UNDERSTANDING SINGLE FRAME PASSIVE FACIAL LIVENESS

ID R&D's IDLive™ Face passive facial liveness product offers ISO 30107-3 Level 1 and Level 2 compliance using only a single image. Achieving this level of accuracy from a single image is a technological breakthrough. The purpose of this paper is to provide a high-level explanation of how the technology works.

WHAT IS PASSIVE FACIAL LIVENESS?

First, it's important to recognize that liveness is critical in preventing spoofs such as photos from passing as the real person during facial recognition matching. The spoof attempts, known as "Presentation Attacks". Common Presentation Attacks include printed photographs, cut-out photos, screen displays, video playbacks, and masks.

Until now most systems used some form of active liveness, such as blinking, smiling or moving a head back and forth to detect liveness, assuming that a photo cannot mimic the actions of a live person. However, active liveness checks create friction, take time, and inform fraudsters of the steps necessary to break the system. In fact, many are now easily broken.

Passive liveness on the other hand, eliminates these concerns. The technology requires no action from the user. But like active solutions, some passive liveness solutions capture video or multiple images during the "selfie" process to detect subtle changes that indicate liveness. These solutions create more processing needs and more data transmission requirements either on the device or to a back-end server. ID R&D IDLive™ Face stands apart as a passive liveness detection product that uses only a single frame to accurately determine liveness.

THE ADVANTAGES OF A SINGLE FRAME

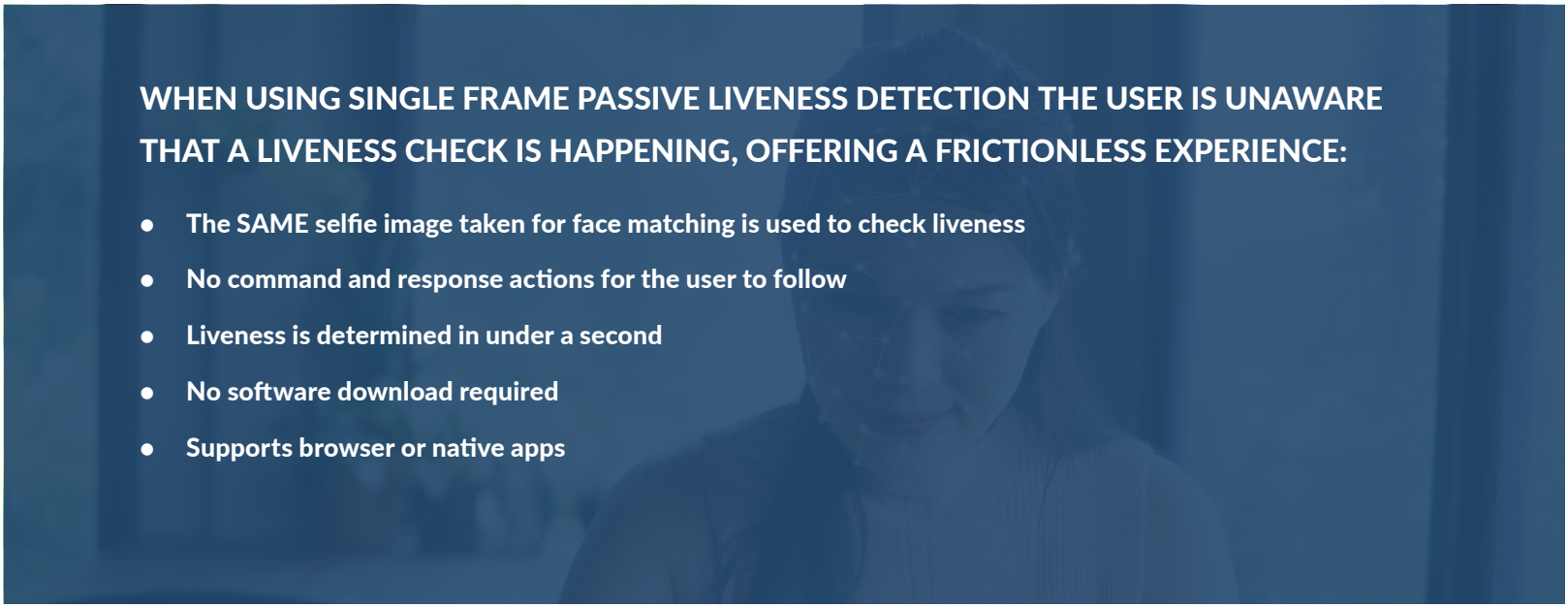
Using a single frame approach offers advantages for both users and developers. **First, it doesn't require movements, gestures, nor extra video frames in order to recognize the user as a live person.** The technology works passively in the background when a selfie is captured for facial recognition, keeping the user experience as simple and fast as possible. The developer uses the same frame for liveness checking as for face matching. The user's only required action is to capture a selfie.

