Towards Automated Biometric Identification of Sea Turtles (Chelonia mydas)

Irwandi Hipiny[1], Hamimah Ujir[1], Aazani Mujahid[2] & Nurhartini Kamalia Yahya[3]

[1]Faculty of Computer Science and Information Technology, UNIMAS, 94300 Kota Samarahan, Sarawak, Malaysia.
[2]Faculty of Resource Science and Technology, UNIMAS, 94300 Kota Samarahan, Sarawak, Malaysia.
[3]Danau Girang Field Centre, Sabah, Malaysia.

Email: mhihipni@unimas.my

Abstract. Passive biometric identification enables wildlife monitoring with minimal disturbance. Using a motion-activated camera placed at an elevated position and facing downwards, we collected images of sea turtle carapace, each belonging to one of sixteen Chelonia mydas juveniles. We then learned co-variant and robust image descriptors from these images, enabling indexing and retrieval. In this work, we presented several classification results of sea turtle carapaces using the learned image descriptors. We found that a template-based descriptor, i.e., Histogram of Oriented Gradients (HOG) performed exceedingly better during classification than keypoint-based descriptors. For our dataset, a high-dimensional descriptor is a must due to the minimal gradient and color information inside the carapace images. Using HOG, we obtained an average classification accuracy of 65%.

Keywords: *visual animal biometrics; template matching.*

1 Introduction

Biometric identification of sea turtles within a population is essential for behavioral and ecological study, allowing researchers to estimate vital statistics such as growth rate, survivorship, foraging patterns and population size. Traditional methods of permanent marking and artificial tagging induce stress and possibly harm the animals. Furthermore, tag loss is common due to various factors, namely elapsed time after tagging, study area, target species, size of animal, piercing site and tag's properties (e.g., material, colour and design) [1, 2, 3, 4, 5]. Individual sea turtles can also be recognised via photographic identification of their natural marks, for example, based on coloration patterns around the head area [6], facial profiles [7] and facial scute patterns [8]. Still, the mark-recapture process puts a considerable amount of stress to the animal.

We propose a passive biometric identification system of sea turtles based on robust and co-variant image descriptor matching, see Figure 1. A distant camera remotely captures aerial images of sea turtles at their nesting site. These images

Received _____, Revised _____, Accepted for publication _____