
ISSN: 2321-2152
IJMECE
International Journal of modern electronics and communication engineering
E-Mail
editor.ijmece@gmail.com
editor@ijmece.com
www.ijmece.com

ISSN 2321-2152
www.ijmece.com
Vol 11, Issue 3, 2023

PROVIDING THE SMART CLOTHES FOR SECURITY FORCES BY ADOPTING THE IOT TECHNOLOGY

Dr.Nagulapalli Lingareddy,
Associate professor ,
Department of CSE,
Vignan Institute of Technology and Science, Deshmukhi, yadadri bhuvanagiri, Telangana, 508284, India,
nagulapalli.lingareddy@gmail.com

Dr. Sheri Deepika,
Assistant Professor,
Department of CSE,
Sreyas Institute of Engineering and Technology, Tattiannaram, Nagole, Hyderabad, Telangana, India,
deepikareddynlr@gmail.com

ABSTRACT:

Smart clothing and body sensors for military use may not sell the same way smartphones do, but it's still a growing market. Tractica forecasts that overall shipments of smart clothing will rise from 968,000 units in 2015 to 24.75 million units in 2021, a compound annual growth rate of nearly 72 percent. Smart clothing has become a key component in the creation of new military uniforms, designed to improve the health of the soldier while providing added battlefield insight. Smart militaryclothing is expected to be a $500 million market by next year. The military has partnered with industry leaders, other government agencies, and academia to support and advance the development of potential smart clothing solutions that would be beneficial to the U.S. military by giving them a technological and tactical advantage over its foes," write the students of the University of California Berkley's Sutardja Center in their analysis of the smart clothing market. Agent Detection is also known as environmental sensors, these sensors are designed to detect and avert dangers by measuring things such as radiation, chemicals, viruses, bacteria, fungi, humidity, temperature and atmospheric pressure. When working with smart clothing and body sensors, the challenge is to create a garment that can be treated like other clothing, being comfortable, flexible and washable. At the same time, many wearable systems are meant to be worn during rugged activity. Soldiers in the field need wearable clothing that can withstand a wide range of temperatures. This clothing also needs to provide effective shock and vibration resistance, as well as resistance to chemicals or solvents that might otherwise destroy a commercial device.

Keywords: Block Chain, IOT,Smart Cloths, Sensors , Security,Wireless Sensor Networks,

1. INTRODUCTION

1.1 Background

"Internet of Things (IOT) is a new and evolving technology which consists of "things" that canbe embedded with sensors, programs or other technologies for the purpose of contacting and exchanging data with other devices and systems over the Internet. Things have evolved due to the convergence of multiple technologies, real-time analytics, machine learning, ubiquitous computing, commodity sensors, and embedded systems. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and buildingautomation), and others all contribute to enabling the Internet of things. In the

ISSN 2321-2152
www.ijmece.com
Vol 11, Issue 3, 2023

consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", including devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smartphones and smart speakers."

Fig 1. Internet of Things

"A Block-chain is a distributed and decentralized digital ledger which is most often made public. It is used to keep track transactions that happen across many computers. Since the Block-chainis expanded in such a manner any record that is considered part of the network cannot be altered, without making those alterations to all subsequent blocks. Block-chain security methods make use of public key cryptic techniques. A public key is a string of random letters and numbers and acts as an address for the nodes on the block-chain. Value tokens sent acrossthe network are recorded as belonging to that address. A private key is acts as a counterpart to a corresponding public key and is used by the owner to access his/her confidential data. RSA is extensively used in the block chain to create a wallet for each user."

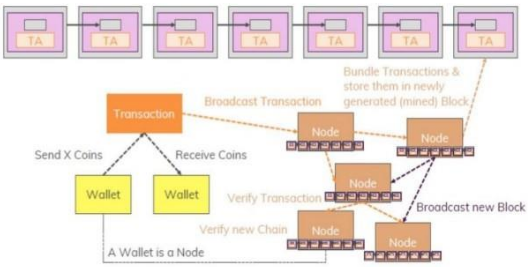


Fig 2. Blockchain Architecture

"As Internet of Things applications are by definition distributed it's only normal that the distributed ledger technology, which blockchain is, will play a role in how devices will communicate directly between each other (keeping a ledger and thus trail of not just devices but also how they interact and, potentially, in which state they are and how they are 'handled'in the case of tagged goods). Blockchain is designed as a basis for applications that involve transaction and interactions. These can include smart contracts (smart contracts are automatically carried out when a specific condition is met, for instance regarding the conditions of goods or environmental conditions) or other smart applications that support specific

Internetof Things processes. This way blockchain technology can improve not just compliance in the IoT but also IoT features and cost-efficiency".

