Résumé du projet de recherche (Langue 1)

Healthy aging affects neurophysiological, perceptual, and executive functioning. Although it is clear that aging influences both low-level and cognitive vision-dependent processes, the link between these aspects of aging remains poorly understood. This doctoral work is part of a larger project carried out at the host laboratory of Aging in Vision and Action (led by A. Arleo) at the Institute of Vision, Paris. The laboratory combines experimental psychophysics and neurcomputational models to bridge the gap between the impact of visual healthy aging on different organization levels (from neuronal processing to behavior). This project aims at building a unified view of the impact of visual aging in humans by integrating models of purely visual perceptual losses and of high-level vision-dependent impairments affecting spatial cognition. We expect this integration activity to serve as the basis for the construction of an “aging avatar”, which will be empirically conditioned on experimental knowledge on human normal aging. By simulating age-related deficits on different processing pathways and on different levels of the neuronal organization, the role of low-level impairments in visual processing for high-level spatial cognitive ability will be studied. For instance, by mirroring some behavioral characteristics such as the time course of eye movements of young vs. elderly subjects, the avatar will help predicting how age influences the active exploration policy of visual scenes in a novel environment. This could in turn help understanding the link between sub-optimal oculomotor exploratory patterns and the consequent less informative anchorage of spatial percepts on available visual cues. We will also test the hypothesis that ineffective exploration-exploitation policies can correlate with age-related vision alterations. Then, we will derive behavioral markers to provide a longitudinal evaluation of the active exploratory behaviour of the elderly. These behavioural markers could help in terms of early detection of age-related spatial orientation deficits, and they could also lead to insights about possible training solutions to reshape the exploration-exploitation strategy in the elderly.

Résumé du projet de recherche (Langue 2)

In addition to their applications as virtual surrogates for humans, avatars have recently acquired a different role in manifold fields, including academic research on decision making, lifespan changes in human behaviors, social interaction, clinical rehabilitation of social disabilities, and virtual support to elderly daily activity. The aging avatar built in this project will perceive the world and acquire spatial representations based on an integrated model of age-related influences on vision and spatial orientation functions. To the best of our knowledge, such an aging virtual human has so far never been developed. It will provide a novel powerful platform to study the link between perceptual and cognitive consequences of normal visual aging. It will also integrate a body of knowledge from epidemiological data analyzed by the host team. Thereby, the aging human avatar has the potential to provide a holistic characterization of visuo-cognitive dysfunctions, which can generate new insights and experimentally testable predictions on longitudinal predictors/markers of vision-dependent mobility and autonomy loss.