Enhancing Vaccine Equity Through Iris-based COVID-19 Vaccination Verification for Undocumented Migrant Workers in Thailand: A Case Study in Research, Development, and Potential Extensions

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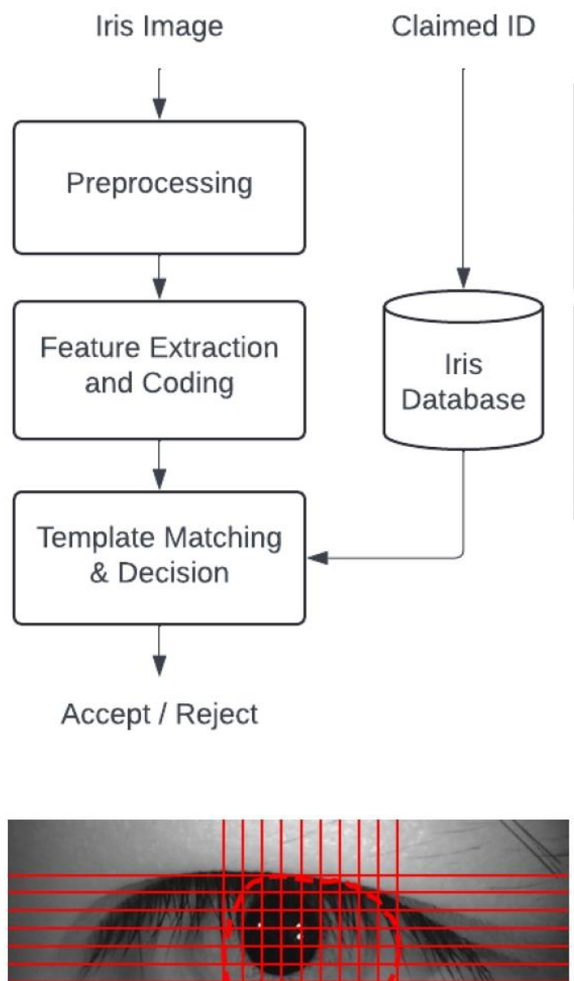
Background

During the COVID-19 pandemic, vaccination was one crucial measure for mitigating the impact and controlling the spread of the disease. Multiple doses of the vaccine were necessary to ensure its effectiveness, thus making vaccine recipient tracking essential. However, Thailand has at least 1,000,000 undocumented migrant workers who lack proper identification. These individuals often hesitate to receive vaccinations within the legally mandated tracking system. Driven by humanitarian concerns, the Thai Red Cross Society (TRC), in collaboration with NECTEC, has developed a biometric identification system (utilizing facial and iris recognition) specifically for vaccinating this population.

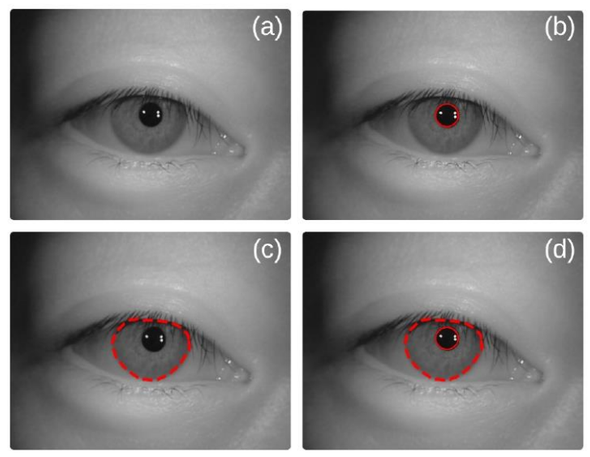
Potential Extension

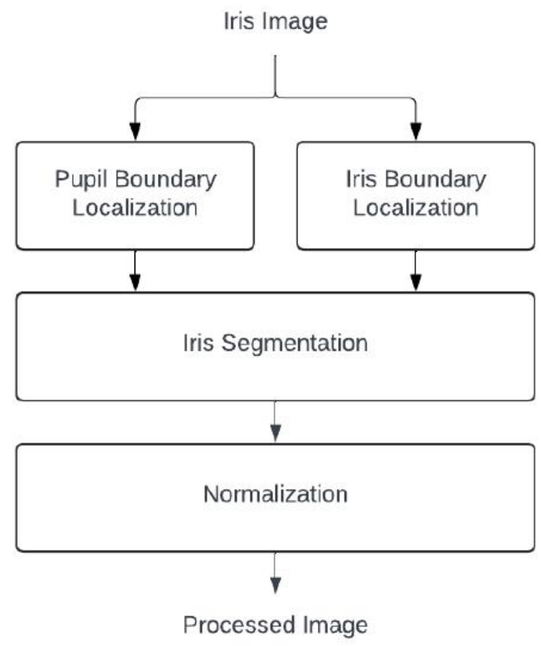
The system has been utilized by TRC since 2021 and has been expanded for collaborative use with the Department of Disease Control (DDC). This expansion now includes 40 pilot hospitals across 15 provinces, with a total user base exceeding 40,000 individuals. There are plans to broaden the collaboration with TRC and DDC to extend the scope, e.g., tracking for other critical diseases, such as tuberculosis, in the future.