Second, a single frame solution is deployed as a separate independent function, requiring no changes to the user interface or communication interfaces. Your back-end application simply performs one liveness check API call to IDLive Face deployed in your back-end infrastructure. This makes integration quick and straightforward for developers.

Third, a single frame solution is imperceptible to users without indication of when it's happening or what it's looking for, therefore offering no clues to fraudsters on how to break it.

And finally, the single frame approach minimizes the amount of data that needs to be sent from the device. A single image can be as small as 50kb when using ID R&D recommended settings versus solutions that send multiple frames or video of photos. And, if you are already sending the image to the back-end, there is zero extra data transmission overhead.

The result is an easier, faster, more secure, and less costly Liveness Solution.



WHEN USING SINGLE FRAME PASSIVE LIVENESS DETECTION THE USER IS UNAWARE THAT A LIVENESS CHECK IS HAPPENING, OFFERING A FRICTIONLESS EXPERIENCE:

- **The SAME selfie image taken for face matching is used to check liveness**
- **No command and response actions for the user to follow**
- **Liveness is determined in under a second**
- **No software download required**
- **Supports browser or native apps**

HOW IT WORKS

Single-frame passive facial liveness works by examining a single image to make a liveness determination. How is this possible?

It starts with the ability to use the same selfie as the face recognition system.

IDLive Face doesn't require special hardware or additional software for image collection and works with images taken on the majority of smartphones or web cameras. As such, ID R&D has trained its algorithms to work on images that meet minimum requirements. Because most face biometric systems determine matching based on a selfie, the system usually already assures the capture of an acceptable image that includes a forward-looking face at an acceptable resolution. Generally speaking, if the selfie is good enough for the face recognition technology, it is good enough for the passive liveness check.

The other factor in enabling the use of a single frame to detect liveness is ID R&D's unique Deep Neural Network ("DNN") based approach. IDLive Face processes the selfie image through a sequence of DNNs. Each of the neural networks examines a different element of the image to detect artifacts that help distinguish between a photo of a live person and a presentation attack.

The software fuses the output of these neural networks to produce a liveness score. The software then maps the score to a probability distribution function value between 0 and 1. This mapping depends on calibration, which in turn is based on using real-world data to find the right balance between false acceptance and false rejection for a particular use case. ID R&D can tune IDLive Face to different environments using calibration, which does not require modifying the neural network design.

Knowing what the neural networks should examine and how to combine the neural networks is proprietary information. ID R&D invested many person-years of research to determine these values and the specific combination of what is useful to perform liveness checks.

