書報討論 Seminar

文獻題目：Active Textile Tailoring

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Figure 1: A textile garment shown before activation (Left) and after activation, demonstrating a tailored ftt (Right).

Active Textile Tailoring is a new process for creating smart textiles in which its fibers change shape and structure in response to heat. This adaptive textile can create a new type of sizing customization or aesthetic patterning for the preference of individual customers. This system was developed in collaboration with MIT, Ministry of Supply, Hills Inc. and Iowa State University with support from the federal non-profit Advanced Functional Fabrics of America (AFFOA).

KEYWORDS

Active Textiles, Material Transformation, Knitting

活动性纺织裁剪是一种新型的智能纺织品制造工艺，它的纤维可以根据热度的反应来改变形状和结构。这种适应性纺织品可以根据个人顾客的偏爱创建一种新型的尺寸定制或审美模式。

该系统是与麻省理工学院、Ministry of Supply、Hills公司和爱荷华州立大学合作开发的，并得到了美国联邦非营利性高级功能面料组织(AFFOA)的支持。

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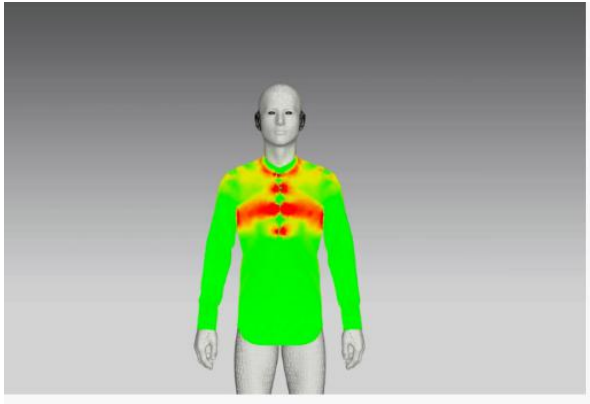
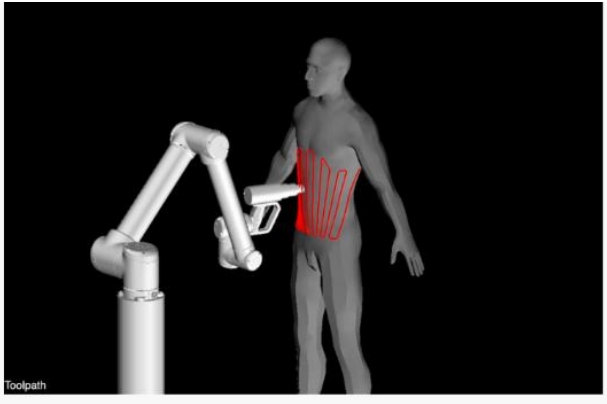
ABSTRACT

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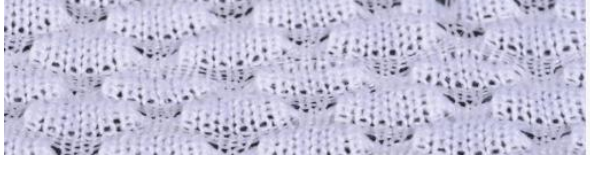


Today's garments are mass-produced in generic
S, M, L, XL sizes and are not tailored to the individual's
body shape, needs or comfort.

Today, garments are mass-produced using static fabrics in generic sizes. Active Textile Tailoring demonstrates a new type of knit garment in which individual fibers and yarns with unique material properties are combined to enable control of localized garment dimension.

大量生产的服装使用的是通用尺寸的静态织物。Active Textile Tailoring展示了一种新型的针织服装，将具有独特材料性能的单根纤维和纱线结合在一起，以实现对局部服装尺寸的控制。

1. **从服装设计的角度来看，这超出了传统剪裁的范围。**在很大程度上，现今的服装设计和制造与19世纪以来大体相同，都采用的是裁剪缝制结构和传统的染色工艺不需要裁剪和缝制布料，用于定制合身服装的技术通常涉及效率低下的工作流程。

2. **从宏观上讲，这项技术是服装产业发展趋势的一部分。**当前的许多进步都依赖于电子设备，这种新技术试图将效率低下的个体化的测量结果转换为定制的模式。今天的智能高性能服装旨在为服装引入新的功能，但传统上依赖于设备繁重的解决方案，这些解决方案需要电子元件和复杂的机制进行感应和驱动。这种方法对于传统服装来说，增加了额外的设备，也增涨了成本，复杂性，故障和笨重（的体积）。

