Résumé of

TOBY M. TERPSTRA, AAS.

Kineticorp™

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EDUCATION: **Associates of Applied Science**, Westwood College of Technology, 2001
Multimedia Program, University of Colorado at Denver, 2000-2001
Graphic Design Program, Arapahoe Community College, 1998-2000
Architecture Program, Arapahoe Community College, 1998

CERTIFICATIONS:

Forensic Video Technician (LEVA), Kansas City Regional Police Academy, May 2019.
Remote Pilot, Small Unmanned Aircraft System Rating, Federal Aviation Administration (FAA), February 2018.
Human Participant-based Research, National Institutes of Health (NIH) Office of Extramural Research, April 2016.

PROFESSIONAL AFFILIATIONS:

- Society of Automotive Engineers (SAE), Member since 2011
- American Society for Photogrammetry and Remote Sensing (ASPRS), Member since 2014
- International Association for Forensic and Security Metrology (IAFSM), Member since 2015
- Association for Crime Scene Reconstruction (ACSR), Member since 2020

AWARDS & RECOGNITION:

- "Outstanding Oral Presentation Award" Society of Automotive Engineers (SAE), 2019

FORENSIC ANALYSIS & VISUALIZATION:

Since 2003, Mr. Terpstra has focused his professional practice and research in the area of computer visualization. From 2003 to 2005, Mr. Terpstra was a Forensic Animator at Knott Laboratory. Since 2005, Mr. Terpstra has acted as the Senior Animator at Kineticorp, specializing in 3D analysis, site reconstruction, photogrammetry, video analysis, visibility, interactive media, animation, and acoustics. In the course of his work and research, Mr. Terpstra has gained experience in many areas including the following:

- Creation and development of the Digital Reverse Camera Projection (DRCP) onsite photogrammetry application available on the Google Play Store.
- In 2017 Mr. Terpstra developed the nation's first ACTAR accredited course on photogrammetry in accident reconstruction.
- Investigation and digital mapping of hundreds of vehicles, accident scenes and shooting incident sites.
- Production of 3D animations, graphics and interactive media for depositions, mediation and courtroom exhibits.
- Photogrammetric reconstitution of evidence no longer physically available.
- 3D analysis of shooting incidents, accident scenes, and vehicle data for accurate position and orientation determination.
- Acoustics as related to vehicles and vehicular accidents.
- Three-dimensional bullet path analysis for shooting incident reconstructions.
- Vehicular accident reconstruction animations for court cases nationwide, as well as for Denver's Channel 4.

ADDITIONAL 3D EXPERIENCE:

In the course of his education and professional work, Mr. Terpstra has gained visualization experience in many areas through the following works:

- (AASHTO) American Association of State Highway Transportation: 3D models of weather patterns and weather-related concepts for computer-based training. www.transportation.org
- (USDOT) United States Department of Transportation, (FHWA) Federal Highway Administration: Environmental impact 3D pre-visualization and animation. www.cflhd.gov
- (USAF)United States Air Force, (CEMM) Center of Excellence for Medical Multimedia: Medical 3D animations. www.cemm.org

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RESEARCH & TEACHING:

In the course of his professional work, Mr. Terpstra has taught and conducted researched in these areas:

- Mr. Terpstra currently teaches "Photogrammetry and Analysis of Digital Media", a course sponsored by the Society of Automotive Engineers. The content of this ACTAR accredited course includes photogrammetry, video analysis, video tracking, and digital media analysis. He is responsible for course instruction and curriculum development.
- Mr. Terpstra has published peer-reviewed research in the Society of Automotive Engineers (SAE) Accident Reconstruction Session on the topics of photogrammetry, lens distortion, LiDAR, site reconstruction, and 3D visualization.
- Mr. Terpstra serves as a peer reviewer for research papers in the Occupant Protection: Accident Reconstruction session for the SAE World Congress.
- Mr. Terpstra has ongoing research in the areas of Photogrammetry, 3D visualization, 3D scanning, 3D modeling, acoustics, photogrammetry, and nighttime visibility.
- Mr. Terpstra has been involved with an internship program to benefit college students through mentoring, training and industry related experience.

