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PALM VEIN RECOGNITION USING NEURAL NETWORK

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Abstract: The project presents robust palm vein recognition using hybrid texture descriptors like discriminative robust local ternary pattern and Weber's local descriptor for improving the recognition accuracy. A Biometric system is actually a pattern recognition system that makes use of biometric traits to recognize individuals. There was a negative effect on recognition performance on fingerprint and palm print biometrics thanks to the some conditions such as oil on the fingers, moisture, and dirt. Therefore, vein patterns stand out from the host of intrinsic biometric traits for development of a recognition system which will meet all these expectations. Vein patterns are the network structure of blood vessels underneath the human skin that are almost invisible to the eye under natural lighting conditions and can be acquired in infrared illumination, which effectively protects against possible external damage, spoof attacks and impersonation. The feel of the blood vessels of different individuals has been proven to be distinctive even among identical twins. Initially the palm vein images are pre-processed to pick the region of interest for vein pattern extraction. Here, local thresholding is employed to extract the vein pattern for its texture analysis. Two textures descriptors called Weber's local descriptors and DRLTP (Discriminative Robust Local Ternary Pattern) are proposed to extract the features about texture for recognizing with original templates. DRLTP is employed to provide the shape and contrast invariant features of an object. WLD provides details about illumination changes between the pixels. Euclidean distances are going to be used to match the features of test and original templates for making decision on person biometric. Finally the performances of proposed algorithm are going to be measured with recognition accuracy and it proves that it provides better matching rate than prior approaches.

Keywords: Palm vein, Biometric, Weber local descriptors, DRLTP, Euclidean distance.

I. INTRODUCTION

The identification of objects in a picture would probably start with image processing techniques such as noise removal, followed by (low-level) feature extraction to locate lines, regions and possibly areas with certain textures. With increasing financial activities and security awareness, followed by the event of science, technology, and therefore the progress of society, traditional authentication, like passwords, personal identification numbers, smart cards, has been largely incapable of meeting the wants of convenience, reliability, and security during a wide range of civilian applications. Under such circumstances, biometric authentication techniques that take full advantage of intrinsic physiological and/or extrinsic behavioural characteristics of humans, like face, iris, fingerprint, palm print, hand shape, and handwriting, or signature, became a powerful alternative, gaining rapid expansion.
Among these, face recognition is popular for identifying individuals in clean environments on the basis of their unique facial characteristics in the absence of direct contact with the individual. However, the face can be obstructed by hair, glasses, hats, scarves, and also facial characteristics can vary according to lighting conditions or viewpoints, which cause performance degradation in real-world applications. Fingerprint and palm print recognition is also a widely used identification technique, but the contact acquisition mode, requiring contact with a sensor, may be regarded as unsanitary and result in user resistance. In addition, under some conditions, such as in factory or construction sites, foreign matter, such as oil on the fingers, moisture, and dirt, will also have a negative effect on recognition performance. In the case of iris recognition, high precision is its greatest advantage, especially for applications with high security requirements, but the cost of the image scanner may be unacceptable in some civilian scenarios, and its special requirements for image acquisition may cause discomfort and concerns for privacy.
Regarding hand shape recognition, the procedure is quickly accepted by users, but common hand lesions (such as arthritis or rheumatism) and temperature changes can cause deformation of the hand shape, which may lead to a decline in the recognition rate and the method is seldom adopted in real scenarios. Additionally, extrinsic biometric traits, like handwriting or signatures, are expected to be more susceptible to spoofing with more effort, which results in greater concerns regarding privacy and security. In contrast, some intrinsic biometrics characteristics, such as vein patterns and DNA, are more difficult to forge because they are deep in the body, and are, therefore, more challenging to acquire. However, in addition to high anti counterfeiting ability, most civilian applications require other system features

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such as high agreeableness and easy collection. Therefore, vein patterns stand out from the host of intrinsic biometric traits for development of a recognition system that can meet all these expectations.

