DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

RISE-MAGAZINE

Recent Innovations In Sophisticated Electronics

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ECE

DEPARTMENT PROFILE

Electronics and Communication Engineering has emerged as the major driving force in the present day Information Technology revolution. It is acting as a bridge between different disciplines of engineering and technology. It has penetrated into other prominent sectors such as health care, instrumentation, agriculture, automation, signal processing, remote sensing etc.., The recent developments such as IoT, Artificial Intelligence and the mercurial advancements in the field of communication.

Vision

To be a focal centre for academic excellence in competing global standards and dynamics in the field of Electronics and Communication Engineering with research and services focusing on effective communication skills, entrepreneurial, ethical and social concern.

Mission

To impart quality technical education in Electronics and Communication Engineering with well established infrastructure, state- of- the art laboratories, core instructions and cognizant faculty.

To prepare the young and dynamic Electronics and Communication Engineers professionally deft and intellectually adept with knowledge, behaviour and information competency.

To enable the learners for changing trends in the field of Electronics and Communication Engineering with a focus on career guidance, placements and higher education by Industry-Institute relationship.

PROGRAM EDUCATIONAL OBJECTIVES

PEO 1. Graduates should be cognizant in basic science, fundamental engineering stream along with core related domains in ECE and Allied fields.

PEO 2. Graduates should understand issues related to design, problem solving, and intellectually adept with knowledge, behavior and information competency.

PEO 3. Graduates should demonstrate their technical, communication, research, aptitudes along with leadership skills in professional environment to empower employability, higher education and entrepreneurs successfully through industry-institute interaction.

PEO 4. Graduate should be motivated with high ethical, human values and team work towards development of the societ.

PROGRAM OUTCOMES

ENGINEERING KNOWLEDGE: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PROBLEM ANALYSIS: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

DESIGN/DEVELOPMENT OF SOLUTIONS: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

MODERN TOOL USAGE: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

THE ENGINEER AND SOCIETY: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

ENVIRONMENT AND SUSTAINABILITY: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

ETHICS: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

INDIVIDUAL AND TEAM WORK: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

COMMUNICATION: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PROJECT MANAGEMENT AND FINANCE: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

LIFE-LONG LEARNING: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO 1. An ability to get an employment in Electronics and Communication Engineering field and related industries and to participate & succeed in competitive examinations like GRE, GATE,TOEFL, PSUs, etc.

PSO 2. Should be able to design and test various electronic systems that perform analog and digital processing functions.

Footwear-Based Wearable Systems

Footwear is an integral part of daily life. Embedding sensors and electronics in footwear for various different applications started more than two decades ago. This review article summarizes the developments in the field of footwear-based wearable sensors and systems. The electronics, sensing technologies, data transmission, and data processing methodologies of such wearable systems are all principally dependent on the target application. Hence, the article describes key application scenarios utilizing footwear-based systems with critical discussion on their merits.

The reviewed application scenarios include gait monitoring, plantar pressure measurement, posture and activity classification, body weight and energy expenditure estimation, biofeedback, navigation, and fall risk applications. In addition, energy harvesting from the footwear is also considered for review. The article also attempts to shed light on some of the most recent developments in the field along with the future work required to advance the field.

Footwear is an irreplaceable part of human life across the globe. While the initial necessity was purely to protect the feet, they have also become a symbol of style and personality. Footwear acts as the interface between the ground and the wearer's foot. Lots of information can be gleaned from observing this interaction. Attempts to capture this information by integrating sensing elements and electronics in the footwear began in the 1990s, both for academic research purposes and in commercial products. In recent times, development of low power, wireless, unobtrusive and socially acceptable wearable computing systems has become an increasingly important research topic.

This trend is aided by the exponential growth in the electronics industry, which is driving rapid advancements in microfabrication processes, wireless communication, and sensor systems. The applications for footwear-based systems range from simple step counting solutions to more advanced systems intended for use in rehabilitation programs for disabled subjects. Footwear-based systems available on the market or in research laboratories today vary in their sensor modalities and data acquisition methodologies in order to meet different application requirements.