TECHNICAL, PEER REVIEWED PUBLICATIONS

1. Neale, W.T.C., **Terpstra, T.,** Beauchamp G., "Empirical Evaluation of In-Feld, Binaural Record and Playback Reproduction." *The Journal of the Acoustical Society of America* 145, 1890. (2019).
2. **Terpstra, T**., Neale, W., Hashemian, A., "Photogrammetry and Analysis of Digital Media" Version: 004, Published through SAE Technical Course Material, Troy Michigan. (2019).
3. **Terpstra, T**., Neale, W., Hashemian, A., "Photogrammetry and Analysis of Digital Media" Version: 003, Published through SAE Technical Course Material, Troy Michigan. (2019).
4. **Terpstra, T.,** Dickinson, J., Hashemian, A., Fenton, S., "Reconstruction of 3D Accident Sites Using USGS LiDAR, Aerial Images, and Photogrammetry." SAE, Paper 2019-01-0423. Detroit, MI. (2019).
5. **Terpstra, T.,** Beier, S., Neale T.C, A., "The Application of Augmented Reality to Reverse Camera Projection." SAE, Paper 2019-01-0424. Detroit, MI. (2019).
6. **Terpstra, T**., Neale, W., Hashemian, A., "Photogrammetry and Analysis of Digital Media" Version: 002, Published through SAE Technical Course Material, Troy Michigan. (2018).
7. **Terpstra, T.,** Dickinson, J., Hashemian, A., "Using Multiple Photographs and USGS LiDAR to Improve Photogrammetric Accuracy." SAE, Paper 2018-01-0516. Detroit, MI. (2018). – Also published in SAE International Journal of Transportation Safety Volume 6, Issue 3, 2018.
8. **Terpstra, T**., Neale, W., Hashemian, A., "Photogrammetry and Analysis of Digital Media" Published through SAE Technical Course Material, Troy Michigan. (2017).
9. **Terpstra, T.,** Miller, S., Hashemian, A., "An Evaluation of Two Methodologies for Lens Distortion Removal when EXIF Data is Unavailable." SAE, Paper 2017-01-1422. Detroit, MI. (2017).
10. Muttart, J., Dinakar S., Suway J., Kuzel M., Maloney T., Biever W., **Terpstra T.,** Voitel T., Cavanaugh D., Harms T., "Comparing A Timed Exposure Methodology to the Nighttime Recognition Responses from SHRP-2 Naturalistic Drivers." SAE, Paper 2017-01-1366. Detroit, MI. (2017).
11. **Terpstra, T.,** Voitel, T., Hashemian, A., "A Survey of Multi-View Photogrammetry Software for Documenting Vehicle Crush." SAE, Paper 2016-01-1475. Detroit, MI. (2016).
12. Neale, W.T.C., Hessel, D., **Terpstra, T.,** "Photogrammetric Measurement Error Associated with Lens Distortion." SAE, Paper 2011-01-28611B-0043. Detroit, MI. (2011).
13. Neale, W.T.C., **Terpstra, T.,** Bortles W. M., "Evaluation of Discrete Vehicle Accident Sounds for use in Accident Reconstruction." *Proceedings of Meetings on Acoustics* Vol.5 (2008).
14. Neale, W.T.C., **Terpstra, T.,** Bortles W. M., "Analysis of Commonly Witnessed Vehicle Accident Sounds *in situ*." *The Journal of the Acoustical Society of America* 124:4 (Oct. 2008): 5aNS5.

15. Neale, W.T.C., **Terpstra, T.,** "Methodology for Physics-Based Sound Composition in Forensic Visualization." *Proceedings of Meetings on Acoustics* Vol.1 (2007).
16. Neale, W.T.C., **Terpstra, T.,** "Methodology for Reconstruction of Vehicle Accident Acoustics for use in Forensic Visualization." *The Journal of the Acoustical Society of America* 121:5 (May 2007): 3pAA8.

OTHER PUBLICATIONS & ARTICLES

1. **Terpstra, T.,** et al. Art of The Point Cloud p.70-71, 84-85, ISBN 978-1-9997189-1-6, Wild Harbor Books Glasgow, 2018.
2. Voitel, T., **Terpstra, T.,** "Benefits of 3D Laser Scanning in Vehicle Accident Reconstruction", FARO – Technology White Paper, May 2012

