Evaluation of HFA3 gaze monitoring feature using lens-based head tracking

Ashwini Tamhankar, MS; Gary Lee, PhD ; Thomas Callan, OD ; Charles Wu, BS; Mary K. Durbin, PhD

Carl Zeiss Meditec, Inc., Dublin, CA

Poster # 2453 - A0617

PURPOSE

A new lens-based head tracking feature for the HFA3 perimeter (ZEISS, Dublin, CA) available on all models can now automatically align the center of the patient's pupil to the center of the lens (Figure 1) and continually reposition throughout the exam.

The purpose of this study was to compare this new lens-based head tracking feature to the original manual alignment and gaze monitoring method.

METHODS

- Two HFA3 (Model 860, SW versions 1.4 and 1.5.1) perimeters, with the liquid trial lens, were used to test one eye of 18 healthy volunteers by taking three SITA Faster 24-2 exams in a randomized test order.
- Mean age for subjects was 41.5 years (SD: 9.9, range: 23-57).
- On version 1.4 SW, the pupil was manually aligned to "+" camera center (CC) mark and manually estimated lens center (LC) while with the version 1.5.1 SW, pupil was automatically aligned (AA) to lens "+" mark during gaze initialization.
- Patient alignment time was recorded from patient being comfortable at the instrument to successful gaze initialization during all exams.
- Fixation loss (FL) and blind spot location threshold (BS) data were recorded. Patient alignment time, FL, and BS data were analyzed and compared using ANOVA and Friedman's tests.

CONCLUSIONS

- In this preliminary study, patient alignment and gaze initialization time were significantly reduced using the lens-based head tracking method.
- Performance of gaze monitoring was comparable in both the software based upon qualitative observations and the analysis of fixation loss and blind spot location threshold results.
- The lens-based head tracking provides automated alignment and improved user interface with indicators for the lens center and the pupil center.

RESULTS

- Patient alignment average time with standard deviation for camera center (CC), manually estimated lens center (LC) and automatically aligned lens center (AA) was 17.2 ± 3.7, 20.4 ± 4.7, and 12.8 ± 2.5 seconds respectively ($p<0.001$) (Figure 2).
- AA significantly reduced the average time by 25.6 % and 37% compared to CC and LC, respectively.
- Differences in FL and BS were determined not to be statistically significant among the methods ($p>0.05$).
- Visual inspection of individual gaze graphs showed minimal differences (Figure 3).

