ABSTRACT

CARDOSO, Alexandre de V. *Dedicated Tracking Strategies using Swarm Intelligence.* 2019. 120f. Dissertação (Mestrado em Engenharia Eletrônica) – Faculdade de Engenharia, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, 2019.

Image processing is an important tool to help in decision taking. Continuous observation of some environment, such as public areas and industrial plants, among others, allows defining the best action strategies and deciding the right moment to act, thus reducing risks and magnifying opportunities. The quality of the information resulting from such image processing must be precise enough so that it does not hinder scenario's evaluation for future action planning and goals achievement. The execution time to obtain this information and process it is fundamental for any successful activities. Hence, computational intelligence can help accelerating procedure executions related to planned actions. In general, slow search process always delays decision making in such a way that the recorded data becomes obsolete or insufficient at the decision moment. Template Matching is one of the most used techniques for finding then tracking patterns in images, wherein a small size image, termed the target, is looked for inside another that represents the environment as a whole. In this work, template matching is used via an existing co-design system. A co-processor is used to calculate the most computationally expensive task of template matching, which is the computation of the coefficient of the normalized cross correlation. The computation of this coefficient allows invariance in the case of global brightness changes in image, but it is computationally more expensive when using larger templates and yet more expensive in videos. We propose to investigate six different swarm intelligence based approaches, aiming at accelerating the process of target tracking. To evaluate the proposed project, the metrics regarding the overall processing time, number of iterations and target hit rate are used and compared. The results show that it is possible to obtain search approaches capable of processing videos at a rate of 30 frames per second while achieving an acceptable average hit rate for tracking the target.

Keywords: Co-design; co-processor; bacterial foraging optimization; cuckoo search; elephant herding optimization; fireflies; fireworks; particle swarm optimization; embedded systems; object tracking; template matching; normalized cross correlation.