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Smart Textile Boon to Textile Industries

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INTRODUCTION

Smart textiles, also known as electronic textiles (e-textiles), include electronic components and perform some functions. Smart fabrics are intelligent systems that can observe or communicate ambient circumstances and detect and process the wearer's state**.** They can sense and react via an active control mechanism for the environmental conditions called stimuli. They stimuli may be electrical, thermal, mechanical, chemical, magnetic, and other inputs and outputs.The systems composed different apparatuses and materials such as sensors, actuators, electronic devices together. Examples: fabric and dyes that will change their color with changes in pH, Clothes made of conductive polymers which give light when they get electromagnetic signals, fabrics which regulate the surface temperature of garments in order to achieve physiological comfort.

History: In 1989, the phrase "smart material" was coined in Japan for the first time. Silk thread with a memory effect was the first textile material to be labelled as a smart textile. Shape-memory materials and intelligent polymeric gels, were widely recognised as the origin of true smart materials in the 1960s and 1970s, respectively. Textiles using intelligent materials did not hit the market until the late 1990s. Smart fabrics are now far more complicated, and they are frequently referred to as wearable computers

How they work as smart textile?

Smart fabrics are made by combining fibres and technologies, depending on their intended function.

Conductive yarns and polymers, shape memory polymers, encapsulated phase change materials, fibre optics, and other tiny electronics are examples of these fibres. Sensors, chemical treatments, and thermochromic dyes are examples of external contributions. These materials interact with one another as well as external stimuli like temperature, light, and pressure, resulting in an energy transfer. Once triggered, the functional fabric reacts in accordance with the function of the material.

Functions of smart textiles:

a) **Sensor:** these are the components that transform one type of signal into another type of signal.

b) **Data processing:** It is necessary to process every collected information and data and obtain the desired output. Therefore in order to obtain the desired output by processing the parameterscollec6ed by the sensors, a processor suitable for the relevant purpose is required in smart textiles.

c) **Actuators**: these are the devices designed to perform the necessary action according to signals from the sensor or processor. These devices are called actuators.

d) **Communication**: It is shaped according to the type and need of communication. There are many types of communication within smart textiles.Some of the basic situation in smart textile are : in one element of the garment itself, can be mounted between two different elements of the garment and in order to command the garment by the wearer, contact is made to inform the wearer or his surrounding then communication component is required.

e) **Storage:** Smart textile need a storage capacity to operate on their own. While the information to be stored in smart textile is usually information or energy. Detection, computing, actuators and communication units generally require energy. Efficient energy management is achieved by combining the energy source and storage in an appropriate manner.

Classification of smart textile

It can be divided into four types based on their functions:

a) **Passive smart materials**: The term "passive smart materials" refers to materials or systems that solely detect the environment or stimuli. They're nothing more than sensors. They reveal what has transpired to them, such as colour, form, temperature, and electrical resistance. These textile materials are more or less comparable to high-performance and functional textiles.

b) **Active smart materials:** Active smart materials are materials or systems that can sense and respond to environmental stimuli. Their primary roles are to detect and respond to stimuli. This demonstrates that they are both sensors and actuators in response to environmental variables.

c) **Very Smart materials:** These are materials and systems that can perform three roles at once; They are, first and foremost, sensors that can accept stimuli from the environment and, second, they can react to those impulses. Third, they have the ability to adapt and restructure themselves in response to changing environmental conditions. We can relate this system to the animal chameleon, which has the ability to absorb the colour of its surroundings and then adapt by altering the colour of its skin to that of its

surroundings in order to defend itself from predators.

d) **Ultra smart textile:** Materials with even higher level of intelligence develop artificial intelligence to the computers. These kinds of materials and systems are not fully achieved in the current investigation of human beings. This may be achieved from the coordination of those Very smart (intelligent) materials and structures with advanced computer interface.

Latest smart textiles

a) **Nadi X yoga pants:** Its patented technology helps you improve your yoga practise by incorporating integrated sensors and haptic feedback (vibration).

b) **Women legging-Athos:** The inner quadrant, outer quadrant, hamstrings, and glutes are the key lower-body muscle groups to keep an eye on. Muscle activity, heart rate, calorie expenditure, and active vs. rest time can all be monitored in real time using biometrics. The garment's sensors read biosignals and relay them to your smartphone app, revealing which muscles are firing and working hard.

c) **Hug shirt-cute circuit:** The HugShirt enables you to deliver hugs over long distances. Sensors record the contact's strength, length, and position, and actuators reproduce the sense of touch and the emotion of the hug to loved ones.

d) **Owlet smart socks**: These are one of the wearables designed for infants and kids up to the weight of 25 kilograms, available in varying sizes and colours. They are embedded with sensors (non-textile) to monitor heart rate, oxygen level and sleep trends.

CONCLUSION

Smart clothing aids in the study and recognition of changes in the human body as a result of environmental and physical activity influences. Modern clothing has feedback devices that can assist the body in adapting to changes. It has gradually developed into a product of multidisciplinary study as science and technology have progressed, integrating biochemical technology, electronic information, human-computer interaction, and bionic technology; therefore, smart textiles can be served as ideal materials for fashion designers.

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