CHAPTER 7

CONCLUSION

The first chapter of this work deals with the objectives of this research, specifications of certain problems and contributions. The second chapter highlights the Digital Image Processing, the significance biometric technology and the comparison of various biometric systems. Applications of biometric systems, limitations of unimodel biometric systems and introduction to the hybrid modal systems have also been delineated in detail. The third chapter gives an over-all survey of image segmentation, hand geometry based human recognition systems and hybrid model biometric systems.

The fourth chapter has explored several approaches towards segmenting a hand image and application of algorithms in a new hybrid model personal authentication system which integrates hand-shape and its features, simultaneously acquired from a single hand image. The fifth chapter presents the hand geometry based human identification and recognition system and highlights how the binary image prepared from the segmented hand image is cropped exactly to contain the hand only area using the detected finger tips and fourteen more significant features are extracted. This chapter has also explored several approaches towards the matching policy for hand image attribute matching and those algorithms are applied in a new personal authentication system by integrating hand-shape and its features, simultaneously acquired from the single hand image.
The sixth chapter deals with the hybrid model for human identification and recognition system. Only some of the hand attributes are used from the fourteen selected for extracting the palmprint area of the hand. Subsequently, factor analysis is used to find the principal factors of the palmprint images which can be considered as feature vectors of the palmprint. Then, the combined feature vector is obtained by concatenating the hand geometry features and palm print features using fusion process. A novel matching policy namely fuzzy weighted attribute set based Euclidean distance metric for matching the input hand attributes with the attributes of hands in the database, is also proposed.

To sum up, this research work introduces a new bimodal personal authentication system by integrating hand-shape and palmprint features, simultaneously acquired from the single hand image. The proposed method of hand-shape and palmprint image segmentation, and the combination of features from these two images, has found to be useful in achieving higher performance. This research has explored several approaches towards the matching policy for hand image attribute matching and those algorithms are applied in a new personal authentication system by integrating hand-shape and its features, simultaneously acquired from the single hand image.

From the experimental results, it is inferred that the shape property (distance between wrist point and finger tips, valley points) can be effectively used in hand-shape recognition. The results derived from the hybrid model are more significant and very much comparable with existing unimodel biometric systems. The results obtained strongly indicate that the combination of hand-shape and palmprint features constitutes a promising addition to the biometrics-based personal recognition systems.
7.1 SCOPE FOR FURTHER RESEARCH

A biometric system, which relies only on a single biometric identifier in making a personal identification, is often not able to meet the desired performance requirements. Identification based on multiple biometrics represents an emerging trend. A hybrid model biometric system has been proposed in this research work, which integrates Hand Geometry and Palmprint of the hand in making a personal identification. This system takes advantage of the capabilities of each individual biometric. It can be used to overcome some of the limitations of a single biometrics. Preliminary experimental results demonstrate that the identity established by such an integrated system is more reliable than the identity established by other verification systems.

There are lots of scope for improving the performance of an identification system using additional biometrics of the person other than hand geometry and palm print. The results of such multi model identification systems will be more accurate and avoid false recognition very much. So, there are so many directions for future improvements.

In the present study, only the right hands of people have taken a role. The improvement in the recognition rate with the use of the images of both hands or with a more extended set of training images, i.e., more than two images per person could be studied. Conversely, experiments could be carried out with hand set sizes going from hundreds toward thousands to determine the limitations in classification performance. More challenging imaging scenarios can be considered as in that obviate physical contact between the hand and the imaging device, but in turn introducing additional variability in lighting, hand orientation and distance.
In the recognition phase instead of using matching policies to search from the database, an efficient neural network can be designed so that even partially obtained fingerprints may be used for identification. Finally, it is suggested that building the system and testing under real-life conditions can prove more rigorously the viability of hand-based access scheme.