

THE TECHIES

# Law Enforcement Technologies

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Our country may be based on laws written as long ago as the 1700s, but that doesn't mean the way our laws are upheld has stayed the same. Our criminal justice system is constantly and rapidly evolving in order to promote a safe society. Through the new technological advancements in law enforcement, officers are able to reduce time and money spent to track criminals. Catching the criminals requires many methods of attack. Among the major advancements that are now in constant use are GPS tracking, license plate recognition, E911, lie detection, and fingerprint recognition.

### **GPS Tracking**

GPS is a satellite-based technology using twenty-four satellites and their ground stations, that disclose the location of a given object. GPS tracking can determine location, vehicle speed, time and direction. Investigators can find and use data from right now or from three months ago.

GPS tracking is based on trilateration. GPS receivers must know two things to be able to track an object. Receivers must know where at least three satellites are above the location, and they must know how far the satellites are apart. When a piece of GPS equipment has multiple receivers, it picks up electromagnetic energy waves traveling at the speed of light from the all three GPS satellites at a same time. The locations can be calculated in three-dimensions with the help of four GPS satellite signals.

For many years, federal, state, and municipal law enforcement agencies have used and benefited from GPS vehicle tracking devices. Law enforcement officers also use GPS technology to obtain evidence in criminal investigations. For example, federal prosecutors have used information from cellular phone service providers that allows real-time tracking of the locations of customers' cellular phones. Police departments are using GPS tracking unit to ensure the safety of the police patrol vehicles, and to track vehicles that have been "set up" to be stolen by

criminals. Tracking Suspected and Convicted Criminals is also another use for GPS units. They are used to record and monitor the movements of crime suspects. Tracking that is updated in the moment enhances vehicle security because it helps vehicle owners pinpoint a vehicle's current location. And, the GPS tracking system in the vehicle may then be able to help police work out where the vehicle was taken to if it was stolen. Online Crime Maps have been used by the San Francisco police department. These maps allow the public to create maps of the locations of different categories of crimes which have occurred over the past 90 days. GPS mapping also aids in license-plate-tracking technology.

### **Automatic License Plate Recognition**

Automatic license plate recognition gives officers the ability to check license plates rapidly. The technology can help locate vehicles that are missing, have expired registration, have expired insurance, and belong to "persons of interest". The software works by identifying the car then it uses algorithms to scan the license plate and then it recognizes the person who is driving the car by looking at the license plate. One company made an automatic license plate recognition camera that could search thousands of drivers in an area at a time. It is a three camera system that scans the right, left, and another that's for parking lots. The person scanning the cars gets results in about 20 milliseconds. Most license plate readers often cost around \$20,000 each, but they can capture plate numbers on cars that are going 150 miles per hour. Images from plates can be recorded along with the GPS coordinates and time. This information is then stored in a database for future use when handing out tickets or trying to track down a criminal. Then, searching algorithms are used to compare plates with each other to find out if plates are connected with criminals or criminal activity.

## **E-911 and PSAP**

Communities are using computer science to aid in their response to emergency situations. Public safety is something required every day. Twenty-four hours each day a public safety answering point (PSAP) works with E-911 (Emergency 911) to help people of most communities. PSAP answers all the 911 calls and even VoIP (voice over Internet protocol) calls. They transfer calls over to private or public agencies, routing and emergency services. Their software shows the name, address and call-back number of the 911 caller. With the aid of computer algorithms, the phone tower is identified that the call originated from, the approximate location or the cell phone number. This advanced technology is known as E-911, which uses mapping software that tracks and locates the 911 caller. This allows emergency vehicles to arrive at the location of a 911 caller in minutes to save lives and solve crimes.

## **Polygraphs**

Polygraphs are a technique used by criminal investigators to detect if someone is lying. The polygraph is named for the many or “poly” sensors which are recorded on a moving paper or “graph”. A polygraph is basically several different medical sensors that record changes that could potentially signal that someone is lying. There are often four to six sensors attached to the person. The polygraph sensors usually keep track of a person’s breathing rate, pulse, blood pressure, perspiration, and sometimes arm or leg movement. Respiratory activity is recorded by rubber tubes that are placed over the person's chest and abdominal area. Two small metal plates are connected to the fingers, and will keep track of sweat gland activity. Also, a blood pressure cuff can record heart rate and blood pressure. The sensors record the results on a single strip of moving paper, or sometimes results are stored in the memory of a computerized polygraph device. Polygraph examinations are designed to look for specific involuntary behaviors a person has when under the stress and pressure of lying and trying to deceive. The actual polygraph does

not detect lies but just records the vital signs. An examiner looks at the graphs and checks for changes in vital signs. Most times, a significant change indicates that the person is lying. An experienced and well-trained examiner can detect lies with high accuracy. Unfortunately, an examiner's interpretation can be inaccurate and not all people behave in the same way when lying. Polygraph tests are not perfect and may be fooled. A technique of polygraph testing is the Control Question Test (CQT). This type of testing compares the response to relevant questions about the crime to questions that relate to possible earlier misdeeds.

