

The Future of Fit Technology

Using LiDAR 3D Scanning
Technology for Safe and
Efficient Shopping Experiences

About FIT:MATCH

FIT:MATCH is a B2B2C SaaS company providing tailored solutions, quick and easy implementation, and data-driven results for brands and retailers, helping change the customer journey to fit first. The company's digital twin platform uses patented algorithms to eliminate guesswork, allowing customers to shop only what fits.



Abstract

This whitepaper presents the advantages of using LiDAR 3D scanning for safe and effective apparel shopping experiences. With recent technological advances, 3D body scanning has become one of the safest and most private experiences since its introduction to the market years ago. FIT:MATCH, a technology company, employs a privacy-first approach to body scanning, ensuring no bio-identifiable data is processed. The technology performs body scans from device sensors, which create a non-identifiable digital twin used to match consumers to their best-fitting apparel.

This paper compares LiDAR technology to other scanning methods and explains why LiDAR mapping is the preferred method for creating accurate and safe body avatars. The implications of these findings for the fashion industry are discussed, along with recommendations for future research in this area. This paper highlights the potential of LiDAR technology to revolutionize the fashion industry by providing safe, accurate, and personalized shopping experiences for consumers.

Introduction

The importance of designing secure and efficient shopping experiences is increasingly evident. Consumers are seeking convenient, personalized experiences that cater to their unique needs while maintaining their privacy and security. Three-dimensional information is more detailed than 1D or 2D. With this in mind, it is difficult to distinguish a consumer's true size solely through traditional measurement methods. Breasts, for example, have complicated shapes that 2D measurements cannot account for, like shape and proportion, among other factors. Due to remarkable technology breakthroughs in 3D body scanning, especially with LiDAR, retailers are now able to address these crucial consumer concerns. This document aims to explore advantages of using LiDAR to facilitate safe, efficient, and personalized shopping experiences.

One company pioneering this technology is FIT:MATCH, a B2B2C SaaS company providing tailored solutions, quick and easy implementation, and data-driven results for brands and retailers that change the customer journey to fit first. The company is on a mission to empower humanity to conduct commerce confidently. This is achieved through providing secure and personalized shopping experiences for consumers, assisting brands to better understand and pinpoint their target demographic, and reducing the environmental impact of clothing waste. FIT:MATCH has developed a privacy-first approach to body scanning that not only ensures consumer safety, but also empowers them with knowledge of their best-fitting garments. Using patented technology paired with LiDAR to perform scans, FIT:MATCH creates non-identifiable body avatars (called digital twins) to match consumers to their best-fitting clothing recommendations.



LiDAR can be found in newer models of iPhones, specifically the Pro and Pro Max models of the iPhone 12, 13, and 14.

What is LiDAR?

LiDAR, or Light Detection and Ranging, technology uses lasers to measure distance. Using these lasers, the technology can map the contours and create a highly detailed 3D map of an object or environment. LiDAR uses lasers to pulse and reflect light off of an object- in this instance, a consumer's body- capturing 3D shapes with precision and accuracy. Traditional measurement methods do not account for factors, such as tissue density; therefore, discerning size solely by measurements is a flawed process. Three-dimensional scanning techniques, on the other hand, account for all factors, like shape and proportion. LiDAR is one of a number of these 3D scanning methods.

Optical Capture

Optical capture- often referred to as photogrammetry or passive stereo- captures photographs of the consumer's body as seen by the human eye. Using photos from various viewpoints via the triangulation principle, the consumer's 3D body surface is generated. This method is two-dimensional and can only relay certain pieces of information to the extent at which the human eye can see, meaning 3D information is developed and derived from the collection of images. Using triangulation, the system calculates the distance between point coordinates. One major disadvantage of employing optical capture techniques is precisely aligning the points across images. Until correspondence across images is authenticated, factors such as disparity and distance cannot be accurately determined. Optical capture has a limited distance range and is a relatively time-consuming method, which may adversely impact price.

Structured Light

Structured light, or active stereo, is a more precise method than optical capture. Like optical capture, this method utilizes the triangulation principle; however, structured light utilizes projector-based scanners to overlay patterns (usually dots or stripes) on the body. Through the examination of each line's edges, the distance from the scanner to the surface of the object is calculated. This method is quick and precise, and with certain projector-based scanners, can achieve relatively high spatial resolution. However, projector-based scanners are not as accurate as lasers. Optical interference from the environment can cause double layering or a lower frame rate, meaning the consumer must consider their scanning environment and remain relatively still during the scanning process to avoid blurring and double layering.

