Extraction and tracking of a body skeleton from multiple views: A survey

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Abstract—**This paper presents a survey of the skeleton extraction. The skeleton is the easy way to capture the essential dynamic relationships and movement of a body. The skeletons do not have a formal definition, then not exist accurate way to evaluate them, then looking some features as homotopic, invariant, centeredness, to meet the requirements. For this reason exist are many methods for skeleton extraction, that will be studied in this article.**

Index Terms—**Skeleton extraction, motion capture, visual tracking.**

CONTENTS

I. INTRODUCTION

Body dynamics is an important area of research devoted to detecting people and understanding their dynamic physical behavior in a complex environment that can be used for biometric applications. We are particularly interested in understanding and interpreting human behavior in complex environments. In a number of applications it is important to identify the actions of certain parts of the body, e.g. hand-gestures, gait analysis, and facial expression analysis[8]. Finally, the modeling of human behavior can be used for a number of applications such as generating natural animation or graphics, understanding normal and pathological behaviors, and analysis of data for medical applications [13].

While the 3D representation is invaluable, many applications require alternative "compact" representations of these models[5].

Skeletonization is a way to reduce dimensionality of digital objects but at the same time a way to capture the essential dynamic relationships[12].

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II. MOTIVATION

Technological advances in the fields of telecommunication, graphic hardware and geometry processing during the last decade, have contributed to an evolution of the digital data being manipulated and transmitted over the Internet. Nowadays, static and dynamic three-dimensional meshes con- stitute the emerging multimedia content[9].

What is needed is an analysis of the desired properties of the curve-skeleton, as required by the various applications, and how the various existing curve-skeletonization methods satisfy these properties[5], because the requirements of a skeleton differ with applications[10].

III. PREVIOUS WORK

What is needed is an analysis of the desired properties of the curve-skeleton, as required by the various applications, and how the various existing curve-skeletoni- zation methods satisfy these properties.

Mesh partitioning and skeletonisation are fun- damental for many computer graphics and animation techniques. Because of the close link between an object's skeleton and it's boundary, these two problems are in many cases complementary. Any partitioning of the ob- ject can assist in the creation of a skeleton and any seg- mentation of the skeleton can infer a partitioning of the object[11].

In this paper we investigate the use of probabilistic graphical models to resolve both issues: incorporate the spatial dependencies between the vertices into the clustering process, while providing a globally optimal solution. In particular, we base our framework on Markov Gibbs Random Fields (MRF). The main idea is the following: for a given number of clusters and a 3D mesh associated with any kind of attributes or features (curvature, roughness, saliency etc.) our approach provides, for each vertex, the appropriate cluster label [9].

We present an algorithm to extract such a skeleton on-the-fly, both from point clouds and polygonal meshes. The algorithm is based on a deformable model evolution that captures the object's volumetric shape. The deformable model involves multiple competing fronts which evolve inside the object in a coarse-to-fine manner. We first track these fronts' centers, and then merge and filter the resulting arcs to obtain a curve-skeleton of the object[1].

Geometry contraction using constrained Laplacian smoothing[2].

A. Definitions

- **Medial axis**: The medial axis of an object is the set of all points having more than one closest point on the object's boundary[4], in 3D case is called **medial surface**.

- **Curve Skeleton**: Is a simplified structure 1D representation of the original 3D object[12].
- **MRF**: Markov Random Fields

IV. Problem Definition

unorganized point cloud processing [5].

Extract skeleton from points clouds and polygon meshes[1].

The acquisition process typically requires an intrusion into the scene in the form of optical markers which are used to estimate the parameters of motion as well as the kinematic structure of the performer. Marker-free optical motion capture approaches exist,but due to their dependence on a specific type of a priori model they can hardly be used to track other subjects, e.g. animals[7].

we present a exible non-intrusive ap- proach that estimates both, a kinematic model and its pa- rameters of motion from a sequence of voxel-volumes. The volume sequences are reconstructed from multi-view video data by means of a shape-from-silhouette tech- nique. The described method is well-suited for but not limited to motion capture of human subjects[7].

V. Applications

Examples of applications that use a curve- skeleton include: virtual navigation, registration, anima- tion, morphing, scientific analysis, shape recognition, and shape retrieval[5].

It is used for diverse applications, including virtual colonoscopy and animation[6].

For example, automatic virtual naviga- tion through a human colon uses the colon skeleton, its centerline, to control the movement and orientation of the virtual camera[3].

VI. Conclusions

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