Demo of Gaze Controlled Flying

Alapetite, Alexandre; Hansen, John Paulin; Scott MacKenzie, I.

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ABSTRACT
Development of a control paradigm for unmanned aerial vehicles (UAV) is a new challenge to HCI. The demo explores how to use gaze as input for locomotion in 3D. A low-cost drone will be controlled by tracking user’s point of regard (gaze) on a live video stream from the UAV.

Author Keywords
Gaze, control, input, robot, mobile, drone, unmanned aerial vehicle (UAV), target acquisition.

ACM Classification Keywords
H.5 [INFORMATION INTERFACES AND PRESENTATION]: H.5.2 User Interfaces — Input devices and strategies

SYSTEM DESCRIPTION
The possible areas of application for drone technology are numerous. It is known, for example, that “commercial companies and civil government bodies are taking an increasing interest in... nano-UAVs, because of their unique surveillance capabilities.” (http://www.bbc.co.uk/news/uk-18633664) UAVs can be useful when conducting reconnaissance missions, such as search and rescue tasks and generally surveying large areas in terrain that may be difficult to traverse. It could be used in video documentation of e.g. building construction work.

Natural control of UAV’s is likely to emerge from research in the fusing of several human input and output modalities. The fusion may occur between sensor data retrieved from e.g. eye-, hand-, head- and facial muscle movements. The intent of this demo is to present a test-of-concept for an “eye in the sky” that can be controlled and manipulated intuitively by gaze. The demo will use a low-cost AR.drone unmanned aerial vehicle (UAV) (www.ardrone.com). See Figure 1. The drone weighs only 420 grams. It includes four small motors and propellers for locomotion. Importantly, the drone includes a camera that provides a view of the scene ahead. Communication with the base station is via WiFi. Commands are transmitted to the robot every 100 milliseconds, thus continuously updating the navigation instructions.

Performance data from the demo participants will be analysed to determine the best mapping approach for a...
future controlled experiment. The task used in the demo involves manoeuvring the drone over a short distance through a target.

Figure 2. Control room. The point of regard on a video stream is used to control the drone. The eye tracker is positioned below the system display.

Figure 3. UAV terrain. The drone is passing through a circular target outside the control room building.

RELATED WORK

Gaze control of locomotion has been investigated in computer games [1] and in virtual environments [2]. Remote cameras were driven by gaze in work by Zhu et al [5]. A driving robot was successfully controlled by gaze in an experiment reported by Tall et al [3]. Finally, Wästlund et al [4] tested a gaze-driven wheelchair.

REFERENCES


