

Just Collecting Fingerprints Without Contact

Introduction [00:00:01] RTI International's Justice Practice Area presents Just Science.

Introduction [00:00:09] Welcome to Just Science, a podcast for justice professionals and anyone interested in learning more about forensic science, innovative technology, current research and actionable strategies to improve the criminal justice system. An Episode seven of our case Study season Just Science sat down with Ross Krewenka product manager IDEMIA and Mike Ransom, automated print manager for the Michigan State Police, to discuss the development and use cases of contactless fingerprint capture technology. Traditionally, ink and paper are used to capture fingerprints from subjects. However, advances in technology have made it possible to document fingerprints electronically. Furthermore, technological advancements have made it possible to capture fingerprints without subjects physically encountering fingerprint sensors or being touched by law enforcement. Listen along as Ross and Mike describe the process of adapting industry fingerprint technology to the public safety field. How contactless fingerprint capture technology can benefit individuals with special needs and preferences and the impact of this technology on the future of identification. This episode is funded by the National Institute of Justice's Forensic Technology Center of Excellence. Some content in this podcast may be considered sensitive and may evoke emotional responses or may not be appropriate for younger audiences. Here's your host, Jaclynn McKay.

Jaclynn McKay [00:01:21] Hello and welcome to Just Science. I'm your host, Jaclynn McKay, with the Forensic Technology Center of Excellence, a program of the National Institute of Justice. On today's episode, we will discuss contactless fingerprint capture technologies. Here to guide us in this discussion is Mobile Solutions product Manager Ross Krewenka and automated print manager Michael Ransom. Welcome, Ross and Michael. Thank you for talking with us today.

Mike Ransom [00:01:47] Thanks for having us.

Ross Krewenka[00:01:47] Yeah, thank you.

Jaclynn McKay [00:01:48] Ross, I'm going to direct the first question to you. Can you provide a little information about your background and how you became involved with mobile technologies?

Ross Krewenka[00:01:56] Sure. So I'm a product manager with IDEMIA and primarily my job focus is on solutions for officers in the field to help identify people when when they don't have ID or they can't provide their names. So I have a background building applications and working with mobile devices and, you know, really kind of focused on that for the last few years at IDEMIA and contactless fingerprints really plays into that.

Jaclynn McKay [00:02:23] Mike, can you describe your background and how you came to supervise the automated technologies at Michigan State Police?

Mike Ransom [00:02:29] Yeah. So before I was the automated manager, I actually did a lot of computer programing. And some SQL report programing. So after a bit I thought that there was a nice fit. And so I've been working with fingerprints for about nine years now.

Jaclynn McKay [00:02:44] Nice. Well, Ross, technology is always advancing, and now it's possible to capture fingerprints without having to come into contact with subjects like traditional fingerprint sensors. Can you describe how this technology actually works?

Ross Krewenka[00:02:58] So, I mean, really, the big difference between contact fingerprint capture and contact lists. Obviously, we have to deal with the distortion that's caused on a physical contact fingerprint. But really the how the technology advances with a lot of contactless solutions is we're actually taking a high rate video feed of your fingers or while they pass through a device or if you put them in front of a phone and then the technology is advanced to the point where you can look at the individual frames and pick out those that capture the fingerprint and refine them so that they could be used for search. So really, the technology is is kind of moved from a actual touch contact to a video stream of fingers. And like I said, the technologies is advanced enough to where you can just pick out the frame of the best image.

Jaclynn McKay [00:03:51] Could you expand on what kind of contactless fingerprint capture technologies are available and what type of cases they support?

Ross Krewenka[00:03:58] Sure. Yeah. The contact tech fingerprints have actually been around for quite some time. Some of the earlier products were available on the market almost about ten years ago, so we just haven't really heard of them and they just haven't had a lot of adoption. But the earliest devices for contactless were were physical devices that usually included, you know, up to four different cameras inside the device that's pointing at a subject's fingers at different angles as they either pass through the device or put their hands in the device. A lot of these devices early on were used for access management. So you just typical access into office buildings, that kind of thing. That technology has been available for a little bit in the private sector and now we're seeing advancements with, you know, mobile devices and essentially having, you know, a product that you don't even need extra hardware for. You can just leverage your phone to do that. But yeah, there have been some early, early advancements in physical devices that you'll see out there. And I think as contactless becomes more popular, some of those kind of stationary devices with multiple cameras will be more popular in the industry for sure.