There is another style of lie detection called Voice Stress Analysis, which measures attributes of a person's voice. Voice Stress Analysis is also recordable and widely used by the police and other law enforcement. This technology is very simple. Research shows that frequencies of the human voice in the 8 to 12 Hz range are sensitive to honesty. When a person is being honest, the average sound in that range is usually below 10 Hz. However, when a person is being deceptive, the sound may be above 10 Hz.

### **Integrated Police Car Technologies**

Can you imagine one system for everything in a police car lights, radio, radar, *everything*? This was a futuristic dream until University of New Hampshire, Consolidated Advanced Technologies Laboratory (CATLab), designed the Project54 Voice Operated, Remote Controlled Police Vehicle System. This one system can be controlled all by easy to use voice commands. Project54 includes a fully integrated system, remote access and in-vehicle data, and a remote controlled system. The fully integrated system converts all electronic devices into the system. The feature of remote access is a handheld device and in-vehicle data is that information is stored in the vehicle. If you need to keep your eyes on the car in front of you, start up the car, and move, no problem, simply say pursuit and the car will do exactly that. Over a data radio officers can receive information about passing vehicles without taking their focus from the

road. This program would benefit officers because they can do everything without taking their eyes off the road.

## **Fingerprinting**

Fingerprinting. The forensic fun is easy to use for everyone from police to personal security. You've seen this commonly in serious court cases or even just for fun on your phone. Fingerprinting must be pretty basic...or is it?

In previous times, people would brand criminals with a specific symbol for identification. There were different ones for each kind of crime committed. Of course, when we got to later times, most were appalled by the idea of marking people with brands, so by the 1800s, people with photographic memories would check on the criminals visually. However, people's looks were hard to keep track of, so fingerprints were used for identification.

FBI methods have been made available for a variety of people and for a variety of finger anomalies such as scarred fingers, deformed fingers, fingers amputated at the tips, fingers completely amputated, missing fingers, and my personal favorite...*extra fingers!* New and exciting ways for all people have been built so that traditional sensor pads are being phased out.

3D is enjoyed in many ways. Maybe for you it's TV, movies, computers, and hand-held games. The word, 'fingerprinting' doesn't often come to mind in this category. But this idea was far-fetched and not believable until recently. The University of Kentucky has developed software for fingerprinting that does not use sensor pads. Hold your finger up to the sensor bars. These specially designed, 'green stripes' can cover the whole finger and detect physical features with ease.

Cases where evidence has only one fingerprint are hard to deal with. If the investigators handle the bullet too much, even with gloves, sweat can rub the print away. Certain chemicals are damaging, as is moving it around too much, which could wash the evidence away. A new

technique to keep prints intact is to use table salt. A simple and unformulated cast can be prepared with a simplistic mold and a little salt. The action of the like is reacted as to make the print stick, since it is covered in the residue from the gunshot.

Once fingerprints are lifted from a crime-scene, police officers enlist software to compare these with previous prints involved in crimes. The FBI, police forces, and many other government agencies have access to databases full of fingerprints from individuals. So, if fingerprints are collected from a crime scene and then are compared with those in a database and there is a match, investigators can ask the match why his fingerprints were at the crime scene. Fingerprinting is a way for investigators to figure out who was at a crime scene, which leads them one step closer to finding out who did what in a crime.

GPS tracking, fingerprint recognition, license-plate tracking and other forms of police technology that aid police officers in the capture and prosecution of criminals is vital to creating a secure and civilized environment. It also makes police work more efficient leading to the capture of more criminals than ever before. In the modern age, computers and software make the world a safer place. Without the aid of computers, none of these modern forms of police technology could be as advanced, let alone exist. Further, by keeping police technologies up to date with current technological advances, as crimes evolve, so will the technologies used to find and stop criminal activity. Police technologies are necessary for maintaining the social order that now prevails.

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