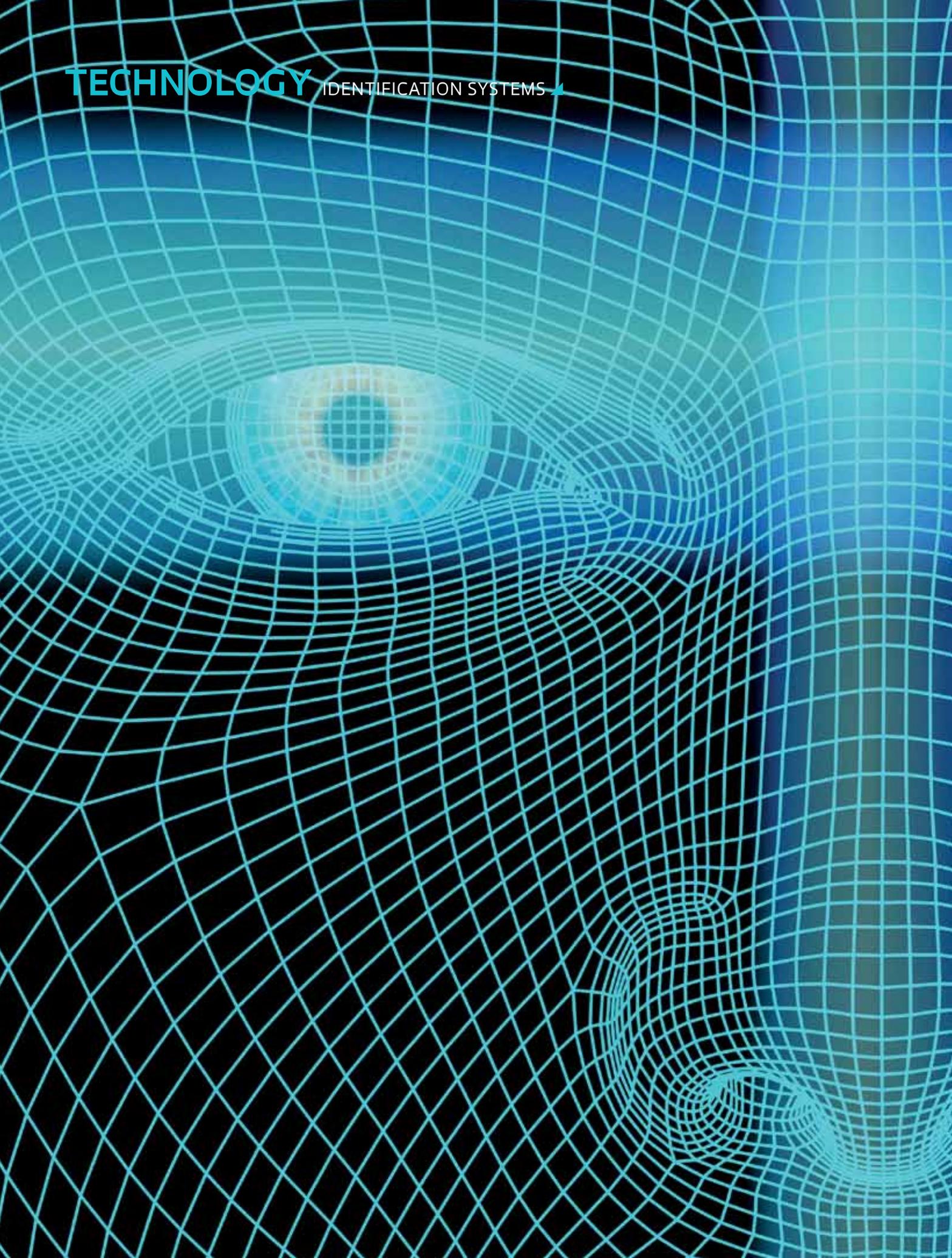


# TECHNOLOGY IDENTIFICATION SYSTEMS



Biometric solutions developed by Brazilian companies perform recognition through unique characteristics, such as the format of facial features