PASSIVE LIVENESS DETECTION PROCESS USING A SINGLE FRAME APPROACH

User takes a selfie

Selfie image is used by the facial recognition system to determine a match

The same selfie image is used for the liveness check

IDLive Face uses deep neural networks and proprietary algorithms to analyze the image for liveness

The system returns a liveness probability score

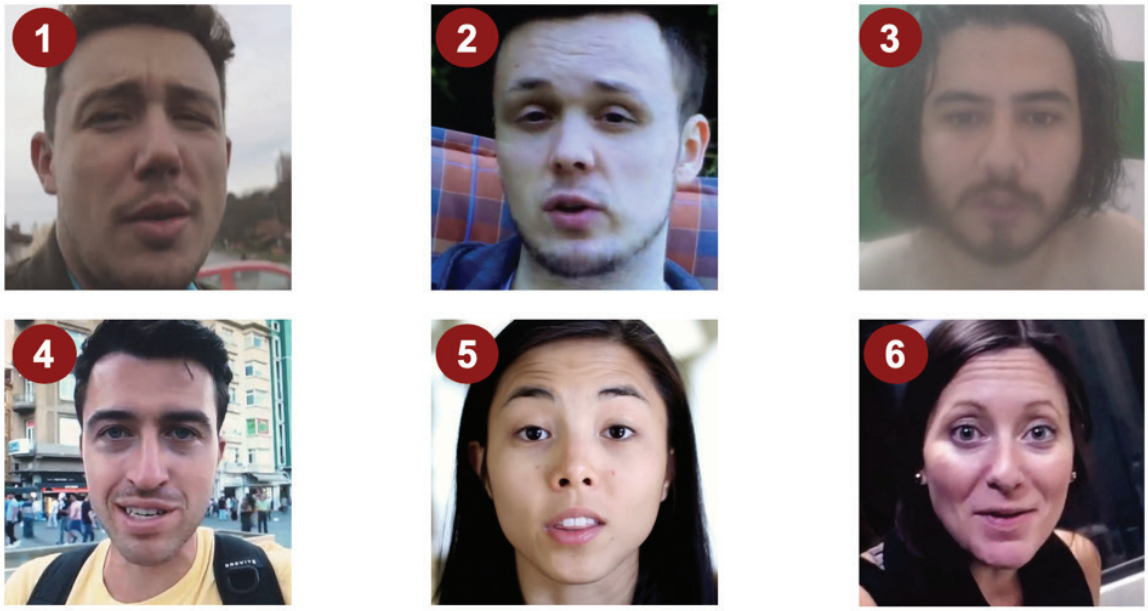
NEURAL NETWORKS PERFORM FAR BETTER THAN HUMANS

Artificial Intelligence of the form used in IDLive Face is Machine Learning. The effectiveness of Machine Learning depends on training with large quantities of labeled data (meaning data in which we know whether the image is real or spoofed), determining the right features to extract and analyze in the image, and determining the optimal structure of the neural network.

Machine Learning refers to the fact that the neural network performs many calculations to compute an error and then tries to minimize the error, changing the values of the neural network until the error is as small as possible. That is, the machine has “learned” how to perform a function that will minimize the error on a given data set.

That same neural network can now run against data it has never seen before. This new data provides the test of how good the network is. If it does not perform well, the Machine Learning experts may need to collect more labeled data and/or modify the structure of the neural network.

Machine Learning works extremely well in the real world even though it is not completely known how. The neural networks far outperform humans in tasks like reading typed or handwritten addresses and postal codes on letters, one of the first real-world use cases for neural networks. This is also true in the case of determining liveness in selfie images. It may seem like a straightforward task, but it’s not as simple as it may seem. As an example, can you spot the spoofed images in the group of photos below?



Images 1, 3 and 5 are real and the others are spoofs. In this case AI not only automates, but improves a process.

SUMMARY

IDLive Face is a sophisticated passive liveness detection product that works in the background with zero requirements from the end user. The use of a single frame image for detection offers advantages including streamlined implementation, improved resistance to fraudsters who aren't aware of the process happening, and a better user experience.

ID R&D's ability to accurately detect liveness in a passive manner using a single frame is the result of extensive and ongoing research and development, and our commitment to enabling a secure, frictionless user experience. The product is Level 1 and Level 2 ISO/IEC 30107-3, having passed iBeta Quality Assurance's Presentation Attack Detection (PAD) testing with a perfect score.

Learn more about IDLive Face at
https://www.idrnd.ai/passive-facial-liveness/