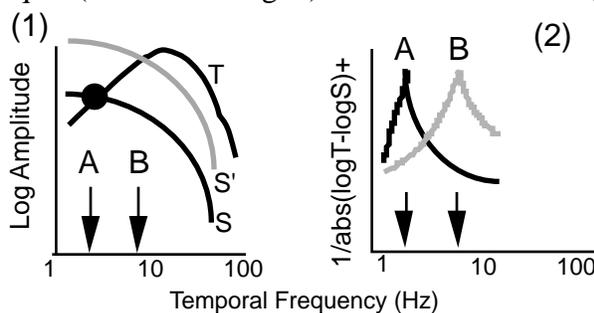


GENERATING ACCELERATION SENSITIVE MOTION SENSORS FROM SETS OF SPATIO-TEMPORAL FILTERS ((J. A. Perrone¹)) Psychology Dept., University of Waikato, New Zealand¹

Purpose. Forward translation through the environment produces retinal image motion that often exhibits a large acceleration component. Such acceleration involves a continuous increase in the temporal frequency of the target and hence cannot be readily analyzed using simple spatio-temporal filters. We investigated methods for processing acceleration while still retaining the basic spatio-temporal filter architecture. **Methods.** Only two temporal-frequency channels (sustained = S and transient = T) are used. Adjusting the gain of the S channel alters the tf at which the two channel outputs are equal (black dot in fig. 1). Subtraction of the log-transformed outputs (plus inversion)



produces an output tightly tuned to this tf (see A in fig.2). Thus speed tuning can be achieved by manipulating the gain of the S channel (Perrone, ARVO 1994). In order to construct a sensor

tuned for acceleration (increasing tf) the gain of the S channel is simply increased (S moves to S')

This enables the increasing tf to be tracked (A to B). Summation of the outputs as the speed tuning moves from A to B will produce a large total output if the target acceleration matches the rate specified by the A to B shift. **Results.** A wide range of speed and acceleration tunings were possible by applying the above mechanism across a small set of spatial frequency channels (4). **Conclusion.** Two broadly tuned temporal filters (supported by human psychophysics) are adequate for acceleration detection. Acceleration information is useful for self-motion estimation and for the control of eye-movements (e.g., Pursuit. Krauzlis & Lisberger, Science, 1991)..

1. Supported by NASA grant NAGW-4127