Formulating Different Detection Algorithms to Identify Invasive Red Lionfish in South Florida and the Bahamas

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The Red Lionfish (Pterosis Volitons) has overwhelmed South Florida's coastal waters and needs to be eradicated before consuming unsustainable amounts of the native fish, which are utilized for commercial and recreational applications. Lionfish spawn at a rate of two million eggs per year and adapt to a variety of ocean depths, making them extremely difficult to eradicate using standard methods. If two algorithms are created, a YCrCb and a HSV classifier, using C++ programming that is processed through accuracy tests, then the YCrCb color space will perform with the highest accuracy. An algorithm "C.O.D.E" or Computer Operated Detection Environment was developed and tested with two different color spaces, YCrCb and HSV. The program was analyzed on its ability to identify Lionfish correctly with a minimum number of false-positives. YCrCb is the most effective program with the average percentage of false-positives being 12.22%, with 87.78% of the time C.O.D.E. had correctly identified the Red Lionfish in the frame based on the minimum and maximum described in the descriptor file. Of all the frames, 94.04% of the time C.O.D.E. identified a Red Lionfish. From the two algorithms created using the C++ program that is tested for accuracy, the YCrCb classifier preformed with the highest accuracy. The HSV test only identified a Red Lionfish 50% of the time out of the possible frames. The FPS of the system averaged at 2.7fps after running 7960 frames for 50 minutes.

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