# Your body is your password

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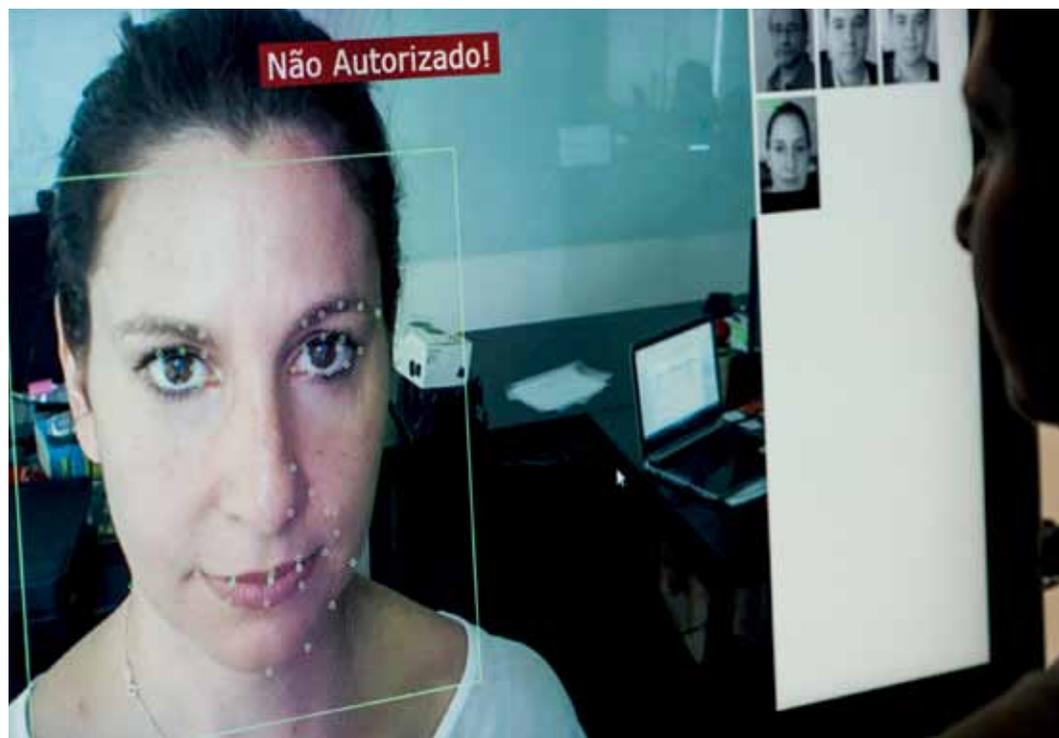
In the more modern smartphone models, users no longer need to input a password to access their content. They can just place a finger on the fingerprint reading sensor integrated into the device. This is one of the new applications of a technology that is increasingly present: biometric identification systems. These devices recognize the individual using their unique characteristics, such as a fingerprint, the palm of a hand, facial features, the format of the iris or voice details. To get an idea of the dynamics of this market, global sales of biometric solutions are expected to exceed \$30 billion in 2021, according to a study by the market intelligence consulting firm ABI Research, in the United States.

In Brazil, the industry had sales of about R\$500 million in 2016. This amount is expected to double by 2020, according to projections by the Association of Digital Identification Technology Companies (ABRID). Biometric technologies are

used in Brazil principally by banks to identify account holders and approve access to accounts at automatic teller machines. In the public sector, the use of biometrics is expected to grow with the approval by the President of the Republic of a bill implementing National Civil Identification (ICN), which will contain a chip and include a citizen's biometric data and public identification records in a single document, such as State ID (RG), Taxpayer Identification (CPF) and Voter Registration Identification. The same biometric database being developed by voting precincts will be used for the new citizen identity card.

“Biometrics provide an unequivocal user authentication mechanism, eliminating the need to memorize authentication information, such as codes or alphanumeric passwords,” says Luciano Baptista, organizer of Biometrics HITEch, the main industry event in Brazil, being held for the third time in 2017. “Biometrics took a large tech-

FullFace face biometrics records only numerical codes describing the face of a person and not a photo, using less storage space



nological leap in the 1990s and became popular worldwide beginning in the 2000s. It is increasingly used to identify people, increase the security of data and transactions, eliminate bureaucratic processes and prevent fraud.”

