Automatic eyeglasses prescriptions? New formula connects optical quality with visual acuity

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For the first time, a study combines measurements of abnormalities in the eye with models for assessing how well an individual can see, meaning it may be possible to program a machine to automatically produce prescriptions for corrective lenses.

The model for predicting visual clarity — based on measurements taken by today's highly accurate aberrometers — could also enable surgeons to more accurately assess and correct the vision of patients undergoing lasik or refractive surgery.

New technology in aberrometers means ophthalmologists and others can accurately measure refractive error and other abnormalities in the eye's optics. But these instruments cannot use these measurements to predict visual acuity, or how well a person can actually see. Usually, ophthalmologists and optometrists rely on a patient's ability to identify characters on an eye chart to determine visual clarity.

A study recently published in the online, peer-reviewed Journal of Vision (http://www.journalofvision.org/8/4/17), published by the Association for Research in Vision and Ophthalmology (ARVO) evaluates the performance of several simple metrics that predict visual acuity from wavefront aberrations — the eye measurements provided by an aberrometer.

To do so, authors Andrew B Watson and Albert J. Ahumada Jr (both of NASA Ames Research Center, CA) make a clear distinction between a metric and model.

"A metric is a formula that describes a quantitative relationship," explains Watson. "It is accurate but not necessarily adaptable to different situations. A model is a mechanistic description that explains why a relationship exists. If the parameters of a model change, one can make predictions of how an outcome will change."

The authors developed a model that successfully predicts visual acuity using both wavefront aberrations and simulations of the complex task of identifying individual letters from the widely used Sloan letter set. They then designed a simple metric that performs as well as the more elaborate model.

The metric could be used internationally. Explains Watson: "The same metric, because of its generality, can predict acuity measured with other symbol sets, such as Chinese characters.

"With this metric, the aberrometer will be able to give direct predictions of visual acuity, and could also provide an automatic optimal refractive prescription for the patient."

Source: Association for Research in Vision and Ophthalmology