



#55

Worldwide Accessible Comprehensive Visual Field Test & Diagnosis System



NASA

W. Fink^{1,2,3}, A. A. Sadun³, J. B. Clark⁴

¹Jet Propulsion Laboratory/Caltech, Pasadena, CA 91109

²California Institute of Technology, Pasadena, CA 91125

³Doheny Eye Institute, Keck School of Medicine at USC, Los Angeles, CA 90033

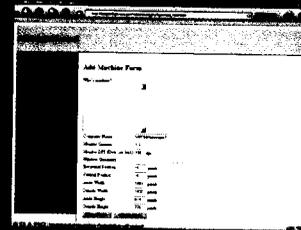
⁴NASA Johnson Space Center, Houston, TX 77058

Purpose: To provide a worldwide accessible, comprehensive 3D threshold Amsler Grid test that allows for screening and examining people worldwide over the Internet and monitoring astronaut health in space. Further, to provide an automated, objective characterization of scotomas, offering a promising perspective towards modern computer-assisted diagnosis in medicine.

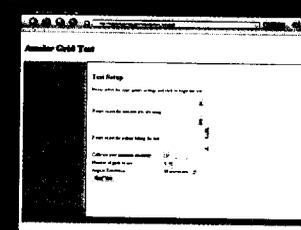
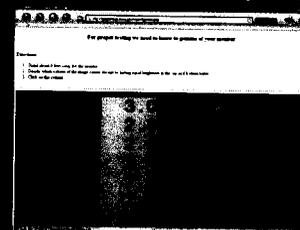
Methods: We have created an Internet-deployable version of the 3D computer-automated threshold Amsler grid test, recently introduced by Fink (JPL/Caltech) and Sadun (Doheny/USC) (see <http://www.wfbabcom5.com/wf335.htm>). With one eye covered the patients are positioned at a fixed distance in front of a computer, equipped with either a touch-sensitive monitor or a regular monitor using a mouse. While focusing on a varying fixation marker the patients trace with their finger/mouse the areas on an Amsler grid that are missing from their field of vision. Various degrees of contrast of the Amsler grid are presented by repeating the test at different grayscale levels. The results are recorded and transmitted via the Internet to a central server, where a topographical contour map, a 3D depiction of the central hill-of-vision, and a comprehensive scotoma characterization (area, volume, and slope distribution of visual field loss, etc.) are generated and sent back to the client.

Results: The now Internet-deployable 3D computer-automated threshold Amsler grid test has shown, in multiple clinical pilot studies, to be innovative and successful for fast (4-5 minutes per eye), easy (use of finger, touch pen, or mouse), accurate (spatial resolution 1° to 15'), non-invasive, and comprehensive visual field testing. Conditions such as optic neuritis, AION, ARMD, glaucoma, and ocular hypertension have been successfully detected by the 3D visual field test. A software package has been developed for the automated, comprehensive evaluation of scotomas in 3D with respect to area of visual field loss as a function of contrast sensitivity, overall volume of visual field loss as compared to a "normal" hill-of-vision, and slope distribution of the scotoma boundaries.

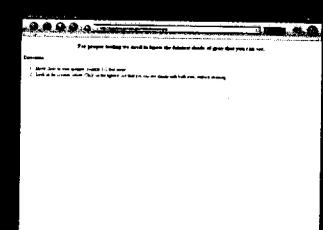
Conclusion: This Internet-deployable automated test & diagnosis system is a significant step towards screening and examining people worldwide, monitoring astronaut health in space, and to assist physicians, both on Earth and in space, with an independent second opinion or provide expertise where otherwise not readily available.



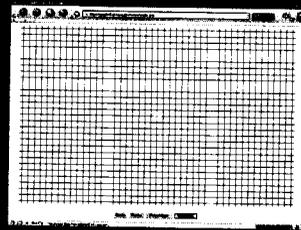
Example of fix operation in software



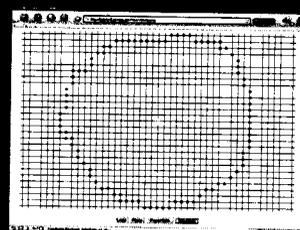
Example of Amsler grid test software



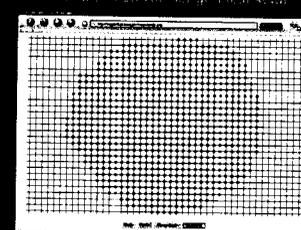
Selection of lowest perceivable contrast



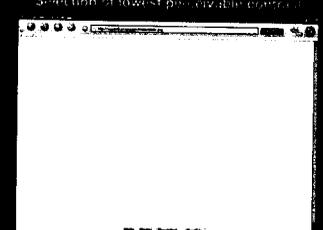
Example of the Amsler grid contrast area



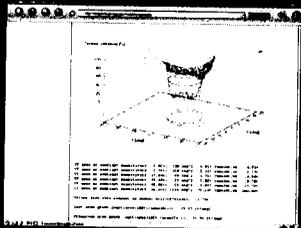
Example of fix operation in the software



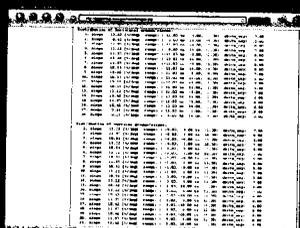
Example of patient visual field



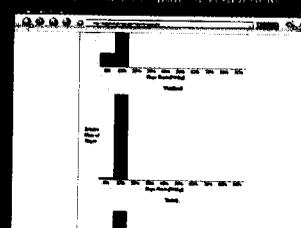
Example of patient visual field at lower contrast level



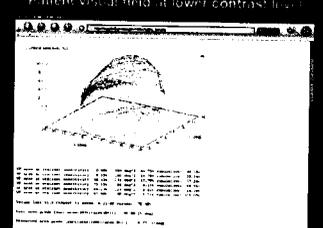
Example of the hill of vision with normal AFM



Example of the hill of vision with normal AFM



Example of the hill of vision with normal AFM



Example of the hill of vision with normal AFM

Contact: w.fink@jpl.nasa.gov

or asadun@ucla.edu

<http://babylon5.jpl.nasa.gov/vision>