VALOORES

The Future of Security Surveillance: A Comprehensive Exploration of CCTV Technology and AI Integration in Crime Prevention and Detection

Widely adopted, especially in developed societies, CCTV serves not only as a tool for crime prevention and control within communities but also as a crucial asset in monitoring national borders and safeguarding industrial and governmental spaces against intrusions. VCIS has adopted a wide-ranging tool that enables people to rethink how we integrate information, analyze data, and use the resulting insights to improve automated security.

Some of the modern ways of detecting crime employed include the use of electronic surveillance devices to ensure effective and efficient detection of crime and criminals.

Table of Contents

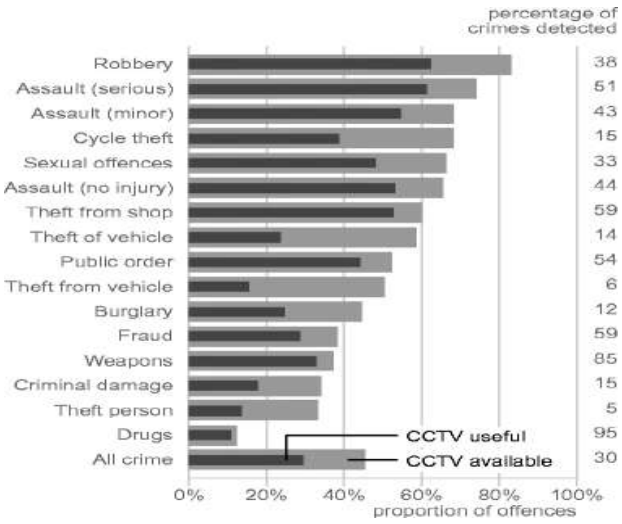
Introduction

The increasing rate of crime has necessitated the application of various measures that will help in the detection of criminal activities with a view to develop appropriate proactive and reactive measures.

However, Closed Circuit Television (CCTV) is the most common electronic device used in crime detection which provides an easy way of identifying perpetrators of crime. It is evident that the nature and pattern of crime being committed across the globe are easily traced to the aid of electronic devices that monitor and record crime in real-time. Surveillance through the use of CCTV is very common and has become popular in the contemporary world. Many societies across the globe, especially the developed ones, employ the use of CCTV in order to monitor individual's activities. The rationale behind using CCTV is beyond crime prevention and control within the society, but also useful in monitoring the territorial border of a country in order to make sure that illegal drugs, arms and contraband goods are not transported into or outside the country. CCTV is also used in industries and governmental agencies to monitor the activities of employees as well as making sure that criminals are detected and identified upon intruding into the company or governmental agency. It is widely known that CCTV cameras can only work when there is adequate power lighting, this means so many crimes are likely to go undetected as a result of irregular power supply. Furthermore, as a result of criminal sophistication, technological advancement and development, CCTV in recent times are being hacked by potential offenders. This denotes that a number of criminal activities can be perpetrated even with the presence of CCTV surveillance.

Overview

CCTV was available in the investigation of 111,608 offenses in the 5 years between 2016 and 2021, 45.3% of all crimes recorded. CCTV was classified as being useful in 72,390 investigations, 29.4% of all recorded crimes and 64.9% of crimes for which CCTV was available. Camera recordings were, for example, useful in the investigation of 1,223 assaults causing serious injury, 4,120 assaults causing minor injury, 1,365 personal robberies and 2,810 physical offenses.



How does it work?

To enable CCTV cameras to work effectively, data is constantly transmitted to a recorder and processed via an AI layer to interpret the raw video. Rule-based cameras are manually configured with specific rules and reference images, such as humans in various postures, angles or movements. The AI then compares what it observes with these rules and images. Depending on the settings, such as "no one is allowed in this area at a certain time," the camera will generate an alert if it detects a rule violation. Some systems use "behavioral analytics" software, which is self-learning. With this technology, the AI analyzes normal behavior patterns for the area and gradually builds a definition of what constitutes typical behavior, including the size, speed, and color of particular objects. It then normalizes the data and tags any objects and patterns it observes. If the AI detects any behavior that falls outside of these patterns, it alerts security professionals.

