

Role of the Brien Holden Vision Institute in Diabetic Eye Disease Management

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Declaration: Brien Holden Vision Institute has commercial interests in the retinal camera



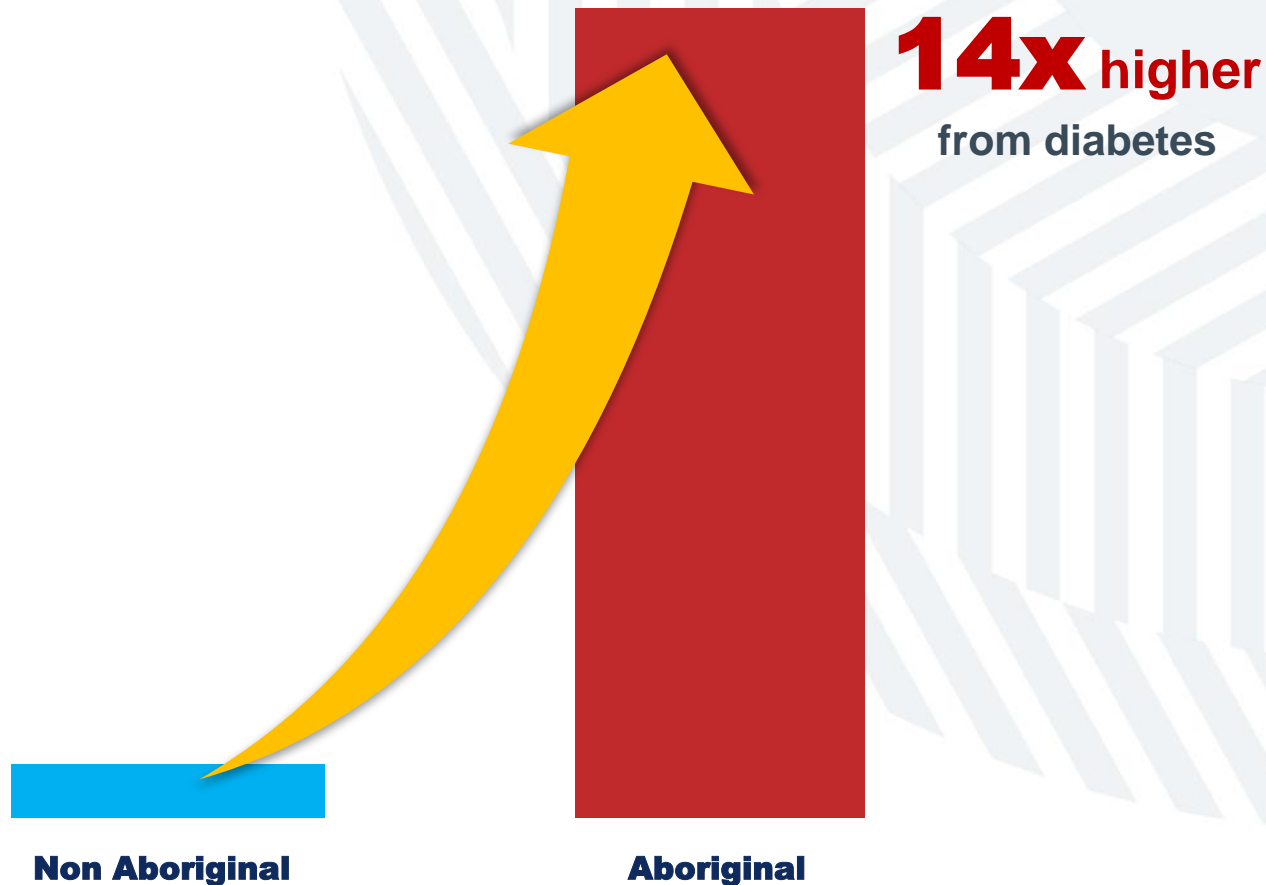
Source: <http://www.vision2020.org/main.cfm?type=WHATISBLINDNESS>



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The Challenge: Closing the Gap

Diabetes - Rate of Blindness



Why Create a New Retinal Camera

- Most people in the world who need retinal imaging don't get it
- Not generally available
 - Cost
 - Specialized training and experience to take images
 - Lack of expertise to diagnose
- **Goal:** Create an easy to use retinal camera with images equivalent to the best at a very affordable price. Make imaging the retina a part of every eye exam.



