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Face Tracking and Detection using S-PCA & KLT Method

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Abstract: Face recognition is one of the most relevant applications of image analysis. Object tracking is a challenging problem. It demands development of an effective method to account for moving object detection or appearance change caused by external aspects. Complexities in object tracking can occur due to sudden object movement, moving appearance patterns, and camera action. Tracking normally occur in the higher-level applications which need the object shape and location in every frame.In this research, tracking system has been ranked on the basis of the object and motion illustrations which provide brief explanation of illustrative methods in each category. In this paper, a new approach of S-PCA along with KLC method is used for combining position and emotions of face for recognition been proposed.

Keywords: Face recognition, object motion, object tracking, s-PCA method, KLT algorithm.

I. INTRODUCTION

Face recognition [1] is most important in the development for its stuff in the coordination of various fields like commercial, medical or military systems. Face recognition are used for access control to security purpose or video monitoring in major security or religious places and areas like airports and other highly sensitive. When we view the human face, we see many interesting features. The most exciting fact is the expression of emotions. By seeing their face identifying & understanding the feeling of the people is amazing as in fig1.

Visual object tracking has been one of the most popular research area in the computer visualization domain. Particularly, human face tracking through video or motion has diverted most attention, which would enable useful practical applications. On the other hand, face tracking is still a problem which cannot be considered solved.

Communication, emotion, speech, and physiology will be major reason for the movements in human fact detection. Changes in the human face arise from many sources. This is main aspect from a computer vision point of view, that have to care the occurrence of speech related lip movement during communication to understand that the modeling of facial motion will involve much more than just emotion recognition. The fact that most of the feature of face appearance can change is the fundamental reason for this complexity.

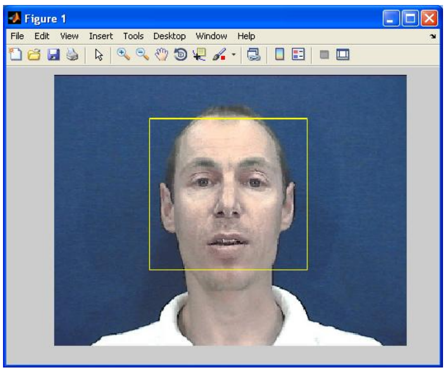


Fig1. Face detection:

Face tracking is the process of localizing the facial movements through a sequence of images. The goal of this study is to track and detect the face, and probably the full pose, as exact as possible in all the frames of a video. In other aspect, tracking can be distinct as a problem of estimating the tracking of a movement of object in the image plane. Face is an stimulating object to track [2][3] since it is a very flexible thing that users use in their daily life.. The hand is the body part that is used most often to interact with the environment. Therefore, much interesting information could be extracted by capturing and analyzing hand motion.

II. Background Process

Face, as a superior case of general object tracking, belongs to the group of more complicated objects to track. Meanwhile, it is no amazement that in spite of active investigation during earlier years, face tracking and detection are still measured to be very complex problems in computer vision. The complexity arises from the fact that the face is an interconnected set object that has many degrees of freedom. Its difficult physiological arrangement allows it to be used in a wide range of different tasks, such as direct object manipulation and communicative intention. Meanwhile, from a tracking viewpoint, many complexities are faced for instance due to the high-dimensionality of the issue, self-obstructions, abandoned environments, and rapid face movements. Due to these encounters, many existing approaches set some kind of limits to the user or the environment, such as using backgrounds or imagining the face to be parallel. With these kinds of encounters, face-appearance changes are kept within reasonable bounds.

Existing Method

PCA for face recognition is based on the compressing data and on reliably storing and communicating data. It abstracts the appropriate information in a face image and encrypt as efficiently as possible. It identifies the subspace of the image space spanned by the training face image data and de-correlates the pixel values. The orthodox illustration of a face image is obtained by sticking out it to the group defined by the Principal components. PCA is frequently used in data analysis, and from bioinformatics to computer media. The difficulty of face recognition in different illumination and poses with different rotation angles using PCA[9]. Face recognition using PCA, based on frontal face, seek a computational model that explains face, by abstract most accurate expression be shown in the face. The experimentation involved the use of Eigen faces [8] and PCA (Principal Component Analysis).The main aim of most commercial face recognition is to increase the capability of security and surveillance systems.

