

Corrections Turns Over a New LEAF:

Correctional Agencies Receive Assistance From the Law Enforcement Analysis Facility

By Megan J. Smith

Video surveillance and audio monitoring can be a difficult process. Many times, tapes are too fuzzy or inaudible to use and are thrown away. Due to this growing problem, correctional agencies have been turning to the Law Enforcement Analysis Facility (LEAF) at the National Law Enforcement and Corrections Technology Center-Northeast Region (NLECTC-NE).

Established by the National Institute of Justice office of Science and Technology (OS&T) in 1996 and located at the Griffiss Business and Technology Park in Rome, N.Y., LEAF operates in partnership with the Air Force Research Laboratory Information Directorate (AFRL/IF) to demonstrate commercially available and emerging technologies to correctional and law enforcement agencies. LEAF engineers demonstrate how cutting-edge Air Force technologies can be modified to benefit criminal justice by using investigative and criminal data from correctional and law enforcement agencies. Agencies can submit tapes to the facility for audio and video enhancement, one of the many areas in which LEAF provides technology demonstrations.

LEAF engineers not only receive technological upgrades and modifications from the lab, but they also participate in the research and development of these technologies, helping to ensure their applicability to corrections and law enforcement. LEAF personnel have completed 600-plus free demonstrations to various correctional and law enforcement organizations, including local,

state and federal agencies. LEAF benefits agencies by providing technology demonstrations in aiding investigations, monitoring communications, and facility safety and management.

Aiding Investigations

LEAF shows agencies technological investigation aids and, at the same time, teaches agencies which technologies are available and how to access and use them. Technologies include video enhancement, time line analysis software and speaker recognition.

Video Enhancement. Although initially developed to demonstrate audio technology, LEAF quickly learned that video assistance was needed just as much as audio assistance. Thus began video enhancement demonstrations as well, using commercially available technology. Since that time, LEAF has established working agreements with the AFRL Imaging Lab and the FBI's Forensic Audio/Video Analysis Unit to build a robust video enhancement capability.

LEAF also is involved in an imaging technologies evaluation at the FBI's request to match hardware and software performance to FBI facility requirements. Operating as an honest broker, LEAF engineers can leverage the information gained by this study to offer more experience and technology to the correctional and law enforcement agencies they serve.

Time Line Analysis System. Many problems that arise in corrections not only are isolated incidents, but systemic issues. When dealing

with day-to-day operations, it is easy to overlook that fact. Finding the patterns in hundreds of incidents is not something many can do in their heads. It helps to somehow visualize the events laid out in sequence. The Web-Based Time Line Analysis System (WEBTAS) does just that.

WEBTAS renders events as graphic icons to aid in visualizing events and finding patterns. This technology was developed by AFRL/IF to analyze sensor intelligence regarding enemy aircraft and ground troops. LEAF is using WEBTAS to aid agencies in graphically plotting criminal events depicting visual and statistical data on time lines, graphs, tables and maps. WEBTAS is more than a management tool for investigative data or a visual aid to crime solving and courtroom presentations. WEBTAS also can build an event/behavior model based on past entries to predict future probabilities of occurrence. It can manage and collect intelligence from individuals, gangs or groups operating within prisons. Inmate activity then can be modeled to predict possible occurrences of crimes from past behaviors.