Most systems were developed and are manufactured by large multinationals such as the Japanese company NEC, the French company Morpho, the German company Dermalog and the US company Cogent, but others were designed by Brazilian companies and research centers. “In Brazil, about a dozen companies develop biometric technologies,” says Carlos Alberto Collodoro, co-founder of Biometrics HI-Tech. The technologies developed in Brazil are mostly software programs used for processing and authentication of individual biometric information. One of the main developers in Brazil is Griaule, a tech company founded in 2002 in the University of Campinas (Unicamp) incubator in the state of São Paulo, with funding from the FAPESP Innovative Research in Small Businesses Program (PIPE).

One of the company’s most recent technological developments is the Agincourt Baby module, for identifying newborn babies. “As there are still cases of babies being stolen or switched in maternity facilities, we developed biometric records of the palms and faces of newborns to increase safety,” says Karina Gomide, Griaule Project Manager. “By associating the biometrics of mother and child, we ensure that the baby the parents take when leaving the hospital is the correct one.”

To scan the baby’s palm, the Griaule module uses a generic scanner that can be bought on the market by the maternity facility itself. “We chose the hand because baby fingerprint information is insufficient. Since the skin of newborns is very thin, the larger the capture area the better. Additionally, taking fingerprints is difficult because babies always have their hands closed, making it hard to take prints of all 10 tiny fingers,” Gomide explains. The record contains the biographical data of the newborn, its photo and the mother’s fingerprints.

The technology, which is being tested by potential clients, took 18 months to develop and was integrated into the Griaule Biometrics Suite (GBS) platform, a set of biometric identification applications developed by the company. “The national Congress and some state legislatures are currently considering more than 10 bills that would make biometric identification of newborns mandatory. When these laws are approved, our system will help put them into practice,” says the project manager, stressing that the technology might also be useful for identifying missing children.

Akiyama, a company in the state of Paraná, has also developed an innovative solution that combines hardware and software to record fingerprints and footprints of newborns at the time they are born, while still in the delivery room. The system, called Natus, is already part of a technical cooperation agreement with state secretaries of health and public safety of the state

of Pernambuco and the Tavares Buril Identification Institute, in Recife, to register newborns in public maternity facilities in the state.

#### MORE SECURE VOTING

Biometrics is also being implemented for electronic voting. Griaule supplies the biometric identification system used by the Superior Electoral Court (TSE) for national elections. Data from the court show that 50.4 million voters already have biometric records, or 34% of the total. The Court's goal is to have all registered voters identified biometrically by 2022. Biometrics were tested for the first time in the 2012 municipal elections in São João Batista (Santa Catarina State), Fátima do Sul (Mato Grosso do Sul State) and Colorado do Oeste (Roraima State). The good results of the experiment led the Electoral Courts to schedule universal biometric identification.

"Using the technology, the voting process became more secure and less subject to fraud," affirms Alexandre Creto, Griaule Product Manager. He explains that the ballot box is only ready for voting when the biometric reader identifies the fingerprints of that voter. "Graule is the software developer that certifies and manages the TSE