Time of Flight

Time of Flight imaging utilizes light detection to create a depth map. In this method, lasers are pulsed from the source to the consumer's body and back to the sensor. By calculating the travel or "flight" time of the laser, a consumer's 3D body surface is generated. Time of Flight is a relatively quick and accurate method of 3D scanning, largely due to the calculation for the speed of light. However, Time of Flight scans tend to be lower resolution, meaning the resulting body avatar is simpler and conveys less detail. Another drawback of this method is that dark surfaces reflect little of the incoming signal, meaning surface texture may not be accurately captured.

Overall, LiDAR scanning is the preferred method for creating accurate and secure digital twins due to its precision, safety, speed, consistency, and versatility. A LiDAR-generated body avatar is the most accurate representation of an individual's body because it captures the most detailed shape information. This method is not only exceptionally precise, but consistent as well. It can create digital twins that are highly reliable and consistent across multiple scans. This is especially important because two individuals could theoretically have the same measurements; however, one could hold their tissue density differently, drastically altering the size. Unlike other methods of body scanning technology, LiDAR does not require physical contact with the individual being scanned, meaning there is no risk of injury during the scanning process. Another benefit of LiDAR scanning is that it can quickly and efficiently capture large amounts of data, which makes it the ideal method for creating digital twins for many individuals in short amounts of time. Lastly, this technology can be- and is- used in a wide range of environments and lighting conditions, making it highly versatile for capturing avatars in varying settings.

Privacy Comparison

	Scanning Method	Validations	Measurements & Matches
FIT:MATCH	LiDAR	Real-time validations using the camera; not saving any picture locally or remotely	Calculation of measurements on device using avatar; Uploading avatar and measurements on remote server for matches
Competitor 1	Optical Capture	Saves pictures for post-validation over the remote server	User video while 360-degree rotation
Competitor 2	Optical Capture	Saves pictures for post-validation over the remote server	Pictures - Front and side pose

Benefits of LiDAR 3D Scanning for Shopping

In recent years, non-invasive methods of scanning have become increasingly popular for their convenience and ease of use. Various benefits make the use of LiDAR scanning a preferable tool for creating frictionless shopping experiences.

Unlike traditional measurement methods, LiDAR does not require consumers to stand still for long periods of time. Scans are performed quickly and easily using mobile devices or other specialized sensors, like Intel's RealSense technology and the Intel Distribution of OpenVINO toolkit. This makes the process more comfortable, efficient, and accurate for shoppers while also reducing the risk of inconsistencies or errors in measurement data and the resulting digital twin.

As previously mentioned, LiDAR scanning can quickly capture the precise measurements of an individual's body, allowing for a deeply personalized shopping experience. With help from non-identifiable digital twins created from scan data, retailers can provide tailored recommendations for their customers, including clothing style, size, and even the garment fit best suited for an individual's body shape and size. This level of customization can also enhance shopper satisfaction, increase sales and loyalty, as well as reduce the likelihood of clothing returns.

One of the biggest environmental concerns in fashion is the large amount of waste generated from clothing returns. LiDAR technology can help reduce waste by improving the accuracy of clothing size and fit recommendations. Providing customers with more accurate clothing recommendations that better suit their body shape and size can assist retailers in reducing returns directly associated with poor clothing fit. Decreasing returns can also save retailer's resources while reducing the environmental impact of clothing production and disposal. In addition, LiDAR scanning can create virtual try-on experiences that not only cater to the individual, but also allow retailers to reduce the need for physical samples and designated fitting areas, further reducing waste and resource depletion.



The Savage X Fenty fitting rooms use LiDAR in combination with Intel technology to scan consumers.

Safety Concerns and Solutions

As body scanning technology has evolved over time, the experience has become safer and more private. However, there are still uncertainties regarding LiDAR technology and the scanning process. This section details common concerns and how to address them.



Privacy

Many consumers worry their personal information and data could be compromised or used without their consent during and following the scanning process. To address this, companies can implement a privacy-first approach to data collection and processing. For example, organizations can ensure no bio-identifiable information is captured during the scan and that any data is stored securely.



Health and Safety

Some individuals are concerned whether LiDAR scanning is safe, especially if the individual has a medical device or condition that could be affected by the scanning process. To address this, companies can ensure the technology meets rigorous safety standards and that individuals with medical devices or conditions are properly informed and advised about the scanning process.



Accessibility

Individuals with disabilities or mobility issues may have difficulty accessing or using LiDAR scanning technology. Companies can employ an accessibility mindset and design with these impairments in mind by providing alternate scanning methods or accommodations for individuals with disabilities or mobility issues.