Jaclynn McKay [00:05:06] What about the strengths and. Possible limitations of this technology. Can you talk about that?

Ross Krewenka[00:05:12] Sure. Yeah, no, no problem. You know, with contactless, you know, first and foremost, you know, your software has to be able to deal with the distortion of a fingerprint. So when you take a traditional fingerprint, you know, you're usually pressing down on a plate and or a piece of glass, and it's spreading out your fingerprints a little bit when you do that. So when you take a contactless fingerprint, it's just an image. There's no compression on the finger. So the matching algorithms have to take that into account when they're trying to match contactless fingerprints against contact prints. You know, so there's an adjustment to the algorithm matching that will need to occur in order to actually match as far as, you know, some of the limitations of contactless. You know, it really does perform a lot better than than contact devices. When you talk about dirtiness on the fingers or wet fingers or even the different environmental conditions. But you do have to be, you know, depending on what type of capture device you're using, you have to be mindful of the scenario you're trying to capture fingers in. If you don't have you trying to do it with a phone, you have to be mindful of the background and kind of some other things that are going on, because sometimes it is difficult to actually identify which fingers you're trying to get captured, especially when you're using a phone. So, you know, there's not a lot of drawbacks to contactless. And I think that's why we feel like in the future this is going to replace contact fingerprints. Right now, I think there's maybe some fringe cases that are still being worked out, but for the most part, not a lot of drawbacks to the actual contactless.

Jaclynn McKay [00:06:49] So I know proper technique for taking a ten print card is to pretty much roll from the edge of the fingernail to the other edge of the fingernail. And obviously, you know, fingers are rounded. So with the contactless, how can you get that entire area of the friction rich skin?

Ross Krewenka[00:07:09] Yep. Yeah. So we're you know, one of the things you're trying to really get is from nail to nail on all the fingers. So I'll talk about two different capture devices. Again, they some of the earlier contactless devices that have been developed that have stationary cameras within the device, they're actually pointing at the finger at different angles. And because of that, you can get a really wide fingerprint that pretty much goes from nail to nail. You can actually get the sides of it with an actual mobile phone. You don't have the advantage of having multiple cameras. So you do have one that's looking directly on to the fingers. So you do miss some of that edge. However, the technology is advancing to the point where I know that we're looking at solutions that could possibly where you move your device in order to get the rest of the finger. Some of the newer phones come equipped with a LIDAR technology that can be leveraged to get a better picture. So we're constantly looking for ways to improve the the use case on the mobile phone. But for some of the physical devices that exist today that do contactless, the camera positioning actually allows you to get nail to nail.

Jaclynn McKay [00:08:17] Mike, I'm going to toss this next question to you. Can you discuss how this technology has been implemented in your agency?

Mike Ransom [00:08:23] Sure. Michigan State's actually been using mobile I.D. technology for over ten years. And even prior from when I got the position back in the day, we were using the old technology with BlackBerry phones. That kind of tells you how far we go back. But going forward, contact technology has improved and improved. And so we were very happy with our contact technology and we're using it really well in Michigan and using it quite a lot. After a while, my division director had come in and said, Hey, you know, let's supplement a little bit this contact technology with contactless. And he's you know, a lot of it was due to the there's a lot of upfront costs and equipment stuff for the contact technology. So at the time it was it was hitting a rate about 75%. And me, myself, I always thought if someone says it's a hit, I want it to be hit. I don't want to be 75%. And I don't want people thinking that it's, you know. And but he said, well, it's better than nothing. And so since he was the division director, I said, okay. Yes, sir. So we moved forward and we started looking at different vendors for contactless. And once you put the word out there that you're going to something, the vendors are going to come out of the woodwork. And really there was nobody who had a good solution. We actually had people coming with Styrofoam boxes saying this is what would be if we had one, you know? So we decided to approach IDEMIA. And because they had done had been doing the morpho way for a long time, which is a another contact solution, and we weren't really impressed with what they had. And after a while, as technology got better, we started investing a little more. And then we started working with them and we've worked with them for like 3 or 4 years to take a solution that was going to be a proof of concept and actually turn it into a real solution. And right now in the field, we're really in a testing phase because the FBI has not officially approved it to hit their databases. So we can't what we call officially it in Michigan. But we do have some of the fields that are working on their testing in a pilot phase along with the contact technology and the reviews are positive.

