OSAC RESEARCH NEEDS ASSESSMENT FORM

Title of research need: 3D Imaging of patterned injuries on human skin

Keyword(s): 3D scanning, 3D photography, color, documentation, database, superimposition

Submitting subcommittee(s): Odontology **Date Approved:** 08 24 2016

(If SAC review identifies additional subcommittees, add them to the box above.)

Background Information:

1. Description of research need:

Current assessment tools for patterned injuries involve considerable potential for error, such as physical contact of impression materials which may distort tissues, 2D photography which has intrinsic errors depending on distance and lighting, and subjective expert opinion. 3D methods are available, but need to be optimized for use on mobile devices (e.g., smartphones and multi-camera systems) and tested for dimensional and color accuracy and ease-of-use. Software is needed for efficient archiving and retrieval, as well as superimposition and matching functions. Comparisons are needed between 3D and current methods preferably in black box experiments.

2. Key bibliographic references relating to this research need:

Zancajo-Blazquez S, Gonzalez-Aguilera D, Gonzalez-Jorge H, Hernandez-Lopez D. An automatic image-based modelling method applied to forensic infography. PLoS One. 2015 Mar 20;10(3):e0118719. doi: 0.1371/journal.pone.0118719.

Leipner A, Baumeister R, Thali MJ, Braun M, Dobler E, Ebert LC. Multi-camera system for 3D forensic documentation. Forensic Sci Int. 2016 Apr;261:123-8. doi: 10.1016/j.forsciint.2016.02.003.

Urbanová P, Hejna P, Jurda M. Testing photogrammetry-based techniques for three-dimensional surface documentation in forensic pathology. Forensic Sci Int.2015 May;250:77-86. doi: 10.1016/j.forsciint.2015.03.005.

Campana L, Breitbeck R, Bauer-Kreuz R, Buck U. 3D documentation and visualization of external injury findings by integration of simple photography in CT/MRI data sets (IprojeCT). Int J Legal Med. 2016 May;130(3):787-97.

https://www.dental-monitoring.com (Smartphone app for measuring tooth positions)

Verhiel SH, Piatkowski de Grzymala AA, Van den Kerckhove E, Colla C, van der Hulst RR. Three-dimensional imaging for volume measurement of hypertrophic and keloid scars, reliability of a previously validated simplified technique in clinical setting. Skin Res Technol. 2016 Jun 10. doi: 10.1111/srt.12296.

Hibler BP, Qi Q, Rossi AM. Current state of imaging in dermatology. Semin Cutan Med Surg. 2016 Mar;35(1):2-8.

Rashaan ZM, Stekelenburg CM, van der Wal MB, Euser AM, Hagendoorn BJ, van Zuijlen PP, Breederveld RS. Three-dimensional imaging: a novel, valid, and reliable technique for measuring wound surface area. Skin Res Technol. 2016 Feb 7.
Liu W, Cheung Y, Sabouri P, Arai TJ, Sawant A, Ruan D. A continuous surfacer econstruction method on point cloud captured from a 3D surface photogrammetry
system. Med Phys. 2015 Nov;42(11):6564-71.
Pavlovčič U, Diaci J, Možina J, Jezeršek M. Wound perimeter, area, and volume measurement based on laser 3D and color acquisition. Biomed Eng Online. 2015 Apr 24;14:39. doi: 10.1186/s12938-015-0031-7. doi: 10.1111/srt.12285.

3a. In what ways would the research results improve current laboratory capabilities?

The proposed research topics would simplify data acquisition, automate data processing, reduce investigator and staff time, reduce errors, increase details related to severity and healing of the injuries.

3b. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

The proposed research topics would simplify data acquisition, automate data processing, reduce investigator and staff time, reduce errors, increase details related to severity and healing of the injuries.

3c. In what ways would the research results improve services to the criminal justice system?

The work would lead to better protocols, establishment of standards for documentation, better understanding of the natural history and causes of patterned injuries, iimproved expert witness testimony.

4. Status assessment (I, II, III, or IV):

Suitability of mobile devices for documentation of patterned injuries	I
Protocols for 3D digital imaging (scanning, photography) for patterned images, especially to methods involving physical contact such as impressions.	I
Availability of archived and accessible 3D databases of patterned injuries (causes, healing, etc.) and methods of uperimposing/matching images.	I

	Major gap in current knowledge	Minor gap in current knowledge
No or limited current research is being conducted	I	III
Existing current research is being conducted	II	IV

This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.

Approvals:

Subcommittee	Approval date: 08 24 2016
(Approval is by majority vote of subcommittee. Once approved, forward to SAC.)	

SAC	
1. Does the SAC agree with the research need?	Yes ☐ No ☐
2. Does the SAC agree with the status assessment?	Yes ☐ No ☐
If no, what is the status assessment of the SAC:	
Approval date:	
(Approval is by majority vote of SAC. Once approved, forward to NIST for posting.)	