Vein patterns are the network structure of blood vessels underneath the human skin that are almost invisible to the eye under natural lighting conditions and can be acquired in vivo only when employing infrared illumination, which effectively protects against possible external damage, spoof attacks, and impersonation. The feel of the blood vessels of different individuals has been proven to be distinctive, even among identical twins. Additionally, the contactless mode of vein pattern acquisition ensures easy acceptance by users without discomfort and concerns for privacy

There are 3 types of images used in Digital Image Processing. They are

1. Binary Image
2. Gray Scale Image
3. Colour Image

a) BINARY IMAGE:

A binary image may be a digital image that has only two possible values for each pixel. Typically the 2 colors used for a binary image are black and white though any two colors can be used. The colour used for the object(s) in the image is the foreground colour while the rest of the image is the background colour. Binary images also are called bi-level or two-level. This suggests that each pixel is stored as a single bit (0 or 1).This name black and white, monochrome or monochromatic are often used for this idea , but can also designate any images that have only one sample per pixel, like gray scale images.

b) GRAY SCALE IMAGE:

A gray scale Image is digital image is a picture in which the value of each pixel is a single sample, that is, it carries only intensity information. Images of this type , also referred to as black-and-white, are composed exclusively of reminder gray(0-255), varying from black(0) at the weakest intensity to white(255) at the strongest. Gray scale images are distinct from one-bit black-and-white images, which within the context of computer imaging are images with only the two colours, black, and white (also called bi-level or binary images). Gray scale images have many reminders gray in between. Gray scale images also are called monochromatic, denoting the absence of any chromatic variation. Gray scale images are often the results of measuring the intensity of light at each pixel in a single band of the electromagnetic spectrum (e.g. infrared, light , ultraviolet, etc.), and in such cases they're monochromatic proper when only a given frequency is captured. But also they will be synthesized from a full colour image; see the section about converting to gray scale.

c) COLOUR IMAGE:

A (digital) colour image may be a digital image that includes colour information for each pixel. Each pixel features a particular value which determines its appearing colour. This value is qualified by three numbers giving the decomposition of the colour in the three primary colours Red, Green and Blue. Any colour visible to human eye is often represented this way. The decomposition of a colour the three primary colours is quantified by a number between 0 and 255. For example, white will be coded as R= 255, G = 255, B = 255; black will be known as (R,G,B) = (0,0,0); and say, bright pink will be : (255,0,255).

In other words, an image is an enormous two-dimensional array of colour values, pixels, each of them coded on 3 bytes, representing the three primary colours. This allows the image to contain a total of 256x256x256 = 16.8 million different colours. This technique is also known as RGB encoding, and is specifically adapted to human vision.

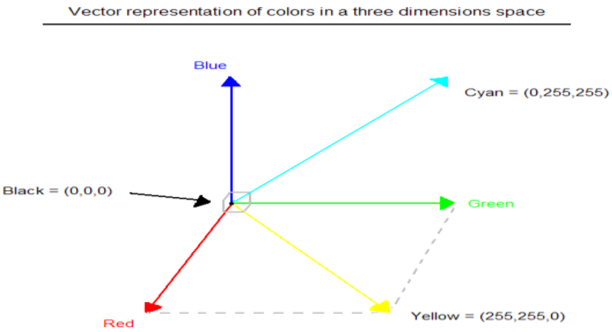

Fig1: Vector representation of colours in a three dimensions space

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From the above figure, colours are coded on three bytes representing their decomposition on the three primary colours. It sounds obvious to a mathematician to right away interpret colours as vectors in a three dimension space where each axis stands for one of the primary colours.

II. EXISTING METHOD

Investigate into utilization of images from the light (RGB) spectrum for identity verification based on the palm-veins. This is often differentiated from the commonly utilized Near-infrared (NIR) images for palm-vein feature extraction. The goal is to explore into the usually omitted palm-vein information from the RGB palm images considering the vast deployment of the RGB cameras. Essentially, the vein line features are extracted at various scales supported an efficient difference image projection. The extracted features from the gallery and therefore the probe images are matched based on a fast Hamming distance implementation. The resultant similarity scores are finally fused at score level for accuracy enhancement. Experiments are conducted on two public multi-spectral palm databases. The results show encouraging matching accuracy and computational efficiency of the tactic which extracts the palm-vein utilizing only the visible spectrum. The result of this study can be deployed as a standalone biometric or as part of a multibiometric system for secure authentication.

