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Original Article

Smart Clothes for Security Forces by Adopting the IoT Technology

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Abstract: *Smart clothing and body sensors for military use may not sell the same way smart phones 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 24.75millionunitsin 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 battle field in sight. Smart military clothing is expected to be a $500 million market by next year. The military has partnered with industry leaders, other government agencies, and academy to support and advance the development to f 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 Berkley's Sutardja Center in their analysis of the smart clothing market. Agent Detection is also knownas environmentalsensors, thesesensors aredesigned 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 wondering rugged activity. Soldiers in the field need wearableclothing 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.*

INTRODUCTION

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 consumer market, IoT technology is most synonymous with products pertaining to the conceptofthe"smarthome",includingdevicesandappliances(suchaslightingfixtures,thermostats, home security systems and cameras, and other home appliances) that supportone or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smartphones and smart speakers."

Figure 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 securitymethods 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 belongingto that address. A private keyis acts as a counterpart toa 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 eachuser."

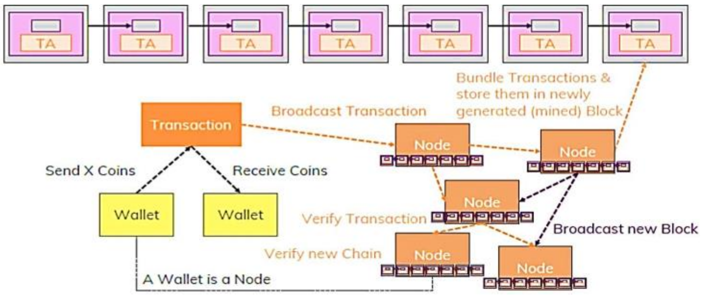


Figure 2: Blockcha in Architecture

"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 conditionsof 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".

ProblemDefinition

"To create powered armorwhichcanbeused bythesoldiersinthe compact. Byusinglatest 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

Data integrity/ownership issues
Highly centralized architectures
Vulnerable to a variety of cyber-attacks
Single point of failure
Un attended environments"

Objectives

1. Analyse the powered Armor used in the compact.
2. Tointegratefollowing Smart TechnologyandIOTforbetter monitor ringthe condition of a person.
   a) TemperatureSensor.
   b) HeartRateSensor.

c) C. PirSensor.
d) D. GoogleGeoLocation.
e) E.Flocking.
f) F.NodeMCU

3. TousetheAntares(IOTPlatform)this assists the conflation of data from sensors and actuators and performs data analytics on a collected data.

LITERATUREREVIEW

Paper[1]

"This technology allows military rehabilitation specialists to track patient performance by defining specific protocols based on algorithms and an end-user interface tailored to theuser's demands. Body-worn health monitoring systems track an individual's physical stateand 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.

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 andwhether 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."

Figure 3: The Smart System Diagram

Paper [2] Smart Clothing Design Issues in Military Applications

The thermo physiological condition can be measured using a thermal imaging technique. Range of motion can be measured with an inertial motion capture device. Currently, Digital Human Modeling (DHM) provides new methods for combining kinematic, kinetic, and physiological data to generate a data representation of a virtual soldier using a smart cloth during a motor activity (Fig. 11). The objective is to ascertain the impact of equipment design on performance as well as to identify and quantify the most significant critical factors influencing performance in terms of effort and work completion.We were able to redesign the final functional garment through iterative research on the co-design approach, resulting in a third prototype—a vest that can be used to track a soldier's performance both inside and outside of the water in terms of training, injuries, and psychological status. This idea tries to decrease the quantity of designs and, consequently, the quantity of fabric joins, enabling more

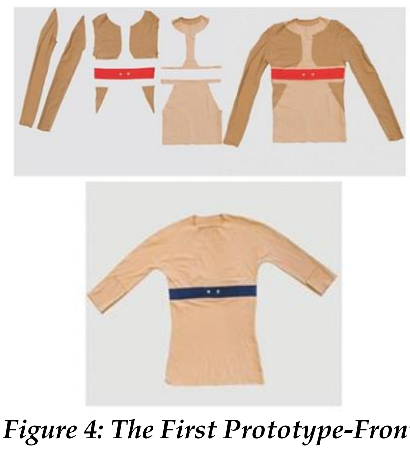


Figure 4: The First Prototype-Front

Paper [3] Smart Army Jacket

In order to complete this project, a smart and intelligent soldier jacket with integrated interconnects, antennas, sensors to track the soldier's physiological characteristics and his surroundings, signal processing, and communication equipment must be designed, fabricated, and tested.

