

WIPES – Wireless Identification of Persons using Ethereal Signatures

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Abstract

Biometric authentication is a growing field of importance [1]. The need to correctly identify a person is critical in a variety of applications including financial transactions, secure access control, and border and airline security. For example, a friend who crosses the border from Canada each day to work in the U.S. is required to get out of his car, go into a building, and be identified by a fingerprint. Sometimes the fingerprint-measuring device requires several attempts before the identification is successful, even though the border guards by now know my friend by name.

This paper describes a new biometric authentication system in which a person simply “writes” his or her signature in the air. Inasmuch as one definition of *ethereal* is *airy* [2] we call our system *WIPES -- Wireless Identification of Persons using Ethereal Signatures*. The WIPES device is worn on the wrist much like a wristwatch. The device contains accelerometers that can measure the x-, y-, and z-components of the acceleration of the device and these values are used to calculate features that are transmitted wirelessly to the host device that authenticates the signature.

Consider the example of an ATM machine. Instead of entering a PIN number from the keypad (that observers can easily detect) the customer would first press a button on the WIPES device and then “wipe” his or her signature in the air. The three acceleration components are measured at 10 millisecond intervals and used to compute the magnitude squared of the vector acceleration as a function of time. The use of the magnitude makes the system independent of the orientation of the WIPES device on the wrist. The average of 32 consecutive magnitude readings forms a feature and 10 consecutive features form a feature vector that characterizes a particular signature over a 3.2 second interval. This feature vector together with a 24-bit person identifier is then transmitted wirelessly to the ATM machine, which then authenticates the signature using a pattern recognition algorithm. Note that the use of the 24-bit person identifier that is built into the device means that only that device can be used to identify a particular person. Even if someone stole a device and had watched a person “wipe” his or her signature, the chance of being able to duplicate the acceleration pattern is very unlikely, even if they knew the person’s name. They would have no idea how the person actually “writes” the name, which needn’t be the person’s actual name, but could be a nickname or other password. The system is therefore extremely secure because the way the signature is written is built into the person’s neuro-motor system and is not something that can be written down (and therefore stolen) like a PIN number. The method is also much less intrusive than other biometric identification systems such as fingerprints or retina scans. Similar examples would apply to opening a door to a secure area and identifying persons at the border or airport.

The hardware used to demonstrate the WIPES concept is shown in Figure 1. The WIPES device consists of the Freescale MC13192 Sensor Applications Reference Design (SARD) board [3] mounted in a small box with a battery. Adding a strap to the box allows the device to be worn on the wrist as shown in Figure 2.

