T E S T I M O N Y

RAND

Is Biometrics an Age Verification Technology?

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PREFACE

On June 9, 2000, John D. Woodward, Jr., a RAND Senior Policy Analyst, testified before a hearing of the Commission on Online Child Protection. Congress created the Commission in October 1998 to "identify technological or other methods that will help reduce access by minors to material that is harmful to minors on the Internet." The Commission invited Woodward to discuss biometrics, or methods of automatically recognizing a person using distinguishing physical characteristics and personal traits. Examples of biometrics include digitized fingerprints, retinal and iris scans, speaker recognition and hand geometry.

Addressing the Commission's interest in learning if biometrics could determine someone's age, Woodward testified that "This Commission understandably wants to protect children from accessing online sites that are harmful to minors. As part of its effort, the Commission has correctly asked whether there are any kinds of commercially-viable age verification biometrics. The good news is there are many kinds of commercially-viable biometrics. The bad news is there are no age verification biometrics, no age determination biometrics and no age estimation biometrics."

Woodward, an attorney and former operations officer for the Central Intelligence Agency, works on national security and technology policy issues at RAND. He recently co-authored RAND's study on U.S. Army biometric applications, *Army Biometric*

Applications: Identifying and Addressing Sociocultural Concerns, RAND Project Memorandum, PM-1031-A, (with Katharine W. Webb *et al.*, 2000 Forthcoming).

TESTIMONY

Mr. Chairman and Commission Members, thank you for inviting me to testify before this hearing of the Commission on Online Child Protection. I am honored to appear before you to offer my insights into biometrics.[1]

This Commission understandably wants to protect children from accessing online sites that are harmful to minors. As part of its effort, the Commission has correctly asked whether there are any kinds of commercially-viable age verification biometrics. The good news is there are many kinds of commercially-viable biometrics. The bad news is there are no age verification biometrics, no age determination biometrics and no age estimation biometrics.

As preparation for this testimony, I spoke with Dr. James L. Wayman, the Director of the National Biometric Test Center at San Jose State University. According to Dr. Wayman, no currently employed biometric technologies have any capability for age estimation. Wayman concluded, "It seems highly unlikely that the biometric identification technologies being employed today will ever have a capability for accurate

[1] John D. Woodward, Jr. is a Senior Policy Analyst at RAND. RAND is a nonprofit institution that helps improve policy and decisionmaking through research and analysis. This testimony is based on a variety of sources, including research conducted at RAND. However, the opinions and conclusions expressed are those of the author and should not be interpreted as representing those of RAND or any of the agencies or others sponsoring its research.

age determination." In fact, one of the key attributes of biometric identification systems is that very little or no personal information is available in the submitted biometric sample.[2]

I recently discussed this same issue with Samir Nanavati, a leading biometric consultant. Mr. Nanavati stated that there are "no biometric systems that are capable of accurately determining a subject's age or age category (*e.g.*, under 18 years)." It is true that certain age groups and occupational groups have a more difficult time participating in some biometric systems. For example, a biometric system might have difficulty capturing or getting a fingerprint biometric from an elderly bricklayer. However, it does not appear that any commercially available biometric system or any system currently in development is able to use this degradation in performance to determine a person's age.

Special Agent Edward German of the U.S. Army's Criminal Investigation Division is one of our nation's leading fingerprint experts. When I interviewed him as preparation for this testimony, Mr. German stated that to his knowledge, "there is no reliable age determination set of factors based on the human body. Currently, there is nothing even close to reliable insofar as age and biometrics. There is not even something that gives a good indication."

[2] "Biometric identification" refers to the use of physiological characteristics and behavioral traits for the automatic identification or verification of individuals. In general, biometric identification requires sensors to convert a physical characteristic or behavior of a person into a signal that can be stored, or compared to previously stored signals, using a computer.

Even estimating age in a face-to-face context can be difficult. Common sense can help a cashier tell whether a person trying to buy alcohol is over age 21. But for many individuals in the age range of 16 to 21 years, personal habits, genetics, and environmental factors combine to preclude reliable age determination from physical attributes. In other words, nothing magically happens physiologically on a person's twenty-first birthday.

