NUSTL
NATIONAL URBAN SECURITY TECHNOLOGY LABORATORY

SAVER TechNote

October 2020

WIRELESS SURVEILLANCE CAMERA SYSTEMS

Wireless surveillance camera systems capture and transmit live video over the air for real-time viewing and/or recording. First responder agencies often use these systems to provide security and situational awareness video. They may also be used in emergencies, for example in search and rescue missions or to capture video of law enforcement activities. Types of wireless camera systems include fixed-mount permanent installation systems as well as portable rapid-deployment units.

Wireless surveillance camera systems fall under AEL reference number: 14SW-01-VIDA.

Overview

Wireless surveillance camera systems include one or more cameras, a transmitter, a receiver, a video monitor, and sometimes a data storage device. Live video is captured by the camera then streamed over a wireless communication system. The wireless communication technology varies from product to product and can be cellular, Wi-Fi, or proprietary wireless point-to-point. Some products have multiple communication system options that increase their versatility. Digitally encoded video can be streamed to a variety of devices, for instance, personal computers (PCs), tablets, or cellular phones. Some wireless surveillance camera systems offer simultaneous live viewing of multiple video channels. Video data can also be recorded by a network video recorder (NVR) or captured on the device itself on removable media.

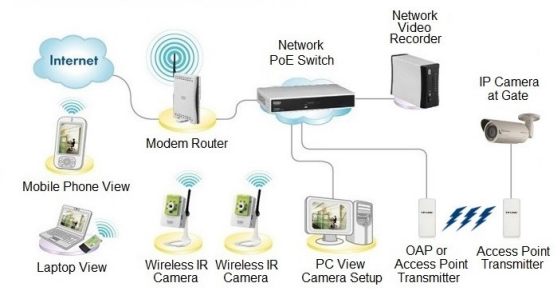

Figure 1. Wireless Surveillance Camera System

Image courtesy of Smart Security Surveillance System

The range of a wireless surveillance camera system depends on the type of wireless communication technology it uses. Cellular-based camera systems require a cellular data plan to connect to 3G/4G/5G networks and perform best in areas with reliable cellular network coverage. Wi-Fi based camera systems require an existing 802.11 compatible wireless network to operate, and their range depends on the position and deployment of the wireless network's infrastructure. Point-to-point wireless systems may be preferable in rural areas with weak or non-existent cellular coverage and work best with a clear line of sight between transmitter and receiver.

Often located outdoors, wireless surveillance camera systems must be able to withstand adverse weather conditions such as wind, humidity, snow and rain. Cameras are often enclosed in protective housings to shield them from the elements. Many applications for these systems require recording video under low-light conditions. In order to provide images at night—even in complete darkness—some cameras include infrared (IR) or thermal technologies.

The U.S. Department of Homeland Security (DHS) Science and Technology Directorate (S&T) established the System Assessment and Validation for Emergency Responders (SAVER) program to assist emergency responders making procurement decisions.

DHS S&T's National Urban Security Technology Laboratory (NUSTL) manages the SAVER program and conducts objective assessments and validations on commercial equipment and systems. These results, along with other relevant equipment information, is provided to the emergency response community in an operationally useful form. SAVER provides information on equipment that falls within the categories listed in the DHS Authorized Equipment List.

NUSTL's SAVER knowledge products focus on two main questions: "What equipment is available?" and "How does it perform?" These knowledge products are shared nationally with the responder community, ensuring responders are prepared to make operational and procurement decisions.

For more information on this and other technologies, contact NUSTL by e-mail at NUSTL@hq.dhs.gov or visit the SAVER website: www.dhs.gov/science-and-technology/SAVER.

Homeland Security
Science and Technology

Fixed-Mount Permanent Location Systems

Wireless surveillance camera systems may be designed as permanent fixtures for use in locations like critical infrastructure, offices, parking lots, and street corners. Because these systems require a constant source of power, they are hard-wired to a utility pole or other power source and may also have a battery backup system in case of power outages.

Some fixed-mount cameras have pan-tilt-zoom (PTZ) capability that allows them to hone in on specific targets. Fixed-mount units may also include motion detectors and lighting systems for added security. Cameras with motion detectors, for instance, can be configured to record video only when motion is detected in their field of view.

Fixed-mount cameras are often positioned outdoors and must be ruggedized to withstand adverse weather. Manufacturers of wireless surveillance cameras often provide an Ingress Protection (IP) rating for their products to indicate the sealing effectiveness of the enclosure against particles and moisture. The higher the IP rating, the better protected the camera is from the elements.

Figure 2. Fixed-Mount Wireless Camera System

Image courtesy of Gvtel Communication Systems

Portable Rapid-Deployment Systems

Portable wireless surveillance camera systems—designed to be compact and lightweight—typically include a PTZ camera, a monitoring station, and a protective carrying case. They can be transported and quickly deployed in emergencies or at crime scenes. Portable rapid deployment systems can also provide security at temporary events such as parades, concerts or other types of mass gatherings. To maintain portability, they run on battery power, though some systems have a secondary power source such as solar panels or generators. Many systems feature removable storage media to preserve recorded video in case of a wireless communication failure.

Portable rapid deployment system cameras may be affixed to a height-adjustable pole or be mounted to a tripod or utility pole using hardware included with the system. Physical specifications of the systems vary widely, with some designed to be hand-carried and others packaged in trailers for vehicle towing. Portable wireless camera systems are generally used outdoors and must be ruggedized to withstand the elements.

Figure 3. Portable Wireless Camera System

Image courtesy of Industrial Video & Control

Other Considerations

First responder agencies planning to employ wireless surveillance camera systems must consider security risks. Wi-Fi networks are susceptible to hacking and require encryption to protect sensitive information. Newer-generation cellular networks provide standard communication signal encryption.

Camera features to consider include resolution and field of view (FOV). Higher resolution provides sharper images, while a larger FOV increases the system's maximum area of coverage. Some cameras provide a full 360º view that can be useful for monitoring large areas like parking lots. A camera's maximum zoom range and ability to maintain focus while zooming in or out may also be important depending on the intended use. For capturing images in near or total darkness, cameras equipped with active IR illumination provide the clearest video.