MINIMIZATION OF RETINAL SLIP CANNOT EXPLAIN HUMAN SMOOTH-PURSUIT EYE MOVEMENTS. L.S. Stone* and B.R. Beutter. NASA Ames Research Center, Moffett Field, CA 94035.

Existing models assume that pursuit attempts a direct minimization of retinal image motion or "slip" (e.g. Robinson et al., 1986; Krauzlis & Lisberger, 1989). Using occluded line-figure stimuli, we have previously shown that humans can accurately pursue stimuli for which perfect tracking does not zero retinal slip (Neuro96; ARVO97). These findings are inconsistent with the standard control strategy of matching eye motion to a target-motion signal reconstructed by adding retinal slip and eye motion, but consistent with a visual front-end which estimates target motion via a global spatio-temporal integration for pursuit and perception. Another possible explanation is that pursuit simply attempts to minimize slip perpendicular to the segments (and neglects parallel "sliding" motion). To resolve this, 4 observers (3 naive) were asked to pursue the center of 2 types of stimuli with identical velocity-space descriptions and matched motion energy. The line-figure "diamond" stimulus was viewed through 2 invisible 3°-wide vertical apertures (38 cd / m2 equal to background) such that only the sinusoidal motion of 4 oblique line segments (44 cd / m2) was visible. The "cross" was identical except that the segments exchanged positions. Two trajectories (8's and ∞'s) with 4 possible initial directions were randomly interleaved (1.25 cycles, 2.5s period, Ax = Ay = 1.4°). In 91% of trials, the diamond appeared rigid. Correspondingly, pursuit was vigorous (mean Hgain: 0.74) with a V / H aspect ratio ~1 (mean: 0.9). Despite a valid rigid solution, the cross however appeared rigid in 8% of trials. Correspondingly, pursuit was weaker (mean Hgain: 0.38) with an incorrect aspect ratio (mean: 1.5). If pursuit were just minimizing perpendicular slip, performance would be the same in both conditions. *NASA RTOPs 548-50-12, 199-16-12-37*