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Authentication Approaches for Standoff Video Surveillance

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Video surveillance for international nuclear safeguards applications requires authentication, which confirms to an inspector reviewing the surveillance images that both the source and the integrity of those images can be trusted. To date, all such authentication approaches originate at the camera. Camera authentication would not suffice for a "standoff video"application, where the surveillance camera views an image piped to it from a distant objective lens. Standoff video might be desired in situations where it does not make sense to expose sensitive and costly camera electronics to contamination, radiation, water immersion, or other adverse environments typical of hot cells, reprocessing facilities, and within spent fuel pools, for example. In this paper, we offer optical architectures that introduce a standoff distance of several meters between the scene and camera. Several schemes enable one to authenticate not only that the extended optical path is secure, but also that the scene is being viewed live. They employ optical components with remotely-operated spectral, temporal, directional, and intensity properties that are under the control of the inspector. If permitted by the facility operator, illuminators, reflectors and polarizers placed in the scene offer further possibilities. Any tampering that would insert an alternative image source for the camera, although undetectable with conventional cryptographic authentication of digital camera data, is easily exposed using the approaches we describe.

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