Jaclynn McKay [00:10:14] That's really exciting that the technology has been overwhelmingly positive. Could you discuss kind of what sort of case examples that this would be used in?

Mike Ransom [00:10:24] So we have a few. Contactless is very strong. A lot of the in the field the officers I did not know this when we started doing mobile ID but they fingerprint the individual when they're in handcuffs and where the contactless technology where the screen is actually facing you when you're taking the photos, it actually is a huge advantage to the contact technology where they can't see the fingerprint quality or they can't see how they're taking it. Also, another use case that I'm pretty excited about is I get to champion the special needs and have programs for that, fingerprinting them, and for hypersensitive kids who don't like to be touched at all, we can actually identify them without physically going hands on and which will limit the trauma to them greatly if we find them in the field.

Jaclynn McKay [00:11:05] So in thinking about the future, how would you like to see this technology expand? And then are there any other areas that might still need improvement?

Mike Ransom [00:11:14] Yeah, so I see a bright future for contactless. Currently we about a year ago we tested it against contactless in a control environment and really we're getting a 97% hit rate contact list versus a 99% hit rate for contacts. So I can definitely see it going forward and be the way of the future. I know a lot of officers are very concerned about residue on patterns and, you know, drugs and stuff and dirt and and so it's one of those things where I think they're going to enjoy it once it goes full screen. There are advantages and disadvantages, like any technology. So like I said, we can have other use cases where we can use contacts a little better, but the learning curve is a little higher. So like Ross alluded to earlier, sometimes the phone is trying to focus on the background or sometimes. And so that's kind of one of the challenges we're going to have as far as teaching them. But I do see this the future. And as technology increases, I mean, we may even be able to do things at more of a distance and such like that. So I can see it being a great thing.

Jaclynn McKay [00:12:11] Ross do you have anything else to add?

Ross Krewenka[00:12:12] Yeah, I think from an industry perspective, you know, kind of the way we're looking at it as it erythema is, you know, first step is to establish contactless is as the standard for criminal searches for law enforcement. Right. You know, in those situations, you're taking fingerprints from an individual, you're not enrolling them. You're simply trying to search against a database. Right. So we want to establish contact devices and law enforcement and make sure that that use case is something that we pursue. I think that the next step after that is to really take a long, hard look at at enrollment and contactless enrollment. Right? So this is replacing your your traditional live scans or other enrollment devices with contactless devices. And like Mike said, you know, the technology is moving that direction. And I'm sure there'll be advancements before everything is said and done. But yeah, from a from a logical perspective, I think, you know, we really want to establish contactless as as the way to to search. And then, you know, soon after that, you know look at ways how we can start taking fingerprints for enrollments in a in a contactless way.

Jaclynn McKay [00:13:18] So, Mike, you mentioned that this technique can be used in the field to take fingerprints of individuals that are in handcuffs so officers on the street can use this technique. Can you explain a little bit about how they would be trained and what all that would entail?

Mike Ransom [00:13:36] So technology nowadays is usually pretty self-explanatory. I mean, the application walks them through the steps step by step. It's not very difficult training, really. I could talk to an officer for five minutes. They would be up and running. The biggest problem now is a better photographer is going to be a better fingerprint taker

so that the folks it's all about the camera focus and such. And with the newer technologies and newer phones, even, that's been eliminated a little bit more. And so it's really almost out of the box. You can use it. It's not a lot of training needed.

Jaclynn McKay [00:14:05] Ross So anything you want to add?

Ross Krewenka[00:14:07] Yeah. With so IDEMIA's mobile biometric check application. The mobile application, or really, it's designed in a way that is very intuitive and we're not really asking for the officer to do a lot to actually get fingerprints. You know, officer safety is key. We understand, you know, during the traffic stop, officers are paying attention to a lot of different things, you know, So we tried to make the application as easy as, you know, putting your hand in front of the phone and holding it there for a second and getting fingerprints. Right. So that training really the only part that becomes a little bit of a training issue is just how far do you keep the phone away from a subject's hand? Every phone manufacturer, the the actual camera in the phone. It tends to have a different focal point even across iOS phones and Android phones. So as someone taking the fingerprints, you know, finding that distance away from the device that takes the best fingers is a little bit of a training issue where we do have indicators and. Inside the application that help you get the right distance. But yeah, if it's the first time doing it, usually you have to show someone this is about where you go and typically after someone takes their prints a few times, you know, it's a non issue. They could just move forward with the technology.

