

R&D Division Project Summary

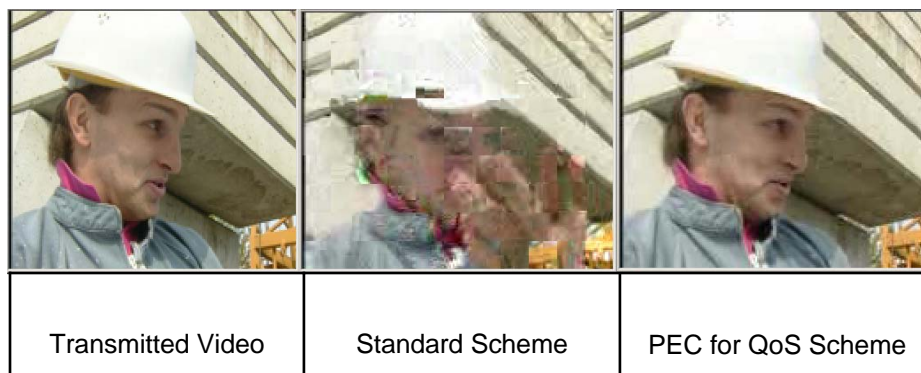
Rapidly advancing technology promises to empower law enforcement officers with real time video monitoring of emergency situations. However, current video streaming technology presents several critical problems that hampered realization of efficient and secure video communication. Research projects currently under way at the Southwest Public Safety Technology Center aim at the development of improved video streaming technology for public safety vehicles.

Through the use of wireless video streaming, it is possible for law enforcement officers to monitor the internal areas of a building from the safety of their vehicle. Such monitoring apparatus would allow law enforcement officers to intervene more effectively in emergency situations and to better protect themselves and the building's inhabitants. However, wireless channel conditions can change abruptly. Interference, increased channel usage, and the even movement of the mobile user, all contribute to signal degradation.

SWTC developed and patented a signal strength filtering (SSF) scheme, which relies on the wireless signal strength to filter packet delay due to automatic repeat request and losses due to wireless channel error. Simulations indicated that SWTC technology results in better video quality even under severe conditions in a wireless channel. Test and evaluation is focused on optimizing the SSF scheme for safety vehicles moving at higher speeds in the metropolitan Houston area.

The public security vehicle of the future will be equipped with surveillance cameras and a networking computer. As a result, headquarters personnel will be able to monitor developing situations in real time based on digital video acquired and transmitted by the equipment installed in vehicles at an incident site. When delivering such compressed digital video over a wireless channel, the perceived visual quality may degrade due to fluctuation of bandwidth, high error rate, and inadequate queue management.

SWTC, in collaboration with Kustom Signals, Inc., is also developing efficient quality-of-service (QoS) mechanisms for supporting video streaming applications in wireless environments. Standard Internet service relies on the best effort mechanism, which discards video data packets when congestion occurs without considering the importance of the information. Such systems provide only minimal performance guarantees, which are not acceptable during emergencies. As an alternative, SWTC researchers are developing a new error control method, called Priority-Based Error Control (PEC) for QoS, which manages the compressed video packets under specific network requirements and priorities. Testing the proposed error control mechanism in wired networks has indicated its potential to improve video quality even under extremely poor network conditions (the figure below shows a frame of a transmitted video sequence and the same frame of the received video sequence, which is streamed by the standard Internet scheme and the PEC for QoS scheme). Field test and evaluation is targeted to begin in early 2006.



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