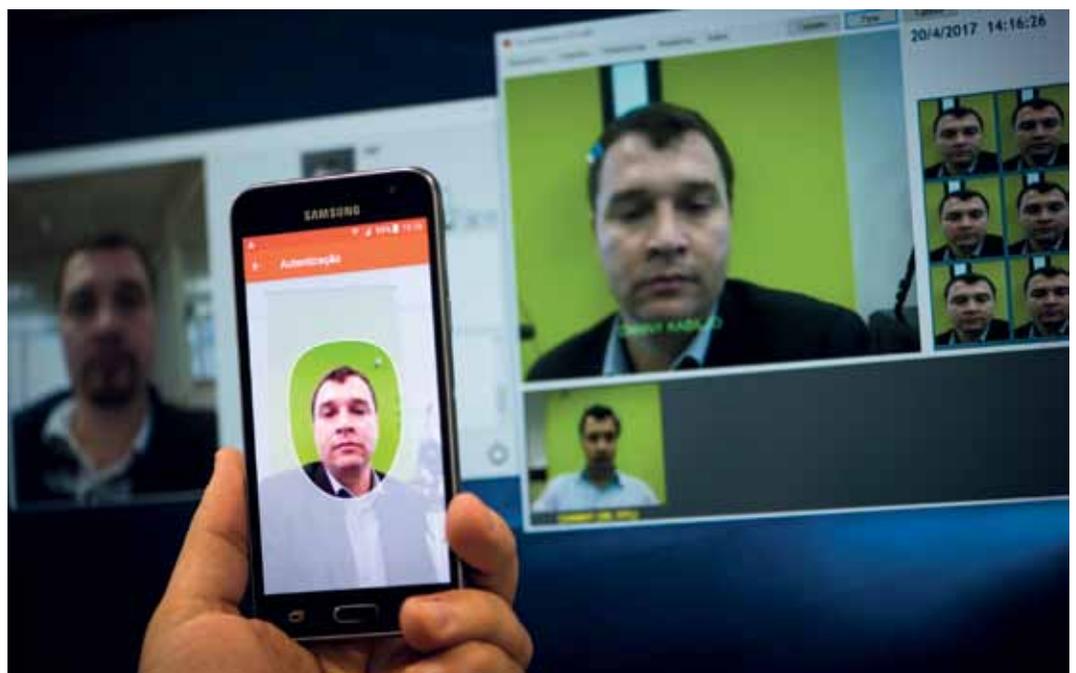
biometric database. Our program ensures that each voter is registered just once." This technology is still restricted to Brazil because other countries do not have totally digital elections. "This is a case in which Brazil is ahead of other countries. We intend to export the system when this way of voting becomes more common in the rest of the world," says Creto. The company exports other identification systems to more than 70 countries, such as the United States, Israel, Argentina, Mexico and India.

Akiyama also participates in the project to register voters' biometrics. It developed the biometric kits that the Electoral Courts use to collect fingerprints and update voter records. The kits consist of fingerprint, face and signature recorders. The company developed most of these devices, which include both hardware and software. Some devices are imported, such as the fingerprint reader.

These readers are also used in several applications, such as authenticating users in banks. The bank biometrics industry in Brazil has grown and today about 90,000 ATM machines (70% of all units installed in Brazil) have biometric sensors. Of this total, about 60,000 ATMs employ the Lumidigm multispectral image technology developed by the US multinational HID Biometrics.

The multispectral image sensor sees both the surface fingerprint and an inner layer of the finger and its blood vessels. By detecting the "live finger", the technology greatly increases the precision of identifying false fingers, whether made of latex, rubber, plastic or gelatin. According to Phil Scarfo, global vice-president of sales and

## Multispectral image sensors capture the internal layers of fingers and their blood vessels



Mobile phones are becoming important in biometric systems to capture images and to recognize the user without requiring a password



marketing at HID Biometrics, there are more than 100 ways to attempt to replicate the fingerprint of a person, but always based on the external surface of the skin.

The type of technology adopted depends on need and cost. In banks and at border control, for example, greater detail and speed are needed. “These systems are generally easier to use and more efficient in indicating errors. In these cases, the system is more expensive. In condominiums and gyms, much cheaper systems can be used, although the identification response might take longer and lead to errors by those not accustomed to this type of biometrics,” explains Baptista, from Biometrics HITech. When collecting fingerprints, another information security practice is on-board encryption that allows end-to-end system protection.

#### FACE RECOGNITION

Biometrics is also being used for border control. Fourteen Brazilian airports have been using the solution Neoface since 2016. Developed by the Japanese company NEC, it provides face recognition of passengers who embark on or disembark from international flights. The system, which identifies people through their facial features, was purchased by the Federal Revenue Service and is used to identify those attempting to flee the police, and those suspected of contraband and drug trafficking, among other crimes. The images captured by the cameras installed in airports are compared with the databases of the Revenue Service, the Federal Police, and the Brazilian Intelligence Agency (ABIN). One aspect of Neoface, also used in other countries, is that it is able to recognize people even with small changes to their physiognomy, such as a beard or new haircut.