The principal component report for as much of the differences in the information as possible, and each subsequent component report for as much of the remaining difference as possible. In the use the cascade object detector scenario on every frame, it is computationally expensive.

III. Methodology

Prediction & Detection

Predicting the right features plays a crucial act in tracking. Commonly, the most suitable stuffs of a visual feature is its individuality, so that the face can be easily distinguished in the feature selection as shown in the fig 2. Prediction and detection is closely related to the object representation. For instance, color is used as a attribute for histogram-based appearance illustration, while for contour-based sign, edges of the object are normally used as attribute.

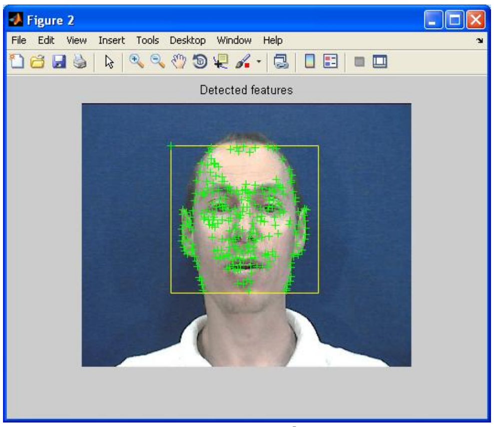


Fig 2. Feature selection

S-PCA algorithm:

S-PCA [4] method is used to predict and detect the face in which various energy ratios of even/odd symmetrical principal components and their dissimilar sensitivities to sample differences are in use for feature selection which is based on a simple idea of the even-odd decomposition. SPCA is built on the fact that PCA can be written as a regression-type resource issue, with a quadratic forfeit; the lasso forfeit can then be directly merged into the retreat criterion, tends to a modified PCA with sparse loadings.

Detection

Every tracking system demands face detection either in every frame or when the face comes into visible in the video [7]. A common method for face tracking is to use information in a single frame. Meanwhile some face detection methods make use of the time-based or sequential data[5][6] generated from a series of frames to minimize the number of false detections. This sequence data is normally in the form of frame variance, which draw attention the changing regions in successive frames. Given the face regions in the image, it is then the tracker's duty to do object correspondence from one frame to the next to generate the detection.

Tracking

In tracking circumstances like in fig 3. an object can be well-defined as anything that is of significance for extension analysis. Boats on the sea, people walking on a road, or vehicles on a road are some of the illustrations which are a set of objects that may be prominent to track in exact domain. Objects can be signified by their shapes and looks.

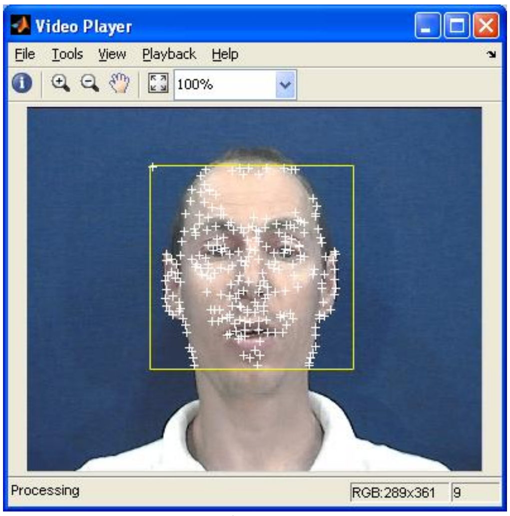


Fig 3. Real time face and movement tracking

KLT Algorithm

The KLT tracking approach calculates the movements of object in consecutive video frames when the image brightness constancy constraint is fulfilled and image movement is small.

Object detection and tracking are vital in most of the vision [9] applications including motion recognition, safety precaution, and observation. Here, face tracking method is categorized into two parts:

1. Detect a face
2. Identify facial features to track

Detect a Face

It is must to detect the face at beginning.

To track the face over time, here used Kanade-Lucas-Tomasi (KLT) algorithm. There is a chance of failure to detect the face, when the person turns or tilts his/ her head. This disadvantage comes from the kind of trained classification model used for detection. Here S-PCA is used to predict and detects the face and then the KLT algorithm tracks the face across the video frames.

Identify Facial Features to Track

The KLT algorithm detects a set of object points across the video frames. Once the detection trace the face, the next step detects feature points that can be constantly tracked.

