**ZKTeco**

# 3-IN-1 PALM RECOGNITION
## POWERED BY
## COMPUTER VISION TECHNOLOGY

# Background

In 2016, ZKTeco first introduced the touchless palm recognition technology which was a breakthrough of touchless biometrics recognition, it was the first and the only recognition available. However, the previous technology was constrained by the angle tolerance and short recognition distance resulted in an imperfect user experience solution. After 5 years of R&D and the technological bloom of computer vision, in 2019 ZKTeco is going to launch the next generation 3-in-1 Palm Recognition Technology.



# Introduction

The newest generation of palm recognition technology is fully upgraded with latest ZKPalm V12.0 in all aspects in terms of recognition method, which combines palm, palm print and palm vein recognition as one, with the help of the delegated computer vision biome-trics CPU, the whole recognition process can be finished in 0.35 second with FAR≤0.01% FRR≤1%. Moreover, the computer vision technology has greatly enhanced the recognition performance, the angle tolerance is improved to as wide as +/- 60 degrees (roll axis), and the recognition distance can be up to 0.5 meters upon the palm-size. Most importantly, the anti-spoof ability has reached a new height of the industry, as the testing result has shown, all the testing subjects including, fake HD photos, fake HD video, and fake palm model cannot stand any chance to crack the system.
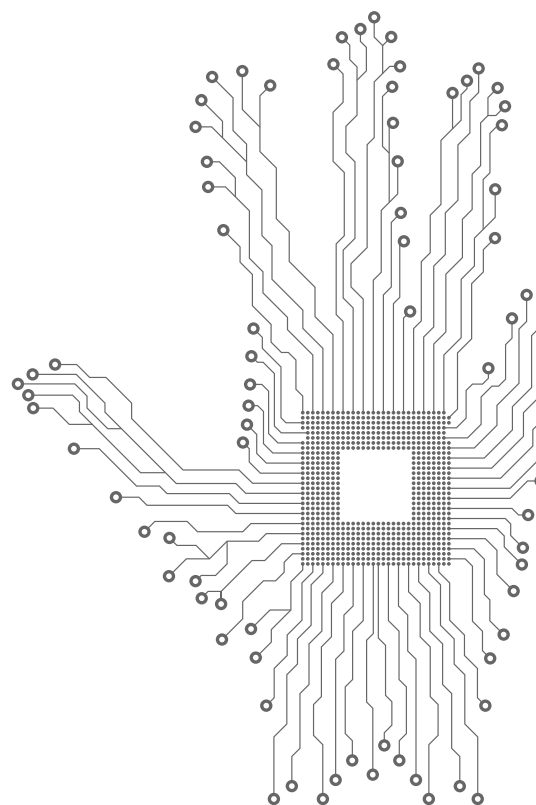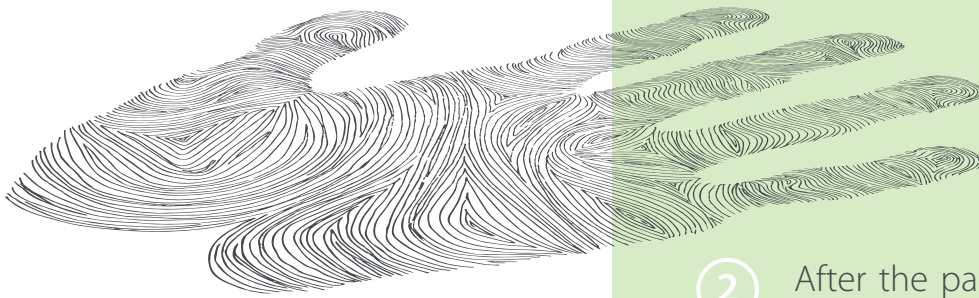
# Recognition Process
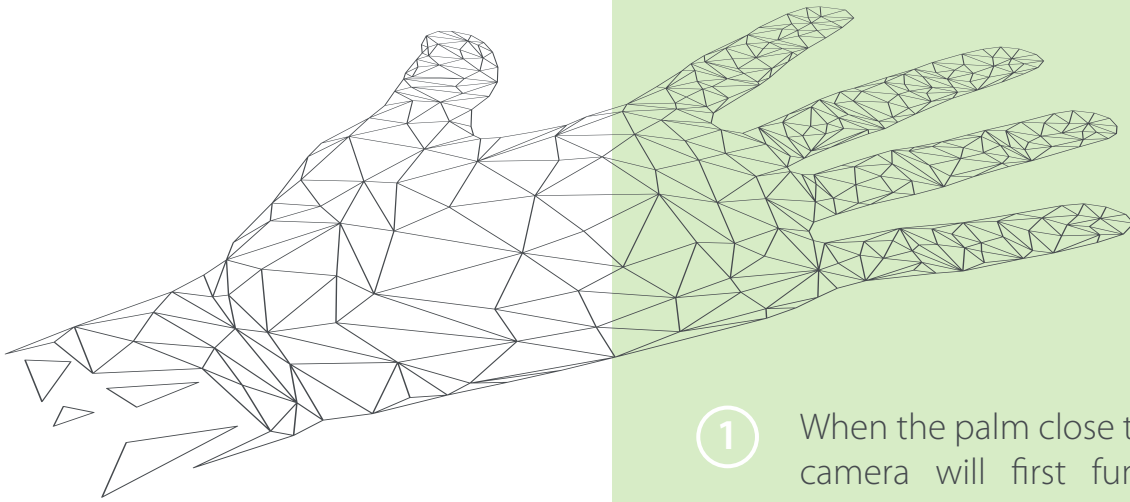
**Palm Recognition**