Initially, flexible circuit boards based on textiles and multi-chip modules will be created. After that, several microwave and radio frequency antenna designs will be modeled, made, and tested on polymeric and textile substrates. Ultimately, several kinds of sensors will be created and incorporated into fabrics. Features that help with mobility, threat detection, and communication—like a chemical sensor, a communication chip, and a signal processing chip—will be beneficial to soldiers.

Future combatants will be dressed in cutting-edge gear that includes climate control, water purification, and navigation devices. It will take over ten years for combat forces to become more intelligent and powerful thanks to super suits.

Paper [4]: Blockchain technology using consensus mechanism for IoT-based e- healthcaresystem

According to this, an e-Healthcare system uses sensors to link the devices and improves the daily activities of the patients. A aspect that makes IoT devices distinctive is their programmability. By 2030, there will be 125 billion connected IoT devices, predicts Ihsmarkit. IoT devices in the healthcare industry allow doctors to check biometric records of patients in real time. The majority of devices now connected to IoT networks authenticate via servers. All of the devices in the Internet of Things system are impacted by server failure; hence these centralized servers should have expensive infrastructure and maintenance costs. Thus, to provide dependable service, an effective centralized server is required. The dangers of hacking and identity theft are a significant problem with the current centralized communication IoT infrastructure. The exchange of patient data inside hospital networks has been safeguarded by the suggested blockchain techniques.

"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 block chain have transmitted the data in the faster way through distributed network, this process flow 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".

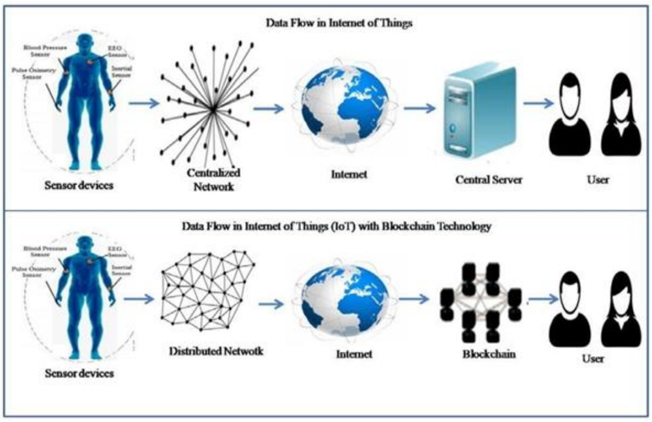


Figure 6: Block Chain In Health Care Sensors

Paper[5] Smart Army Jacket Using IOTandCMD

Internet of Things discusses the situation of service-oriented Internet of Things (IoT) deployment, where it is challenging to reach consensus on services at various IoT edge nodes where the information that is provided may be inadequate or overwhelming.Current statistical techniques aim to address the discrepancy, necessitating sufficient data to facilitate decision-making.Compared to current statistical methodologies, distributed consensus decisionmaking (CDM) methods can offer an effective and dependable way to synthesize knowledge by utilizing a larger variety of data.First, by minimizing the multi-parameter dependent matching value, this discusses service composition for the Internet of Things.A cluster-based distributed algorithm is then suggested, in which local consensus is first determined and then integrated in an iterative manner to establish a global consensus.

The distributed consensus method strengthens and increases the reliability of the decision-making process. In addition, a distributed CDM approach for IoT service detection, categorization, composition, and data processing is presented in this study. The suggested algorithm seeks to increase distributed average CDM's efficiency and trustworthiness. For service-oriented Internet of Things deployments, it first suggests a three-layer service provisioning framework that can represent, find, detect, and compose services at edge nodes. Services can decide what to perform depending on application layer requirements thanks to the suggested CDM approach for service composition. In order to achieve global consensus when numerous services are involved, a distributed consensus method is subsequently presented to produce robust decision results. Simulation findings demonstrate the performance and efficacy of the suggested method. The aim is to produce more complete services that encompass all stages of the service lifecycle as part of future research.

