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Features

Focus on Technology

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Virtual Reality
The Future of Law Enforcement Training

By
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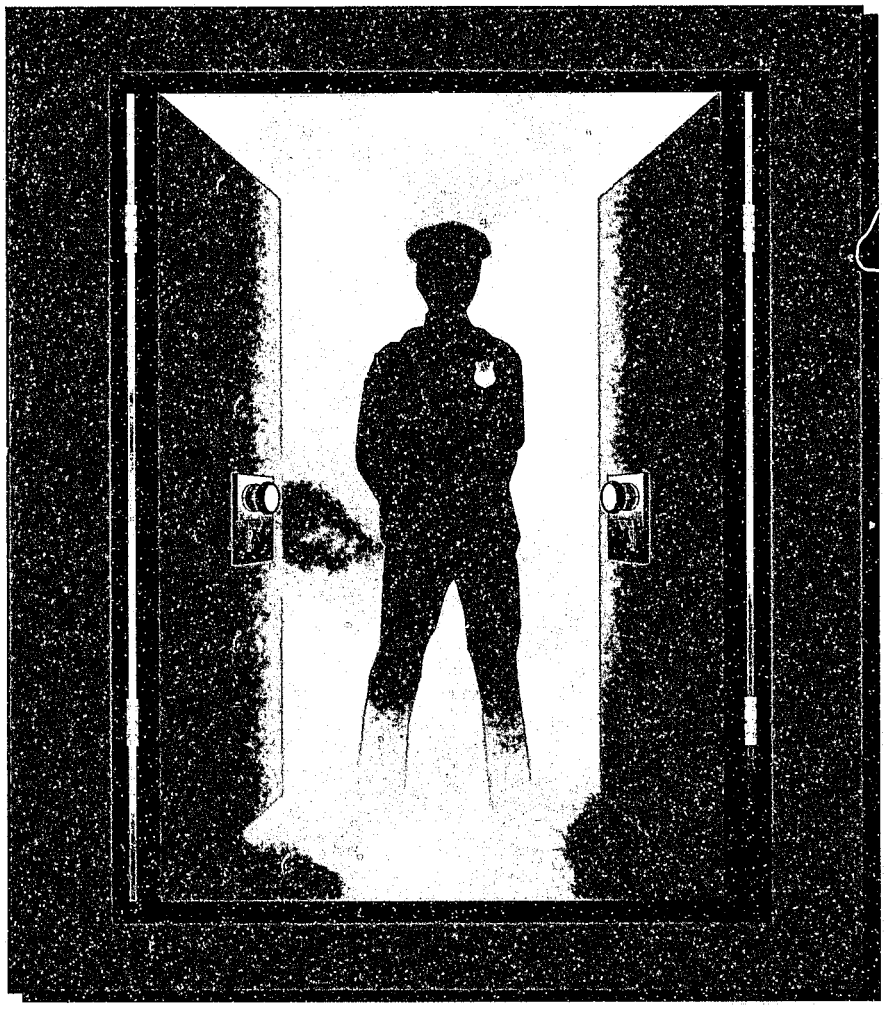

A late night police pursuit of a suspected drunk driver winds through abandoned city streets. The short vehicle chase ends in a warehouse district where the suspect abandons his vehicle and continues his flight on foot. Before backup arrives, the rookie patrol officer exits his vehicle and gives chase. A quick run along a loading dock ends at the open door to an apparently unoccupied building. The suspect stops, brandishes a revolver, and fires in the direction of the pursuing officer before disappearing into the building. The officer, shaken but uninjured, radios in his location and follows the suspect into the building.

Did the officer make a good decision? Probably not by most departments' standards. Whether the officer's decision proves right or wrong, the training gained from this experience is immeasurable, that is, provided the officer lives through it. Fortunately for this officer, the scenario occurred in a realistic, high-tech world called virtual reality, where training can have a real-life impact without the accompanying risk.

TRADITIONAL TRAINING LIMITATIONS

Experience may be the best teacher, but in real life, police officers may not get a chance to learn from their mistakes. To survive, they must receive training that prepares them for most situations they might encounter on the street. However, because many training programs emphasize repetition to produce desired behaviors, they may not achieve the intended results, especially after students leave the training environment. Thus, the more realistic the training, the greater the lessons learned.

