EXTRACTING OBSERVER HEADING AND SCENE LAYOUT FROM IMAGE SEQUENCES ((J.A. Perrone)) University of Waikato, New Zealand.

Purpose. Despite the application of a wide range of computational schemes, it has proven to be difficult to emulate the human ability to extract self-motion and depth information from image sequences. I present and test a new approach which incorporates properties of cells found in areas V1, MT and MST of primate visual cortex. **Methods.** The need for accurate image speed estimates can be avoided by adopting template based approaches for self-motion estimation (Perrone, J.O.S.A., 1992, Perrone & Stone, Vis. Res., 1994). The templates use networks of direction and speed tuned motion sensors to register the global patterns of image motion generated during observer motion. I have previously shown how a combination of transient and sustained spatio-temporal energy filters can produce a 2-D motion sensor which is tightly tuned for speed and which provides excellent localization of edges in a scene (ARVO, 1994, 1996). These motion sensors were incorporated into template networks designed to extract observer heading, rotation and scene layout from image sequences. Digitized movies (256 x 256 pixels x 8 frames) from a range of observer motion scenarios were analysed. **Results.** Successful heading and depth recovery were achieved in most instances but sequences with high levels of image acceleration caused problems. It became apparent that the retinal acceleration we experience during normal locomotion, provides an upper limit (~200 msecs) to the integration period of 2-D motion sensors. **Conclusions.** The template based scheme provides a practical solution to the problem of extracting self-motion information from image sequences and overcomes many of the problems faced by conventional flow-field based methods.

Supported by NASA grant NAGW-4127 None