While the search for age determination and age estimation "metrics" is not an Internet-only phenomenon,[3] the Internet-driven need is for a reliable, remote verification of claimed age for a person likely to be unknown to the checker. As Peter T. Higgins, the former head of the FBI's Integrated Automated Fingerprint Identification System (IAFIS), has observed, "There might be some who advocate using a driver's license and comparing the person's face to the license photograph remotely through a camera and facial recognition software. The security concern, however, is that anyone can generate or purchase a false ID with a photo."[4]

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[3] To consider just one example, for many years, law enforcement has grappled with the problem of trying to determine the age of minors appearing in pornographic materials. To make this age determination, investigators used a list of features, such as facial and pubic hair, breast development, curvature of the hips, *etc*. Called "Tanner staging," after Dr. James Tanner who compiled the list, this physical feature screening for age determination has recently been abandoned at Dr. Tanner's urging because Tanner scaling is not designed for estimating chronologic age and, therefore, not properly used for this purpose. *See, e.g., Regional Task Force on Internet Crimes Against Children for Northern New England* available at http://www.ci.keene.nh.us/police/tannerscale.html (Tanner staging was designed for estimating development or physiologic age for medical, educational, and sports purposes, in other words, identifying early and late maturers. Tanner staging is appropriate for this, provided chronologic age is known.).

[4] *See, e.g.,* Susan Schmidt, "Probe Finds Security Lapses at Airport, Pentagon, FBI," *Washington Post*, May 25, 2000, at A2 ("Startling security weaknesses were discovered at two airports and all 19 of the federal agencies visited by special GAO investigators, who used counterfeit identification and phony law enforcement badges they obtained on the Internet.").

It is possible that the time will come when secured databases will combine both a person's registered biometric and a verified age determination procedure to achieve the desired protective result.[5] For example, this age determination procedure could be done during enrollment when the person would physically appear at a center to enroll. But this approach does not depend on an age verification biometric but rather requires a vetted database in which known age data is used in conjunction with a biometric.

Although there is currently no reliable age determination biometric, there is one area of current scientific research that I want to call to the Commission's attention. This research involves the chemical compositions of fingerprints and highlights differences in physical characteristics between children and adults.

In layperson's terms, when a finger touches a surface, it may leave a latent fingerprint which is an invisible pattern of "oil," containing chemical secretions from the skin. These secretions can contain hundreds of chemical compounds. Researchers, led by Dr. Michelle V. Buchanan of the Oak Ridge National Laboratory, have concluded that there are dramatic differences in the chemical compositions of fingerprints from children and adults.[6] Dr. Buchanan believes that the dramatic differences between children and

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[5] For example, federal law requires that firearm background checks generally are to be conducted using a computerized system, known as the National Instant Criminal Background Check System (NICS). *See* General Accounting Office, *Gun Control: Options For Improving the National Instant Criminal Background Check System*, GGD-00-56, Apr. 12, 2000.

[6] Adult fingerprints contain oilier, longer-lasting compounds, such as fatty acid esters, than children's fingerprints. Children's fingerprints contain more cholesterol and volatile chemicals, such as free fatty acids, than adults' fingerprints. Many of the chemical components released by children's fingers quickly evaporate, making it extremely difficult for law enforcement investigating crimes such as child abduction. *See* "Chemicals in Fingerprints Could Help Solve Crimes," *Science News*, Apr. 22, 2000; Michelle V. Buchanan, Keiji Asano, & Arthur Bohanon,

adult fingerprints can be explained by changes brought on by puberty. She believes she can determine when children are going through puberty by examining the chemical compounds in their fingerprints.[7] Research in this area continues.[8]

In conclusion, while an age verification biometric would seem to be the ideal "silver bullet" to protect children from accessing harmful online sites, there currently is no viable age verification biometric. While I am reluctant to underestimate the speed of technological advance, the experts seem to agree that an age verification biometric is at best a very long way from reality.

I am happy to answer any questions you may have.

"Chemical Characterization of Fingerprints from Adults and Children," *SPIE Photonics East Conference Proceedings*, Conference 2941, Nov. 1996, at 89-95. *See also* Deborah Noble, "The Disappearing Fingerprints," *Chem Matters*, Feb. 1997, at 9; Deborah Noble, "Vanished into Thin Air: the Search for Children's Fingerprints," *Analytical Chemistry*, July 1, 1995, at 435A.

[7] Analysis of the chemical composition of fingerprints might also provide (1) medical information (*e.g.*, explaining why some people's skin heals more quickly than others) and (2) a noninvasive way to test for certain medical disorders or presence of drugs (*e.g.*, nicotine). The research conducted to date has taught law enforcement investigators to look for children's fingerprints as soon as possible because they can quickly evaporate from a crime scene.

[8] Dr. Buchanan and her colleagues are continuing their research efforts. Recently, the Forensic Services Division of the United States Secret Service has also begun researching this area. Dr. Buchanan's research was supported by the Department of Energy's Chemical and Biological Nonproliferation Program (DOE NN-20).