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IEEE SA 3D BODY PROCESSING INDUSTRY CONNECTIONS

SUMMARY AND RECOMMENDED ACTIONS FOR COMMUNICATIONS, SECURITY, PRIVACY, AND TRUST (CSPT) [IEEE P3141]

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ABSTRACT

3D scanning is a process that captures the three-dimensional attributes of an object and includes surface texture and spectral content. 3D scanners have become a critical tool for shortening product development and manufacturing time. The ongoing technological advancements in terms of portability, scanning range, and image quality have opened new application areas for 3D scanning. However, 3D scanning appears to be primarily dependent on users. Innovation in technology and application software, as well as growing and diverse connectivity, are leading 3D scanners to become a more integral element in the overall value chain. This notwithstanding, interoperability, data security and privacy, quality, portability, and trustworthiness are opportunities to be realized. The intent of this white paper is to highlight areas of opportunity for standard development organizations, specifically the IEEE P3141 Working Group, to focus on and further enable broad market use for the various sectors and users.

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1. INTRODUCTION

Broadly speaking, the 3D Body Processing (3D BP) Industry Connection (IC) Communications, Security, Privacy, and Trust (CSPT) group investigated the system representative of the 3D BP ecosystem, which consists of individual scanners that may interoperate using proprietary networks or existing LAN/WAN infrastructure for the purpose of scanning people and allowing individuals to use and share scanned data, in a ubiquitous manner. The 3D BP ecosystem is complex and may be difficult to capture in its entirety, due to the vastness of possibilities, especially considering the ongoing evolution of solutions and potential applications.

3D BP is creating numerous opportunities for engineering and science, as well as users and equipment vendors. The success of 3D BP may depend strongly on standardization to enable communication, security, and privacy, in a trusted environment, as well as further enable interoperability, compatibility, reliability, and effective operation on a global scale. Recognizing the value of 3D BP and the benefits this technological innovation brings to the public, the 3D BP IC group has investigated the ecosystem that may support 3D BP and is forwarding the findings and providing recommendations to the IEEE P3141 Working Group (WG) to help enable the development of a standard to foster broad market acceptance, an environment necessary for a vibrant and evolving 3D BP ecosystem.

In 2019 the 3D BP IC group published a background paper on communications, security, and privacy (CSP) [1], resulting in a focused effort by the 3D BP group to ensure these aspects were vetted, with the motivation and goal to bring together diverse stakeholders from technology, retail, research, and standards development to build thought leadership around 3D body processing technology standards in areas such as 3D capture, processing, storage, sharing, and (augmented) representation. The Communication, Security, and Privacy (CSP) subgroup focused on evaluating 3D scanning and processing technologies, identifying potential gaps in existing standards and recommending solutions for the IEEE P3141 Working Group. It also considered interoperability in terms of trustworthiness (i.e., communication, security, and privacy), identified and recommended deliverables (guidelines, practices, standards) for IEEE P3141 WG, and considered candidate use-case scenarios in terms of trusted 3D BP data.

The CSP subgroup engaged stakeholders in key areas (technologically and geographically) to get input that shaped the study. This engagement was in the form of a series of formal and informal discussions, which were augmented by input from university and industry researchers, as well as a review of workshop and conference papers. The structure of the CSP investigation included three principal areas: market, technology, and standards. After each of these three areas were examined, the role of academia and research as contributors to the three areas were considered. Finally, the importance of user acceptance was also addressed. There have been many bold predictions about where the exchange of high-fidelity 3D human body scans will eventually take various markets or sectors (e.g., apparel, fashion, health care, and automotive). However, there is no question that 3D body scanning is influencing consumers and impacting how people shop.

A key aspect of 3D BP is the intelligent connectivity of scanning technology and the resulting data, but the opportunity may be fragmented at this point. Early players are active and currently creating products for which they see a market. These players include various businesses and industries enabled by detailed anthropometric data, and they are implementing solutions, some of which may evolve into de facto standards, that may be creating an interoperability chasm. In order to get broader market acceptance, interoperability and trustworthiness are key considerations.

Founded as perhaps a niche application (e.g., airport security), 3D BP is now trending towards vertical

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applications (consumer-goods, apparel, fashion, health care, automotive/transportation, and other industrial applications), with 3D BP development and deployment motivated by the desire to provide or enable customer experience and tailored needs (cheaper, faster, better), and by the desire to create new goods and services that will drive new revenue streams. Connecting 3D BP equipment and subsequent data transfers will open new markets, but at what costs to users? New products and business models will evolve and be disruptive with unintended consequences of technology deployment.

Improved communication and network technologies, along with the subsequent growth of personal data are further stressing privacy concerns. Consequently, the CSP examined technology needs and topics related to the expected disruptions in communications, security, and privacy.

The sections that follow highlight the discoveries and recommendations in the communications, security, and privacy aspects that the SCP subgroup proposes to the IEEE P3141 Working Group.

2. COMMUNICATIONS

The ability to connect to any device anywhere is essential to modern business. Being able to store and retrieve 3D body data with any personal device (such as smartphone, tablet, PC, thumb drive, or the cloud) saves time, reduces costs, and gives versatility to customers and retailers to manage items in the modern fashion industry.

With the increasing deployment of autonomous information systems, deep learning algorithms, and the growth of applications, data becomes an asset, as mined data can be transformed into meaningful information allowing individuals to be recognized by their behavior patterns. The CSP considers end-to-end privacy critical to the successful deployment of 3D BP solutions, and believes that it may be necessary to process data in such a manner to prevent intentional or unintentional release of personally identifiable information (PII), or any virtual representations (i.e., avatars).

Different devices require different connectivity options. One of the most popular options implemented on personal devices and peripherals include USB and wireless interfaces, such as IEEE Std 802.11, IEEE Std 802.15, and cellular communications, which provide a low cost, flexible interface for smart communications involving 3D body data.

IEEE P3141 will enable vendors and developers to use the aforementioned communication interfaces, offering customers and retailers a flexible modern implementation of 3D body processing.

3. MOTIVATIONS FOR PROVIDING SECURITY TO ENABLE TRUST IN AVATARS

The presence of entities in virtual worlds has increased in recent years, such that it is anticipated that perhaps 80% of internet users will have an avatar. The CSP group added Trust as this aspect is required for virtual worlds. This increase demonstrates the need for 3D BP diligence in terms of CSPT. As avatars may reflect personally identifiable information (PII) of real consumers (see Appendix A for PII definitions), there appears to be a need for the CSPT to address avatars to help ensure a shared understanding [2].

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