A
Project Report
On

HAND IMAGE ACQUISITION SYSTEM

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Introduction

Biometric security reads the unique characteristics of fingerprints, voice, facial and iris patterns to prove a person's identity and offers significant advantages. Identities protected by biometric security cannot be transferred to another person, stolen, written down, copied or compromised. One common method of biometric security is done by processing the image of the hand by feature extraction. Feature extraction involves computing the widths and lengths of the fingers at various locations using the captured image. These metrics define the feature vector of the user's hand. The technology used here verifies identity by the size and shape of the hand. For this purpose, the need for a device exclusively for image acquisition was being felt for quite some time now.

Aim and Goals

Designing an image acquisition system to capture hand-images for personal identification. The designed product should be compact, user friendly, fast, low-cost and should acquire both video and still images.

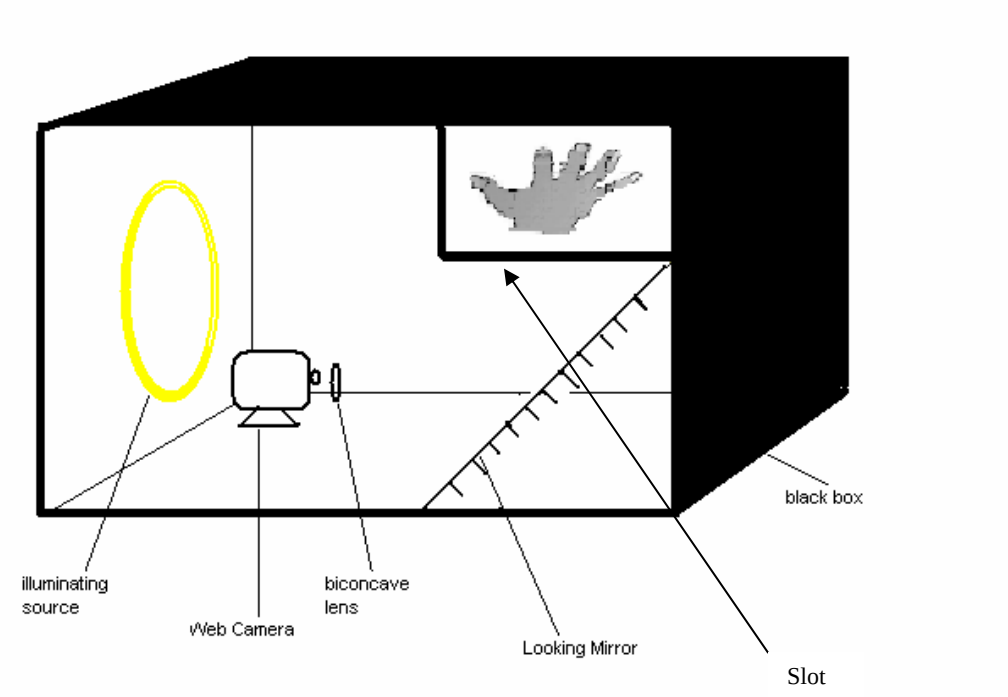
Components used and specifications

1. **Web Camera**- 1086 * 960 resolution (1.3 MP), can acquire both still and video images.
2. **Demagnifying Lens**: A biconcave lens of focal length = 3.7cm used in front of the camera.
3. **Looking Mirror**: A mirror is placed at an angle of 45^0 to cause a diversion of 90^0
4. **Ring Light Source**: To provide uniform illumination.
5. **Light weight body**: Wooden box used is both strong, durable and light.

Design and Implementation:

The image acquisition system comprises of a light source, a camera, a single mirror. The user inserts his hand - palm facing downwards - into the slot provided. The slot serves as control points for an appropriate placement of the right hand of the user. The device can be hooked to a PC with a GUI application which provides a live visual feedback of the palm-view of the hand. The GUI aids in capturing the hand image.

The camera provided to us, required the hand to be placed at a distance of at least 50-60cm from it to give a full image of the hand. It resulted in the construction of a large box which was difficult to handle.Our job therefore was to decrease its bulkiness, improve image quality and user convenience. So keeping in mind all the aspects, we went for the following structure:



Hand Image Aquisition System

The dimension of the implemented structure 30cm x 22cm x 20cm (l*b*h) (external). Slot of size 15cm * 8cm is cut to insert the hand inside the box. Mirror of size 20cm * 16cm is placed at an angle of 45^0 to divert the rays by 90^0. Here, we used a biconcave lens to demagnify the image of the hand formed by the mirror. The effective optical path (object

distance for the lens) is the sum of the distances between the camera and mirror and the mirror and hand.

- **Magnification Calculation**

$$M = v / u$$

$$= f / u - f$$

$$= 3.7 / (30-3.7)$$

$$= 0.14$$

(Assuming object distance to be approx. 30 cm.)

Illuminating source used is a round illuminator of power 22 watt. It is strategically placed behind the web camera; so that no light falls on the lens of the camera. By law of reversibility of light, the light from the illuminating source will automatically fall on the hand. A translucent material is placed in the front of the source to ensure the following:

1. Uniform distribution of light
2. To overcome the problem of “glare “.

Results:

The system resulted in a good quality image, which can be used for further processing, as shown below:

Cost:

Webcam	Rs. 1800/-
Lens	Rs. 200/-
Lights	Rs. 250/-
Body(including mirror)	Rs. 300/-
Total	***Rs. 2550/-***

Modifications:

- **Sensors** – To capture the image automatically the laser sensors can be used.
- To improve the quality of image, better cameras can be used.
- Weight can be reduced by using some other material like plastic or aluminum and beautification can be achieved.
- Both **size** and **cost** can be further reduced using camera specifically made for this purpose

Utilities:

We anticipate widespread use of HIAS in access control and time and attendance applications. HIAS can provide improved security, accuracy, and convenience in the fields of:-

1. Access Control: It can ensure that the person who enters isn't merely carrying someone else's access card or PIN.

2. Time and Attendance: HIAS can improve accuracy and simplicity by allowing automated attendance.

3. Personal Identification: HIAS can guarantee that the people on a site actually belong there.

Intended Markets:

HIAS can look forward for its growth to three specific markets:

Access Control – HIAS can bring the true security and convenience of biometric technology easily within reach of most access control applications. The benefits of biometric security reserved primarily for high-security applications, can now be available to all even at very common places like health clubs, day care centers, laboratories and prisons.

Time & Attendance - HIAS can bring the accuracy and convenience of biometric technology easily within reach of most time and attendance applications as well. In operations that range from coalmines to class rooms, HIAS can prove to be a practical and precise solution.

Personal Identification – HIAS may be installed at the Immigration centers at airports; as well as in banks as a way to put a person's bank account on a memory card.