Additionally, even some in law enforcement may fall prey to the effects of what has come to be termed "The MTV Generation."[1] As products of this generation, today's young officers purportedly have short attention spans requiring new, nontraditional training methods. The key to teaching this new breed is to provide fast-paced,

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> ***"...virtual reality allows law enforcement officers to...react to real-world situations without the accompanying dangers."***

attention-getting instruction that is clear, concise, and relevant.[2]

TRAINING WITH VIRTUAL REALITY

Virtual reality can provide the type of training that today's law enforcement officers need. By completely immersing the senses in a computer-generated environment, the artificial world becomes reality to users and greatly enhances their training experiences.

Although considerable research and development have been conducted in this field, only a limited amount has applied directly to law enforcement. The apparent reason simply is that, for the most part, law enforcement has not asked for it.

Because virtual reality technology is relatively new, most law enforcement administrators know little about it. They know even less about what it can do for their agencies. By understanding what virtual reality is, how it works, and how it can benefit them, law enforcement administrators can become involved in the development of this important new technology.

WHAT IS VIRTUAL REALITY?

Simply stated, virtual reality is high-tech illusion. It is a computer-generated, three-dimensional environment that engulfs the senses of sight, sound, and touch. Once entered, it becomes reality to the user.

Within this virtual world, users travel among, and interact with, objects that are wholly the products of a computer or representations of other participants in the same environment. The limits of this virtual environment depend on the sophistication and capabilities of the computer and the software that drives the system.

HOW DOES VIRTUAL REALITY WORK?

Based on data entered by programmers, computers create virtual environments by generating three-dimensional images. Users usually view these images through a head-mounted device, which can be a helmet, goggles, or other apparatus that restricts their vision to two small video monitors, one in front of each eye. Each monitor displays a slightly different view of the environment, which gives users a sense of depth.

Another device, called a position tracker, monitors users' physical positions and provides input to the computer. This information instructs the computer to change the environment based upon users' actions. For example, when users look over their shoulders, they see what lies behind them.

Because virtual reality users remain stationary, they use a joy stick or track ball to move through the virtual environment. Users also may wear a special glove or use other devices to manipulate objects within the virtual environment. Similarly, they can employ virtual weapons to confront virtual aggressors.

To enhance the sense of reality, some researchers are experimenting with tactile feedback devices (TFDs). TFDs transmit pressure, force, or vibration, providing users with a simulated sense of touch.[3] For example, a user might want to open a door or move an object, which in reality, would require the sense of touch. A TFD would simulate this sensation. At present, however, these devices are crude and somewhat cumbersome to use.

USES FOR VIRTUAL REALITY

In today's competitive business environment, organizations continuously strive to accomplish tasks faster, better, and

inexpensively. This especially holds true in training.

Virtual reality is emerging rapidly as a potentially unlimited method for providing realistic, safe, and cost-effective training. For example, a firefighter can battle the flames of a virtual burning building. A police officer can struggle with virtual shoot/don't shoot dilemmas.[4]

Within a virtual environment, students can make decisions and act upon them without risk to themselves or others. Instructors can critique students' actions, enabling students to review and learn from their mistakes. This ability gives virtual reality a great advantage over most conventional training methods.

Military Training

The Department of Defense (DOD) leads public and private industry in developing virtual reality training. Since the early 1980s, DOD has actively researched, developed, and implemented virtual reality to train members of the armed forces to fight effectively in combat.

DOD's current approach to virtual reality training emphasizes team tactics. Groups of military personnel from around the world engage in combat safely on a virtual battlefield. Combatants never come together physically; rather, simulators located at various sites throughout the world transmit data to a central location, where the virtual battle is controlled. Because it costs less to move information than people, this form of training has proven quite cost-effective.

An additional benefit to this type of training is that battles can be fought under varying conditions. Virtual battlefields re-create real-world locations with interchangeable characteristics. To explore "what if" scenarios, participants can modify enemy capabilities, terrain, weather, and weapon systems.

Virtual reality also can re-create actual battles. Based on information from participants, the Institute for Defense Analyses re-created the 2nd Armored Cavalry Regiment Offensive conducted in Iraq during Operation Desert Storm. The success of the virtual re-creation became apparent when, upon viewing the simulations, soldiers who had fought in the actual battle reported the extreme accuracy of the event's depiction and the feeling of reliving the battle.[5] Clearly, virtual reality holds great potential for accurate review and analysis of real-world situations, which would be difficult to accomplish by any other method.

