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Counting shells

Are current neural networks performant enough to count various types of shells in an uncontrolled environment

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Masterproef ingediend tot het behalen van de graad van master of Science in de industriële wetenschappen: E-ICT Software Engineer

Academic year 2022 - 2023

Summary

Every year the Flemisch Institute for the sea organises a shell counting day to map the diversity of our seaside. Thousands of volunteers go to the beach to count and classify shells. In this thesis we will try to automate this process by using neural networks. The goal is to be able to count the shells in an uncontrolled environment so the volunteers would only have to take pictures of the shells and the neural network would do the rest.

Of course this is not a trivial task, as the shells are not always in the same position, the lighting conditions are not always the same and the shells are not always of the same size.

Abstract

Het extended abstract of de wetenschappelijke samenvatting wordt in het Engels geschreven en bevat 500 tot 1.500 woorden. Dit abstract moet niet in KU Loket opgeladen worden (vanwege de beperkte beschikbare ruimte daar).

Keywords: Voeg een vijftal keywords in (bv: Latex-template, thesis, lang document, ...)

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Chapter 1

Introduction

Every year, one day per year, nearly a thousand volunteers travel to the Belgian coast to collect and categorize the shells that wash up on the beach. This data is collected by the flemish institute for the sea (VLIZ) to study populations of marine molluscs and the impact of their environment(climate change, fishing, etc) on the population. The volunteers participating in this study are mostly enthoustiasts, but also scientists and families with children. To ensure a good quality of the data, most volunteers participate in a workshop. The counting of the shells is done by walking along the beach and noting every shell that is found individually. This is a very time consuming process, and the volunteers are often not very experienced in counting, resulting in mistakes with all but the most common shells. When a volunteer finds a shell that they are not familiar with, they can contact a helpdesk to help them.

Insert flowchart of usual process of counting here

The fact that the project relies on volunteers to do most of the legwork, combined with the fact that experts have to man the checkpoints and the helpdesk makes the project unscalable beyond having a single dedicated day per year. With over 5 million people visiting the Belgian coast every year, there is a lot of potential to collect more data if the process of collecting the data could be simplified to be accessible to anyone visiting the beach at any time.

In this thesis, we will attempt to simplify the process of collecting data so that it can be done by anyone, anywhere, at any time. We will do this by training a counting network to recognize shells in an image and count them automatically. This is already done on a smaller scale by VLIZ with obsidentify, obsidentify is a mobile app/website where users can submit pictures of a single shell and get a result of what kind of shell it is. This is a useful tool, but taking a close up picture of every single shell is a very time consuming process. We will have to work with a limited dataset to train the neural network as no dataset exist with large quantities of anotated pictures of beaches.

Insert flowchart of new simplified process of counting here

We will be studying if current counting networks are performant enough to recognise shells in beach image. We will build up to this by first training a network to count objects from a more established dataset in order to have a baseline to compare our model to. We will then train that network with a small dataset to count shells and study its performance.

Chapter 2

Litature Review

2.1 State of the art/related work

There are plenty of papers about counting the number of objects in an image, with plenty of different approaches/architectures. As `https://openaccess.thecvf.com/content/CVPR2022W/L3D-IVU/papers/Ranjan_Vicinal_Counting_Networks_CVPRW_2022_paper.pdf` situates itself in quite a similar position as to our problem, using its references as a reference could be a good idea.

2.2 Proposed approach

In this section we'll go into more detail about the approach we'll be taking. This will include a number of subsections, each describing a different aspect of the approach.

2.2.1 Few-shot

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