The basic information has now been established to solve the displacement d of a feature from one window to the next. For simplicity, we redefine the second window as B(x) = I(x,y,t+) and the first window as A(x - d) = I(x - d) = I(x-Δx, y-Δy,t) where x = (x,y). The relationship between the two images is given by

B(x) = A(x-d) + (x) (2)

(x) is a noise function caused by interference . An error function which has to be minimized in order to minimize the effect of noise:

€ = [A(x-d) – B(x)] [A(x-d) – B(x)] wdx (3)

As we see € is a quadratic equation of d . To minimize € we need to differentiate € with d and set the result to 0.

d€ / dd = [A(x) – B(x) – d] gwdA = 0 (4)

Where A refers to area of window W. If the terms of 4 are rearranged and if we use the fact that (d)g = (g)d it follows that (g wdA) d = [A(x) – B(x)] gwdA (5)

Using a similar derivation as for the KLT, Shi and Tomasi showed that the search can be performed using the formula

$$Tz = a$$

Where T a matrix of gradients is, z is a vector of affine coefficients and a is an error vector. Compare this to $\nabla d = e$

I(x; y; t + ¢t) = I(x + ¢x; y + ¢y; t)

Let x = (x; y)Tand v = (¢x; ¢y)

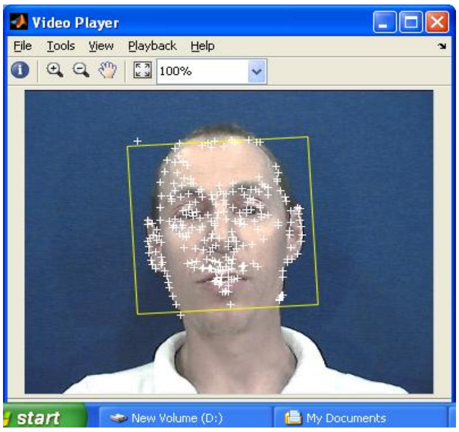
In the presence of image noise r I(x; t + ¢t) = I(x + d; t) + r

KLT will compute the displacement vector d that minimizes the following error

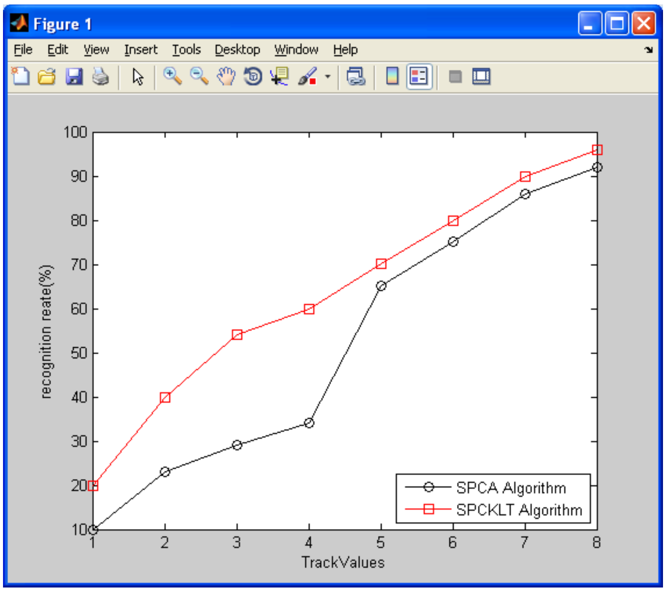
r =XW(I(x + d; t) ¡ I(x; t + ¢t))

IV. EXPERIMENTAL RESULTS

The goal of an tracking face is to generate the path of an face over time by locating its position in every frame of the video in fig 4. Face detection may also issue the entire region in the image that is engaged by the face at every time instant. The tasks of detecting the face and establishing correspondence between the object instances across frames can either be performed individually or grouply. In the first scenario, possible object regions in every frame are achieved by means of an face detection algorithm such as S-PCA and KLT, and then the tracker represent objects across frames. In the second scenario, the object region and correspondence is together projected by related updating object location and region information achieved from preceding frames. In either tracking system, the objects are represented using the shape and/or looks.