> **"...virtual reality holds great potential for accurate review and analysis of real-world situations, which would be difficult to accomplish by any other method."**

Preliminary studies show that military units perform better following virtual reality training.[6] Even though virtual environments are only simulations, the complete immersion of the senses literally overwhelms users, totally engrossing them in the action. This realism presumably plays a major role in the program's success and likely will prove positive in future endeavors. In fact, due to its success in training multiple participants in group combat situations, DOD plans to train infantry personnel individually with virtual reality fighting skill simulators.[7]

Law Enforcement Training

While virtual reality has proven its value as a training and planning tool for the military, applications for this technology reach far beyond DOD. To varying degrees, many military uses can transfer to law enforcement, including training in firearms, stealth tactics, and assault skills.

Unfortunately, few organizations have dedicated resources to developing virtual reality for law enforcement. According to a recently published resource guide, more than 100 companies currently are developing and/or selling virtual reality hardware or software. However, none of these firms mentioned law enforcement uses.[8]

Further, a review of relevant literature revealed numerous articles on virtual reality technology, but only a few addressed law enforcement applications. Yet, virtual reality clearly offers law enforcement benefits in a number of areas, including pursuit driving, firearms training, high-risk incident management, incident re-creation, and crime scene processing.

Pursuit Driving

Pursuit driving represents one area in which a virtual reality

application has become reality for law enforcement. Law enforcement personnel identified a need and provided input to a well-known private corporation that developed a driving simulator equipped with realistic controls.

The simulator provides users with realistic steering wheel feedback, road feel, and other vehicle motions. The screen possesses a 225-degree field of view standard, with 360-degree coverage optional. Simulations can involve one or more drivers, and environments can alternate between city streets, rural back roads, and oval tracks. The vehicle itself can change from a police car to a truck, ambulance, or a number of others.

Virtual reality driving simulators provide police departments invaluable training at a fraction of the long-term cost of using actual vehicles. In fact, the simulator is being used by a number of police departments around the country.

During the past year, the Los Angeles County Sheriff's Office Emergency Vehicle Operations Center (EVOC) has used a four-station version of the driving simulator to train its officers. The simulators help students develop judgment and decisionmaking skills, while providing an environment free from risk of injury to students or damage to vehicles. Still, as the EVOC supervisor cautions, virtual reality training should complement, not replace, actual behind-the-wheel instruction.[9]

Firearms Training

Virtual reality could greatly enhance shoot/don't shoot training simulators currently in use, such as the Firearms Training System, a primarily two-dimensional approach that possesses limited interactive capabilities. A virtual reality system would allow officers to enter any three-dimensional environment alone or as a member of a team and confront computer-generated aggressors or other virtual reality users.

Evaluators could observe the training from any perspective, including that of the officers or the aggressors, or from any other location in the environment. Training scenarios could involve actual building floor plans or local city streets, and criteria such as weather, number of participants, or types of weapons could be altered easily.

High-Risk Incident Management

In addition to weapons training, virtual reality could prove invaluable for SWAT team members before high-risk tactical assaults. Floor plans and other known facts about a structure or area could be entered into a computer to create a virtual environment for commanders and team members to analyze prior to action.

Incident Re-Creation

Law enforcement agencies could collect data from victims, witnesses, suspects, and crime scenes to re-create traffic accidents, shootings, and other crimes. The

Key Terms

Virtual Image: An image observed even though no concrete object exists. A reflection in a mirror is an example of a virtual image.

Virtual Display: Visual, auditory, and tactile images that, like virtual images, do not actually exist.

Virtual Reality: An environment created by projecting visual, auditory, and tactile images into the eyes. With the senses immersed in these images, users perceive this environment as reality.

Virtual Common or Virtual Community: The virtual environment where virtual reality users "meet."

Cyberspace: The network of virtual reality users interfacing in a virtual community.

Source: Carmen Miller, "Online Interviews Dr. Thomas A. Furness, III, Virtual Reality Pioneer," Online, *November 1992, 14.*

virtual environment created from the data could be used to refresh the memories of victims and witnesses, to solve crimes, and ultimately, to prosecute offenders.

Crime Scene Processing

Virtual reality crime scenes could be used to train both detectives and patrol officers. Students could search the site and retrieve and analyze evidence without ever leaving the station. Actual crime scenes could be re-created to add realism to training or to evaluate prior police actions.

IS VIRTUAL REALITY VIRTUALLY PERFECT?

Though virtual reality may appear to be the ideal law enforcement tool, as with any new technology, some drawbacks exist. Currently, areas of concern range from cumbersome equipment to negative physical and psychological effects experienced by some users. Fortunately, however, the field is evolving and improving constantly, and as virtual reality gains widespread use, most major concerns should be dispelled.