The Human Eye Has Its Limitations

Maintaining constant surveillance can be an overwhelming task for human operators, especially when dealing with dozens of screens over a 12-hour shift. This challenge is magnified in a city-wide context with hundreds of video feeds to monitor in real-time. However, VCIS technology and machine learning can help augment human strengths and enhance the capabilities of CCTV to support government and community needs.

How can AI help the human eye?

Rather than acting as an autonomous entity, VCIS supplements the work of existing security teams by alerting them to potential hazards that require further investigation. The system's ability to analyze thousands of video feeds in real-time is central to its applicability in a security context. Machine learning algorithms learn by recognizing patterns, just like humans. For example, if the algorithm sees enough instances of a car, it will begin to recognize it independently and can flag any anomalies to known patterns.

This "smart" and "intelligent" CCTV is revolutionizing security systems in various key areas. For instance, it can recognize fraudulent point-of-sale activity in retail, flag suspicious behavior at ATMs, underpin security solutions for unattended luggage in train stations, and help reunite lost children with their guardians. As its prevalence grows, it will likely become a crucial tool for urban crowd analysis and control in a post-pandemic world. Recognizing potential security risks before they occur will no doubt be an essential tool for combating security threats.

Real Time Alert

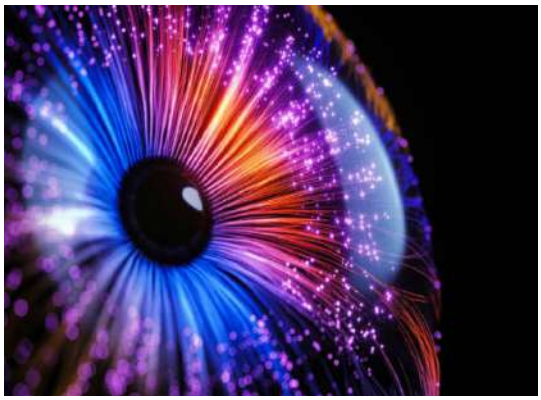
CCTV cameras have long been used as deterrents for criminal activity or implemented to reduce the fear of crime in both public and private spaces. However, many older CCTV systems only aid in solving a crime after it has happened, which is often too late.

VCIS uses AI and alert management systems that store information so any incidents can be reviewed. However, AI CCTV can detect and send alerts in real time. This means operators can send out mobile response units to manage a situation as it happens.

These systems can also provide object tracking, where a red rectangle will appear on the screen and automatically follow the detected risk. Some cameras also feature a two-way audio system, so operators can speak to anyone in the area through an app on their mobile or tablet, leaving open the option for operators to talk down a possible intruder and prevent any criminal behavior from happening. There may also be the option to play pre-recorded audio announcements such as those about social distancing or potential hazards, which can improve public safety and provide further deterrents.
Although a somewhat controversial aspect of video surveillance, facial recognition can be beneficial to identify known suspects of crimes or track vulnerable people who may need police or community intervention.
A High-profile example of this occurring is the Capital Gazette newspaper shooting in 2018, when the Maryland police used facial recognition to help correctly identify the suspect. Similarly, some cameras, including those used in public spaces like hospitals and public transport, can also detect whether people are wearing masks or social distance. These are particularly helpful for monitoring compliance to government rules and analyzing public behavior.

CCTV view from VCIS Map Explorer

VCIS gives exclusive access and view on CCTV located on different areas on the map in order to check which CCTV was the closest to the desired hit and by doing so, Police can easily detect the wanted CCTV in order to retrieve the recorded video on a desired time from it.



CCTV Scan

VCIS with CCTV Scan query type feature allows to show the mutual devices between 2 CCTV’s close to each other and to give a clear vision of them. It enables the potential devices existing in common AOI to be viewed from several angles and in case any hit has been lost on the map, another close CCTV to the AOI can be viewed in order to see the movement of the desired device being tracked.