III. PROPOSED METHOD

Palm vein pattern is extracted using image segmentation technique using local thresholding algorithm. The goal of image segmentation is to cluster pixels into salient image regions, i.e., regions like individual surfaces, objects, or natural parts of objects.

In computer vision segmentation ask the process of partitioning a digital image to multiple segments. The goal of segmentation is to simplify and/or change the representation of a picture into something that is more meaningful and easier to analyse Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is that the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics.

The result of image segmentation is a set of segments that collectively cover the entire image, or a group of contours extracted from the image. Each of the pixels during a region are similar with respect to some characteristic or computed property, like colour, intensity, or texture, Adjacent regions are significantly different with reference to the same characteristics.

The project presents robust palm vein recognition using hybrid texture descriptors such as discriminative robust local ternary pattern and Weber's local descriptor for improving the recognition accuracy. A Biometric system is essentially a pattern recognition system that makes use of biometric traits to recognize individuals.

There was a negative effect on recognition performance on fingerprint and Palm Vein biometrics due to the some conditions such as oil on the fingers, moisture, and dirt. Therefore, vein patterns stand out from the host of intrinsic biometric traits for development of a recognition system that can meet all these expectations. Vein patterns are the network structure of blood vessels underneath the human skin that are almost invisible to the naked eye under natural lighting conditions and can be acquired in vivo only when employing infrared illumination, which effectively protects against possible external damage, spoof attacks, and impersonation.

The texture of the blood vessels of different individuals has been proven to be distinctive even among identical twins. Initially the palm vein images are pre-processed to select the region of interest for vein pattern extraction. Here, local thresholding is used to extract the vein pattern for its texture analysis.

Two textures descriptors called Weber's local descriptors and DRLTP are proposed to extract the features about texture for recognizing with original templates. DRLTP is used to provide the shape and contrast invariant features of an object. WLD provides details about illumination changes between the pixels. Euclidean distance will be used to match the features of test and original templates for making decision on person biometric. Finally the performance of proposed algorithm will be measured with recognition accuracy and it proves that it provides better matching rate than prior approaches.

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a) SYSTEM ARCHITECTURE:

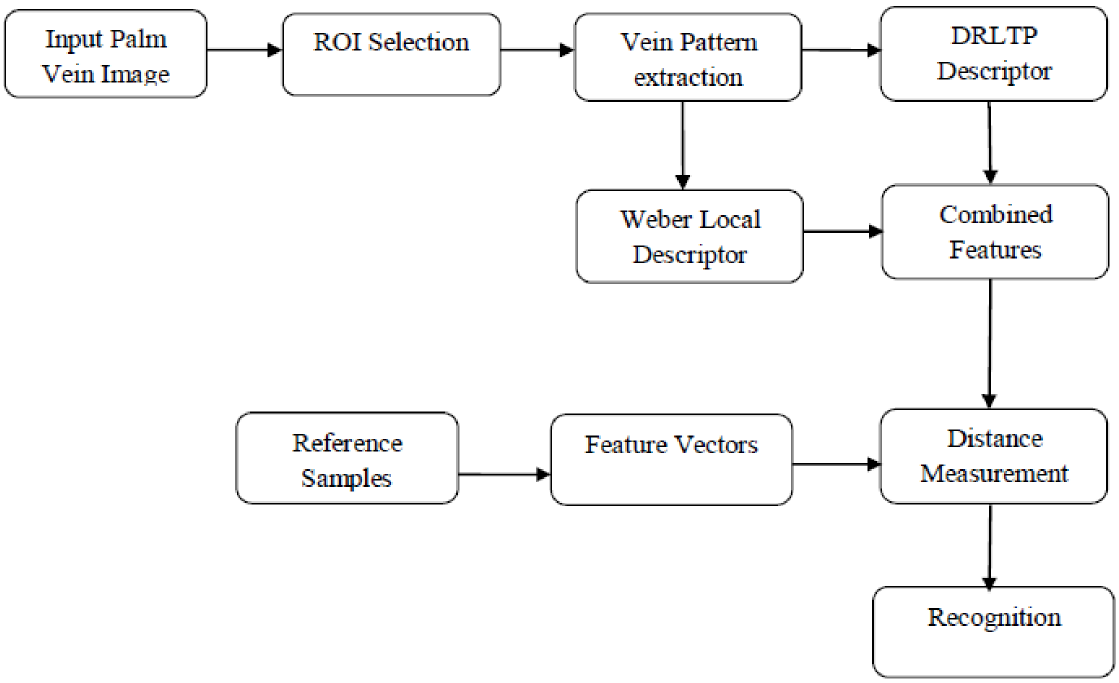

Fig 2: Block diagram of system design

b) PALM VEIN ANALYSIS:

✓ In recognition stage, textures features are used to match the input biometrics with database images for identification.

✓ First process is to crop an input hand image with fixed width and height for extracting Palm Vein for finding the features.

✓ Then an image will be applied to extract texture pattern with help of Weber's local descriptor and statistical features.

✓ WLD is used to determine changes of luminance conditions from an image and it is powerful tool in texture analysis.

c) WEBER LOCAL DESCRIPTOR:

✓ Weber Local Descriptor (WLD) has been proposed for image texture classification.

✓ Orientation component in Weber Local Descriptor is that the gradient of an image, which doesn't properly represent the local spatial information of an image.

✓ Weber local descriptor (WLD) is applied for addressing the challenges in image/pattern problems, especially in computer vision and pattern recognition domains.

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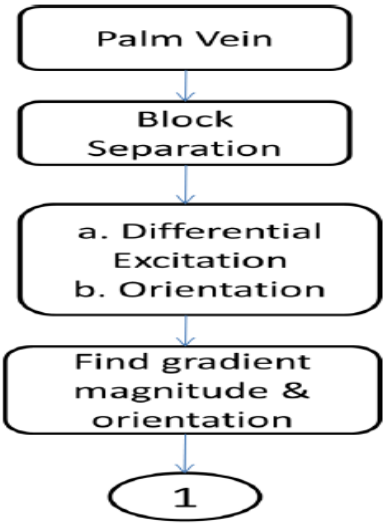

Fig 3: Block diagram of Weber Local Descriptor

d) WEBER'S FEATURES:

- ✓ The Weber's palm will be determined using two factors such as differential excitation and gradient orientation.
- ✓ An extracted palm print will be separated into overlapping blocks to evaluate the differential excitation with current coefficient and neighbourhood matrix.
- ○ **De = sum (change in difference b/w current & surrounding values)/ Current Value**
- ✓ The gradient is defined by g = a tan(De)
- ✓ The feature vectors such as gradient orientation and magnitude will be determined from Weber's palm.

e) LOCAL THRESHOLD BINARIZATION:

The basic steps of the method are as follows:
(1) Set the initial threshold T
(2) Using T segment the image to get two sets of pixels B(all the pixel values are less than T) and N (all the pixel values are greater than T)
(3) Perform connected component analysis to suppress the background noise for enhancing details about vein texture.

f) RECOGNITION:

- ✓ At recognition stage, features from input images Palm Vein are combined to form a common feature vector.
- ✓ Before matching process, the same features are extracted from available and Palm Vein pair of database.
- ✓ The first level of recognition is to match the input features with database image features to identify the authorized person.
- ✓ Matching process will be performed using hamming distance and search desired minimum value for identification.

g) EUCLIDEAN DISTANCE:

Euclidean distance measures the similarity between two different feature vectors using

$$ED=\sqrt{\sum_{j=0}^{1}(FV1,j - FV2,j)2}$$

Where J is the length of the feature vector, Fv1j is the feature vector for individual j.

