Accuracy of visual tracking during pseudorandom two-dimensional target motion

G. Daunys, D. Miniotas, O. Spakov, V. Laurutis
Dept. of Electronics, Siauliai University, Vilniaus 141, LT-5400 Siauliai, Lithuania
(e-mail:g.daunys@tf.su.lt)

It is well established that errors associated with visual tracking of a target moving in a predetermined way are significantly lower than those recorded in an unpredictable paradigm. This observation has been validated in numerous studies on tracking ability of subjects involved in one-dimensional tasks.

A study was conducted to investigate whether subject's performance will be equally degraded by removal of the natural predicting ability when the task is extended to two dimensions. Gazepoint locations were transduced using pupil centre/corneal reflection technique. The target trajectory was generated using combination of multiple arcs obtained through intersection of circles of varying location and radius. To avoid generation of saccades as much as possible, an algorithm was used to control the trajectory so that the target moved smoothly and did not bounce from the boundaries of the screen. Target velocity was varied from 5 deg/s to 15 deg/s. Tracking error was obtained by subtracting target position from eye position measured at the same instance, and subsequently splitting this difference into two components: tangent component (the component along the movement direction) and its orthogonal counterpart. The mean value of tangent component was found to increase proportionally to target velocity, whereas its standard deviation remained at the same level.

These findings provide an interesting contrast to those reported in our earlier study for the case of predictable target motion in two dimensions where negligible change in the mean tangent error with increasing target velocity was accompanied by proportional increase in standard deviation. We discuss whether such a reverse in the roles between the mean tangent error and its standard deviation could be attributed to removal of directional cue for the saccadic system by making the target move unpredictably; the saccadic system thus seems to be deprived of its corrective function which does not allow performance of the pursuit system to be boosted in traditional way.