1.2 Problem Definition

"To create a powered armor which can be used by the soldiers in the combact. By using latest smart technology along with Internet of Things(IOT) and Blockchain. IoT-blockchain applications have advantages of managing massive IoT devices, achieving advanced data security, and data credibility. However, there are still some challenges when deploying IoT applications on blockchain systems due to limited storage, power, and computing capability of IoT devices. Applying current consensus protocols to IoT applications may be vulnerable to Sybil node attacks or suffer from high computational cost and low scalability. IoT cannot be fully trusted outside of data owner 's sphere due to inability to verify that data is not manipulated before being sent, sold or used by third parties for their own benefits. For example, autonomous car start-ups and ride sharing giants such as Uber or Ola have no solution to share trusted mapping or ride data. Instead, they gather and store similar datasets independently in their servers. Listed below are some of the problems faced by the current consensus algorithms for blockchain based IOT.

1.2.1 Data integrity/ownership issues

1.2.2 Highly centralized architectures

1.2.3 Vulnerable to a variety of cyber-attacks

1.2.4 Single point of failure

1.2.5 Unattended environments"

1.3 Objectives

1. To Analyse the powered Armor used in the combact.

2. To integrate following Smart Technology and IOT for better monitoring the condition of a person.

a. Temperature Sensor.

b .Heart Rate Sensor.

c. Pir Sensor.

d. Google Geo Location.

e. Flocking.

f. NodeMCU

3. To use the Antares (IOT Platform) which assists the confaltion of data from sensors and actuators and performs data analytics on a collected data.

2. LITERATURE REVIEW

Paper [1] Smart Clothing Design Issues in Military Applications

"This technology allows military rehabilitation specialists to track patient performance by defining specific protocols based on algorithms and an end-user interface tailored to the user's demands. Body-worn health monitoring systems track an individual's physical state and performance bymeasuring physiological signals in real time. By combining data from known human monitoring technologies with environmental and performance data, the system delivers precise live feedback from military rehabilitation training, tracks their well-being, and tracks changes in ability over time.

2.2 Concept:

The Thought The identification of measurement parameter requirements is the first stepin designing smart clothing. Our first requirement is to figure out where sensors should be placed on the body and whether they are wearable. According to, we should consider areas that are relatively the same size among people,areas that are larger as surface areas, and finally areas with modest motions while positioning sensors."

Fig 3. The smart System diagram

Paper [2] Smart Clothing Design Issues in Military Applications

"A thermal imaging approach can be used to measure the thermophysiological state. An inertial motion capture device can be used to measure range of motion. Nowadays, Digital Human Modeling (DHM) offers novel ways to combine physiological, kinematic, and kinetic data to create a data representation of a virtual soldier wearing a smart cloth while performinga motor task (Fig. 11). The purpose is to identify and quantify the most important key aspects influencing performance in terms of effort and job completion, as well as to assess the impact of equipment design on this performance."

"iterative studies on the co-design workflow permitted us to redefine the finalfunctional garment realising a third prototype, a vest that can be used for monitoringsoldier 's performance in terms of training, injuries, and psychological status moni-toring inside and outside the water. This concept aims to reduce the number of patterns and, as a result, the number of fabric joins, allowing for greater comfort and flexibility. The vest is a loose- fitting, breathable clothing that allows you to move freely."

ISSN 2321-2152
www.ijmece.com
Vol 11, Issue 3, 2023

Fig 4. The first prototype-front

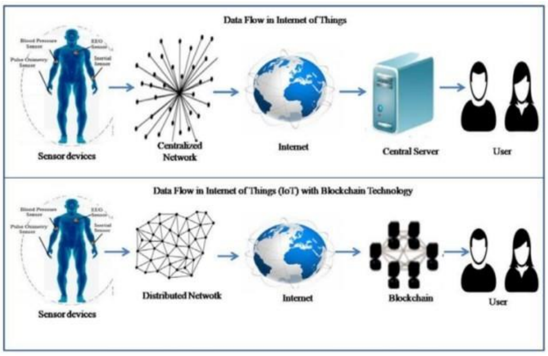
Paper [3] Smart Army Jacket "This project entails designing, fabricating, and testing a smart and intelligent soldier jacket with integrated interconnects, antennas, sensors for monitoring both the soldier's physiological features and the environment around him, as well as signal processing and communication equipment.

In the beginning, textile-based flexible circuit boards and multi-chip modules will be developed. Following that, different types of radio frequency and microwave antennas will be modelled, fabricated, and tested on textile-based and polymeric substrates.

