

# STUDY OF SMART TEXTILE IN SPORTS AND DESIGNING A SMART JERSEY FOR ATHLETES HEALTH ISSUE

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**Abstract-** The lately huge Development of information technology, wearable technologies and smart technology has changed the way to conceive sports and a well being concept. New kind of performing textiles especially the electronic ones are nowadays used in several application throughout all everyday activities. Textiles has now become the supporting platform to integrate the technologies adding functionality to what we wear which involves innovation. In this paper we have tried to identify the issues faced by the athletes in relation to their health while they are in active mode. In such a case the health sometimes turns to the impactful area to overcome such an issue this paper will provide an implementation of smart textile ie wearable technology which will have sensors to detect the health concern and provide an appropriate feedback or signal to the athlete so that precaution can be taken. This development can have several hundreds of sensors that detect problems and has signalling capabilities. This paper will provide the smart technology implementation for development of a smart Jersey. This paper will provide some base to this new Development which will be helpful to the future developers and researchers.

**Keywords:** smart technology, athlete's, health concerns ,textile sensors

## 1. INTRODUCTION

The lately huge Development of information technology, wearable technologies and smart technology has changed the way to conceive sports and a well-being concept[1].

Textiles and apparel market representation one of significant segment in the world trade and product manufacturing. Traditionally the textile industry is referred to production of fiber yarns, fabric and textile goods[2].

Smart textile possess properties of conventional textiles materials and carry additive functional values.

Smart textile is the future of textiles anticipated for use in several fashion, health applications. The vision of smart textile is to create textiles products that interact by merging smart material and technology in textiles

structure offer an opportunity to create a textile with new type of behaviour and functionality

Besides behaviour like sense, react on and conducting electricity the textile will be able to perform computational operation. While the health benefits of moderate exercise have been well documented exercise training and competition at elite level may significantly increase the health risk to the athletes.

At wearable its always looked ahead to the next generation of fitness trackers smart watches and VR headsets. Fitness trackers continue to be at the forefront of much of the innovation that's happening at moment whether that's to help us to keep a check on your stress level or even to track our emotional state[4].

It is observed that athlete's for health issues related to asthma, exercise associated muscle cramp, heart problem, heat strokes, dehydration.

Athletes trying to improve their performing in sports can harm themselves by overtraining.

## 2. LITERATURE STUDY

Muscle injuries are extremely common in athletes and often produce pain, dysfunction, and the inability to return to practice or competition. Appropriate diagnosis and management can optimize recovery and minimize time to return to play. Contemporary papers, both basic science and clinical medicine, that investigate muscle healing were reviewed. A Medline/PubMed search inclusive of years 1948 to 2012 was performed.[8]

E-textiles, also known as intelligent garments, intelligent clothing, electronic textiles, smart clothes , or smart fabrics, are fabrics that enable digital components (including small computers), and electronics to be embedded in them. Smart fabrics are created with technologies that incorporate value to the wearer. Pailes-Friedman of the Pratt Institute states that "what makes smart fabrics revolutionary is that they have the capability to do frequent things that old fabrics are not able to do, including communicate, transform, conduct energy and even grow".[11]

Smart textiles can be thought as performance increasing. Some of these fabrics merge energy from the surrounding by applying vibrations, sound or heat,

acknowledging to these inputs. Performance increasing smart textiles are intended for use in athletic, extreme sports and military applications. This has textile created to maintain body temperature, decrease wind resistance, and maintain muscle vibration – all of which may improve athletic performance. Many fabrics have been developed for watchful clothing, to guard against environmental hazards, such as radiation and the effects of space travel.[12] The health and beauty industry is also taking outcomes of these innovations, which range from drug-releasing medicine textiles, to textile clothing with moisturizer, perfume, and aging preventing properties.[11] Many smart clothing, wearable technology, and wearable computing projects involve the use of e-textiles. [13]

### 3.IMPLEMENTATION

This paper is based upon the study of the wearable technology and we have tried to implement some of the technologies together so that we can propose an idea of smart jersey which will help the athletes to maintain their health.