LTP and RLTP are also robust to illumination and contrast variations and only capture texture information. The kth weighted LTP bin value of a M × N image block is as follows,

$$\textbf{http (k)} = \sum_{x=0}^{M-1}\sum_{y=0}^{N-1} \omega x, y\ \delta(LTP\ x, y, K)$$

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IV RESULT

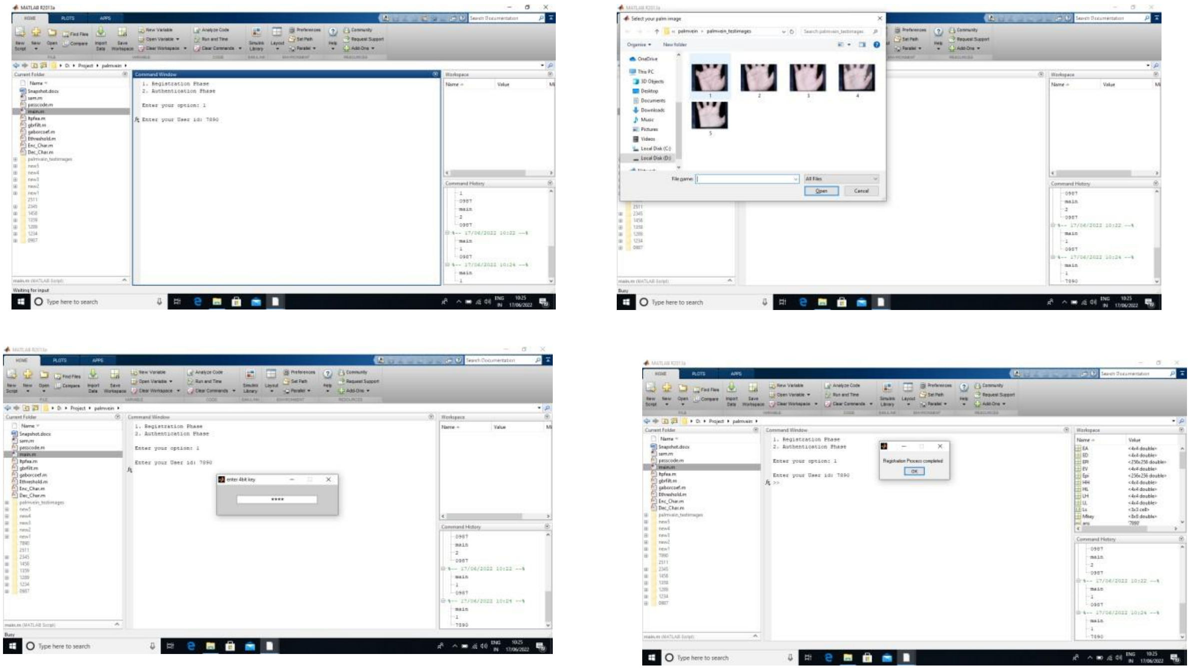

Fig 4: Registration Process

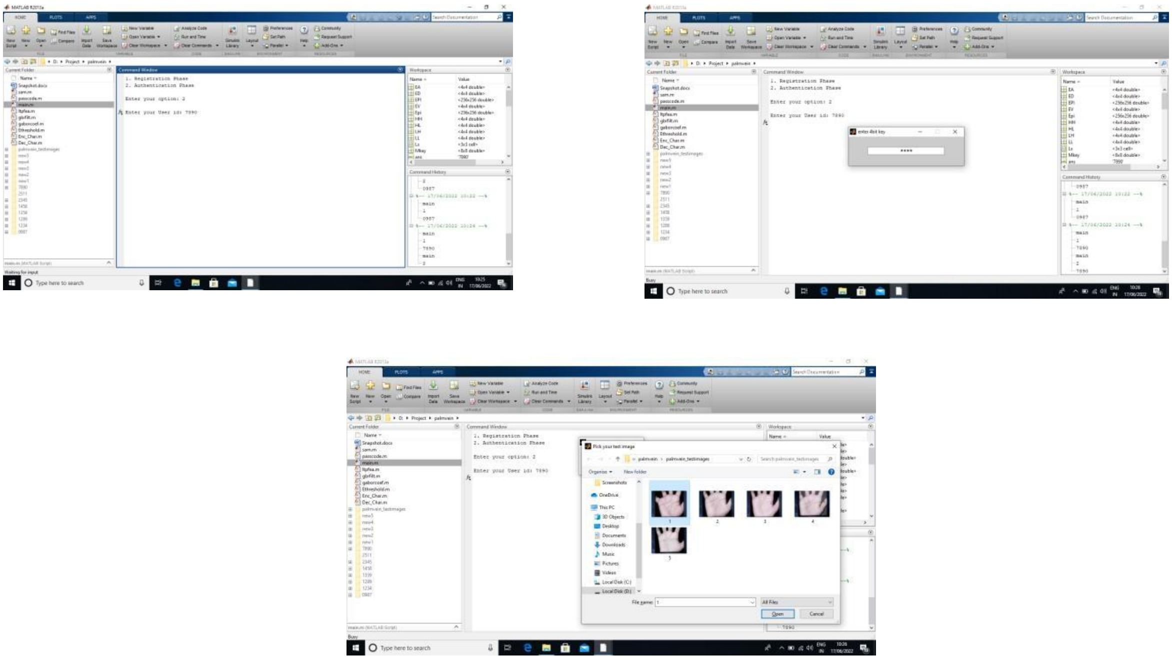

Fig 5: Authentication Process

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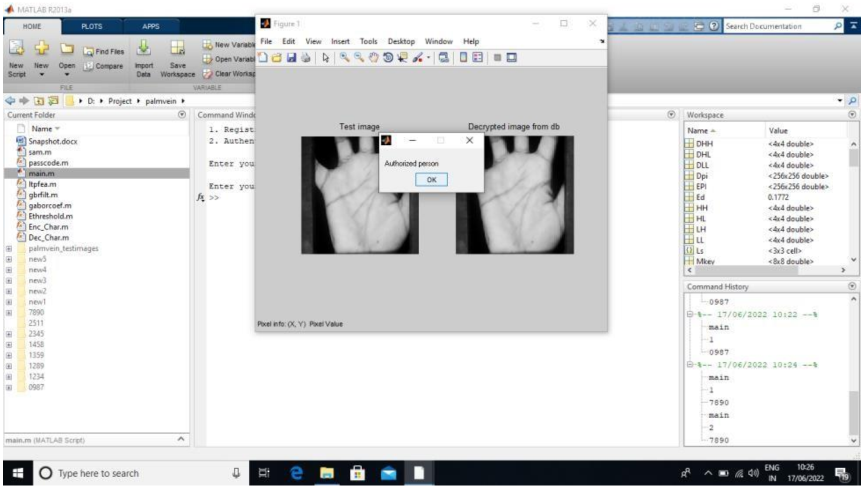