Accuracy

An extremely common concern, many consumers wonder whether LiDAR technology can provide reliable recommendations for clothing sizing. To address this, companies can conduct meticulous testing and validation of the technology, ensuring it meets industry standards.



Cost

Many may worry the technology is too expensive for utilization on a personal level. However, companies can explore ways to reduce the technology cost and offer affordable pricing for consumers, if applicable. On an enterprise level, offering LiDAR technology to consumers can provide long-term cost savings achieved through increased accuracy, customer average order values, and brand loyalty.



Privacy



Health & Safety



Accessibility

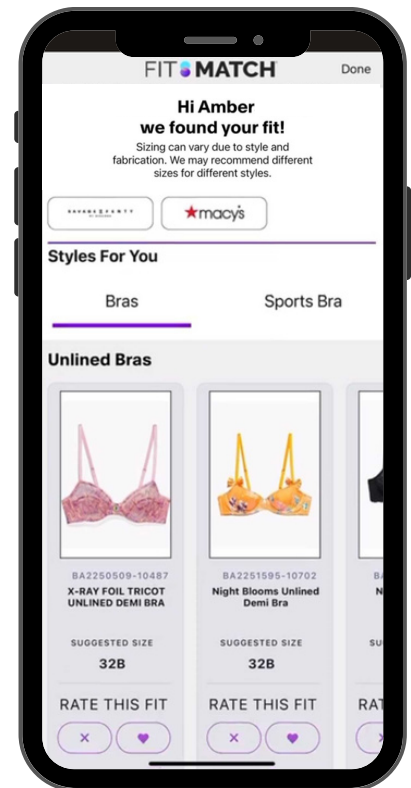
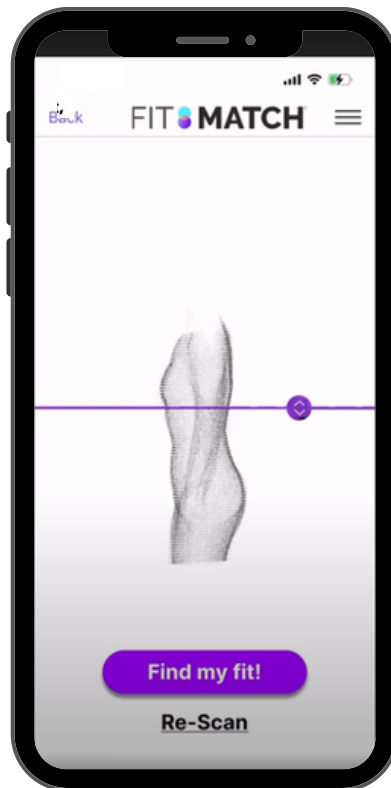
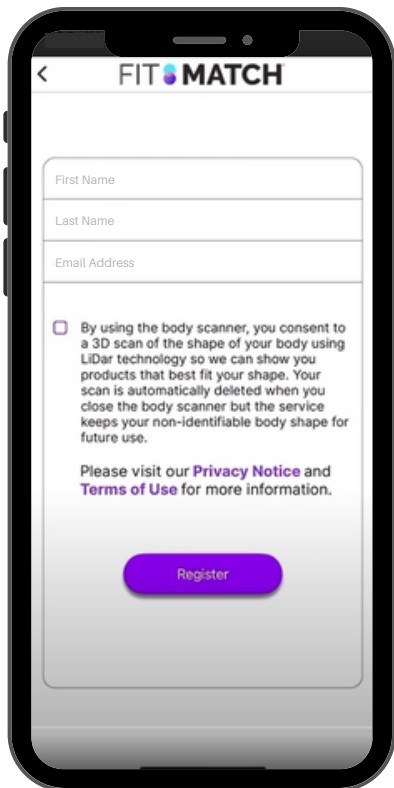


Accuracy



Cost

FIT:MATCH took these concerns into consideration and chose to use LiDAR, providing a 3D solution to a 3D problem. The company is on a mission to showcase how brands and shoppers alike can positively and safely use LiDAR scanning technology in their lives today. FIT:MATCH employs a privacy-first approach to 3D body scanning and works diligently with external experts in product design and development to ensure its processes and documentation meet stringent requirements. This includes adhering to UK/EU General Data Protection Regulations (GDPR) guidelines. FIT:MATCH also understands privacy and security are of primary importance to clients, brand partners, and vendors, so the company has made data protection a fundamental part of its brand.



FIT:MATCH also adheres to several guiding principles that facilitate a safe and accurate scanning experience:

No Photos

When building its technology, FIT:MATCH chose to focus on LiDAR technology versus the need for optical capture. Due to this decision, there is no request or need for photos from customers to help predict size recommendations.

