

## **Real-time, Adaptive, Color-based Object Tracking Using Generative Models**

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Color-based approaches to tracking have been proposed because of their low computational cost and their resistance to out of plane rotations, object deformations, and motion blur. Unfortunately current color-based methods have some major disadvantages: (1) They rely on local search algorithms and thus tend to get trapped in local maxima created when an object moves too fast for the given capturing frame rate. (2) Color is very sensitive to illumination conditions. (3) Most color-based models ignore information about the background. We present a new method for real-time color-based object tracking which addresses each of these issues. First, our method performs a global search in each frame, making it resistant to fast, unpredictable motion. Second, we run a slower but more accurate feature-based face detector in parallel with the color-based system, and use its results to dynamically adapt the color models of object and background, reducing sensitivity to lighting conditions. Finally, the color system uses a generative model, allowing us to model the colors in the object and the colors in the background independently, and to adapt the parameters of the model over time. In order to determine the conditions in which our new system works effectively and the conditions in which it falters, we are carrying out experimental simulations on datasets of video footage containing, among other confounding factors, variable lighting conditions and complex backgrounds. The source code, written in multi-platform C++, is freely available to the research community, and has already been deployed as a control and feedback mechanism for communication robots and for the Colorado University platform for computer agent animation.