Finally, sensors of various types will be developed and integrated into textiles. Soldiers will benefit from features such as a signal processing chip, a chemical sensor, and a communication chip, which will aid mobility, threat detection, and communication. Combat warriors of the future will be outfitted in high-tech clothing with everything from navigation and water purification systems to climate management. It will take more than a decade for super suits to make combat forces stronger and smarter."

"Paper [4]: Blockchain technology using consensus mechanism for IoT-based ehealthcare system says that in an e-Healthcare system is enhanced day to day patient's activity and also used to connect the devices through sensors. IoT devices have uniquely identified programmability feature. According to Ihsmarkit the number of connected IoT devices would grow to 125 billion in 2030. In healthcare IoT devices enable real time monitoring of patients biometric records to their Doctors. Most of the existing devices in IoT network are authenticated through servers. These centralized servers should have high infrastructure and maintenance cost and server failure also affects all the devices in the IoT system. So an efficientcentralized server is needed to ensure reliable service. Another major issue of existing centralized communication IoT model is the risks of hacking and information theft. The proposed blockchain methods have protected patient information exchange in hospital networks".

Fig 6. Blockchain in health care sensors



"Blockchain can resolve the issue of IoT by providing distributed computation processing and storage for IoT data. The data collected by the sensor devices transmitted by the centralized network and transmitted to the central server through the internet. From the centralized server,"

"analytics proceeded according to the user prerequisites and convenience. At the same time the blockchain have transmitted the data in the faster way through distributed network, this processflow is shown in Fig 6. IoT with blockchain will reduce the risks of hacking, cost of installing network and cost of server maintenance. So IoT integrated with blockchain technology has given decentralized healthcare system. This paper is discussed various consensus algorithm used in blockchain network and its integration with the IoT based healthcare system".

"Paper [5] Smart Army Jacket Using IOT and CMD Internet of Things talks about the caseof service-oriented Internet of things (IoT) deployment in which it is difficult to make consensus decisions for services at different IoT edge nodes where available information might be insufficient or overloaded. Existing statistical methods attempt to resolve the inconsistency, which requires adequate information to make decisions. Distributed consensus decision making (CDM) methods can provide an efficient and reliable means of synthesizing information by using a wider range of information than existing statistical methods. This first discusses service composition for the IoT by minimizing the multiparameter dependent matching value. Subsequently, a cluster-based distributed algorithm is proposed, whereby consensuses are first calculated locally and subsequently combined in an iterative fashion to reach global consensus. The distributed consensus method improves the robustness and trustiness of the decision process. This paper also presents a distributed CDM method forservice detection, classification, composition, and data processingfor the IoT. The proposed algorithm aims to improve the trustiness and efficiency of distributedaverage CDM. It first proposes a three-layer service provisioning framework for service- oriented IoT deployments, which is able to represent, discover, detect, and compose services at edge nodes. The proposed CDM method for service composition enables services to make decisions based on application layer requirements. Subsequently, a distributed consensus algorithm is proposed to provide robust decision results when multiple services are involved to reach a global consensus. Simulation results show the proposed method's effectiveness and performance. As part of future research, the aim is to develop more comprehensive services covering all phases of the service lifecycle".

3. METHODOLOGY

3.1 Technologies used

3.1.1 Heart Rate Sensor.

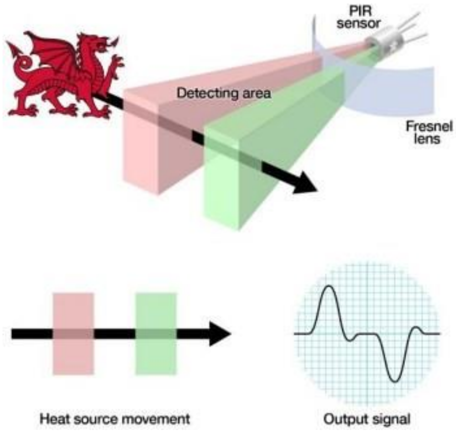
An optical heart rate sensor measures pulse waves, which are changes in the volume of a blood vessel that occur when the heart pumps blood. Pulse waves are detected by measuring the change in volume using an optical sensor and green LED. Adopting an optical filter optimized for pulse wave detection in the sensor block minimizes the effects of ambient light such as red and infrared rays. This enables high quality pulse signals to be acquired, even outdoors. In addition, leveraging optical sensor technology cultivated over many years allowed ROHM to significantly increase the sensitivity of the sensor block. Support for low brightness low VF LEDs makes it possible to achieve a low power optical heart rate monitoring system without the need for external circuitry(i.e. boost circuit). This contributes to longer operating times in wearables with limited battery capacity. Wearable Heart Rate Sensor.

