Object tracking with trajectory approximation using polynomial fitting

Heikki Saul, Taavi Adamson
Institute of Technology, University of Tartu
Tartu, Estonia

ABSTRACT

In today's world of automation and autonomy, accurate detection, tracking and prediction of objects is extremely important to maintain safety or to allow robots to work independently. The implementation covered in this paper handles two important problems in object tracking - tracking a visible object and approximating its location if it becomes obscured. This implementation can be used a basis for more advanced object tracking and location prediction applications.

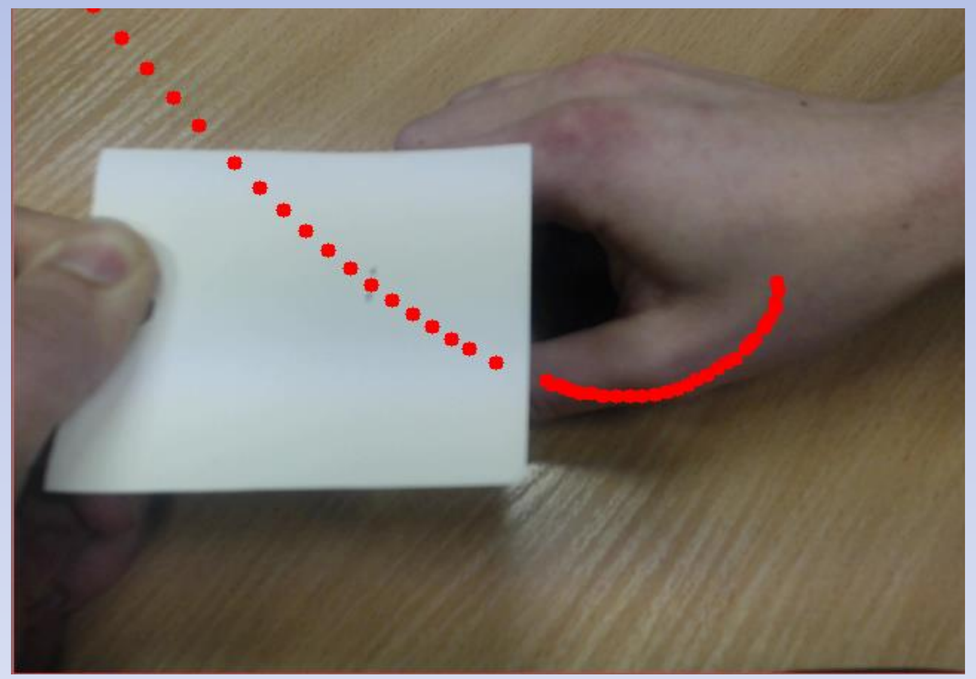

Figure 1. Object, moving in from right side is obscured by sheet of paper. Tracking line and location approximation visible in red

Possible applications:

- **Autonomous traffic accident prevention**
- **Industrial and domestic robots**
- **Home security**

and many more

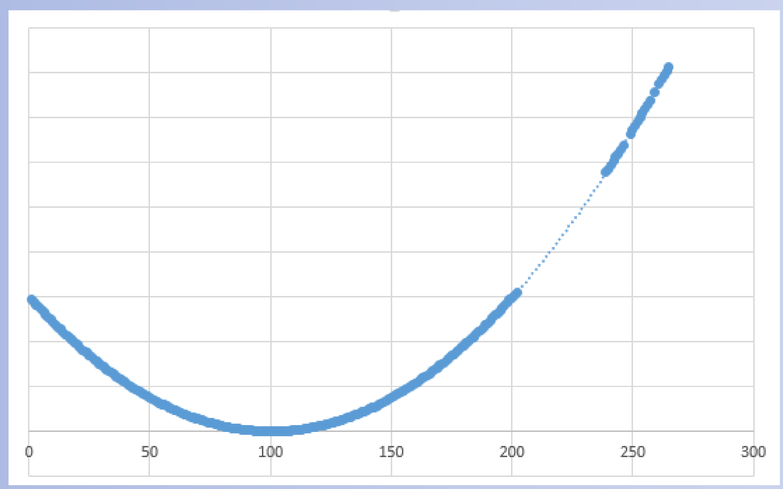

Figure 2. Polynomial curve fitting

METHODOLOGY

Digital video from camera is processed frame by frame. To detect object on a frame, the image is first thresholded within HSV color space which has proven more reliable than the common RGB color space. The resulting binary image is passed on to contour detection which returns various information about the detected objects contour. From there on it is possible to calculate its center coordinates in frame. Analysis of these coordinates enables the prediction of future trajectory. This is done using curve fitting with least squares error method. In the current implementation the best performance in means of result accuracy and computing power usage was achieved by using a third degree polynomial.

This work was done as part of the „Digital Image Processing“ course in University of Tartu in autumn semester 2016.
Advisor: Gholamreza Anbarjafari, PhD