Physical Limitations and Effects

Because computers currently are not fast enough to process large amounts of graphic information in real time, some observers describe virtual environments as "slow-moving."[10] The human eye can process images at a rate much faster than a computer can generate them. In a virtual environment, frames are displayed at a rate of about 7 per second, an extremely slow speed when compared to a television, which generates 60 frames per second.[11] Users find the resulting choppy or slow graphics less than appealing.

Slow graphics also produce a phenomenon known as simulator sickness. Some virtual reality users experience disorientation and nausea somewhat akin to motion sickness. Simulator sickness occurs because the eyes are accustomed to real-world speed; virtual reality's slower graphics negatively affect about 8 to 10 percent of all users. However, as the motion more closely mimics real-time speed, fewer people will experience such ill effects.[12]

> ***"Virtual reality is emerging rapidly as a potentially unlimited method for providing realistic, safe, and cost-effective training."***

Another equipment shortfall is the head-mounted device (HMD). In general, HMDs are large and awkward, and many users find them uncomfortable. Although virtual reality innovators generally view this as a relatively minor problem, they are working to improve design.

One HMD currently under development compares in size and shape to a pair of sunglasses. Rather than using small video monitors, the glasses contain laser-imaging equipment that projects the virtual image directly onto the user's retina. In other words, the retina itself provides the screen for the virtual image, which will be as detailed as any computer graphics produced on a monitor.[13]

Psychological Effects

Mental health professionals have expressed concern about the psychological impact virtual reality may have on users, who experience a loss of contact with the real world. Some individuals may be especially at risk, including drug users, individuals with schizophrenia or other mental disorders, and people who are emotionally unstable.[14]

However, due to the recent emergence of virtual reality technology, little research exists to support psychologists' health concerns.[15] As more individuals and organizations use virtual reality, researchers can study its potentially negative effects. In the mean time, law enforcement agencies should be aware that virtual reality users may experience some ill effects.

CONCLUSION

At present, many individuals equate virtual reality with science fiction; yet, with numerous commercial firms and nonprofit organizations dedicated to its development, virtual reality soon will be an important part of life, especially for law enforcement personnel. By understanding how the technology works and what it can accomplish, law enforcement organizations can become active in research and development and request that applications be developed to meet their special needs.

Virtual reality by no means represents a panacea for all aspects of

police work. However, this new and intriguing technology holds great potential for opening the door to a multitude of possibilities.

In its present form, virtual reality allows law enforcement officers to enter a virtual training environment and react to real-world situations without the accompanying dangers. Virtual environments can be created and re-created to test and evaluate strategies both before and after using them in a real situation.

In the case of the officer in the opening virtual reality scenario, he became caught up in the heat of the moment and entered a dangerous situation without backup. Fortunately, this officer could return to the real world, review his actions, and learn from his mistakes.

Law enforcement officers who make errors in judgment sometimes pay for it with their lives. Virtual reality forgives mistakes and gives officers a second chance.✦

Endnotes

[1]Myrna Marofski, "Training the MTV Generation," *Training and Development Journal*, 9-10.

[2]Ibid.

[3]Carmen Miller, "Online Interviews Dr. Thomas A. Furness, III, Virtual Reality Pioneer," *Online*, November 1992, 14.

[4]Glen Emery, "The Radical Visions of Artificial Reality, *The Washington Times*, May 6, 1991.

[5]Dr. Robert E. Roberts, vice president for research, the Institute for Defense Analyses, interview by author, November 23, 1994.

[6]Ibid.

[7]Ibid.

[8]Tor Berg, "Virtual Reality Resource Guide," *Virtual Reality Special Report*, Fall 1994, 39.

[9]George Grein, supervisor, Emergency Vehicle Operations Center, Los Angeles County Sheriff's Office, Los Angeles, California, interview by author, December 6, 1994.

[10]"Virtual Reality Gets Real," *The Economist*, February 20, 1993, 61.

[11]Clarence Barrett, Human Interface Technology Laboratory, Washington Technology Center, University of Washington, Seattle, Washington, interview by author.

[12]Ibid.

[13]Ibid.

[14]Glenn F. Cartwright, untitled article, *World Future Society*, 1994, 104.

[15]Ibid.

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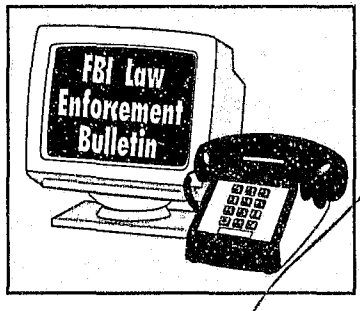

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