Plantar Pressure Measurement

Plantar pressure is the pressure distribution between the foot and the support surface during everyday locomotion activities. Foot plantar pressure measurement applications focus on measuring of a plantar pressure map during one stance phase (heel strike to heel off) of a healthy individual The foot and ankle provide the support and flexibility for weight bearing and weight shifting activities such as standing and walking. During such functional activities, plantar pressure measurement provides an indication of foot and ankle functions. Plantar pressure measurement has been recognized as an important area in the assessment of patients with diabetes. The information derived from plantar pressure measurement can also assist in identification and treatments of the impairments associated with various musculoskeletal and neurological disorders.

Hence, plantar pressure measurement is important in the area of biomedical research for gait and posture analysis, sport biomechanics, footwear and shoe insert design, and improving balance in the elderly, among other applications. For all the above applications, there are solutions that utilize non-wearable systems, such as force plates and force mapping systems, but footwear is an ideal location for such measurements. Footwear-based platforms also offer much higher portability and can potentially enable monitoring outside of the laboratory, in uncontrolled, free living applications. Almost all the footwear-based applications reviewed in this work have some form of plantar pressure sensing elements built in to them; however, in this section we place an emphasis on the footwear systems that deal explicitly with plantar pressure measurement.

In this work we reviewed footwear-based wearable systems based on their target application. Existing footwear-based solutions from academic research as well as commercial ones in the areas of gait monitoring, plantar pressure measurement, posture and activity classification, body weight and energy expenditure estimation, biofeedback, fall risk applications, navigation, along with footwear-based energy harvesting solutions were detailed. **-----P Meghana- 18BF1A04G5**

Flexible Electronic Skin

Electronics plays a very important role in developing simple devices used for any purpose. In every field electronic equipments are required. The best achievement as well as future example of integrated electronics in medical field is Artificial Skin. It is ultrathin electronics device attaches to the skin like a sick on tattoo which can measure electrical activity of heart, brain waves & other vital signals.

Artificial skin is skin grown in a laboratory. It can be used as skin replacement for people who have suffered skin trauma, such as severe burns or skin diseases, or robotic applications.

This paper focuses on the Artificial skin(E-Skin) to build a skin work similar to that of the human skin and also it is embedded with several sensations or the sense of touch acting on the skin. This skin is already being stitched together. It consists of millions of embedded electronic measuring devices: thermostats, pressure gauges, pollution detectors, cameras, microphones, glucose sensors, EKGs, electronic holographs. This device would enhance the new technology which is emerging and would greatly increase the usefulness of robotic probes in areas where the human cannot venture.

The sensor could pave the way for a overabundance of new applications that can wirelessly monitor the vitals and body movements of a patient sending information directly to a computer that can log and store data to better assist in future decisions. This paper offers an insight view of the internal structure, fabrication process and different manufacturing processes.

