Fingerprints of the dead

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Accessing a murder victim's smartphone to help solve a crime

When the Michigan State University Police Department approached Anil Jain to see if he could access a fingerprint-locked deceased man’s smartphone to aid in a police investigation, Jain accepted the scientific challenge.

On July 25, it was mission accomplished – Jain and his team unlocked the phone.

Video: Unlocking the fingerprints of the dead

The journey to unlock the phone began when MSU Police Department Detective Andrew Rathbun, part of the Digital Forensics and Cyber Crime Unit, was contacted by the Lansing Police Department for help in unlocking a Samsung Galaxy S6 phone that supposedly contained important evidence.

Rathbun racked his brain trying to figure out how to unlock the phone to perform a forensic examination and analysis of the data extracted from the phone. He spent hours on the Internet researching options, and even called some vendors for help, but he kept on getting the same answer: the technology does not exist to access fingerprint-locked smartphones.

In another attempt to find answers, Rathbun Googled “spoof fingerprint” and, much to his surprise, came across the work of Jain, University Distinguished Professor of Computer Science and Engineering, right here at MSU.

After agreeing to attempt to unlock the phone, Jain and his team met with detectives who provided him supervised access to the deceased man’s phone and the man’s original ink fingerprints, which Jain used to create digital scans of the man’s fingerprints.
Jain then went to work with two of his team members, Kai Cao, post-doctoral scholar, and Sunpreet Arora, Ph.D. student.

The team printed both 2-D and 3-D replicas of all 10 of the homicide victim’s fingerprints, not knowing which finger the deceased may have used to lock the phone. Neither the 2-D nor the 3-D replicas unlocked the phone, and Jain’s team quickly realized that they had to improve the quality of the ink fingerprints provided by the detectives.

They decided to enhance the fingerprints digitally – actually fill in the broken ridges and valleys of the man’s prints – in order to improve the quality without wiping out any crucial details in the prints. The computer program used to do this enhancement was specially created by Cao and was the key to their success.

Once the fingerprints of the deceased were enhanced, Jain and his team printed new 2-D versions of the prints with conductive ink needed to create an electrical circuit just like live fingerprints do. According to Jain, smartphone fingerprint readers require an electrical circuit to unlock, which is why severed fingers won’t unlock a phone.

“Lucky for us, this phone did not require a passcode after a fixed number of failed attempts with fingerprints,” Jain said. “This allowed us to try different digitally enhanced fingerprints.”

Jain then asked the detective to bring the phone back to his lab for another attempt to unlock it. This time, it worked.

“All of us just looked at each other,” Jain said. “And then we all shouted ‘it worked’ and started giving each other high fives.”

The detectives from both the MSU Police Department and Lansing Police Department were thrilled with the development. According to Lansing Police Lt. Rob Backus, “We are very thankful for the support and resources MSU provides our department during our investigations. Nowhere is this more evident than with their knowledge and accessibility to new techniques and cutting-edge technology. This is a great example of partnerships working together, over several different disciplines, to contribute to the common goal of furthering an important investigation.”

“The reason we have fingerprint readers in phones is to increase the security of information stored in our phones,” Jain said. “We use our phones to make financial transactions and that information is important to keep private. My
team is not in the business of hacking phones, but in the research side of the fingerprint technology. Hopefully, our ability to unlock this phone will motivate phone developers to create advanced security measures for fingerprint liveness detection.”

The next challenge, Jain said, will be to figure out passcodes.

Related Website: Story courtesy of MSUToday.
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