3.1.2 Temparature Sensor

A temperature sensor is an electronic device that measures the temperatureof its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. There are many different types of temperature sensors. Some temperature sensors require direct contact with the physical object that is being monitored (contact temperature sensors), while others indirectly measure the temperature of an object (non-contact temperature sensors). Non-contact temperature sensors are usually infrared (IR) sensors. They remotelydetect the IR energy emitted by an object and send a signal to a calibrated electronic circuit that determines the object's te Temperature sensors are vital to everyday life. These important pieces of technology measure the amount of heat an object or system is giving off. The measurements given allow us to physically sense a change in temperature. One important role of temperature sensors is prevention. Temperature sensors detect when a set high point occurs which allows time for preventative action.A good example is seen in fire detectors.

3.1.3 PIR Sensor

The PIR sensor itself has two slots in it, each slot is made of a special material that is sensitive to IR. The lens used here is not really doing much and so we see that the two slots can 'see' out past some distance (basically the sensitivity of the sensor). When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls or outdoors. When a warm body like a human or animal passes by, it first intercepts one half of the PIR sensor, which causes a positive differential change between the two halves. When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a negative differential change. These change pulses are what is detected.



3.1.4 GOOGLE GEO LOCATION

The Geolocation API returns a location and accuracy radius based on information about cell towers and WiFi nodes that the mobile client can detect. This document describes the protocolused to send this data to the server and to return a response to the client. Communication is done over HTTPS using POST. Both request and response are formatted asJSON, and the content type of both is application/json.

```
{
"homeMobileCountryCode": 310,
"homeMobileNetworkCode": 410,"radioType": "gsm",
"carrier": "Vodafone","considerIp": true, "cellTowers": [
// See the Cell Tower Objects section below.
],
"wifiAccessPoints": [
// See the WiFi Access Point Objects section below.
]
}
```

3.1.5 NODEMCU

NodeMCU is an open source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit).[8]

The term "NodeMCU" strictly speaking refers to the firmware rather than the associated development kits.[citation needed]

Both the firmware and prototyping board designs are open source.[8]

The firmware uses the Lua scripting language. The firmware is based on the eLua project,and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects,such as lua-cjson[9] and SPIFFS. [10] Due to resource constraints, users need to select the modules relevant for their project and build a firmware tailored to their needs.

Supportfor the 32-bit ESP32 has also been implemented.

There are two available versions of NodeMCU as version 0.9 & 1.0 where the version 0.9 contains ESP-12 and version 1.0 contains ESP-12E where E stands for "Enhanced".[11]

3.2 Working Principles

1. The Optical heart rate sensor and the MAX30205 sensor, respectively, sense vitals such as heart rate in BPM and body temperature.

2. A PIR sensor is used to detect human movements surrounding the person wearing smart cloth as an extra feature.

3. The information collected from the above-mentioned sensors, integrated in clothing,is then forwarded to the AZURE cloud, where it is tracked using NodeMCU and Google Geolocation.

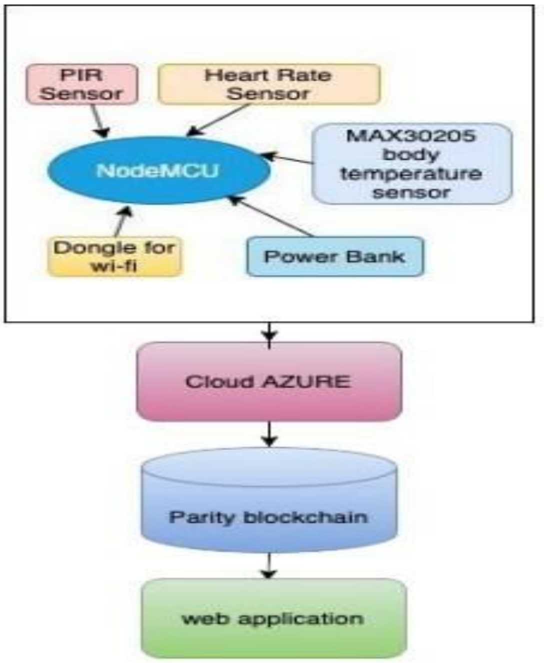
4. On the AZURE cloud, the Antares IOT platform integrates location coordinates, heart rate BPM, and body temperature measurements (in Fahrenheit).

5. The data from the cloud is subsequently hashed and stored on the Parity blockchain, which serves as a database.

6. The position and vitals of security staff are saved in Parity and analysed to determine each security personnel's status.