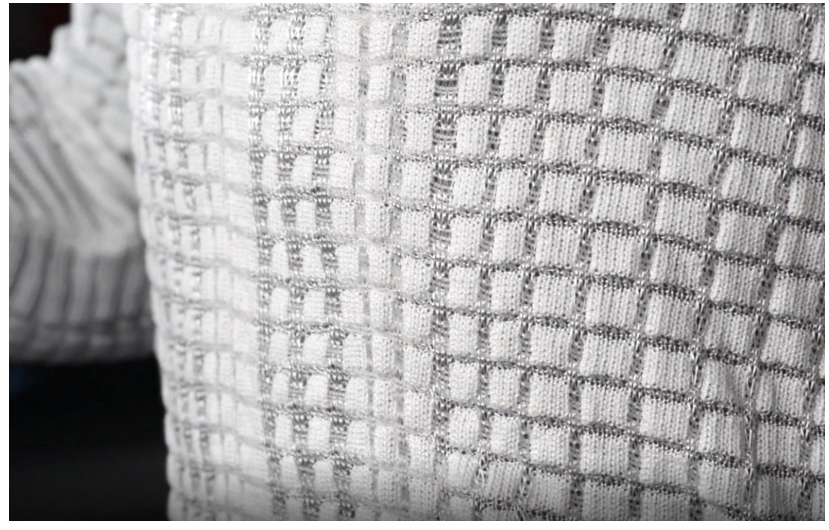
3. Active Textile Tailoring 提出了一种截然不同的方法，**它依靠纤维织物品的固有物理特性，是根据热量和水分改变服装外观。**利用工业纺织机器的针迹水平控制，服装可以被预编程，使其能够根据个性化的客户数据调整尺寸。

Our approach is based on a combination of

1) materials properties enabling fiber-level physical transformation in response to temperature or moisture change,

2) fabric-level structural responsiveness based on knit structure, and

3) industrial knitting of whole garments enabling precise control over local/global structure.



1）能够根据温度或湿度变化，实现纤维级别物理转变的材料特性；

2）基于针织结构的织物级别的结构响应性；

3）整个服装的针织工业能够实现对局部/整体结构精准的控制 。

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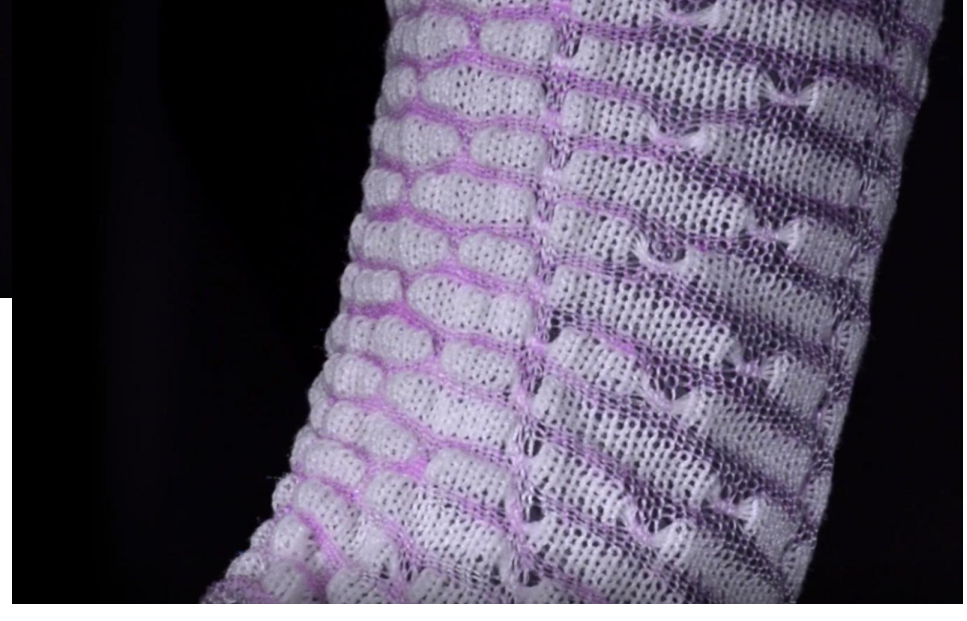
METHOD



The proposed garments integrate standard materials with selectively placed active material that exhibits permanent local shrinking in response to heat. The configuration of the active material in the garment's knit structure produces fabric contraction in the horizontal and vertical directions, allowing flexibility in adapting to different scenarios of fit adjustment. The active knit structure can be applied to any area of the garment to allow for targeted fit adjustment.