The Ideal System

Will:

- be widely available and accessible
- have instrumentation that is:
 - automatic
 - portable
 - rugged
 - cost-effective

And Will:

- produce high quality images
- provide accurate recording, analysis & assessment
- guidance on-site and to the expert
(remotely if needed)

Objective

- ❑ To develop an affordable and innovative high-resolution retinal camera that acquires multispectral images (MSI) of the retina, coupled with a custom image analysis (ImA) algorithm and artificial intelligence (AI).
- ❑ This will provide automated, same-visit detection and interpretation of retinal images that can be used by health care workers in regional/remote communities and professionals at all levels of the health system.



Retinal Camera



Camera Overview

Product features include:

- Auto-focus, point/click/drag tablet software that allows for easy aiming of camera, auto-capture of images, 2D and 3D image analysis.
- Uses custom software and unique optics to produce high resolution, high quality digital images to provide diagnosticians with details of the retina *that are useful in detecting, at an early stage, a wide range of pathologies.*
- Takes images in stereo, *allowing clinicians to see the shape and depth of features on the retina, particularly useful for tracking changes over time for glaucoma or tumors.*

- Takes images in three wavelengths: green (550), red (650) and infra-red (850). Green enhances the visibility of features on the surface of the retina (blood vessels and hemorrhages). Infra-red makes visible features below the surface of the retina, (choroid layer). Red, in combination with green, provides images in color.
- Captures a set of images each with a 20° field of view. *A 20° field of view assures consistent high resolution of image across the full 20° degree field of view.*
- Uses stitching software to build image mosaics: Camera has capability of taking up to 7 stereo images of each eye. When these 7 images are stitched together, the result is a 55mosaic presents a high-resolution 55° field of view.
- 24" high by 18" wide by 24" deep. The camera will weigh approximately 26 pounds.



- Tele-medicine: The camera will be able to send images via the Internet by email or via Remote Desktop access when connected via a router to a computer that has Internet connectivity. Brian Holden Vision will supply "readers workstation software" to manage photos on a computer with a Windows 7 or later Windows operating system.
- Initial Languages – English, Spanish, French, German, Italian, Portuguese, Chinese
- Many future capabilities – software only upgrades
- Very affordable



Unique HQ Multi-Spectral Imaging Camera

Conventional Camera

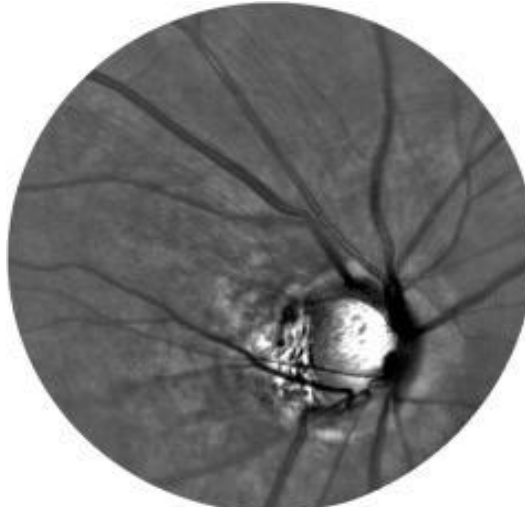


Composite Colour Image

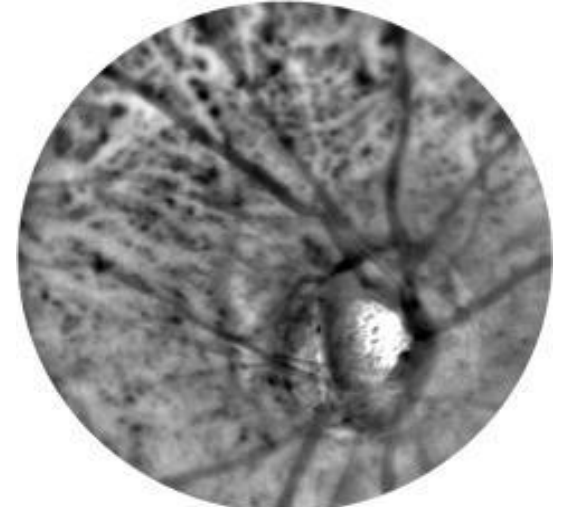
Confounding of colour information limits image analysis options



