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研究報告書 Research Report

TAIST-Tokyo Tech Student Exchange Program in Japan 2023 – Research-oriented Program

TAIST 運営委員長殿
To Chair of TAIST Steering Committee

2023 年 9 月入学
Enrolled in September 2023

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Signature

私はこのたび研究が終了しましたので、下記のとおり報告します。
I confirm that I have completed my research as described below:

研究題目
Research Topic

Tilt Correction for Eye Images Using Iris Recognition Techniques

（注）本書類を学生自身が記入し、2023 年 11 月 20 日までに A4 サイズ 1 枚程度の発表要旨と共に国際推進課国際推進グループに提出すること。発表要旨は 1 枚を超えても構わない。また、図表や、学会で発表した内容等を含めても構わない。

Note: This form must be completed by the student and submitted to the TAIST Administration Office together with an approximately one-page abstract (formatted in A4 size) by November 20, 2023. The abstract may exceed one page. Charts, diagrams, and contents that the student has presented at academic conferences or published in papers can also be included in the abstract.

Tilt Correction for Eye Images Using Iris Recognition Techniques

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In the field of image recognition, it is often the case that eye images, whether for iris recognition or other applications, can be subject to tilting, which can significantly impact the accuracy and effectiveness of recognition tasks, presenting a noteworthy challenge in my ongoing thesis on iris recognition. Thus, in this project, we propose a novel technique inspired by iris recognition methods to correct the tilting of eye images. This correction process involves several stages, including localization, normalization, reference image matching, shifting, and Hamming distance calculation.

For the iris correction, the process begins with the localization and normalization of the iris into a rectangular image. This normalized iris image is then matched with a reference eye image that has no tilt. To correct the tilt, the tilted eye/iris image is systematically shifted from left to right, and Hamming distances are calculated for each shift. The shift with the highest Hamming distance score is identified. The number of shifts and the angle of tilting are then calculated. Finally, the angle of tilting is corrected, resulting in a more accurate and reliable eye/iris image.

The same correction process is applied to the eye region, with the region being localized and normalized in a manner similar to iris. The results of this project demonstrate a very high correction accuracy, with the majority of correction errors for the iris region typically falling below 2 degrees. Moreover, for the entire eye region, the majority of correction are even more precise, typically measuring below 1 degree in error. This underscores the effectiveness of the proposed technique in correcting the tilting of both iris and eye images, rendering them highly suitable for recognition tasks and significantly enhancing the overall accuracy of eye-based applications.

This advancement holds great promise for our current thesis on iris recognition, as it offers the potential for achieving better and more precise results, ultimately contributing to the field's progress and the enhancement of practical applications.

In conclusion, the tilt correction project outlined in this abstract provides a robust solution to the problem of tilted eye images, leveraging techniques traditionally used in iris recognition. The success of this project highlights its potential to improve the accuracy and reliability of recognition tasks dependent on eye imagery.