Research on AI Promoted Apparel Mass Customization*

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Abstract

The traditional apparel industry faces challenges to the quarantine of the global COVID-19 pandemic dramatically. The AI technics provide promising solutions for the apparel industry shift from labour-intensive to technic-intensive for survival. However, there are many open problems on how AI could find its application in mass customization. This paper presents practicable methods, frameworks and the curial technologies of AI-promoted apparel mass customization. The AI cloud will apply in traditional knowledge management of customers (KM) with which AI cloud has been trained and make predication of trends and customer's preferences and enable personalized AI recommendations. With AI measurement flexible digital research development techniques can automatically generate personalized patterns and virtual garment prototypes based on different body shapes. By using the RFID label, the AI cloud could easily provide quality control, products tracing back in the production process and AI logistics. Those solutions and key technologies will benefit the process of apparel industry 4.0.

Keywords: AI Promoted apparel Mass Customization; RFID Technology; AI Knowledge Management; AI pattern making; Flexible Manufacturing

1 Introduction

It is known that the traditional garment industry is labor-intensive and time-consuming. The quarantine of the COVID-19 pandemic has brought challenges to the traditional apparel industry. The AI-promoted mass customization of the garment industry will be a promising solution for some of these problems, as it provides alternative online and digital production processes. The traditional garment industry requires processes of measurement, pattern making and prototype garment fitness, which might repeated several times. The traditional garment industry also relies manually on measuring, pattern making and sewing sample cloth. In addition, there is a communication barrier between manufacturers, designers, and customers. Traditional garment production is not able to update the production progress in real-time and is also not able to trace back the process for consumers. At the same time, product logistics mostly depend on

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third-party logistics companies, which have relatively higher-costs and have increased apparel production costs. The emergence of Industry 4.0 provides intelligent technology solutions for the apparel industry. Industry 4.0 adopts technologies such as the Internet of Things, big data, and artificial intelligence to mass customise apparel and provide personalized services to consumers [1]. Mass customization (MC) of garment at minimal cost could be achievable by applying advanced computer technology to the apparel industry. The MC could provide online digital customization services without the customer's presence. It could offer personalized garments for customers at a lower cost at the same time, shorten production cycles. Flexible manufacturing in Industry 4.0 will accelerate the transformation trend of mass customization of apparel. However, there are many open problems on how AI could find its application in mass customization. This paper presents the key technologies of AI-promoted mass customization.

2   Methodology

The contribution of this paper presents methods and framework for how AI could find its application in mass customization of the garment industry which is an prompted mass customization framework.

To know the real challenges of current mass customization in the garment industry, besides a survey of research documents, this paper also chose 14 typical companies of different types in the garment industry from all over China for investigation of the real garment industry from the year 2019-2021. To eliminate the sampling data biases, the companies were chosen from different areas of china, i.e. northern China, Southeast China, and southern China. From those investigations and andch archives, this paper generalized the traditional garment industry pattern at different stages. To solve the challenges of the traditional garment industry, the correspondent ideal AI promoted MC solutions framework is provided and with some experimentations for verification.

This paper is organized as follows. Section 2 discusses the technologies of AI-promoted mass customization of apparel in terms of the knowledge management of customers, AI measurement, AI recommendation, and flexible manufacturing, for example RFID and AI logistics. It then proposes an optimized AI production method for mass customization. Section 3 provides conclusions and future research.

3   AI Promoted Mass Customization of Apparel

Generally, the garment industry includes 3 stages: pre-sale, research and developent and manufacturing, and delivery. This section provided a full-stage intelligent framework of each stage as well as data flows through each stages.

AI Promoted Mass customization can use AI knowledge management of customers and AI recommendation to obtain customer information. Apparel pre-sales, production, and logistics use the AI cloud for data management and sharing. Consumers, manufacturers, and AI logistics interact with data to enable flexible apparel manufacturing. Fig. 1 shows the process of AI-promoted mass customization. The MC could also offer customization production on customer's demand. In addition, the MC could theoretically realize zero inventories of products.