No Videos

Storage of any video recording is strictly prohibited on FIT:MATCH technology. After each completed scan, any bio-identifiable data captured on a consumer's device is immediately deleted. What is solely captured by FIT:MATCH is the shopper's point cloud avatar, a discrete set of data points in space, generated from their body scan. This obscure, anonymous object is sent for processing and is compared with a database of digital twins using patented algorithms. What differentiates FIT:MATCH from other body scanning platforms is the lack of need to save or publish a customer's bio-identifiable data to the cloud in order to provide product match recommendations.

Data Encryption

Any data processed during a scan employs data at rest and in transit AWS encryption practices such as AES managed KMS keys and TLS, respectively. For an added layer of security, PII data is encrypted using RSA-3072 as well. Non-identifiable data processed by FIT:MATCH is secured by a hashed identifier, unique to each user. This identifier is protected by one-way SHA3 hashing, making it impossible to be

de-identified by FIT:MATCH or any other entity. Pseudonymization of data is also implemented to ensure additional protection. In the event of data transfer, FIT:MATCH employs SSL-encrypted REST APIs for secure transmission.

FIT:MATCH Front-End Registration continues stringent security. The First and Nickname fields are sent in plain text to the backend and do not require encryption. However, a one-way SHA3-512 hash of the last name, in case-insensitive and trimmed format, is stored. Last names are trimmed and sent to the backend encrypted with RSA 3072 via KMS in their as-recorded case-sensitive format. Additionally, a one-way SHA3-512 hash of the last name, in case-insensitive and trimmed format, is also stored.

The Nickname field, which is used for display on the waitlist/fit results page, concatenates the trimmed and case-sensitive first name and the first letter of the last name field. This field is sent unencrypted from the front end and received unencrypted from the backend.

FIT:MATCH's email input field does not allow spaces and is converted to lowercase. Emails are also sent to the backend encrypted with RSA 3072 via KMS in their case-insensitive format. A one-way SHA3-512 hash of the email, in case-insensitive format, is stored for additional security.

Applications of LiDAR Scanning in Fashion

As previously mentioned, LiDAR technology could improve the shopping experience for customers through an increased focus on accuracy and individualization. Precise measurements that lead to better clothing fit recommendations can save consumers time and money by reducing the need for multiple store visits, exchanges, or returns. Furthermore, designing virtual try-on experiences allows a customer to see how clothing will fit on their body- from anywhere- prior to completing a purchase.

Body scanning technology presents appealing benefits for brands and retailers, including customization options. The LiDAR solution can create more precise sizing and fit alternatives for consumers, increasing average order values, repeat business, and customer loyalty. A brand can also gain greater understanding of its shopper base, including demographics, preferences, and purchasing habits, like the most purchased styles and sizes.

Lastly, there are several recommendations for future research to further improve LiDAR technology applications for the fashion industry. One such recommendation is an increased focus on the development of more advanced LiDAR scanning technology and the integration of this technology with existing retail experiences to create more accurate, personalized, and immersive shopping experiences for customers. Another recommended area of research is the impact of LiDAR scanning on customer satisfaction and loyalty to provide additional findings on the correlation between LiDAR technology and customer satisfaction and loyalty. Finally, more research is needed to determine additional savings opportunities for retailers.



LiDAR technology can save resources valuable to consumers—like time and money—while shopping for apparel online and in-store.

Conclusion

LiDAR technology has emerged as the most preferred method for creating accurate, safe, and personalized shopping experiences for consumers. LiDAR offers several advantages over traditional 1D or 2D measurement methods and other 3D scanning techniques. This technology uses lasers to map contours and create a highly detailed 3D map of an object or environment, making it an ideal solution for fashion retailers who aim to offer accurate, efficient, and personalized shopping experiences.

FIT:MATCH is a B2B2C SaaS company that has embraced LiDAR technology, developing a privacy-first approach to body scanning. Their patented technology paired with LiDAR performs scans that create non-identifiable body avatars to match consumers to their best-fitting clothing recommendations.

This whitepaper recommends that companies embrace LiDAR technology to revolutionize the fashion industry by providing secure, accurate, and personalized shopping experiences for consumers. As a responsible tech company, FIT:MATCH ensures consumer safety and privacy by using their privacy-first approach to body scanning.

If you want to learn more about how LiDAR scanning can improve your business operations, schedule a call with the FIT:MATCH team today. With their tailored solutions, quick and easy implementation, and data-driven results, they can help brands and retailers change the customer journey to fit first.

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