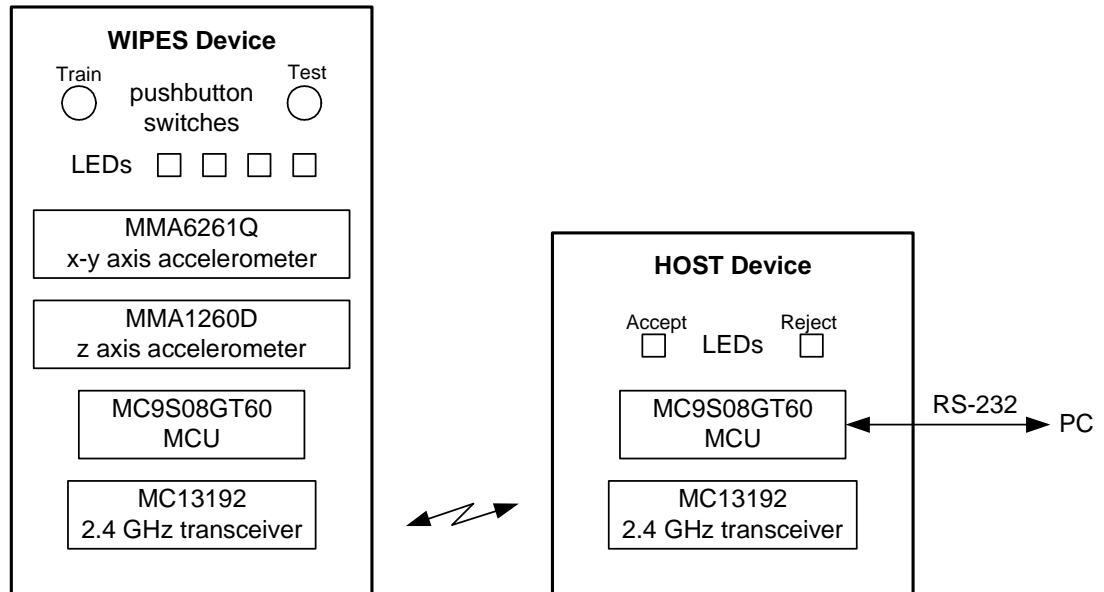


Fig. 1 Block diagram of the WIPES system

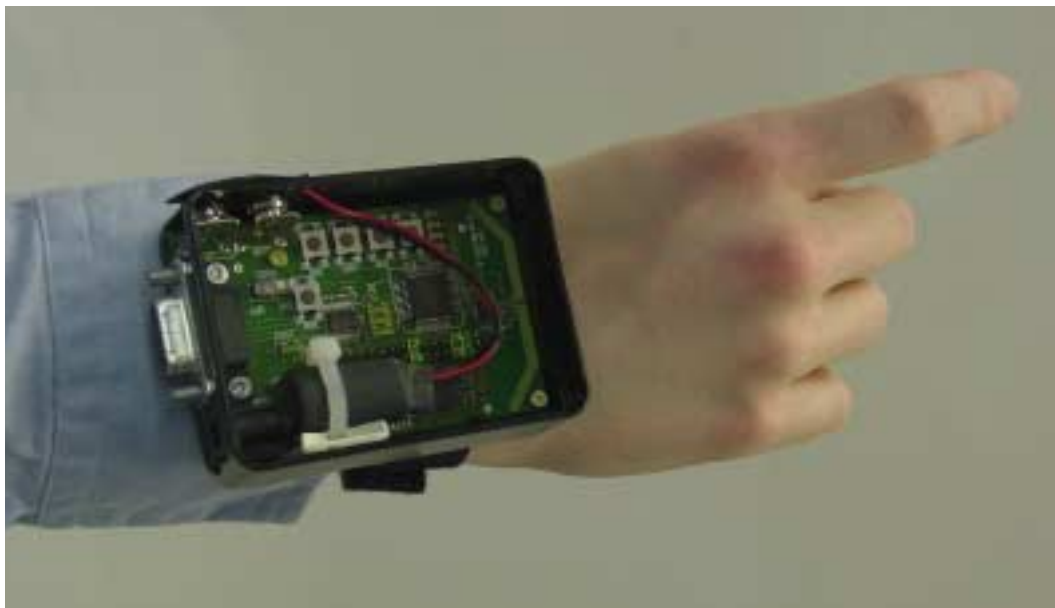


Fig. 2 The WIPES device worn on the wrist

A simplified schematic of the WIPES device is shown in Figure 3. A detailed schematic can be found in [3].

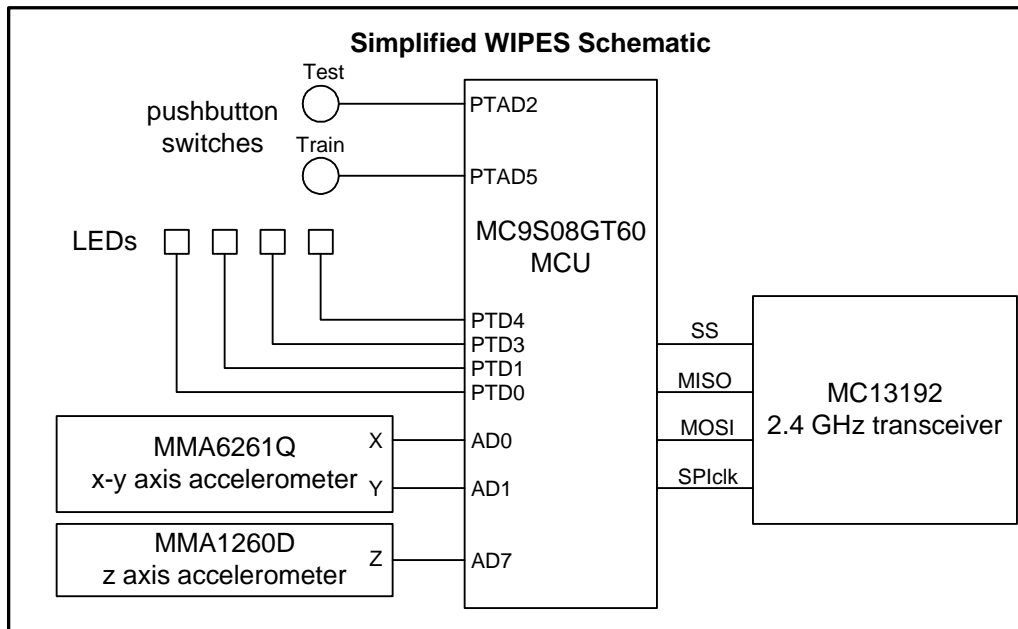


Fig. 3 Simplified schematic of the WIPES device

- [1] Kung, S. Y., Mak, M. W., and Lin, S. H., *Biometric Authentication*, Prentice Hall, 2005.
- [2] New World Dictionary of the American Language, Second College Edition, Simon and Schuster, 1984.
- [3] Sensor Applications Reference Design (SARD) User's Manual, MC13192SARDUG/D, http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=MC13192&nodeId=01J4Fsm6cy7103.