**(1)** When the palm close to the camera, the camera will first function the palm recognition process to identify whether this is a palm, if the nearing object is not a palm, it will stop the further recognition process. If the nearing object is a palm, it will pass it to the next step

**Palm Print Recognition**

**(2)** After the palm recognition process, the infrared camera will be activated, and then processing the palm print recognition and palm vein recognition simultaneously, the camera will recognize the feature point of the palm print and cross-check with the database.
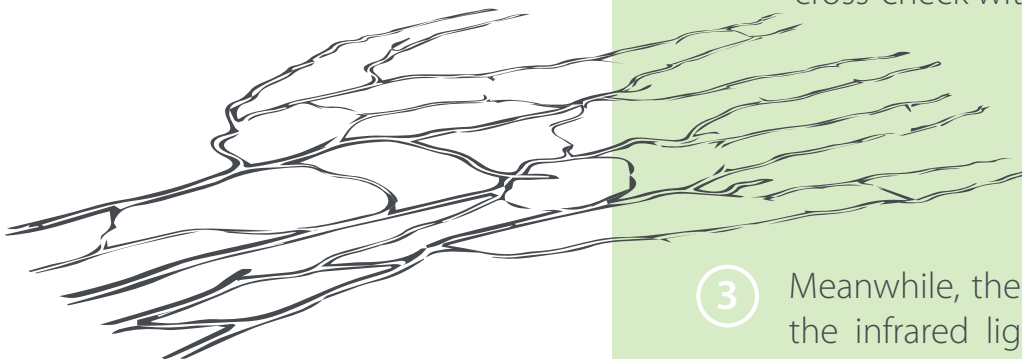
**Palm Vein Recognition**

**(3)** Meanwhile, the infrared camera will use the infrared light to observe the palm vein, which is normally unobservable by the human eye, same as the palm print, it will recognize the feature point of the palm vein and then cross-check with the database for its availability.

# Technological Features

## Anti-spoofing Technology

With the help of Computer Vision technology, the anti-spoof ability has been greatly enhanced. The 3-in-1 combination of palm, palm print and palm vein sets an extremely high bar for spoofing attacks to pass through. All attacks are guarded throughout three layers as follows:



### 1st Layer - Palm Recognition

The latest algorithm contains the palm recognition function, it can identify whether the object is in proper "palm" shape, all the objects that are not in a proper "palm" shape will be identified as non-palm object and will be refused to process to the further recognition process.