Fig 6: Authorized Person

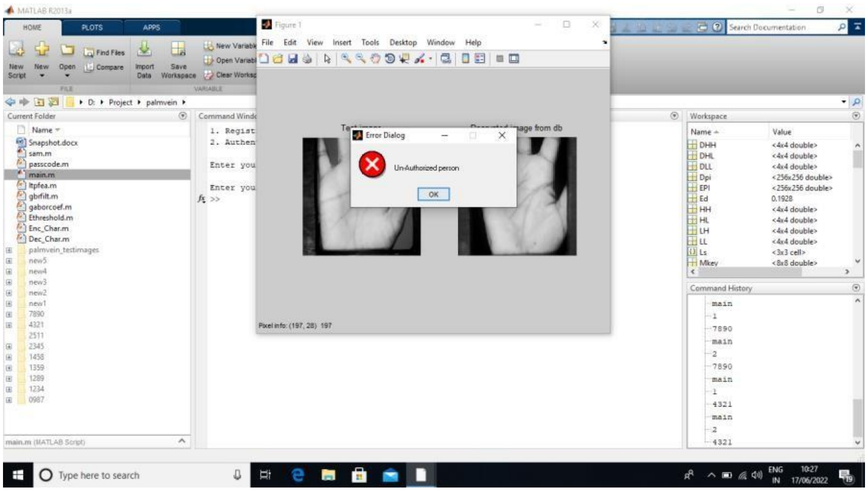

Fig 7: Unauthorized Person

V. CONCLUSION

In this project, we have presented a new vein based user recognition system forpersonal security and recognition. The system provides effective and efficient features using feature extraction algorithm. The vein based recognition technology has high security and reliability compared to the traditional authentication mode. It also can be applied in public or private equipment.

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