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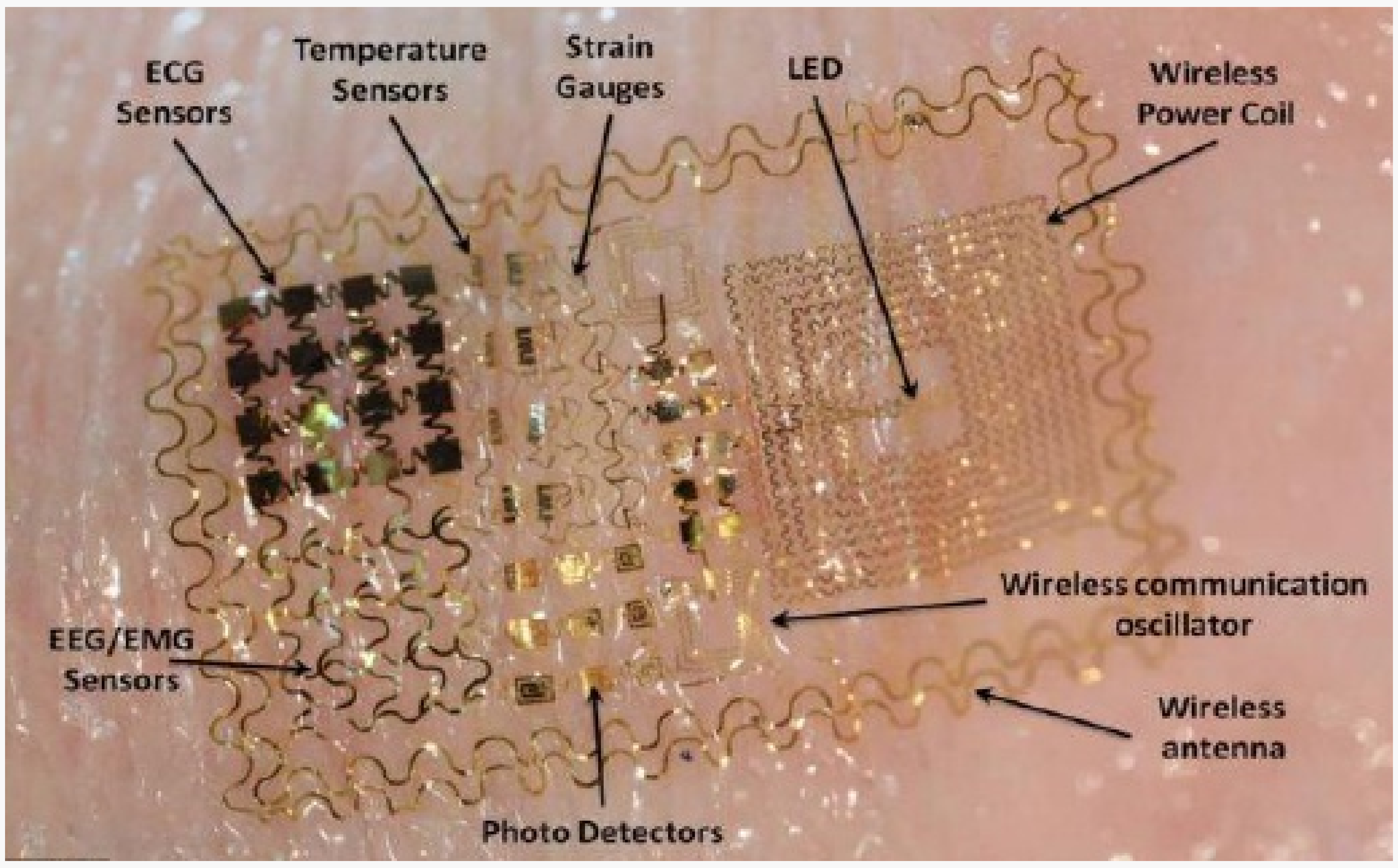
Goal is to develop sensors on flexible substrates that are compliant to curved surfaces. Researcher's objective is for making an artificial skin is to make a revolutionary change in robotics, in medical field, in flexible electronics. Skin is large organ in human body so artificial skin replaces it according to our need. Main objective of artificial skin is to sense heat, pressure, touch, airflow and whatever which human skin sense. It is replacement for prosthetic limbs and robotic arms. Artificial skin is skin grown in a laboratory.

In the anti spoofing techniques, the sensor level presents a higher fake detection rate, whilst feature level techniques are less expensive, less intrusive and more user friendly, since their implementation is hidden from the user. The score level protection technique presents a much lower performance when compared to the sensor level and feature level protection measures. Hence, they are designed only as a support to the sensor level and feature level techniques.



Biostamp use high-performance silicon, can stretch up to 200 per cent and can monitor temperature, hydration and strain, among other medical statistics. Javey's study claims that while building sensors into networks isn't new, interactive displays; being able to recognize touch and pressure and have the flexible circuit respond to it is 'breakthrough'. His team is now working on a sample that could also register and respond to changes in temperature and light to make the skin even more lifelike.

