Chapter 1
3D Data Security:
Robust 3D Mesh Watermarking Approach for Copyright Protection

Imen Fourati Kallel
Ecole Nationale d'Electronique et des Télécommunications de Sfax (ENET'Com), Tunisia

Ahmed Grati
Ecole Nationale d'Electronique et des Télécommunications de Sfax (ENET'Com), Tunisia

Amina Taktak
Ecole Nationale d'Electronique et des Télécommunications de Sfax (ENET'Com), Tunisia

ABSTRACT

Three-dimensional data reveals more explicative information and more realistic visualization than that of the two-dimensional ones. This explains the remarkable growth in the use of 3D data in different fields of application, which increases in respect to the risk of illegal use of data and piracy, as well. Since its appearance, digital watermarking has been an essential solution to attest the identity of the owner, control illegal reproduction, and protect the copyright of the 3D object. The current work is about designing a robust 3D object watermarking technique in order to protect copyrights associated with triangular polygon meshes. The approach is based on a watermark's insertion in the spatial domain. The findings are a proof demonstrating that the proposed 3D objects watermarking method does not only meet the need of imperceptibility but also shows, at least, similar or even better robustness, compared with other commonly used 3D objects watermarking approaches in the literature.

INTRODUCTION

Nowadays, three-dimensional data have invaded several fields of activity, including medical imaging, cultural heritage, industry and video games. This type of data presents more significant information than the two-dimensional one. In this respect, the manipulation, visualization and transmission of three-dimensional objects have continuously been increasing in recent years, which make the protection of the 3D objects copyright vital (Beugnon, 2022).

Watermarking (Corsini, 2003) has long been an efficient solution for copyright protection. It consists of inserting a secret message into a multimedia medium in a robust and invisible way. This message is also called "signature" or "watermark", which proves the ownership of the said content. With the case of the present study, the 3D objects watermarking (Garg, 2022) is a device for marking the authorized distributions of the original 3D object with different signatures. In the event of leaks or illegal distributions, the owner can identify the source of weakness or even the copy that has been pirated. Equally, the watermark is an effective evidence of proving the possession of these data (3D objects).

In this chapter, a robust 3D objects watermarking technique is developed for the copyright protection. In fact, it is approached by an insertion of the same signature several times in disjoint regions, precisely in the same 3D object in order to identify it from illegal copies. Accordingly, the redundancy of the signature will ensure more resistance against the various manipulations and attacks. The work presented in this chapter is an exploration of the different ways for the implementation of secret writing digital techniques on a very particular type of medium. It is the triangulated mesh surfaces which present the most useful solution with regard to their simplicity, flexibility, and availability.

This chapter is composed of four sections: the first section is an overview of three-dimensional data accompanied with a general idea of digital watermarking. The second one is mainly about studying related works concerning the 3D object watermarking. The third is focalized on the newly suggested approach by a meticulous examination of both used techniques, particularly of insertion and detection. The fourth is essentially a summary of the main findings with an evaluation of the obtained performance, based on the suggested method. An in-depth comparison with other algorithms is also considered as a part of the last section. The chapter ends up with a general conclusion of the whole work.

35 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/3d-data-security/324145

Related Content

A Blockchain-Trusted Scheme Based on Multimedia Content Protection

Aarti Sharma, Bhavana Choudharyand Divya Garg (2023). *Examining Multimedia Forensics and Content Integrity (pp. 197-217).*

www.irma-international.org/chapter/a-blockchain-trusted-scheme-based-on-multimedia-content-protection/324152

Forensic Accounting and Corporate Governance

Randa Diab-Bahmanand Talal Abdullah Bahman (2022). *Handbook of Research on the Significance of Forensic Accounting Techniques in Corporate Governance (pp. 150-166).*

www.irma-international.org/chapter/forensic-accounting-and-corporate-governance/299687

The Essence and Prospects of Forensic Accounting in Developing Countries: A Systematic Literature Review

Abdulkadri Toyin Alabiand Abdullahi Omogbolahan Ishola (2022). *Handbook of Research on the Significance of Forensic Accounting Techniques in Corporate Governance (pp. 211-231).*

www.irma-international.org/chapter/the-essence-and-prospects-of-forensic-accounting-in-developing-countries/299690

SSD Forensic Investigation Using Open Source Tool

Hepi Sutharand Priyanka Sharma (2023). *Examining Multimedia Forensics and Content Integrity (pp. 56-78).*

www.irma-international.org/chapter/ssd-forensic-investigation-using-open-source-tool/324147

Cognitive Radio Network-Based Design and Security Challenges in 5G Communication

Arvind Dhaka, Amita Nandaland Rahul Dixit (2020). *Forensic Investigations and Risk Management in Mobile and Wireless Communications (pp. 221-241).*

www.irma-international.org/chapter/cognitive-radio-network-based-design-and-security-challenges-in-5g-communication/234079