

## **“An Application of Biometric Technology: Voice Recognition”**

### *Overview of Previous Article*

Our last article reviewed facial recognition biometrics, specifically: (1) How facial recognition systems work; (2) The application environments for facial recognition; (3) The facial recognition technologies that are available today; and (4) The privacy issues that are involved with facial recognition.

This article focuses upon another biometric technology: Voice Recognition. This technology has been gaining attention recently as another means for verifying individuals.

This article is divided into the following sections: (1) How voice recognition works; and (2) The applications of voice recognition systems.

### *How Voice Recognition Works*

The first step in voice recognition is for an individual to produce an actual voice sample. Voice production is a facet of life in which we take for granted every day, and the actual process is complicated. The production of sound originates at the vocal cords. In between the vocal cords is a gap. When we attempt to communicate, the muscles which control the vocal cords contract. As a result, the gap narrows, and as we exhale, this breathe passes through the gap, which creates sound. The unique patterns of an individual's voice is then produced by the vocal tract. The vocal tract consists of the laryngeal pharynx, oral pharynx, oral cavity, nasal pharynx, and the nasal cavity (1). It is these unique patterns created by the vocal tract which is used by voice recognition systems. Even though people may sound alike to the human ear, everybody, to some degree, has a different or unique annunciation in their speech.

To ensure a good quality voice sample, the individual usually recites some sort of text, which can either be a verbal phrase or a series of numbers. The individual usually has to repeat this a number of times. The most common devices used to capture an individual's voice samples are computer microphones, cell (mobile) phones, and the land line based telephones. As a result, a key advantage of voice recognition is that it can leverage existing telephony technology, with minimal disruption to an entity's business processes. In terms of noise disruption, computer microphones and cell phones create the most, and land line based telephones create the least. There are also other factors which can affect the quality of voice samples other than the noise disruptions created by telephony devices. For example, factors such as mispronounced verbal phrases, different media used for enrollment and verification (using a land line telephone for the enrollment process, but then using a cell phone for the verification process), as well as the emotional and physical conditions of the individual. Finally, the voice samples are converted from an analog format to a digital format for processing.

The next steps are unique feature extraction and creation of the template. The extraction algorithms look for unique patterns in the individual's voice samples. To create the template, a "model" of the voice is created. In voice recognition systems, stochastic models, particularly Hidden Markov models, have been utilized. With this type of modeling, statistical profiles are created by comparing various voice samples to determine any repeating patterns.

The final step is verification of the individual. At this stage, the live voice sample submitted for verification is compared to the statistical profiles created, and a probability score is then computed which describes the likelihood that the individual is who he or she claims to be.

### *The Applications of Voice Recognition Systems*

The current applications for voice recognition systems are for physical access entry and where "remote identity verification" is required. Examples of this include call center automation, and transaction processing applications via the telephone or computer. Popular applications in this area are financial transactions (account access; funds transfer; bill payment; trading of financial instruments) and credit card processing (address changes; balance transfers; loss prevention). Voice recognition has also made an impact in the penal system. This technology has been used for inmates on parole, juvenile inmates, and those under house arrest.

However, voice recognition technology has not been as widely adopted and utilized as the other biometric technologies examined in previous articles (iris recognition, fingerprint recognition, hand geometry recognition, and facial recognition). But, there are indications that voice recognition could be adopted by a larger scale in the future. A recent study conducted by Vocent Solutions, Inc. (a leader in voice recognition technology) suggests that: (1) Telephony is the primary means by which consumers will conduct financial transactions and access financial account information; (2) Consumers know about the problem of identity theft; (3) Consumers feel that PIN Numbers and passwords are not secure enough; (4) A strong amount of concern exists when communicating confidential information over the telephone; (5) As a result of these security concerns and fears, consumers would be willing to participate in a voice recognition system, and also feel that it could potentially reduce fraud as well as identity theft. (NOTE: The source of this information is from the *Biometric Media Weekly*, October 6<sup>th</sup> issue).

Some future applications for voice recognition systems include Customer Relationship Management (CRM) applications, wireless products, and Voice Over IP (VOIP).

Our next article will examine another biometric technology related to the eye-Retinal Recognition.

We at HTG Solutions would like to wish everybody a safe and Happy Holiday Season.

(1) "Speaker Recognition", Joseph P. Campbell, Jr. Article is from the book:  
"Biometrics: Personal Identification in Networked Society", By Anil Jain, Ruud Bolle,  
and Sharath Pankati.