Large-area ultrasonic sensor arrays that could keep both robots and humans out of trouble. An ultrasonic skin covering an entire robot body could work as a 360-degree proximity sensor, measuring the distance between the robot and external obstacles. This could prevent the robot from crashing into walls or allow it to handle our soft, fragile human bodies with more care. For humans, it could provide prosthetics or garments that are hyperaware of their surroundings.

By Organic Light Emitting Diode

Javey and colleagues set out to make the electronic skin respond optically. The researchers combined a conductive, pressure-sensitive rubber material, organic light emitting diodes (OLEDs), and thin-film transistors made of semiconductor-enriched carbon nanotubes to build an array of pressure sensing, light-emitting pixels. Whereas a system with this kind of function is relatively simple to fabricate on a silicon surface, for plastics, this is one of the more complex systems that has ever been demonstrated, says Javey.

The diversity of materials and components that the researchers combined to make the light-emitting pressure-sensor array is impressive, says John Rogers, a professor of materials science at the University of Illinois at Urbana-Champaign. Rogers, whose group has produced its own impressive flexible electronic sensors (see Electronic Sensors Printed Directly on the Skin), says the result illustrates how research in nanomaterials is transitioning from the fundamental study of components and simple devices to the development of sophisticated, macroscale demonstrator devices, with unique function. In this artist's illustration of the University of California, Berkeley's interactive e-skin, the brightness of the light directly corresponds to how hard the surface is pressed. Semiconducting material and transistors are fitted to flexible silicon to mimic pressure on human skin.

The electronics devices gain more demand when they are compact in size and best at functioning. The Artificial Skin is one such device which depicts the beauty of electronics and its use in daily life. Scientists create artificial skin that emulates human touch. According to experts, the artificial skin is "smarter and similar to human skin." It also offers greater sensitivity and resolution than current commercially available techniques. Bendable sensors and displays have made the tech rounds before. We can predict a patient of an oncoming heart attack hours in advance. In future even virtual screens may be placed on device for knowing our body functions. Used in car dashboard, interactive wallpapers, smart watches.**-----R Sireesha- 19BF5A0416**

Face Liveness Detection

Face spoofing is considered to be one of the prominent threats to face recognition systems. However, in order to improve the security measures of such biometric systems against deliberate spoof attacks, liveness detection has received significant recent attention from researchers. For this purpose, analysis of facial skin texture properties becomes more popular because of its limited resource requirement and lower processing cost.

he traditional method of skin analysis for liveness detection was to use Local Binary Pattern (LBP) and its variants. LBP descriptors are effective, but they may exhibit certain limitations in near uniform patterns. Thus, in this paper, we demonstrate the effectiveness of Local Ternary Pattern (LTP) as an alternative to LBP.

In addition, we adopted Dynamic Local Ternary Pattern (DLTP), which eliminates the manual threshold setting in LTP by using Weber's law. The proposed method was tested rigorously on four facial spoof databases: three are public domain databases and the other is the Universiti Putra Malaysia (UPM) face spoof database, which was compiled through this study. The results obtained from the proposed DLTP texture descriptor attained optimum accuracy and clearly outperformed the reported LBP and LTP texture descriptors.

Spoofing attacks upon face recognition systems involve presenting artificial facial replicas of authorized users to falsely infer their presence in order to bypass the biometric security measures. Such attacks can be carried out easily by means of printed photographs or digital images displayed on tablet, smart phones, etc. In order to distinguish real face features from fake faces, face liveness detection is a commonly used countermeasure approach. It is aimed at detecting physiological life signs in an identity. Face liveness detection algorithms can be classified into two methods: intrusive and non-intrusive. In intrusive methods, the involvement of the user is required to exhibit certain response to the system such as rotating head, performing few actions or mouth movement by uttering some words according to the system's instructions. While in non-intrusive methods, the system does not require any user involvement nor are users required to give any performance in any manner for liveness detection.

-----M Sahithi- 18BF1A04D4