INVITED LECTURES AND COURSES TAUGHT

1. "Photogrammetry and Analysis of Digital Media" Society of Automotive Engineers Course C1712, 3-day course, Troy, MI. September 2020.
2. "Photogrammetry and Analysis of Digital Media" Society of Automotive Engineers Course C1712, 3-day course, Troy, MI. May 2020.
3. "Utilizing LiDAR and Photogrammetry-based Point Clouds for Shooting Incident Analysis" Association for Crime Scene Reconstruction, 30th annual conference, Reno, NV. 2020.
4. "Examination of Trajectory Rod Mapping Methods" Association for Crime Scene Reconstruction, 30th annual conference, Reno, NV. 2020.
5. "Photogrammetry and Analysis of Digital Media" Society of Automotive Engineers Course C1712, 3-day course, Troy, MI. September 2019.
6. "Photogrammetry and Analysis of Digital Media" Society of Automotive Engineers Course C1712, 3-day course, Troy, MI. June 2019.
7. "Empirical Evaluation of In-Field, Binaural Record and Playback Reproduction" Acoustical Society of America 177th Meeting, Louisville KY. 2019.
8. "Reconstruction of 3D Accident Sites Using USGS LiDAR, Aerial Images, and Photogrammetry" SAE Technical Paper Presentation, SAE World Congress, Detroit, MI. 2019.
9. "The Application of Augmented Reality to Reverse Camera Projection" SAE Technical Paper Presentation, SAE World Congress, Detroit, MI. 2019.
10. "Alleged Excessive Force Recreation Using LiDAR and Photogrammetry" Association for Crime Scene Reconstruction, 29th annual conference, Nashville, TN. 2019.
11. "Photogrammetry and Analysis of Digital Media" Society of Automotive Engineers Course C1712, 3-day course, Troy, MI. June 2018.
12. "Using Multiple Photographs and USGS LiDAR to Improve Photogrammetric Accuracy" SAE Technical Paper Presentation, SAE World Congress, Detroit, MI. 2018.
13. "Photogrammetry and Analysis of Digital Media" Society of Automotive Engineers Course C1712, 3-day course, Troy, MI. December 2017.
14. "An Evaluation of Two Methodologies for Lens Distortion Removal when EXIF Data is Unavailable." SAE Technical Paper Presentation, SAE World Congress, Detroit, MI. 2017.
15. "Digital Imaging Devices for Accident Reconstruction" SAE Technical Session: Knowledge Bar, SAE World Congress, Detroit, MI. 2017.
16. "Using Photogrammetry and 3D Analysis to Determine Visibility Through a Weapon Sight" Association for Crime Scene Reconstruction, Black Hawk, CO. 2017.
17. "Using Accident Reconstruction Methods to Help Solve Shooting Incidents" Association for Crime Scene Reconstruction, 27th annual conference, Black Hawk, CO. 2017.
18. "A Survey of Multi-View Photogrammetry Software for Documenting Vehicle Crush." SAE Technical Paper Presentation, SAE World Congress, Detroit, MI. 2016.
19. "3D Analysis and Visualization" – Ohio Organized Crime Investigations Commission, Grove City, OH. 2015.
20. "Forensic Photogrammetry – Extracting Critical Evidence from Crash Photos." Society of Automotive Engineers, Detroit, MI. 2011.
21. "Photogrammetric Measurement Error Associated with Lens Distortion." SAE Technical Paper Presentation, SAE World Congress. 2011.
22. "Topics in Noise – Active Noise, Product Noise, and Community Noise." Acoustical Society of America 156th Annual Conference, Miami, FL. 2008.
23. "Topics in Architectural Acoustics: Acoustics in Rooms, Ducts, and Forensics." Acoustical Society of America 153rd Annual Conference, Salt Lake City, UT. 2007.
24. Advanced Animation course, Art Institute of Colorado, Denver, CO. 2006.

TECHNICAL TRAINING, CLASSES, AND CONFERENCES

1. Annual conference training and seminars. Association for Crime Scene Reconstruction, Reno, NV. March 2020.
2. "Digital Multimedia Evidence Processing" Law Enforcement & Emergency Services Video Association (LEVA) International Inc., at Kansas City Regional Police Academy. May 2019 (5-day course).
3. "Long Exposure Photography at a Crime Scene" Association for Crime Scene Reconstruction, Nashville, TN. February 2019.
4. "Using SketchUp in Crime Scene Reconstruction" Association for Crime Scene Reconstruction, Nashville, TN. February 2019.
5. Annual conference training and seminars. Association for Crime Scene Reconstruction, Nashville, TN. February 2019.
6. "Forensic Video Analysis & The Law" Law Enforcement & Emergency Services Video Association (LEVA) International Inc., at North Carolina State Bureau of Investigation. June 2018 (5-day course).
7. "Advanced Photogrammetry for Collision Reconstruction" PhotoModeler class, Denver, CO. October 2017 (3-day course).
8. "Advanced Matchmoving Strategies in PFTrack" The Pixel Farm, September 12, 2017.
9. "High Accuracy Mapping with DJI Drones" The Pixel Farm, August 8, 2017.
10. "Human Factor in Driver Vision and Lighting" and "Occupant Protection: Accident Reconstruction" seminars. SAE World Congress, Detroit, MI. April 2017.
11. Annual conference training and seminars. Association for Crime Scene Reconstruction, Black Hawk, CO. February 2017.
12. UAS Flight Safety Program. 1UP Aerial Drone Services Inc, Greenwood Village, CO. September 2016.
13. Live vehicle crash tests, presentations and seminars. World Reconstruction Exposition, Orlando, FL. May 2016.
14. "Human Factor in Driver Vision and Lighting" and "Occupant Protection: Accident Reconstruction" seminars. SAE World Congress, Detroit, MI. April 2016.
15. "World DEM" American Society of Photogrammetry and Remote Sensing Annual Conference, Fort Worth, TX. April 2016.
16. "Shooting Incident Reconstruction" Bevel Gardner and Associates, Denver, CO July 2015 (5 days).
17. "Admissibility of 3D Evidence" SPAR International, Colorado Springs, CO. April 2013.
18. "Occupant Protection: Accident Reconstruction" seminars. SAE World Congress, Detroit, MI. April 2011.
19. "Noise: Active Noise, Product Noise, and Community Noise." Acoustical Society of America 156th Annual Conference, Miami, FL. 2008.
20. "Tire Mechanics & Modeling." Colorado State University, Denver, CO. March 2008.