Improved Object Tracking Using Radial Basis Function Neural Networks

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Abstract
Here, an improved method for object tracking is proposed using Radial Basis Function Neural Networks. The Pixel-based color features of object are used to develop an extended background model. The object and extended background color features are then used to train RBF Neural Network. The trained RBFNN will detect and track object in subsequent frames.

Introduction
Tracking is basic task for several applications of computer vision. In its simplest form, tracking can be defined as the problem of estimating the trajectory of an object in the image plane as it moves around a scene. Some of important challenges encountered in visual tracking are non-rigid objects, complex object shapes, occlusion and scale change of the objects and real-time processing. In the last few decades, neural networks have been successfully used in a number of applications such as pattern recognition, remote sensing, dynamic modeling. In [2] a global approach is proposed for adapting the neural networks for tracking purpose. In [3] and [4] neural networks are used for object tracking too, but these methods are computationally expensive. Here a fast algorithm of tracking is proposed.

Proposed algorithm
The process of the presented method is shown in here:

1. Select object in first frame
2. K-means Segmentation
3. Background Extension
4. RBFNN training
5. Locating object centroid
6. Insert next frame
7. Detect object using RBFNN
8. Locating object centroid

Object tracking starts with selecting object approximately in the first frame manually.

Next, k-means color segmentation is separating the object from background this results in a binary image. The features used for k-means segmentation are simple R-G-B value of pixels.

Conclusions
We have proposed an improved object tracker using k-means color segmentation and radial basis function neural network. The k-means color segmentation is used to detect object in the initial frame. Background extension is used to improve RBF neural network performance when background colors change during tracking. RBF neural network is trained in offline stage by result of background extension. Trained RBF neural network is used for classifying object and non-object pixels in other frames. Object localization is achieved by estimating object in each of the frames by using RBF neural network. Our method is able to track the detected moving objects in a scene. Since the k-means color segmentation and RBF neural network incurs very low computational load, the proposed algorithm is suitable for real-time applications.

Experimental Results
The tracking result for the PETS 2001 sequence is shown in here. Here, the object walks such that his body undergoes partial occlusion, as well as, appearance and illumination and background changes, over time. One advantage of the NN is that if an object is temporarily occluded, it will not adversely affect the Ultimate classification. A further advantage of this method is that it is robust with regard to background clutter. It is observed that the proposed tracker is able to track the object when background changes or the object undergoes partial occlusion.

References