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Thermal Hand Based Authentication using Heat Distribution Features and Dimensionality Reduction Techniques

Alex Knish. M.Sc. student at the Department of Industrial Engineering at Tel Aviv University

The lecture will be held on

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https://us02web.zoom.us/j/86465625887?pwd=UUwwSGY1eCswbTVhNktTUjBNTmthZz09

Abstract:

Thermal imaging is a non-invasive and portable method with growing use in medical applications and for authentication. Nowadays, thermal imaging is examined for replacing traditional instruments for detection diseases and monitoring treatments. In the field of security, biometric methods are preferable due to the high level of certainty and use simplicity since the user naturally holds the identification element, which ensures the user's physical presence. In favor of authentication, thermal imaging is not sensitive to skin damages or room lighting, in comparison to conventional methods, which are based on finger, handprint or face recognition.

This research focuses on thermal-based hand identification. Existing biometric hand methods mainly extract geometric features (fingers absolute sizes and ratios) from the image. In this work, the strength of hand heat distribution features for subject identification is examined. These features do not depend on the geometric shape of the hand, but rather capture only physiological properties and convert them to statistical features. In order to examine the suggested identification approach, a novel thermal image processing algorithm was developed. The algorithm identifies and locates the hand posture from the image and extracts several features from 15 locations in hand. Then, dimensionality reduction methods are applied to form a compact model of the data. Identification of new image data is carried out in this low-dimensional space.

We show that non-linear dimensionality reduction techniques produce better visualization and clustering of the data compared when compared to linear techniques. In addition, we use the low-dimensional representation to explore the effect of time and environmental factors. It was found that these factors have a low impact on the coded data, which indicates the suitability of the method not only for identification purposes but as well as for medical needs.

Bio:

Alex Knish is an M.Sc. student at the Department of Industrial Engineering at Tel Aviv University, under the supervision of Dr. Neta Rabin. Alex holds a B.Sc with summa cum laude in programing and system information engineering from Ben Gurion University. Previously, Alex worked as a data scientist and has extensive experience in systems development. His current research intrust are dimensionality reduction techniques, image processing, and deep learning algorithms.

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