Transfer functions for 3D rotations

Duration: 6 months
Team: Loki (Inria Lille – Nord Europe & CRIStAL)
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The virtual trackball is the most common rotation technique available in many softwares and websites to rotate 3D objects [2, 4, 8]. It consists in defining a sphere surrounding the object to rotate. Displacements of the mouse cursor are then interpreted as rotations of the sphere and the associated 3D object. This interaction technique has hidden parameters such as the radius of the sphere that we hypothesis affect the performance of the task. The goal is to systematically investigate the parameters affecting this interaction technique to inform the design of non-linear transfer functions, in different contexts: mouse-based interaction, touch interaction and 3D physical rotations.

Description
Transfer functions are commonly used in indirect pointing tasks. They define a mapping between the actions performed by the user in motor space and the resulting cursor displacement. Previous work show that non-linear mappings allow to improve user performance [1]. In a similar way transfer functions for rotations define a mapping between the physical action of the user on the input device and the resulting rotation in 3D. While non-linear functions for 3D rotations have been used in previous work, it remains unclear if they improve performance and how they should be designed [5].

After reviewing the related work on 3D rotation techniques and transfer functions, the candidate will design and run a controlled experiment to systematically investigate the parameters associated to virtual trackballs, before designing and evaluating non-linear transfer functions. Different contexts will be considered: mouse-based interaction [3], touch interaction [6, 7] and physical 3D rotations.

Candidate
The candidate will be a Master student, ideally with HCI and 3D background.

Context
LOKI is a dynamic world class HCI research group whose research aims at producing original ideas, fundamental knowledge and practical tools to inspire, inform and support the design of human-computer interactions. Members of LOKI frequently publish in top-tier HCI conferences such as ACM CHI and ACM UIST. The selected applicant will work with Prof. Géry Casiez.

Bibliography