Jaclynn McKay [00:15:22] Thank you for bringing up how important this is to officer safety because I think that this technique can really fill a void there. Mike, you also mentioned that this technique is beneficial to individuals with special needs. Can you tell us a little bit more about that program?

Mike Ransom [00:15:38] I mean, you've probably all heard about a person maybe who've wandered away from a retirement home or person with special needs, maybe autism found in the street. And it's difficult finding where they, you know, they live. So we in Michigan have passed a law that basically stating we as parents or guardians of special needs kids or a guardians of elderly members with dementia, whatever, we can allow them to fingerprint stored in that database along with a photo. And we can use fingerprints and facial recognition both on the street to be able to identify them and immediately alert the officer if they're ever in contact with them, that this person's special needs and they may not be able to respond to directives. Special needs sometimes does mirror like unfortunately, someone with high drug use or strung out on drugs or on alcohol. And so there's a different way we respond to those people who are maybe having issues with substance and those that have special needs. There's a different voice. We use different demeanor. And if we can get these responses back and usually within 50s, these responses come back from the mobile ID, we can figure out who we're dealing with and really understand.

Jaclynn McKay [00:16:41] Thank you for discussing that. Ross, Can you discuss what some of the challenges are for law enforcement when it comes to implementing this technology?

Ross Krewenka[00:16:48] Yeah, that's that's a great question. You know, one of the biggest challenges I think, facing law enforcement today is the actual just use of mobile devices. A lot of agencies, you know, they already budget for having cell connectivity in the patrol cars. You know, some haven't budgeted to actually provide devices to to their officers. And under no conditions would we ever expect an officer to utilize this type of technology on their personal phone for a number of different reasons. So for those agencies that are looking to leverage this technology, it's it's really important, first off, to

have a mobile device management system in place to be able to manage your fleet of mobile devices. Essentially, this is going to give you control. So whether an officer loses a phone or it gets stolen, you can it you can wipe it or clean it from a remote location. So these are kind of just best practices that that agencies need to kind of look at and implement before they can really start leveraging some of the apps on the phone. Again, you know, under no condition would we ever want someone using their personal device to do this kind of thing. So that's been a little bit of a challenge. We are talking to some agencies, but, you know, as time goes on, you're going to see more and more officers get department issued phones, which is really going to open up their ability to use a lot of cool tools in the field like like contactless technology apps.

Jaclynn McKay [00:18:07] Mike, can you talk about some of the implementation challenges your agency faced and what the future of implementation looks like at your agency?

Mike Ransom [00:18:16] With new technology, there's there's always especially a little resistance for more the older generation, but the younger generations are pretty much demanding nowadays. So the a lot of the resistance we had is going from something that's familiar to something new. People know that that's that needs to happen. So they're they're coming around. But it's it's a selling tool and we want it to be perfect as we push it out to the field. Because once that first impression comes, if it's not a good one, you know, they have a tendency to be less likely to use it. What's really stopping us to go from full implementation right now is the FBI still needs to test to make sure that it is okay to hit their database, were not approved to hit the FBI database. As of now, we can hit our Michigan database. So anybody who, you know, commits a crime in Wisconsin or a different state, we won't know that on a mobile ID hit right now with contactless. So we're looking to start testing with them later in the year and hopefully be done with that and get approved pretty quickly. I guess one of the other roadblocks in getting this technology is funding and really with as many things as this can help. So you're talking about public safety. You talk about officer safety, you talk about special needs. You can really plug into a lot of grants. There's a lot of grants out there. One of the times we advanced our contact technology, we got a quite a sizable grant to be able to buy new equipment to actually do that. So there are grants out there that you can plug into. You just have to look for them.

Jaclynn McKay [00:19:37] You brought up that because you haven't been able to fully implement this technology and you can only search the prints in Michigan. Are you also taking the traditional type of prints in addition to the contactless prints of individuals?

Mike Ransom [00:19:53] So as far as enrollment, we are still only using contact prints and we will probably the foreseeable future for the queries. We are doing them side by side right now. So we are doing the contact with the contact prints once the FBI. Comes along and is able to approve it. Then we will allow the contactless to be operated in Michigan. There has been discussions to allow the contactless to be approved in Michigan without the FBI to. So it does limit us to the Michigan database and any crimes in Michigan. But sometimes that the thought processes is something is better than nothing. So we're in discussion of that right now.

