This paper presents a novel concurrent algorithm for object detection based on the Hough Transform. The Generalized Hough Transform can detect object contours regardless of scale and orientation, but has a computational complexity of $O(N^2RS)$, where $N$, $R$, and $S$ are the array dimensions for X/Y, rotation, and scale, respectively. The high complexity makes it impossible to perform object detection in real-time. In our work, we propose a modified, concurrent algorithm using a multi-threading technique with manager-worker scheme to obtain a reduced complexity of $O(N^2/M)$ where $M$ is the number of processors. Our new algorithm utilizes multi-threading technology to enhance the computing speed. The algorithm is evaluated from both the perspective of output image quality and performance scalability.