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Presentation Abstract

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Abstract Title:	**Detection of Structures in the Retina Using AM-FM for Diabetic Retinopathy Classification**
Presentation Start/End Time:	Sunday, May 03, 2009, 8:30 AM -10:15 AM
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Reviewing Code:	246 imaging techniques: novel image processing - VI
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Keywords:	549 image processing, 500 diabetic retinopathy, 685 retina
Abstract Body:	**Purpose:** To validate a novel computer algorithm for assigning diabetic retinopathy (DR) severity level to people with diabetes based on AM-FM from color fundus photographs, that automatically adjusts all model parameters based on the quality and format of the data. **Methods:** The dataset consisted of 400 digital images from the MESSIDOR database (http://messidor.crihan.fr/download.php), Service Ophtalmologie Laribosière. This data set was graded by ophthalmologists as a Risk 0, Risk 1, Risk 2, or Risk 3, according to the severity of the DR. Each image was processed to obtain a feature vector for a region of 40x40 pixels that encoded structures in the retina in frequency and amplitude information. Histograms for seven sets of scales were binned to form single feature vectors. A subset of 30 images for each Risk level was randomly selected and used for testing and validating the resulting models. Models were developed to detect each of the three DR Risk levels (1, 2, and 3) in the presence of no DR (Risk 0). A total of 840 features representing different frequency scales and amplitudes were used to characterize the retinal images. Then the features are reduced in dimensionality using PCA to around 100 features. Finally, to classify these features, we use a combination of a clustering method and Partial Least Square (PLS). Area under the ROC curve (AUC) was determined on the three sets. **Results:** For Risk 0 versus Risk 3, AUC was 0.981, for Risk 0 versus Risk 2, AUC was 0.956 and for Risk 0 versus Risk 1 AUC was 0.902. **Conclusions:** These results demonstrate that AM-FM is attractive for developing a system for detecting DR risk levels from retinal color

photographs. If these results can be reproduced on a larger dataset from, a screening population, with an appropriate prevalence of DR, AM-FM has the potential to become the primary algorithm for screening for DR. To further assess the algorithm, it will be trained and tested using other databases.

Commercial Relationships: **C. Agurto rios**, University of New Mexico, F; **M.S. Pattichis**, University of New Mexico, F; **S. Murillo**, University of New Mexico, F; **V. Murray**, University of New Mexico, F; **M.D. Abramoff**, None; **S.R. Russell**, None; **H.T. Davis**, VisionQuest Biomedical, I; **S. Barriga**, University of New Mexico, F; **P. Soliz**, VisionQuest Biomedical, I.

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