TELECOMUNICACIÓN

Campus Sur

POLITÉCNICA

SCHOOL OF TELECOMMUNICATIONS SYSTEMS AND ENGINEERING

FINAL DEGREE PROJECT

TITLE: Object counting in RGB images with convolutional networks using spatial division.

ABSTRACT

In aquaculture, biomass estimation is essential for the viability of enterprises, both to be able to evaluate breeding and growth processes and to be able to determine the amount of food to be supplied in each tank, with the consequent ecological benefit of avoiding food waste. One of the key factors for biomass estimation is the determination of the number of fish in the tanks.

Different methods have been used throughout the history of aquaculture, ranging from manual to more technological methods such as radar-based ones. However, the development of machine learning techniques in recent years and advances in the application of these techniques to images and video, have opened the door to implementing these algorithms to try to solve the fish counting problem in an efficient and non-intrusive way.

The main advances that are applicable in this field come from developments in the field of crowd counting, whose latest proposals implement convolutional neural networks to estimate the density and number of people in images and videos. In this sense, although limited in number, there are already some approaches that the use these techniques in the field of aquaculture.

The aim of this project has been to adapt and implement one of the models that, in recent years, have shown its effectiveness in crowd counting, in order to evaluate their performance in counting turbot fry in aquaculture tanks. Specifically, the SS-DCNet model has been implemented, which uses an approach based on density estimation and spatial division and is among the algorithms that have shown the best results, not only for counting people, but also for counting vehicles or corn mazes.

The application of this algorithm for counting turbot fry has shown remarkable accuracy, with an average error of less than 3.5%. In addition, the flexibility of the model has been observed for counting in images with higher density and higher number of turbot than those present in the training set. Finally, another benefit of the model is that it does not require a large dataset to generate acceptable results.