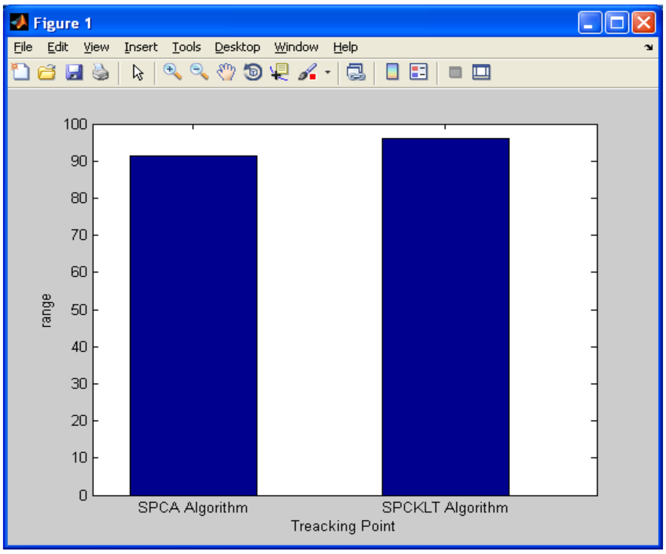


Accuracy calculation compares two algorithms



ALGORITHM	FEATURE SELECTION	ACCURACY (%)
SPCA ALGORITHM	563	91.235
SPCKLT ALGORITHM	621	96.12

Bar graph for feature selection:



V. CONCLUSION

The objective of this paper was to investigate the problem of hand tracking in high-speed videos. First, a literature review was conducted, and then the experiments investigated the problem in practice. Specifically, the reason for this struggle is the physical structure of the hand, which allows significant appearance changes. To solve the problem, two main approaches were found S-PCA method and KLT method. Out of the approaches, KLT aim to track and recover the face which is the ultimate solution to the problem. Nevertheless, practical reasons have been making simpler and faster 2D tracking a more useful alternative in many applications. In the future, one would expect that both approaches would be maintained in their own application areas.

Goals usually change over time, due to learning, a changing environment, or changing resource bounds. Computer vision systems must therefore be able to self-modify to reflect these changes. This implies that decoupling the task from the goal is not the optimal approach, and we have argued in this paper for a model that unifies the low-level computer vision tasks with the high-level goal oriented systems in a coherent whole using Bayesian networks. In addition, we plan to integrate multiple visual cues to better describe objects in different scenarios and to utilize prior knowledge with online learning for more effective object tracking.

References

1. Blanz, P. Grother, P.J. Phillips, and T. Vetter, "Face Recognition Based on Frontal Views Generated from Non-Frontal Images,"Proc. IEEE CS Conf. Vision and Pattern Recognition, pp. 454-461, 2005.
2. Vladimir I Pavlovic, Rajeev Sharma, and Thomas S. Huang. Visual interpretation of hand gestures for human-computer interaction: a review. IEEE Transactions on Pattern Analysis and Machine Intelligence, 19(7):677–695, 1997.
3. Y. Li, H. Ai, T. Yamashita, S. Lao, and M. Kawade, "Tracking in low frame rate video: A cascade particle filter with discriminative observers of different life spans," IEEE Trans. Pattern Anal. Mach. Intell., vol. 30, no. 10, pp. 1728–1740, Oct. 2008.
4. J.Savitha and Dr.A.V.Senthilkumar, "Efficient Method for Face Recognition from Pose and Expression," International Journal of Advanced Research in Computer Science and Software Engineering., volume 3, Issue 10, October 2013.
5. ALI, A. AND AGGARWAL, J. 2001. Segmentation and recognition of continuous human activity. In IEEEWorkshop on Detection and Recognition of Events in Video. 28–35.
6. BLACK, M. AND ANANDAN, P. 1996. The robust estimation of multiple motions: Parametric and piece wise smooth flow fields. Comput. Vision Image Understand. 63, 1, 75–104.
7. Siddharth S. Rautaray and Anupam Agrawal. Vision based hand gesture recognition for human computer interaction: a survey. Artificial Intelligence Review, pages 1–54, 2012.
8. M.A.Turk and A.P. Pentaland, "Face Recognition Using Eigenfaces", IEEE conf. on Computer Visionand Pattern Recognition, pp. 586-591, 1991.
9. Bruce A. Draper, KyungimBaek, Marian Stewart Bartlett, "Recognizing faces with PCA", Computer Vision and Image Understanding 91 (2003) 115-137.