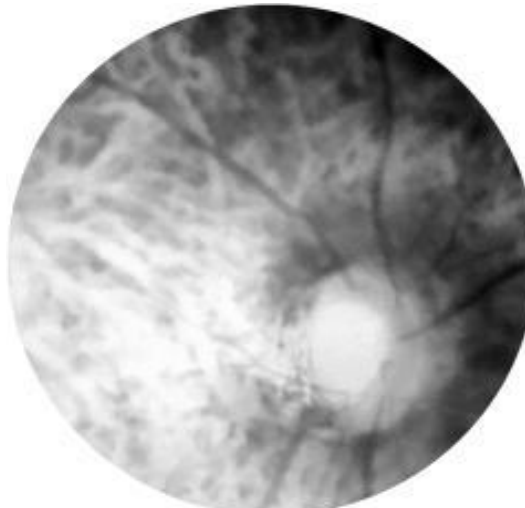
Multispectral Imaging Camera



Green Image



Infra-Red Image



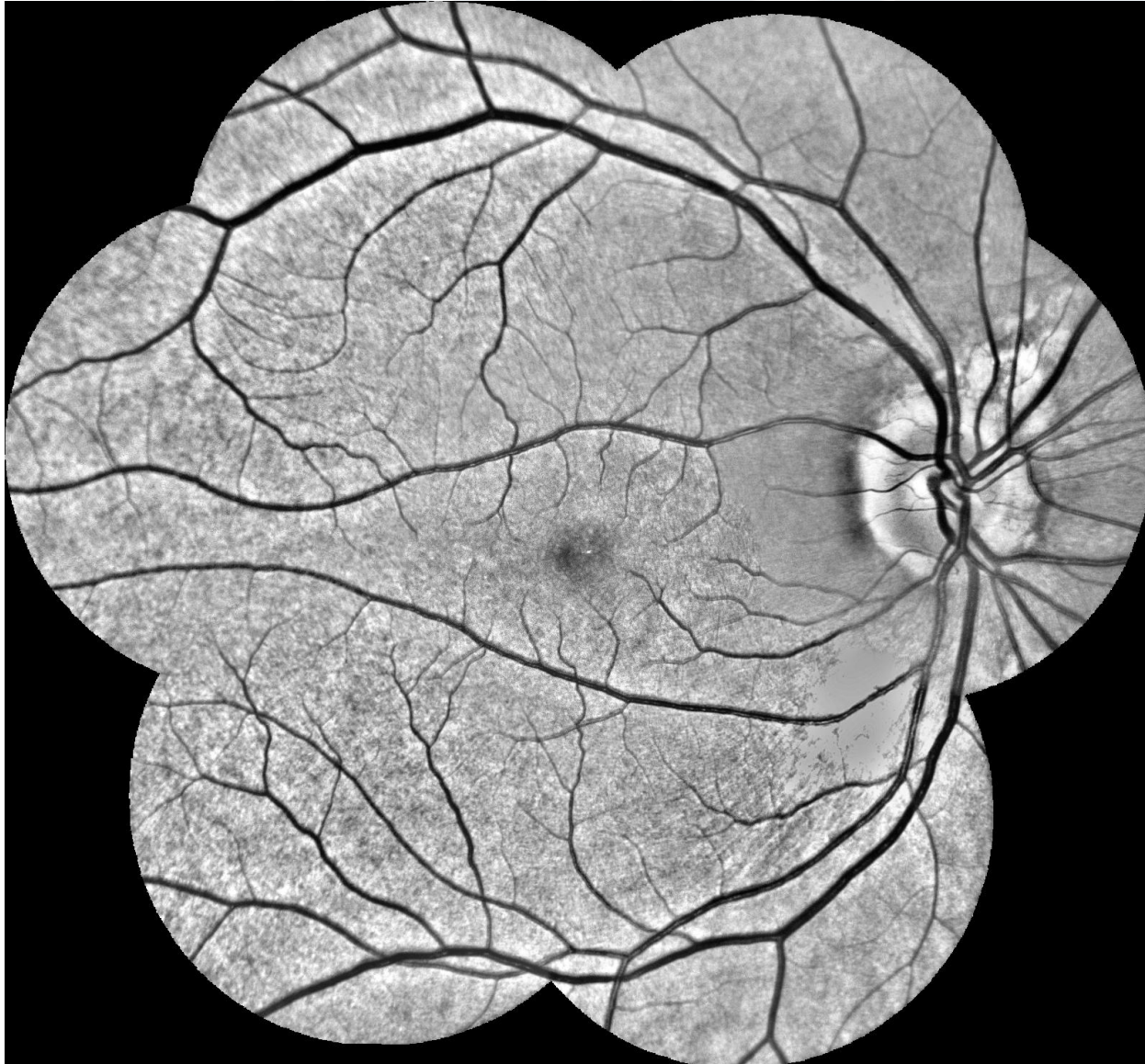
Red Image

Multi Spectral Images & HiRes Camera reveal detailed features unobtainable with colour cameras