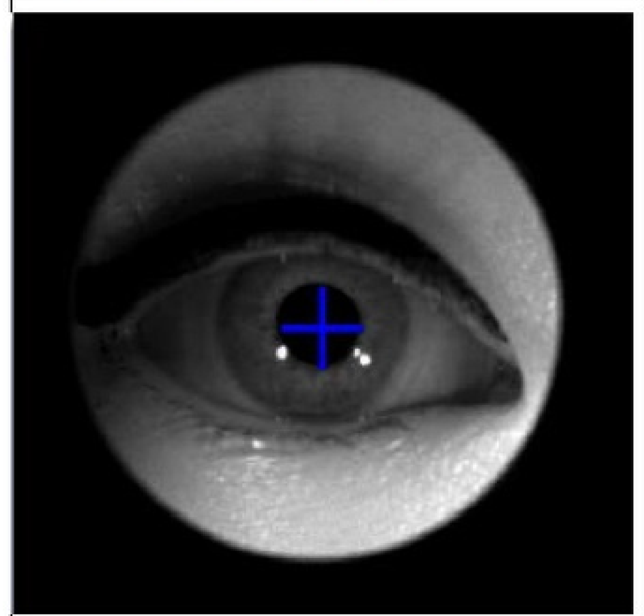
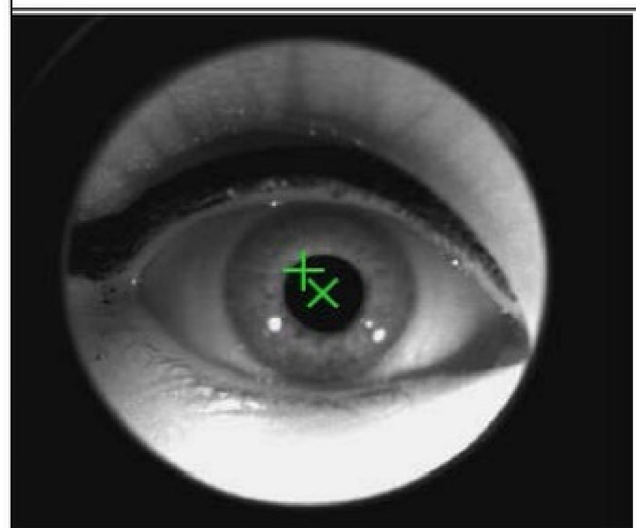
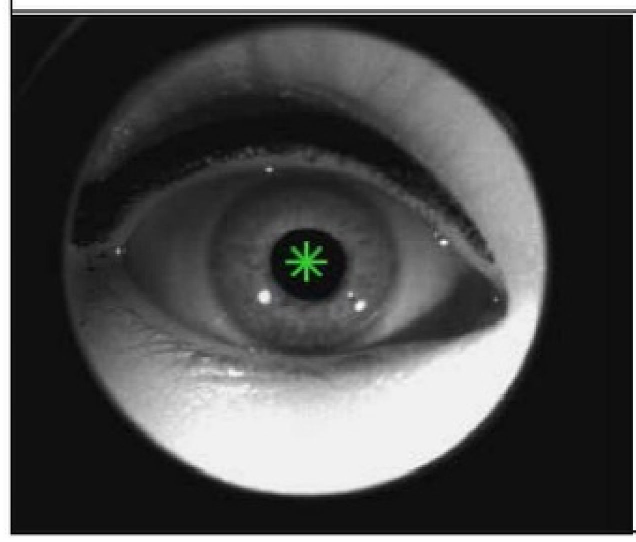
Camera Display	Software
	a) 1.4 software showing "+"at the camera center. 1.4 requires manual alignment to this "+" landmark prior to gaze initialization, which may introduce errors during the initialization process and during the exam due to lens rim artifacts.
	b) Prototype 1.5 software showing "x" at the pupil center and "+" at the lens center. 1.5 automatically aligns to "x" and "+" prior to gaze initialization and during the exam.
	c) Prototype SW 1.5 showing centration and successful gaze initialization

