

C21 An Analysis of Body-Worn Camera Photogrammetry Using Depth Mapping

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Learning Overview: After attending this presentation, attendees will be aware of both the issues of contemporary body-worn cameras as well as the accuracy with which 3D information can be obtained from within the video using camera-matching photogrammetry. This is done through specific research and is demonstrated through a case example.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by increasing awareness of how photogrammetric analysis can benefit use-of-force cases. Body-worn cameras are capturing an increasing number of events with controversial implications. Often, the events are fast paced and the video can be both disorienting and misleading. A 3D video analysis can bring greater understanding to the events as they occurred.

The initial push to have a video record documenting a police officer's encounter with suspects began in the early 1980s with the advent of the Mothers Against Drunk Driving (MADD) Campaign.¹ The need to document and record traffic stops, specifically drunk driving instances, was under heavy influence by the MADD campaign.² Since then, dash-mounted cameras have become common place in patrol vehicles and have expanded to include Body-Worn Cameras (BWC). In 2007, *NBC News* and the *Associated Press* reported that "Britain straps video cameras to police helmets."³ Momentum from Europe's use of BWCs continued, transitioning to the United States in 2014 when Washington, DC, New York City, and Los Angeles began pilot programs.⁴

The video and audio record of an event captured by BWCs, as well as cell phones by witnesses and surveillance footage, have led to the emergence of issues surrounding the use of force. However, BWC footage can be blurry, distorted, shaky, and difficult to view due to the constant movement of the body to which the camera is attached, the limited vantage point and field of view of the camera, and movement of the camera from contact with other objects and personnel. To better understand what is actually occurring in the video, techniques of photogrammetry and videogrammetry have been developed to determine the position, orientation, and movement of objects and people involved in an incident that is captured in video. This research examines the issues and accuracy of using existing photogrammetric and videogrammetric techniques with BWC footage. Additionally, this research evaluates the techniques used to correct the factors that can make BWC footage different than other types of video recordings such as low light levels, low resolution, the distance from other objects, lens distortion, motion blur, limited field of view, and obstructions from the arms and hands of the officers themselves.

Reference(s):

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3. Britain Straps Video Cameras to Police Helmets. *NBCNews.com*. *NBCUniversal News Group*, July 13, 2007. http://www.nbcnews.com/id/19750278/ns/world_news-europe/t/britain-straps-video-cameras-police-helmets/.
4. Hermann, Peter, and Rachel Weiner. Issues over Police Shooting in Ferguson Lead Push for Officers and Body Cameras. *The Washington Post*. WP Company, December 2, 2014. https://www.washingtonpost.com/local/crime/issues-over-police-shooting-in-ferguson-lead-push-for-officers-and-body-cameras/2014/12/02/dedcb2d8-7a58-11e4-84d4-7c896b90abdc_story.html.

Video Analysis, Photogrammetry, Body-Worn Cameras