Jaclynn McKay [00:20:29] Ross, is this technology being used anywhere outside of Michigan?

Ross Krewenka[00:20:33] Yeah, actually, that's a great question. So IDEMIA has been developing our mobile biometric check application for the last few years and working with with agencies like Michigan State. However, we have worked with a couple of other agencies to actually implement the same type of solution. Folks in Arizona Department of

Public Safety do have our mobile biometric check application and they are currently right now searching their own state database or their state AFIS system for fingerprints. And then we also have another customer in the northeast, part of the of the United States that's used the technology essentially for identification in a number of different use cases. So yeah, there we do have implementations again, that there is a tendency from some agencies to wait until we have the full FBI approval. Again, agencies in addition to just searching their state AFIS they really would like to search the risk database as well. So for those folks that have AFIS systems that are at the state level that suffice for what they're doing, it's a great opportunity to implement the technology today.

Jaclynn McKay [00:21:38] And so from a disaster victim identification or an unidentified human remains standpoint, could this technology be used to help identify deceased individuals?

Ross Krewenka[00:21:49] Yeah, that's that's a great question. And we hear that a lot. A lot of times, you know, identifying someone out in the field becomes really important. And if that person is not respondents or unfortunately has deceased, really you're reliant on the fingerprint images to kind of find out who that person is from a purely, you know, deceased type of individual. There is going to be a breakdown of the fingerprint over time and it will decompose over a certain amount of time. And and unfortunately, once once a body has gotten to that point, you won't be able to take fingerprints from it. But, you know, there's a certain amount of time after someone's been deceased where you can still use contactless technology to get the fingerprints in a similar way that you would a contact device. And yeah, there's a certain amount of time afterwards where that would work just fine to get their fingerprints.

Mike Ransom [00:22:39] And from a law enforcement perspective, that's probably one of the reasons I was most shocked that that mobile ID was used for was for deceased individuals and contactless and contact can pretty much pick up the same ridge structures about the same amount for the same time. We've had certain people report that they've been in the morgue for 4 or 5 days and they have no problem picking up their fingerprints.

Jaclynn McKay [00:23:02] So we've talked about using this technology on developing fingerprints from individuals. But on crime scenes, as we all know, you can develop latent prints. Could this technology be used in that capacity at all?

Ross Krewenka[00:23:19] Currently, the contactless technology, it's not at a point right now where you can just take your phone and take a picture of a latent fingerprint and send it through for search. Unfortunately, the cameras in normal smartphones today are just not equipped with the technology to to actually just get that image off of the various different surfaces that you might find a latent fingerprint. We have been experimenting with certain applications. We know that if you treat the fingerprints or you dust the fingerprint or put a fluorescent light on the fingerprint does usually make the image easier to capture. And and there is some possibility to kind of kind of use a phone in conjunction with some of your traditional methods to to get latent fingerprints. But unfortunately, it's not a technology right now that's that's kind of been developed to a point where it's it's easier for people to use and it's really going to provide a a time saving or benefit. Again, we think that moving forward, that's going to be extremely beneficial to crime scene investigators to to just use their phone to capture latents. But currently the technology is just just not there just yet.

Jaclynn McKay [00:24:30] Yeah, I think that's the dream, right, for crime scene investigators to be able to process and get those prints and search them right away and provide those leads to law enforcement as soon as possible.

Ross Krewenka[00:24:40] Yeah, of course. I couldn't agree with you more. And, you know, a lot of times in those those scenarios, time is of the essence, right? So the faster you can get a latent prints in for search and the faster you can make an identification, you know, it's really going to provide a lot of value to the agencies that are working the case and actually, you know, getting the case solved as quickly as possible.

Jaclynn McKay [00:25:00] Ross and Mike, thank you for your time today discussing this topic with us. It has been a pleasure speaking with you.

Mike Ransom [00:25:07] Thank you so much.

Ross Krewenka[00:25:07] Thank you.

Jaclynn McKay [00:25:08] If you enjoyed today's episode, be sure to like and follow just science on your platform of choice. For more information on today's topic and resources in the forensics field, visit forensic.coe.org. I'm Jaclynn McKay and this has been another episode of Just Science.

Introduction [00:25:27] Next week, Jason sits down with Brian McVicker to discuss processing fabric for footwear and tire impressions using the and ninhydrin. The points of views expressed in this podcast represent a consensus of the authors and do not necessarily represent the official position or policies of its funding.