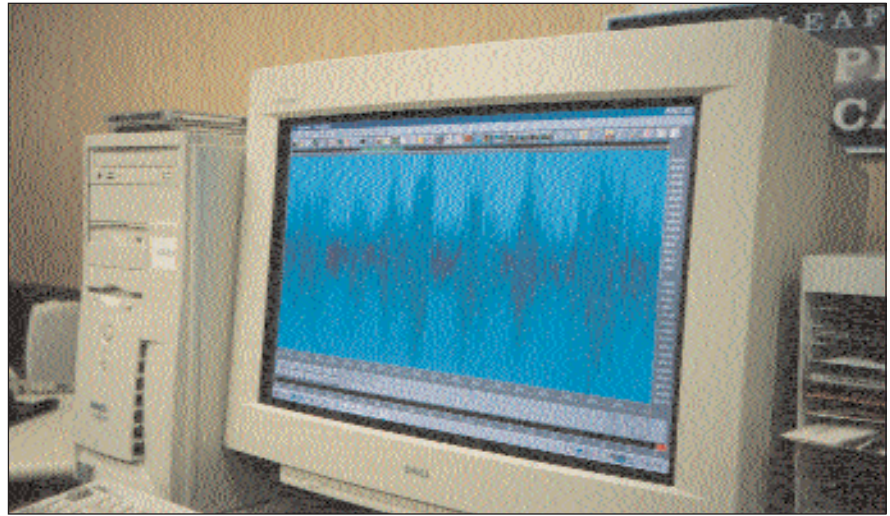
Speaker Recognition. Speaker recognition technology uses a segment of the speaker's speech. Given a sample from an unknown speaker and a database of known speakers' voice samples, the software can compare voice waves, one to many, and find the closest match. Speaker recognition technology also is useful in phone monitoring and facility access.

The Minnesota Department of Corrections (DOC) was in the middle of an official misconduct investigation in October 1999. It needed to compare voice samples from an unknown speaker and a known suspect to confirm that both speakers were the same person, but had no way to do it. The department contacted LEAF and engineers used speaker identification technology to analyze the data provided. According to Warden David R. Crist of the Minnesota Correctional Facility-Stillwater, "Within six hours, they were able to identify the voice on the tape as the staff member who was illicitly involved with the inmate." The analysis gave administrators confidence in their evidence and the individual was charged and administratively removed from state service.

Monitoring Communications

Correctional agencies have spent many years and dollars developing and improving ways to track objects entering and leaving facilities. However, administrators also need to know about information that is shared between inmates. LEAF engineers demonstrate a number of technologies that can aid in monitoring inmate communications, including the SMART (Speech Manipulation and Analysis in Real Time) system and Automatic Gisting.

SMART. Poor hardware setup, unpredictable phone connections and the inferior acoustical characteristics found in cell blocks, dining halls and prison yards can result in low-quality data collection when one is trying to monitor inmate phone calls. SMART technology has helped correctional facilities overcome these obstacles. The technology evolved into its current form, a software-driven tool residing either on a desktop or laptop, from original "black-box" type hardware called the Signal Enhancement Unit (SEU). SEU was developed by the Air Force to clarify pilot communications, and has the ability to automatically identify and eliminate audio interference due to impulse



A sample audio file in digitized processing format.



LEAF staff use advanced software to analyze an audio recording.

(pops and clicks), tonal (persistent tones) and wideband (static) corruption. Input signals are processed in real time, with a maximum system delay of only 300 milliseconds. SMART technology also is useful in recording interviews when accuracy is critical in a setting with poor acoustics.

A study regarding the suitability of Speaker Recognition Technology adapted to the inmate phone monitoring systems was tested by AFRL/IF. A Technology Evaluation and Analysis on Inmate Telephone Monitoring at Five Federal Prisons, outlines the benefits this software provides in identifying appropriate phone communications between inmates and those outside prison.

Automatic Gisting. The task of recording and monitoring all inmate transmissions is laborious and requires a great deal of media storage space and time to sift, sort and flag the data. A technology known as Automatic Gisting can significantly reduce staff time and storage space, making this task less daunting. A computer automatically monitors speech communications for keywords that are indicative of certain activities. The program generates a "gist" or synopsis of a speech transmission or conversation. AFRL/IF has developed a real-time prototype gisting system that has been successful in screening communication between pilots and air traffic controllers. Upon training the system to identify and flag key-

words and phrases such as “take-off,” “landing” and “ground control,” the system logs a list of aircraft identifications and particular activities in which they were engaged. In the same way, training the system to flag conversations, including crime-related terms, such as “drugs,” “money” or proper names, could assist in monitoring inmate phone communication. Automatic Gisting could trigger the system to record conversations that only include keywords and topics, saving time and storage space.

Facility Safety And Management

Beyond aiding investigations and improving communication monitoring, LEAF technologies also can help improve facility safety and management through information-sharing, language translation, developing surveillance architecture and securing facility access.