#### 3.1 Solution to Respiratory problems

Athletes face a running induced breathing problems most of the time which is commonly misdiagnosed as asthma. To detect the high rate fluctuation in the breathing rate a sensor can be attached to the anterior of the jersey. A capacitive respiratory rate sensing technique based on the capacitive sensing approach is proposed. The sensing unit consists of two conductive textile electrodes that can be easily fabricated, laminated, and integrated in garments. Respiration cycle is detected by measuring the capacitance of two electrodes placed on the inner anterior and posterior sides of a jersey at either the abdomen or chest position. A helpful wearable respiratory sense detector setup with a capacitance-to-voltage converter has been created. Respiratory rate as well as breathing mode can be accurately identified using the designed sensor. The sensor output provides significant information on respiratory flow.

#### 3.2 Solution to muscle strain

Strain can be a problem while athletes are involved with huge amount of physical activities. At a point of time this strain may cause a major health concern which might create pain and the athlete might not be able to conduct normal activities in such a case it will be helpful if the sensor can detect the early signs before the condition worsen

A conductive carbon-loaded rubber can be harden on an elastic textile to yield a conductive fabric. The electrical resistance of this fabric depends on its stretch. Thus it can be used as a strain sensor. When elongated, the

resistance increases. However the resistance is highly non-linear in its reaction to strain and exhibits hysteresis which can be problematic in some applications.[7] Such carbon-loaded rubber fabrics are lightweight and can easily be integrated into a garment. In the light of wearable computing, attempts have already been made to use such sensors to detect body postures and arm gestures.

This sensor can be attached around the arm region, around the stomach and back as these sections are more prone to strain

#### 3.3 Hydration level of body

Whether you're a serious athlete or simply exercise for recreation, it's important to stay hydrated. Good hydration means getting the right amount of water before, during, and after exercise. Water maintain your body temperature and greases your joints. It helps carries nutrients to give your body energy and keep you healthy. If you're not hydrated, your body can't perform at its highest level. You may feel tired, have muscle cramps, dizziness, or other serious symptoms. A wearable skin sensor in the form of a capacitor is determine based on skin burdance measurement. The capacitor consists of two interdigitated or parallel electrodes that are made of silver nanowires in a polydimethylsiloxane matrix. [9]The flexible and stretchable nature of the electrode allows conformal contact to the skin. The hydration sensor is not sensitive to the external humidity change and is measured against a commercial skin hydration system on an artificial skin over a wide hydration range. The hydration sensor is wrapped to a malleable wristband, along with a network reviewer chip, a button cell battery, and an ultralow power microprocessor with Bluetooth.

#### 3.4 Body temperature regulation

An increase of the core body temperature during activity is proportional to the relative performance according to study results. Because of muscle strain, heat is generated and is then scattered through the blood stream in the body core. The internal thermal sensors are continuously measuring the difference between current and target body temp level, and are sending signals to the central nervous system to take the necessary precautions in order to slow down the internal temperature rise.[10]

### 4. FUTURE WORK

In health and wellness settings, nanomaterials could also respond to injuries by delivering drugs or facilitating sensors that could alert health care providers of blood clots, or even specific diseases. Although U.S. Military spending on textiles and other textiles is reducing, there is a healthy interest in textiles used in applications such

as tents, with fabrics that provide solar-powered electricity, for example, and tent seams that repel water. Smart fabrics including wearable technologies are poised to show rapid growth in the future, says Rasmussen. Market drivers today will continue to influence this progression:

The Military, particularly for power sources

Technology-savvy younger populations that expect instant connectivity, speed and multi-functionality in communication

A burgeoning elderly population that will benefit from more health-related advanced technologies.

## 5. CONCLUSION

A number of researches and development conducted in areas such as advanced materials, polymers, microelectronics computer's and information technology. These are all done for development and advancement of new material and better communication. Textiles are also changing day by day. The developing field of smart textile could show a lot of new things in all its application. It has importance for medicine and health care, protective clothing in the casual clothing and lifesaving products. Even after the development final key factor for user acceptance of wearable devices is the fit comfort. We are continued that goal can only be achieved by addressing mechanical resistance and durability of the material in what is recognized to be harsh environment for electronics for human body and society

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