## Voice system analyzes more than 20 elements, such as power, the form of vowels and speech speed

Face recognition solutions are also used by the police for monitoring environments, such as soccer stadiums, and to control access to public and private locations. A survey of the Brazilian Association of Urban Transport Companies (NTU) shows that at least 18 Brazilian cities, including Porto Alegre, Fortaleza and Manaus, already employ face identification tools to monitor passengers on city buses. This is to monitor the use of tickets or cards involving some benefit, such as for students or the elderly, by unauthorized people.

Some Brazilian companies have developed facial biometric systems. One example is the São Paulo startup FullFace Biometric Solutions, which developed “IVision.” “One advantage of our algorithm is that it does not need to store the image of the user’s face in the database. This image is converted into a numerical code,” says engineer Danny Kabiljo, one of the company’s partners. He explains that, based on facial measurements and proportions, the system analyzes 1,204 points on the face, generating a unique code that is the facial ID of that individual. The identification is transferred to a database and can be accessed on-site or remotely. The data management software was developed by FullFace. Cap-



Newborns (*above*) are the next focus of companies producing biometric systems. Voter registration (*above*) is performed using software developed by Akiyama, a company in the state of Paraná

ture of the image of the face can be done with a simple computer webcam or cell phone.

“The precision of our technology is 99%, and it can differentiate between identical twins in 5 milliseconds,” says Kabiljo. “One of the advantages of the technology, when compared to conventional systems, is that it requires a smaller database, because storing numbers requires less space than storing images. Additionally, our solution is more secure, because if the system is invaded or stolen, the identity of the users is preserved because we do not store facial images.” The FullFace system is already used by a marketing firm in São Paulo, by Cubo Coworking, a space established by Banco Itaú, and by the investment fund Redpoint eVentures, to control employee and visitor access.

#### UNIQUE VOICE

Located in Campinas, the Center for Research and Development in Telecommunications (CPqD), an independent institution focused on innovation based on information and communication technologies, also designed a face biometrics solution. Called CPqD Smart Authentication, its advantage is that it is integrated into a voice recognition system. “The objective is to verify

the identity of a person through unique voice and facial characteristics,” says Luciano Lemos, CPqD product manager.

Voice biometrics is used principally in client authentication processes when accessing or authorizing e-commerce and e-banking transactions, and when identifying consumers when contact is made through call centers. It is also used during operations to obtain a new password, in which bank customers, credit card holders, health plan members, and other users of corporate systems need to change their means of accessing the service.

“Every time a person forgets their password for accessing the computer or the company’s system, or has run out of permitted attempts, or wants a new password, he must go through a long process to obtain a new one,” says Lemos. He notes that this process is also highly susceptible to fraud due to the ease of obtaining someone else’s password.

One of the advantages of voice biometrics is that it can be used via telephone, Skype, a cell phone application or the computer. Another is the increased agility of identification processes. “Using the normal process, it takes the service center employee about a minute and a half to identify a user. Using voice biometrics, the process is automatic and the delay falls to 20 to 30 seconds,” says Alexandre Winetzki, president of Woopi, Stefanini’s research and development branch. Stefanini is a Brazilian multinational in the information technology industry. Woopi is bringing Nuance’s voice biometrics solution to Brazil. The US leader in voice recognition and processing systems, Nuance has more than 50 million users worldwide.

Winetzki explains that, in voice validation and authentication processes, the voice is decomposed as if it were a signature. “More than 20 elements of speech, including power, speed, how phrases are linked together and the format of some vowels, such as ‘a’ and ‘o’, are analyzed to ensure user authenticity,” he explains. As the voice changes over time, the system updates user voice characteristics with each contact. In this way, the system protects against fraud and prevents imitators from successfully pretending to be someone else or using a recording of the original voice. “This is a recent technology which is still relatively expensive. We need more than 100,000 users to justify it,” says Winetzki. ■

#### Project

*Improvement to the quality of recognition and availability (SpeedCluster) of Griaule’s AFIS (No. 03/07972-6); Grant Mechanism Innovative Research in Small Businesses Program (PIPE); Principal Investigator Iron Calil Daher (Griaule); Investment R\$352,605.89.*