn specific eccentric points (PRLs) on which to direct gaze in order to "cofixate" with their residual visual field. In addition to evident influences on eye- and head-gaze behavior, AMD can have an impact on body-centered representation of the 3D space.

#### General objectives and main activities

By exploiting an HMD-based simulator of low-vision (already available in the lab, see [https://www.youtube.com/channel/UCgL\\_gWw626D3nnwFz3zwFA/featured](https://www.youtube.com/channel/UCgL_gWw626D3nnwFz3zwFA/featured)), the thesis aims at a systematic investigation of (1) the effects of a simulated maculopathy in healthy subjects on their ability of perceiving both allocentric and egocentric spatial relationships. The hypothesis is that the developed visuomotor transformations underlying gaze-independent 3D space representation might be altered both by the offset of the PRL and its lower resolution with respect to the fovea's, and thus require re-calibration.

The activity comprises (1) the collection of experimental data, under different simulated AMD conditions, and for different training stages, (2) the development of (theoretical and neuromorphic) models that can explain altered perception of 3D space and its possible recovery by adapting mechanisms.

#### Training Objectives (technical/analytical tools, experimental methodologies)

The student will learn to employ an array of methodologies and instrumentation, including:

• Graphic Engines (Unity3D)

• HMD with embedded eye-tracking system and external stereo cameras for video pass-through

• Stereoscopic rendering

• Psychophysics methodologies

• Task design and data collection with subjects

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

### Additional information

**Maximum number of students:** 2

**Financial support/scholarship:** None