Figure 1: Gaze monitoring software comparison

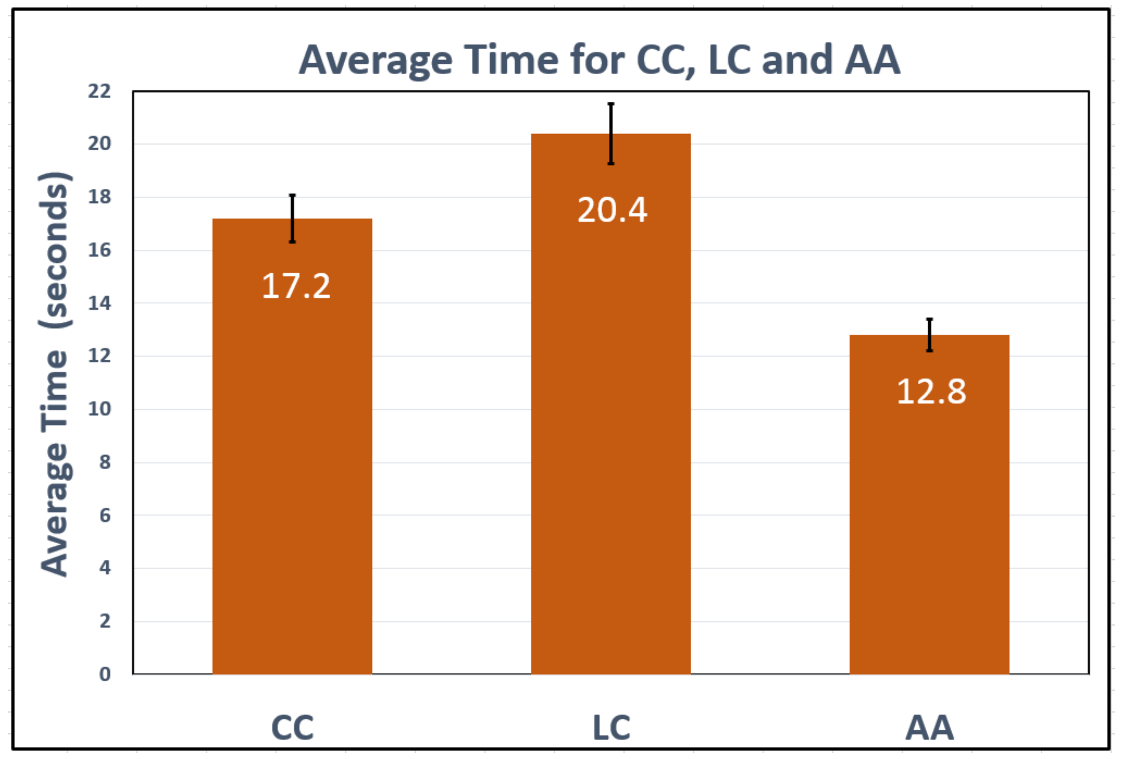


Figure 2: Patient alignment average time comparison with standard error

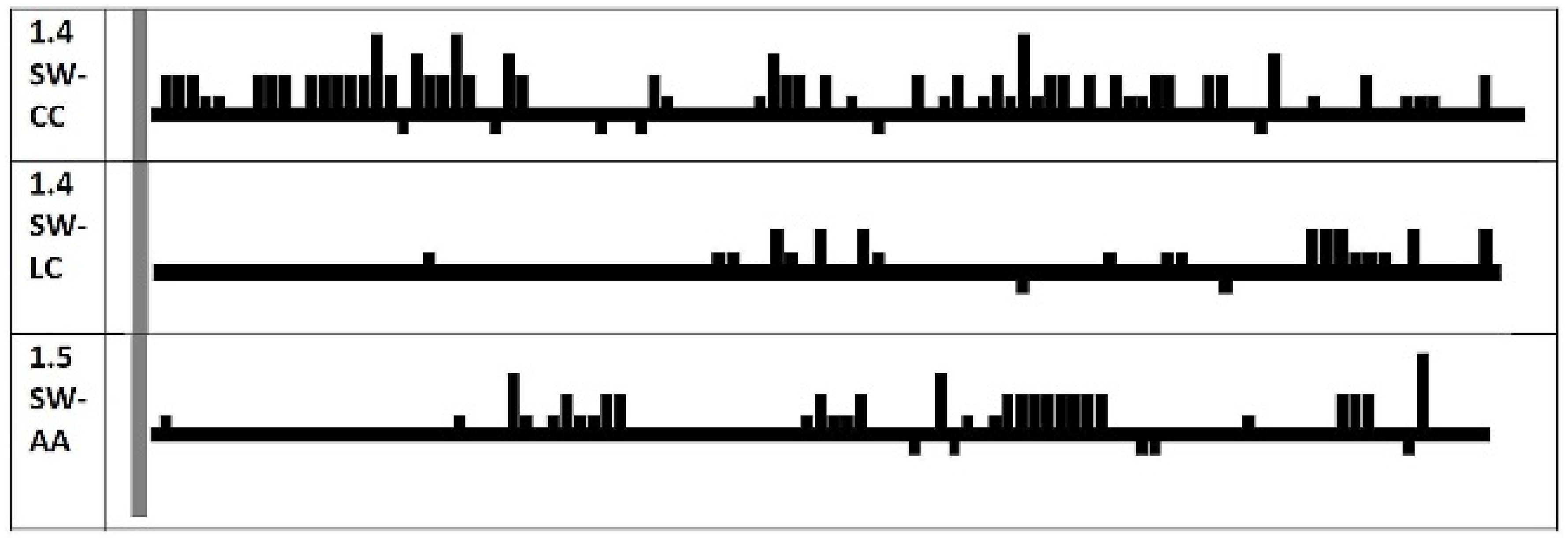


Figure 3: Gaze graph examples of one subject

E-mail: ashwini.tamhankar@zeiss.com

Disclosures: AT (E), GL (E), TC (E), CW (C), MD (E): Carl Zeiss Meditec, Inc.