7. These details are made available to monitoring centres using a centralisedweb application that is linked to the database.

8. The online app allows the authorities to easily monitor the data. On the web app, data is updated on a regular basis. It also allows them to respond to casualties more quickly.



4. CONCLUSION

Wearable advances are currently infesting numerous applications in a few fields. The point of this paper is to abridge the genuine savvy attire in the military field where conditions could be basic for wellbeing and security, and diagram the advancement pattern for inventive administrations to security forces and warriors. Also Smart clothes that exist today are expensive because of the use of conductive yarns for providing interwoven circuitry. We believe that our idea of creating smart clothes can be cost efficient and provide precise information about the location and psycho- physiological details of the wearer without compromising security and privacy.

5. REFERENCES

[1] Perego, P., Moltani, A., Andreoni, G.: Sport monitoring with smart wearable system. Stud. Health Technol. Inf. 177, 224–228 (2012)

[2] Sahin, O., Kayacan, O., Bulgun, E.Y.: Smart textile for the soldiers of thefuture. Defence Sci. J. 55, 195–205 (2005)

[3] Bonato, P.: Advances in wearable technology and applications in physical medicine and rehabilitation. J. Neuroeng. Rehabil. 2(1), 2 (2005)

[4] Scataglini, S., Andreoni, G., Gallant, J.: A review of smart clothing inmilitary. In: Proceeding WearSys@MobiSys 2015, pp. 53–54 (2015)

[5] Gilsoo, C.: Smart Clothing: Technology and Applications. CRC Press, BocaRaton (2009)

[6] Tharion, W.J., Buller, M.J., Karis, A.J., Muller, S.P.: Acceptability of a wearable vital sign detection system. In: Proceedings of the Human Factors and Ergonomics Society (2007)

[7] Andreoni, G., Standoli, C.M., Perego, P.: Sensorized garment for monitoring.biomedical Design issues. In: International Conference ofSensors and Applications (2015)

[8] Gemperle, F., Kasaback, C., Stivoric, J., Bauer, M., Martin, R.: Design for wearability. In: Proceedings of the 2nd IEEE International Symposium on Wearable Computers (1988)

[9] Tao, X., Koncar, V., Huang, T.-H, Shen, C.L., Ko, Y.C., Jou, G.T.: How to make reliable, washable, and wearable textronic devices. In: Chung, H.-J., Kim,

[10] T. (eds.) Sensors, Basel, Switzerland (2017)

[11] Scataglini, S., Truyen, E., Perego, P., Gallant, J., Tiggelen, D.V., Andreoni, G.:Smart clothing for heart rate variability measures in military. HBIM J. 1, 74 (2017)

[12] Scataglini, S., Truyen, E., Perego, P., Gallant, J., Tiggelen, D.V., Andreoni, G.: Smart clothing for human performance evaluation: biomechanics and design concepts evolution. In: 5th International Digital Human Modeling Symposium, Germany, Bonn(2017)

[13] Scataglini, S., Andreoni, G., Truyen, E., Warnimont, L., Gallant, J., Tiggelen, D.V.: Design of smart clothing for Belgian soldiers through a preliminary anthropometric approach. In: Proceedings 4th DHM Digital Human Modeling, Montréal, Québec, Canada, 15–17 June (2016)

ISSN 2321-2152
www.ijmece.com
Vol 11, Issue 3, 2023

[14] Drillis, R., Contini, R.: Body Segment Parameters, Report 1166-03. Office of Vocational Rehabilitation, New York (1966)

[15] Scataglini, S.: Ergonomics of gesture: effect of body posture and load on human performance, Joint Ph.D. Politecnico di Milano and Belgium Royal Military Academy (2017). (https://www.politesi.polimi.it/handle/

[16] Smith, C.J., Havenith, G.: Body mapping of sweating patterns in male athletes in mild exercise-induced hyperthermia. Eur. J. Appl. Physiol.

[17] 111(7), 1391–1404 (2011)

[18] Xiang, Xing Zhao. Smart textiles(3):Very smart.Textile Asia, August 2001,35-37.

[19] Kirstein, T.; Bonan, J.; Cotter, D. & roster,G. Electronic textiles for wearable computer systems. Canadian Textile J., July/August 2002,29-31.

[20] Biberdorf, Curt. Active fabric. The Warrior,Jan-Feb 2002, 10-1 1.

[21] Andrews, A. Michael. Smaller, smarter and lighter systems. In Nanoscience forthe Soldier Workshop, 08-09 February 2001, Army Research Office.

[22] Wakefield, J. US looks to create robo-soldier.http://news.bbc.co.uWl/hi/sci/1908729.stm