Information-Sharing. When inmates are transferred to a new facility, administrators often must learn critical information about them, such as their penchant for violence, histories of physical and mental illness, and possible gang affiliations. Corrections personnel would benefit from background information regarding inmate behavior at previous correctional institutions — a corrections-to-corrections conduit for shared inmate history. To aid in this, LEAF demonstrates COPLINK software to agencies.

COPLINK enables agencies with dissimilar database tools to share information. It sits on top of an established database and provides an interface for information queries. This program retrieves agency-determined releasable data from a remote source and displays it. Data are protected by a system firewall so the originating agency can establish which pieces of data can be released to other agencies. COPLINK is not a data entry tool. It strictly is

designed for retrieving and viewing data. Neighboring agencies in Arizona are testing the technology. Inmates often commit crimes while incarcerated and they sometimes have information regarding ongoing investigations. A “link” between a correctional facility and a law enforcement agency would aid investigative efforts and keep all parties informed of pertinent events.

Language Translation. Originally used as a field interrogation tool by the military, LEAF demonstrates automatic spoken language translation. Inmate in-processing and medical examinations represent two focal areas for this technology that benefit corrections. The current technology allows a user to speak into the system in one of five languages. The computer then “translates” the sample to a selected alternate language. This software enables two-way communication using standard typical predetermined questions, phrases and responses. It does not require “voice training” and recognizes basic human voice signals. Future initiatives will call for the development of additional languages and lexicons, toolkits for user customization and multi-application capabilities, as well as the development of handheld models.

Audio and Video Surveillance Architecture. LEAF has the experience and expertise to assist in the generation of facility surveillance architecture. Exposure to many surveillance systems, hardware and software has provided LEAF engineers with a solid background in equipment performance, system setup and matching product features to agency requirements. A surveillance architecture, designed for proper data collection, consists of a complete survey of the facility layout/structure, a needs assessment, a defined budget and well-researched equipment availability.

Securing Facility Access. The same speaker recognition technology that LEAF used to help the Minnesota DOC close out an inves-



Only One LEAF Of the Whole Tree

LEAF and NLECTC-NE are part of OS&T's larger NLECTC system, which consists of facilities across the country that are colocated with organizations or agencies that specialize in one or more specific areas of research and development. Although each NLECTC facility has a different technology focus, they all work together to form a seamless web of support, providing technology assistance, support and information. Facilities include a national center in Rockville, Md.; the Southeast Center in North Charleston, S.C.; the Rocky Mountain Center in Denver; the Western Center in El Segundo, Calif.; the Northwest Center in Anchorage, Alaska; the Border Research and Technology Center in San Diego; the Rural Law Enforcement Technology Center in Hazard, Ky.; the Office of Law Enforcement Standards in Gaithersburg, Md.; and the Office of Law Enforcement Technology Commercialization in Wheeling, W.Va.

For more information, call (315) 330-2253 or visit www.nlectc.org/nlectcne. For information regarding the NLECTC system, call 1-800-248-2742. Due to the demonstration nature of LEAF (all analysis is free), it is required that an alternative means of processing be attempted before submitting data to LEAF. At that time, an explanation of why LEAF's resources are uniquely necessary is requested. ♦

tigation also can aid in facility access control. A “voiceprint” collected from each inmate, staff member and visitor could be used to confirm authorization to enter or leave a specific area of the facility and further, grant or deny access based on that match.

Criminal Justice Partners With Air Force

The AFRL/IF’s mission is to advance and apply information systems science and technology for

aerospace command and control, and its transition to air, space and ground systems. The partnership with the Air Force allows NLECTC-NE to draw upon the engineers of AFRL/IF to help assess the applicability and usefulness to criminal justice agencies of products and technologies originally designed for military use.

LEAF is chartered to bring cutting-edge technology to the criminal justice community and has been successful at reaching and

assisting both large and small agencies in nearly 40 states. For all assistance given, LEAF prepares a technical report describing the processes used and detailing any lessons learned specific to individual cases and provides it to the practitioner. These then can educate other agencies.

Megan J. Smith, LEAF technical administrator, coordinates statistical information regarding technology success and is the facility technical writer.