**Project Title: Fabric stretch sensor**

**Background:**

**Main objective of the project**

The main objective that revolves around all my project idea is tracking of bio signals of users using wearable E-textile interface. A bio signal is any signal derived from a living beings that can be continually measured and monitored. Bio-signal interfaces provide important data that display the physical status of a user. But capturing biosignals is highly complex and demands a lot of efforts and time. ***As the time is limited,to make my idea work in a small scale project,my primary focus is to build fabric stretch sensors .My extended research goal and future vision would be is to capture biosignal data and help users in seeking for help from others on emergency situation by using IOT technologies***

**Motivation from emerging trends:**

In the last decade there has been an increasing interest for developing different types of wearable sensors. There are many sensor types that have shown potential as wearable sensors among them piezoresistive films which show good change in resistance by simple changes to their geometry and observed micro cracking contributing to high gauge factors [7,9]; although their durability and strechability are areas of concern for further development. Capacitive sensors are another common type seeing in touch screens because of their good sensitivity, low energy and adaptability [3]. They have however mainly being used for pressure because they suffer from environmental noise and hence becomes very difficult for use in wearable applications. Textile-based sensors are desirable for wearable end users [14] because they are comfortable, flexible, and not obstructive to the wearer’s everyday activities. A textile sensor can be designed and presented in numerous types and forms. One particularly interesting type is as a strain resistance sensor, which is achieved by the alteration of the mechanical properties of the material under stress/strain deformation, whilst its flexibility allow care of wrapping of the body of the wearer. Textile strain sensors can detect stretch, displacement, and force resulting from large movement of joint bending [16] or small body movements such as breathing [2,17]. Many studies have investigated theoretical and practical relationships between the electrical resistance and elongation of conductive fabrics [18] I am highly motivated by that and strongly believe that Textile-based sensors have the ability to replace solid-state sensors and the next generation of garments will be capable of providing physiological measurement to users.

**Real-time Application area and functionality:**

This project idea could play a significant role in medical field. It could be great help to the physically and mentally challenged persons who are not able to communicate their needs and uneasiness in their body to the world around them for offering immediate help and support. The main goal of the project is inspired by the existing scientific literature [1]As it is a wearable technology, it’s always attached to user and through touch interface regularly tracks the heart rate, blood pressure and monitors breathing pattern of the user .They are used not only in the medical field but also various other areas.In the medical field, they are used in monitoring systems for early detection of dangerous situations and diseases by monitoring the patient’s health status and in medical automation systems that provide continuous treatment or rehabilitation services. [5]Methods that use biological signals for automatic measurement of stress and objective data collection have achieved practical results in many scenarios. [4] Biological-signal interfaces are used in rehabilitation, fitness, and sports training such as practicing the method of controlling breathing or training body balancing.The application of biological-signal systems has expanded beyond the medical services to various other areas such as education, information security, and human-computer interaction as the Internet and mobile devices have become ubiquitous[14]. Measurement of the physiological or physical performance data not only improves our understanding of the physical health but also help us better understand the experience of users by supplementing the results of other methods.

**Overview of Project idea**

The main working principle of my chosen area of wearable e-textiles would be to sense and detect the bio signals such as breathing rate from user's body through textile sensors and tracking the response of users and signalling the output through the means of LED displays which brightens up based on the resistance range of sensors and the corresponding change in resistance to change in voltage could be done by means of voltage divider.This principle of chosen project idea is similar to the working idea of the paper[12].

**Outcome of the project:**

This project could successfully track biological signals such as  measurement of breathing rate and send responses by means of output LED's.This project idea plays a immense role in medical field.By this means,the collection of performance data not only improves our understanding of the physical health but also help us better understand the experience of users by supplementing the results of other methods.

**Existing Commercial Products:**

·         XSENSOR Technology cooperation’s Textile sensor for tracking bio signals

·         Google and Levi’s Jacquard Conductive Fabric jacket using textile switches

**Existing DIY projects**- [3] [4] [8]  [11] [12]

**Extended project goal and research interests:**

As there could be widespread use of wearable e-textile-based devices in the years to follow, I have few ideas to take on as my research interests. To improve the durability and signal integrity of the sensors with time and washing cycles while fabricating smart textiles for long-term health advanced embedding technique and logics, dynamic operation and novel algorithms for a target application could be adopted.[10][15]

**Project Concept**

The mainconcept of my project revolves around building stretchable sensors that could be attached in a belt to capture the breathing rate of the user.The wearable E-textile breathing belt use fabric stretch sensors to turn analog motion to digital data. The capturing of this data can be used to visualize and record human body movement. Sewing stretch sensors into form-fitting clothing allows us to establish a mutual relationship between the movement of the ribs and the movement of a sensor placed on that joint.Fabric sensor would be built in such a way that they have a maximum extension of 80mm (80% strain of their active area). Once they have extended to this length, they strainlock (i.e. cannot be stretched any further). This ensures they are always operating within their strain limits and prevents them from being damaged by overstretching.Stretch sensor is made from a conductive fabric designed to have  sensitivity  allowing for incredibly precise measurements.The fabric sensors  are designed to measure how much they have stretched (i.e. the shape change), by brightening up the LED's in a means to provide visual feedback.The Fabric Stretch Sensors are supposed to generate the best results when attached to close-fitting garments that allow the sensors to follow body motion precisely. Correct mounting of the sensors is very important as sensors attached to loose or ill-fitting clothing will generate inaccurate results.

**User Interaction:**

The below statements states the detailed steps on how user would interact with the Fabric Stretch Sensors stitched with the belt.

* Typically user could observe the fabric stretch sensor stitched on cotton strap with buckle and placed on the 15 x 15 frame.
* User could take the belt and could wear the fabric stretch sensor made as a form of belt around his waist.
* First he could remain in relaxed position and observe the led attached for visual feedback turned off
* Then he can take a deep breath that would stretch the sensor
* Now he can again visualize the LED attached that would blink brightly depicting change in breath pattern