By applying heat to adjust the shape of the garment, a robotic arm provides a method of transference between dimensional data related to the consumer and a resulting individualized pattern. This can be applied precisely and evenly by the robot without the need to convert customer data into a textile pattern, circumventing the complexity of manufacturing problems typically involved in achieving custom fit.

- 活性材料表现出对高热度的反应是永久性局部收缩。
- 活性材料的配置使织物在水平和垂直方向上都收缩，可以应用于衣服的任何区域，使服装的结构变化更灵活。
- 通过热度来调整衣服的身形，是通过机器人精确而匀称地实施，把消费者相关的尺寸数据进行转换，从而绕过了涉及定制合身服装所带来典型生产的复杂制作问题。

Active Textile Tailoring is a first step in a series of investigations into programmable material in textiles. In addition to fit customization, current projects seek to create built-in material configurations that can passively respond to changes in body heat or environmental conditions. Among our investigations, we have shown that by designing complex knit structures including both temperature active and non-active fibers, we can change both compression and porosity in response to heat, demonstrating the potential of active of material-based activation for garments.

活动性纺织品裁剪是对纺织品进行一系列可编程材料研究的第一步。除了合身定制外，当前的项目寻求创建可以被动响应人体热量或环境条件变化的内置材料配置。在我们的调查中，我们通过设计复杂的编织结构，包括温度活性纤维和非活性纤维，我们可以通过对热量的响应而改变压缩率和孔隙率，从而证明了基于材料的活化对服装的激活潜力。

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CONCLUSION

Figure 2: A textile sleeve shown before activation (Left) and after activation with porosity, shape and color change (Right).

1 独特性能的纤维 Unique performance fibers

2 热度 Heat

3 压缩率和孔隙率 compression and porosity

Active Textile Tailoring

Self-Assembly Lab, MIT + Ministry of Supply + Hills Inc, + Mechanosynthesis Group, MIT + Iowa State U.

MIT's Self Assembly Lab and MIT-born apparel company Ministry of Supply have developed a new system called Active Textile Tailoring. This demonstrates a completely new system for "smart" textiles in which its fibers change shape and structure in response to heat and moisture, unlocking a new wave of customization of fit and aesthetic. This technology was developed in collaboration with the Self-Assembly Lab, MIT, the Mechanosynthesis group at MIT, Ministry of Supply, Hills Inc. and Iowa State, and with support from the federal non-profit Advanced Functional Fibers of America (AFFOA).

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Ministry of Supply:
Gihan Amarasiriwardena, Aman Advani

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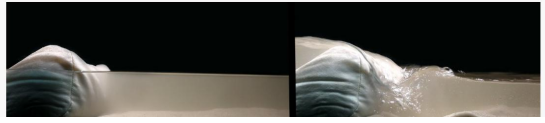
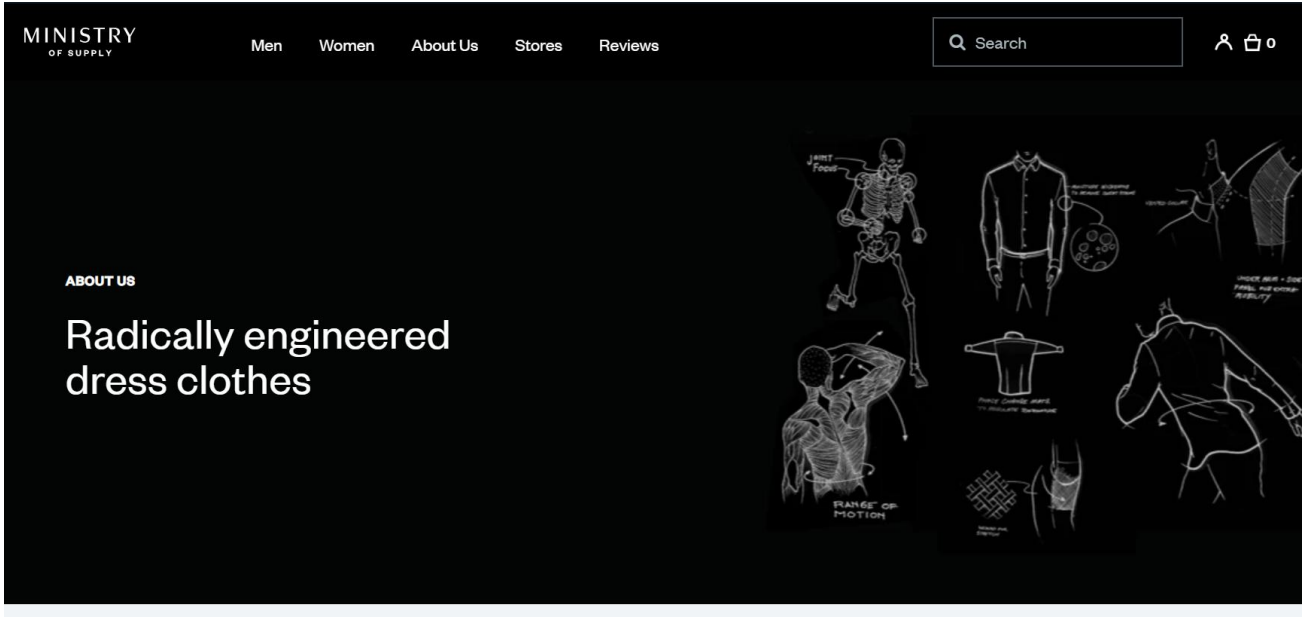
Iowa State Team:
Rui Li, Guowen Song

