

## 3D Shape Analysis in Video Content

Ms Bharti Bansal  
Assistant Professor, Amity University Haryana

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**Abstract-**With rapidly changing imaging techniques, camera hardware and increasing use of computers to automatically process the imaging data, the demand to explore new ways of image and video processing is more than ever. In the field of video processing, maybe it's the problem of traffic management systems or crowd control system, Object labeling and context based analysis in videos, object tracking sports videos to name a few, the trend is to find new and cost efficient methods.

The Object representation is an important part of any analysis algorithm for image or video processing. Traditional Image or video processing algorithms consider 2D representation of objects. But with new 3D imaging technology a possible extension of video processing is to consider 3D representation of objects. In this paper we explore and discuss the possibility of using 3D shape analysis, which is a developing field of computer vision and computer graphics, in context of video processing.

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### I. Introduction

The traditional problems in Video Processing can be classified into two classes broadly. The area related to object detection and tracking, which are sub problems of sophisticated problem of object recognition or labeling of object components of video. In the former case video processing can be seen as finding out and keep the track of an object in a Video. The possible transformation of object might be deformation of translation in space with time. The area where Object move in space with time, define the classical problem of object tracking. While the area where Object deform with time have problems of pose estimation and human behavioral modeling. In the later case the problem is more of a Connected Component Labeling [1] problem where a given video contextual overview is expected as output. Suppose for a soccer video the problem of locating a soccer ball and players is a problem in former category while problem of describing a seen like who has the ball or to whom a player has given a pass is a problem of second category [6]. The typical application fields are video surveillance, sports video, computer animation, traffic control and medical imaging [4]. While the object under the consideration in object tracking are 3D objects in real world. The techniques used so far in video processing consider object as 2D object in Video sequences. But with the advancement in the imaging technology like depth imaging, RGB-D, there is a need for a different kind of shape analysis in Video Processing domain where we can exploit the 3D structure or depth knowledge available about objects. In this paper we try to provide a brief introduction of these technology and advancements. In next section we provide an overview of shape analysis techniques. Then in following section we try to define the problem of shape analysis for video and provide some examples followed by conclusion.

### II. Shape Analysis

Shape analysis is a well developed yet emerging branch of computer vision which deals with the problem pertaining to shape matching, deformation and classification. Shape analysis finds its application in the medical image processing, architecture design, CAD systems, computer graphics etc. In this section we are going to discuss different aspects of shape analysis.

The most important part of shape analysis is shape representation. Different type of shape representation which researcher have used till now includes points sets, boundary curves or surfaces, medial representations, and feature-based representations to name a few. In order to understand the possible areas where shape analysis can be applied in the field of video processing, one need to understand the motivation behind shape analysis. Shape analysis objectives:

- How similar two shapes are: The objective is to find out the similarity measure between two shapes. The idea is to define a metric under which similar shapes have small distances.
- Can we define a shape template? : The objective is to define a shape template for each type of shape class which represents the mean shape of the class.
- Shape classification: The idea is given a set of different shape can we tell which class they belong to.

For detailed survey refer [3]. With these goals in hand shape analysis can be seen as a problem of finding relations between different objects. In vast space of research problem which the shape analysis offers, the problem of shape analysis naturally seems to form a possible extension of traditional video processing. Applications like gait-based biometrics, action recognition, and video summarizing and indexing with tool from shape analysis domain can provide good informative analysis.

### **III. Video Processing**

Typical task of video processing is to analyse video frame sequences of video.

Like in case of traffic flow control and road traffic monitoring the task is to analyse video for traffic information. Possible subtasks include the detection of vehicles and people, speed measurement, multiple-point vehicle counts, vehicle classification and highway state assessment [2]. As another problem the Human pose or motion estimation [5] demands to find the state of a human object in a video and classifies different state in different Pose classes. In this section we discuss basics of these problems in brief.

Object tacking methods in video processing can be seen as of following types:

- Region-based Tracking: The idea is to find out which region is moving and which are stationary. Tools like optical flow plays important role in that.
- Contour-based Tracking: The idea is to track boundary of a object which is given in term of boundary contours.
- Feature-based Tracking: The idea is to look for similar features moving frame of video.
- Model-based Tracking: The idea is to look for a set of predefined models in the video. Like search humanoid or cars in traffic monitoring.

Traditionally, features such as color, texture, contours, and motion are use to characterize an object in video processing. Now with the new imaging techniques and hardware like kinect available to user, the need to devise new methods or looking at the problem of video processing from different view point arise. The techniques from 3D shape analysis can, naturally, contribute to the benefit.

### **IV. Challenges and future scope**

There are benefits but also challenges involved in the proposed field of research.

Where with the new technology the object can be represented in its natural form and rather than working on some projected version of shapes we can directly work on the natural object representation. The application in the field in virtual reality, game design and modeling the tracking and modeling of different objects will be a lot easier.

But there are few challenges also. Like one of the concern in video processing is to provide a real time solution for analysis problems. Usually time complexity of such algorithms tends to be high due to involvement of a large amount of data. Using 3D representation for shape further adds up into the challenge of providing a real time solution.

So the idea is to look for best of two fields to provide a cost efficient solution.

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