## 2nd Layer – Palm Print Recognition

After the 1st layer recognition, the palm shape object will go for the second recognition process, the infrared camera will recognize the palm print, as palm print is one of the unique features points of human being, and is formed by hundreds of thousands of lines, accurate replication of palm print is extremely hard to be done, and 90% of the fake palm will be identified and rejected in this stage.
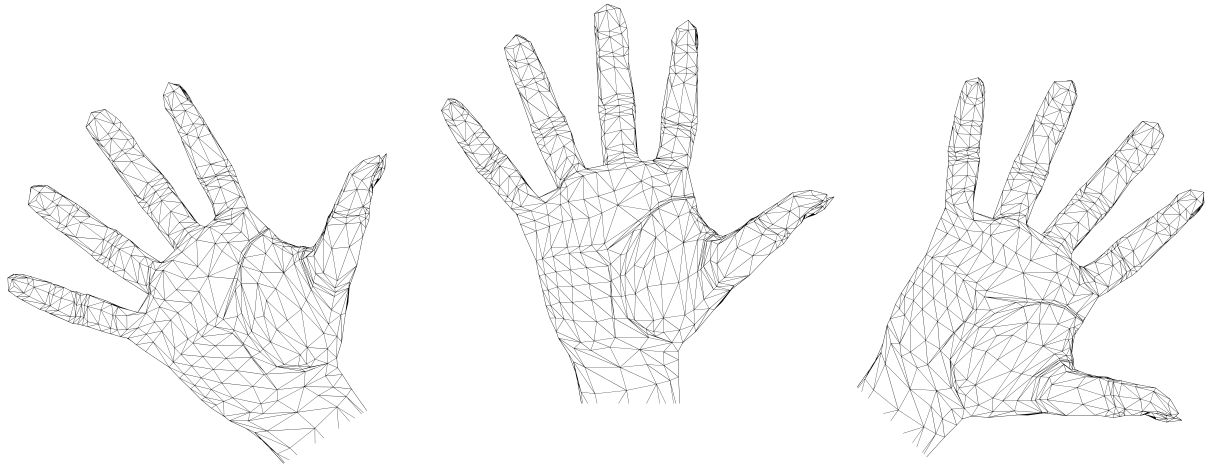


## 3rd Layer – Palm Vein Recognition

In this stage, the infrared camera will be activated. Under normal sunlight, palm vein cannot be imaged, but under infrared light (wavelength 700 – 900nm), the palm vein will become visible as the deoxygenated hemoglobin in the blood exhibits stronger absorp-tion characteristics than moisture in other tissues and tissues under infrared light. Using a near-infrared light source to illuminate the palm, the venous blood in the shallow layer of the palm absorbs most of the light, while the body tissue such as the skin absorbs light less and reflects the light back. Through the imaging of the image sensor, the venous blood vessels and other tissues are imaged with a strong difference in brightness, so that the structural distribution of the vein can be clearly distinguished. Hence the complication process to get a clear image of the palm vein, and the vein image is extremely complex which is involved with millions of vessels and some of the vessels are as tiny as a hair, it is almost impossible to replicate a qualified fake palm vein model to pass the recognition process.
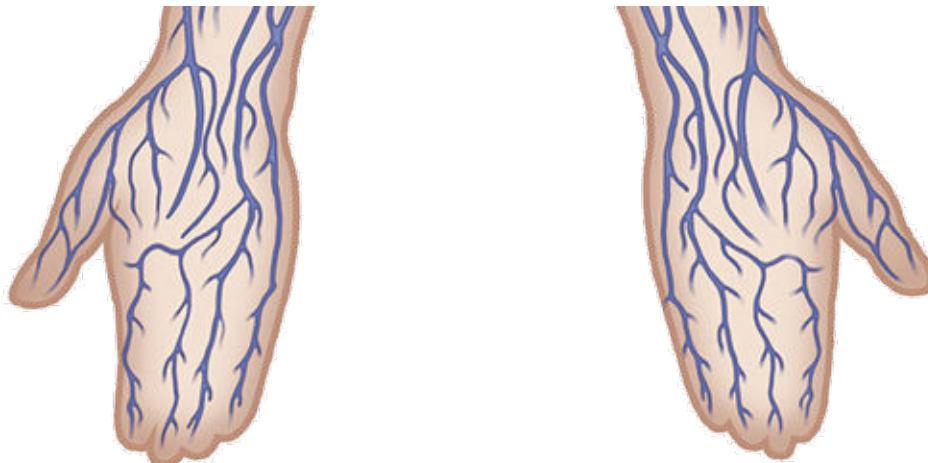
## Wide Angle Tolerance

The latest palm recognition algorithm was developed by Deep Learning and Computer Vision technology, and applied CNN algorithm and was trained up with hundreds of thousands of palm images, and completely understands how palm looks like in different angles. Therefore, in this generation terminal, the angle tolerance of palm image can be extended to as wide as +/-60 degrees in roll axis and slight angle twist in both pitch and yaw axes, which is almost reached the critical point of the widest angle acceptance of palm posture.

## Ultra-long Recognition Distance

With the help of the HD image sensor and HD and infrared camera technology bloom in recent years, getting a clear palm, palm print and palm vein image in the range of 10 – 60 cm is absolutely simple. With ZKTeco's biometrics processing unit, the whole recognition process can be finished in less than 0.35s, which is absolutely one of the finest in the industry.

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up to 60cm