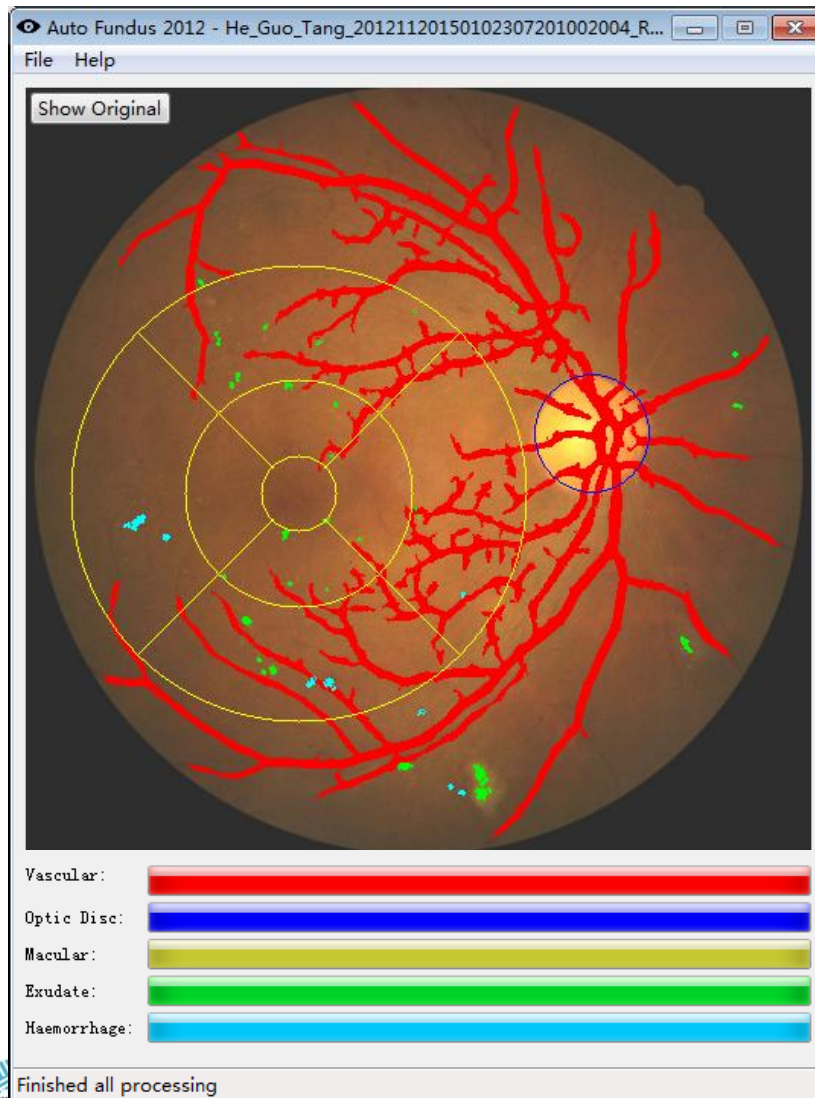


Representative 20° FOV image





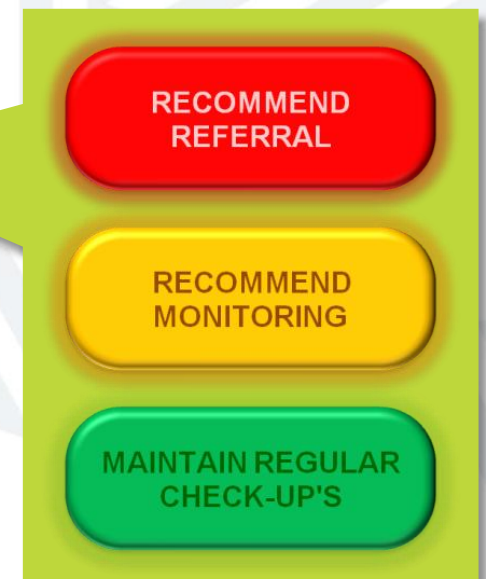
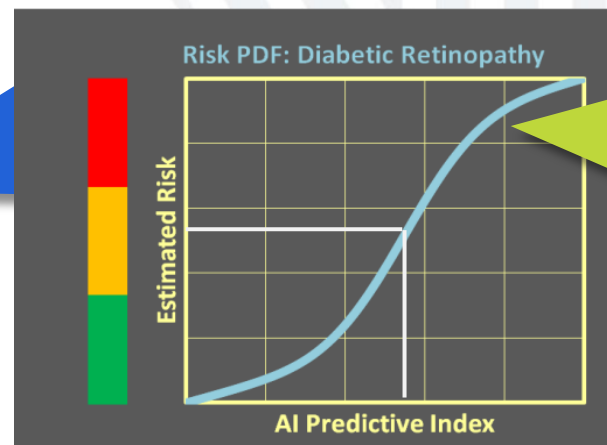
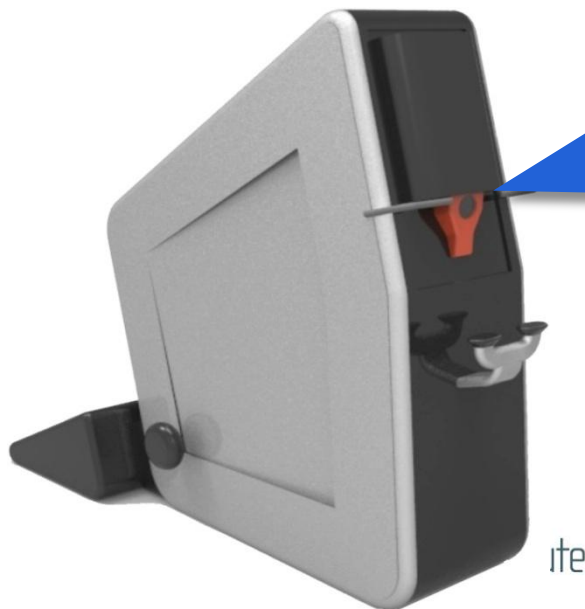
We have Image Analysis for Feature Extraction



- Current image analysis software applied to a conventional RGB retinal camera image
 - vascular branches
 - optic disc
 - macular
 - exudates
 - haemorrhages
- What we need is Automated algorithm feature analysis with High Res images

The Solution

- Automatic: can be used by non-expert operators
- Accurate (sensitivity/specificity)
- Fit for environment, fit for purpose
- Same-visit recommendation
- Provide detailed HQ MS and stereoscopic images and analysis for the Expert to review and manage the patient either on-site or remotely
- By 2015, System for detection, interpretation and 'diagnosis' of diabetic retinopathy and glaucoma
- By 2015, risk assessment software
- Beyond 2015 – other conditions detected



Commercialization Strategy

- India, China, Australia and U.S. initial focus
- Most sales through distributors
- Market based pricing in developed market, pricing in undeveloped markets subsidized by sales in developed markets
- Additional functionality every 9-12 months
- Release auto-refractor software within 1 year, enables use of camera as an auto-refractor



Research: Retinal Camera

- India
- Mexico
- China
- Evaluate the instrument and the delivery system



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