Hills Team:
Tim Robson, Jeff Haggard

A research lab at MIT inventing self-assembly and programmable material technologies.





MISSION

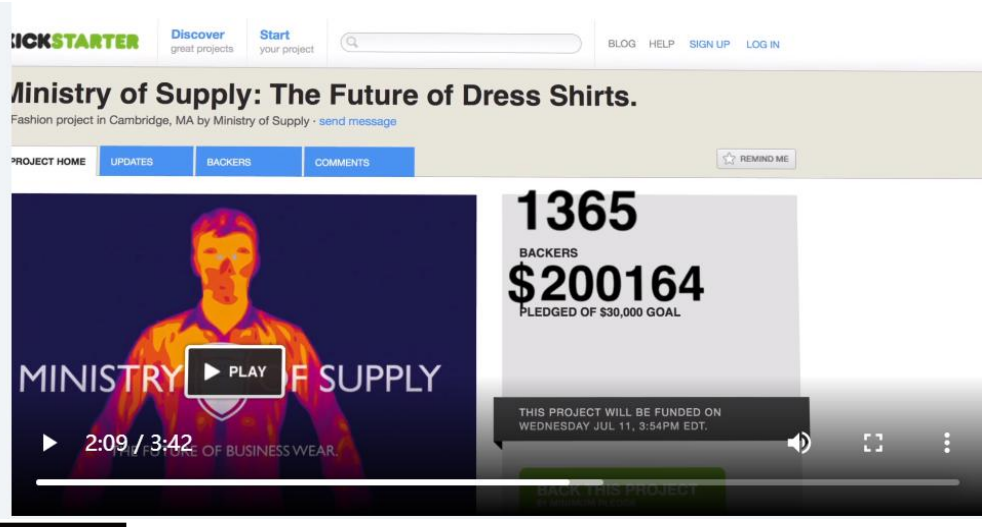
We started Ministry of Supply to solve the problems of stiff, high-maintenance dress clothes by engineering high-performing, comfortable apparel.

Ministry of Supply

是一家位于波士顿的高性能商务男装和女装时装品牌，于2012年推出由前麻省理工学院的学生创办，使用的一些温度调节材料与美国宇航局宇航员的衣服相同。 该公司目前在网上销售他们的大部分服装，目前在华盛顿特区，旧金山，纽约，圣莫尼卡，波士顿，芝加哥，亚特兰大和贝塞斯达都有实体零售店。

旗下品牌： Apollo; Aviator; Aero; Atlas; Aeon; ATMOS

总部： 美国麻萨诸塞州波士顿



HOW IT STARTED

We realized dresswear didn't have to hold us back.

It all started with shirts and socks. We knew athletic clothes were made with high-tech fabrics that kept you comfortable while working out, and we wanted that kind of performance when we were at work. Our first prototypes were Frankenstein creations: socks and dress shirts built by cutting and sewing fabric from our favorite athletic clothes into business-appropriate attire.

SHOP APOLLO 3

THANK YOU