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| **Company Info** | | **Technical POC** | |
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| **N2N System Description** | | | |
| Title:  Contactless Optical Fingerprint System (COFS) | | □ Software Solution (uses conventional sensor)  **X** Hardware/SW Solution (custom hardware and software) | |

# **IARPA Nail-to-Nail Challenge Registration**

## All Stage 1 Registrations need to be submitted to Challenge.gov by **March 17, 2017**

Abstract

GE Global Research has developed a novel, contactless fingerprint capture system under funding from DHS S&T. Zeteo Tech LLC is working with GE Global Research to transition this technology into a product called the Contactless Optical Fingerprint System (COFS). The system is based on a single camera and multiple liquid crystal panels, coupled with birefringent lens, to enable high resolution 3-D acquisition of fingerprints. The system rapidly and accurately electrically switches the path length of the reflected light from the fingers to enable fingerprint acquisition using the technique known as depth-from-defocus (DFD) – **without any moving parts**. The system was shown to **rapidly (<20 seconds) and accurately (~1000 pixel per inch)** generate 3-D images of four finger simultaneously and to use the acquired data to calculate equivalent rolled nail-to-nail fingerprints that matched those taken by highly skilled technicians. This four step process is shown in Figure 1.

We have signed a materials transfer agreement with GE Global Research to acquire the residual operational hardware for modification and updating for use in the N2N Challenge. A follow-on product envisioned by Zeteo Tech combines the COFS with long wavelength infrared hyperspectral imaging to simultaneously acquire high resolution N2N fingerprints and sensitive detection of contraband materials such as drugs and explosives.

Concept of Operations

The system uses a visual aid approach to guide the fingerprinting subject through the collection process. The subject inserts the four fingers of one hand for one scan and the thumb of that hand for a second scan. The system uses a simple, low cost auxiliary camera to provide a side view of the fingers with monitor markings to determine the required position. Similarly, a live bottom view from the primary capture camera provides feedback about the x and y finger position. Once the hand is in position, the data is rapidly acquired for that hand and the subject is directed to insert the thumb or next hand into position. The current system is completely contactless but could include a wrist rest to assist with hand location. However, this does add the potential on needing to clean the wrist rest.

System Diagram

A SOLIDWORKS model of the COFS is shown in Figure 2. The electrical components of the system are power for the display panels, illuminators, cameras, and computers required for data acquisition and analysis. We anticipate a power draw of < 5 amps at 115 V. The current system is not battery powered. 

Materials of construction are standard plastic for the enclosure, the mounts for the screens, illuminators and cameras are machined aluminum, and the structural chassis is mild steel. In the current configuration, there are no materials that contact the subject.

Optics are all broadband visible. The illuminators are low level (<1000 lumens) white light.

The COTS parts include the illuminators, camera, computer, lens, power supplies. The custom parts include the LCD panels that are coupled with custom birefringent lens to enable the DFD imaging technique, the mounting system and the physical enclosure. There are no mechanical movements of the system. The path length changes that are integral to the technique are achieved with the combination of electrically switch LCD panels and coupled custom birefringent lenses.

Anticipated Equipment

The hardware and software packages are completely custom and integrated into the COFS. This entire system will be brought to bear for the N2N challenge.

Devices

Augmenting Existing Device

Matchers  
*A) Which Matcher will your team use for the* ***tenprint*** *to* ***tenprint*** *comparison? Please select one:*

*\_X\_\_ Government \_\_\_ Custom \_\_\_\_ Not Sure*

*B) Which Matcher will your team use for the* ***latent*** *to* ***tenprint*** *comparison? Please select one:*

*\_X\_\_ Government \_\_\_ Custom \_\_\_\_ Not Sure*

Safety Assessment

There are no high voltages, and all electrical components are inside the casing and do not provide a hazard to the user or the subject. The light sources used are low level broadband visible light (no lasers) and do not provide a skin or eye hazard.

Innovation

Our device is intuitive for users and provide simple guidance throughout the capture process. By putting most of the burden of capture on the system, we will increase the likelihood that this technology can be used in many locations *with little to no operator intervention*. GE Global Research has two issued patents on the technology US8600123B2 and US8406487B2 and Zeteo Tech is currently negotiating a license to these patents and other associated IP. The system:

* Increases rate of fingerprint image acquisition regardless of dry, oily, and/or damaged fingerprints
* Produces high quality fingerprint images, resulting in improved fingerprint matching accuracy
* Presents less intrusive and more acceptable fingerprint collection process for screened individuals
* Reduces risk of transfer of microorganisms and communicable diseases
* Improves “liveness” detection (“liveness” implies a living individual and not some means of deception)
* Eliminates costs and downtime associated with cleaning the platen of conventional scanners between users