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Award Abstract #1430062

PFI:BIC Making Full Use of the High-Resolution Image Capability of Smartphones to Collect Data through Ophthalmic Devices for Smart Mobile- and Tele-Health

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Awarded Amount to Date:	$800,000.00
Investigator(s):	Wolfgang Fink wfink@email.arizona.edu (Principal Investigator) Kevin Garcia (Co-Principal Investigator) Joseph Miller (Co-Principal Investigator)
Sponsor:	University of Arizona 888 N Euclid Ave Tucson, AZ 85719-4824 (520)626-6000
NSF Program(s):	PARTNRSHIPS FOR INNOVATION-PFI
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ABSTRACT

This Partnerships for Innovation: Building Innovation Capacity (PFI:BIC) project from the University of Arizona is designed to extend healthcare to remote patients suffering from eye diseases. The field of Mobile Health, or M-Health, is the merging of mobile technology and healthcare. Its purpose is to extend the reach of healthcare services to people living in rural, remote, or isolated areas who do not have routine access to healthcare. M-Health allows for effective medical analyses and decisions to be made where remote patients are located,

rather than requiring them to travel to a distant city to receive medical care. Ocular trauma, glaucoma, and macular degeneration are all significant causes of preventable vision loss, if detected and treated early. A series of devices is proposed which act as medical examination extensions to a smartphone. A visiting healthcare practitioner attaches such a device to a smartphone and runs a custom app to perform a specialized examination of specific portions of the eye. Using a WiFi or cell signal, the smartphone app submits the collected examination data to a remote "expert system," which provides in-depth medical analysis processing. The analysis results are sent back almost immediately and are displayed onscreen to the healthcare practitioner. Through this process of telediagnosis, the project offers the potential of greatly improving remote patient screening and triage. It will help to ensure that patients with undiagnosed eye diseases are detected early and can arrange to visit an ophthalmologist in time to prevent permanent eye damage. The result of establishing this paradigm of remote medical care will extend healthcare to those most in need.

The project establishes a smart service platform in ophthalmology by creating a server-based telediagnostic analysis capability for current and future smartphone-based ophthalmic examination devices, three of which are to be developed in this effort: a microscopic extension, a panoptic ophthalmoscope, and a portable slit lamp. This capability would allow examination data, gathered with such devices, to be sent wirelessly to a remote server for automated analysis, the results of which would be sent back to the originating smartphone. This server-based telediagnostic analysis capability allows for either tele-expert or automated machine-based in-depth evaluation and diagnosis of the submitted image data. This is made possible because smartphones are ubiquitous and Internet-connected. This capability enables both real-time and store-and-forward teleconsultation and communication to other health professionals for a full diagnosis later in time when convenient or possible. These handheld devices will enable field-conducted examinations that are otherwise restricted to clinical settings (e.g., medical offices and clinics). Compared to state-of-the-art ophthalmic equipment, the proposed devices will be miniaturized, portable, and usable even by non-specialists outside clinical settings.

At the inception of the project, the partners are the lead institution, University of Arizona (Departments of Biomedical Engineering and Electrical & Computer Engineering and Department of Ophthalmology and Vision Science), and a small business, Breault, Inc. (Tucson, AZ). Broader context partners are Tech Launch Arizona (University of Arizona, Office of Technology Transfer) and California Institute of Technology.

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