Iris Verification Framework



General Framework





Iris Segmentation

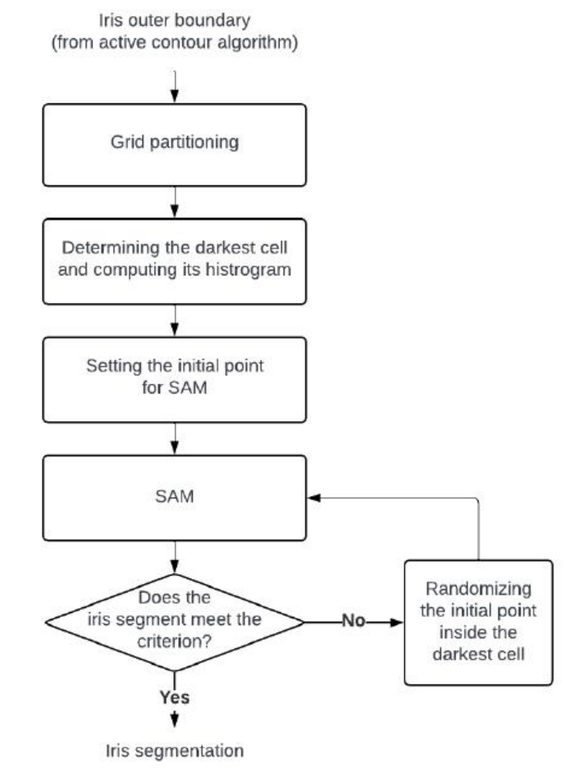
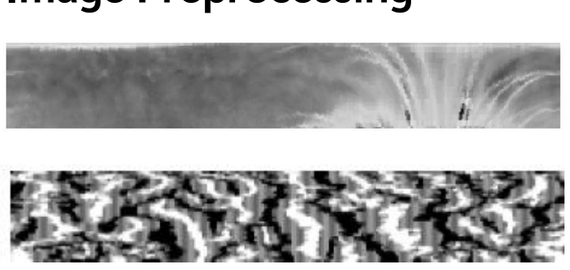
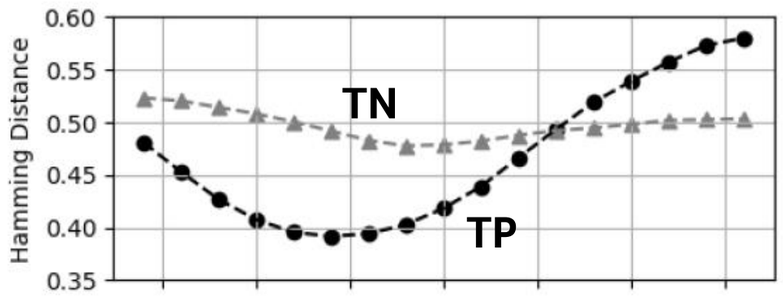
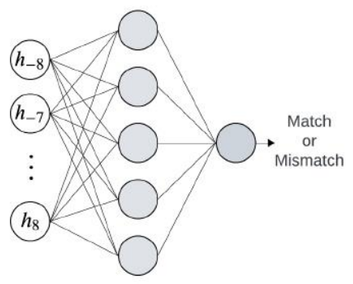


Image Preprocessing



NN-Based Classifier





Evaluation Result

	Precision	Recall	F_1	$F_{0.5}$	Balanced Accuracy	Accuracy
Baseline [1]	0.0701	0.8327	0.1294	0.0859	0.8273	0.8221
Baseline [1] + SAM [12]	0.1578	**0.8965**	0.2683	0.1889	**0.9163**	0.9355
Proposed Method	**0.9499**	0.7192	**0.8186**	**0.8927**	0.8594	**0.9958**