Image Matching System

Traditional CCTV cameras can have limited visibility in public spaces due to weather conditions like rain or fog, or obstructions caused by physical objects. This can make it difficult for human operators to identify potential security risks. However, AI-powered CCTV cameras can analyze multiple camera feeds in real-time, using advanced algorithms to compare them with millions of reference images in VCIS's Name/Image matching system.
This enables the cameras to detect potential intruders or hazards more efficiently. Temporary AI CCTV towers are commonly used in private spaces like construction sites, but the technology can also be deployed in public areas, such as at events, to monitor crowd actions, movements, and behaviors.

Case Study

Prior to the installation of the cameras, there was a particular area in Beirut where people were selling stolen goods. The police made a number of attempts to clamp down on this activity, but they were only successful in disrupting temporarily. It soon became very difficult for officers to carry out undercover surveillance as the traders recognized the officers by sight. When the cameras were installed however, they were used to carry out discreet surveillance of the area. The cameras allowed the police to gain excellent information about the activities of the traders. This information was used to coordinate timely and effective action against the traders. The problem has since ceased after the Police has cooperated with VCIS smart system keeping an eye out for wanted persons. Intelligence reports have indicated that a certain area is suffering from a spate of certain types of offenses. The camera operators have looked out within these areas for these types of offenses. The police have used the cameras for gathering evidence as part of organized surveillance operations and in collaboration with VCIS the police were able to disrupt these activities and arrest its responsible crowd.

Conclusion

Evidence from the analysis of recorded crime data suggests that the presence of cameras has had most effect on robbery and theft from the person; VCIS case management is also evidence to suggest that the cameras may have acted in conjunction with other traffic calming measures to reduce the incidence of burglary within the city center. In general, however, these findings indicate that there have been reductions in crime in those streets with a good CCTV view, and that this reduction is most noticeable for robbery and theft from the person. Within VCIS survey and advanced Data Management Both the survey data and the recorded crime data indicate that offending has increased in areas where there is partial or no camera coverage which suggests that some locational displacement of crime may have occurred, is most evident for robbery and theft from the person. Hence, an alert can be triggered from VCIS workflow for CCTV implementation in a specific area. However, how far the increases in these offenses in surrounding areas are a direct result of crime displacement, or of an increase in opportunities within these areas. Using VCIS AI and machine learning It is possible that the extensive re-development that has taken place within areas outside the central zone, may have increased the number of potential targets for this type of offense Evidence from the analysis of recorded crime data

The findings presented here provide compelling evidence that initially the presence of CCTV cameras had a strong deterrent effect on the incidence of a number of offenses. However, there is also evidence to suggest that the effect of the cameras on some offenses began to fade after a period of time, although it is important to note that the central division is faring better than the control division and the rest of the force. Risk management based on different elements can achieve the use of cameras that has had a lasting effect on burglary and criminal damage. This may be due to the increase in risk of detection associated with these two types of offenses within the central area. On the basis of the evidence presented here, the number of public disorder incidents has remained unchanged since the installation of the cameras. But as the case study and arrest data show, the strength of CCTV systems might lie less in preventing these offenses (which it is argued will occur regardless) than with coordinating a quick effective response and gathering evidence should it be required. A quick response may mean

that officers are able to defuse a situation before it becomes serious, or at least reduce the harm done to one of the participants. Providing evidence can direct investigations, saving officers both time and money. VCIS can also define the behavior and the pattern at a specific time and location.

The information provided by camera systems is also very useful in helping the police to manage their resources more effectively. Almost one third of all calls to the police are false alarms.

Ongoing Challenges

At VALOORES, we are committed to ensure all data collection and real-time monitoring is consistent with privacy legislation - high secured architecture, Real-time monitoring is designed solely to inform action as close to the camera as possible, while all analytical data is appropriately anonymized and untraceable to the individuals it originated from. We believe this approach strikes the perfect, necessary balance between protecting peoples' personal information and solving the ongoing challenges faced in public and private spaces.