METHODOLOGY

Technologies used Heart Rate Sensor

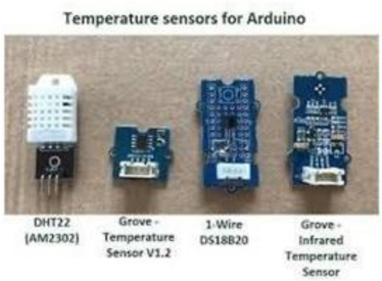
Pulse waves are variations in blood vessel volume brought on by the heart's blood pumping action, and they are measured using an optical heart rate sensor. An optical sensor and a green LED are used to measure the change in volume in order to identify pulse waves. Using an optical filter in the sensor block that is tuned for pulse wave detection reduces the impact of ambient light, including red and infrared rays. This makes it possible to obtain excellent pulse signals even outside. Additionally, ROHM was able to greatly enhance the sensitivity of the sensor block by utilizing optical sensor technology that has been developed over a long period of time. Assistance with low luminosity without the need for additional circuitry, a low power optical heart rate monitoring system can be achieved with low VF LEDs (i.e. boost circuit). Longer operational times in wearable's with small battery capacities are a result of this.

Wearable Heart Rate Sensor

Temperature Sensor

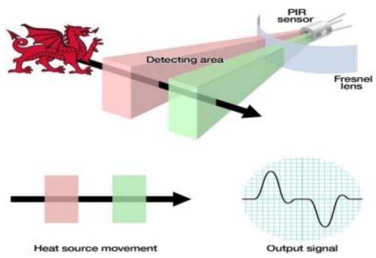
A temperature sensor is an electronic device that records, monitors, or signals temperature changes by measuring the ambient temperature and converting the input data into electronic data. Temperature sensors come in a variety of forms. While some temperature sensors measure an object's temperature directly (contact temperature sensors), others measure an object's temperature indirectly (non-contact temperature sensors).

Infrared (IR) sensors are typically used as non-contact temperature sensors. They use remote infrared radiation detection to identify an object's temperature by sending a signal to an electrical circuit that has been calibrated. In daily life, temperature sensors are essential. These crucial technological instruments gauge the quantity of heat emitted by a system or an object. We are able to physically detect a change in temperature thanks to the provided measurements. Preventive functions are one of temperature sensors' key functions. Temperature sensors provide early warning at a predetermined high point, enabling prompt corrective action. Fire detectors are a prime example.



PIR Sensor

The PIR sensor comprises two slots, each composed of a unique infrared-sensitive substance. The two slots can "see" out over a certain distance because the lens being used here isn't really accomplishing anything. This distance is essentially the sensor's sensitivity. Both slots detect the same quantity of infrared radiation from the room, walls, or outdoors while the sensor is not in use.A positive differential change occurs between the two halves of the PIR sensor when a warm body, such as a human or animal, passes by and first intercepts one side of the sensor. The opposite occurs when the heated body exits the sensing region, in which case the sensor produces a negative differential change. What is detected are these change pulses.



GOOGLE GEOLOCATION

The position and accuracy radius returned by the Geolocation API are dependent on the mobile client's ability to detect Wi-Fi nodes and cell towers. The protocol used to transmit this data to the server and provide the client with a response is described in this document. POST is used for HTTPS communication. The content type of both the request and the response is application/json, and they are both formatted as JSON.

```
{
"homeMobileCountryCode": 310, "homeMobileNetworkCode": 410,"radioType": "gsm",
"carrier":"Vodafone","considerIp":true,"cellTowers":[
//SeetheCellTowerObjectssectionbelow.
],
"wifiAccessPoints":[
//SeetheWiFiAccessPointObjectssectionbelow.
]
}
```

NODEMCU

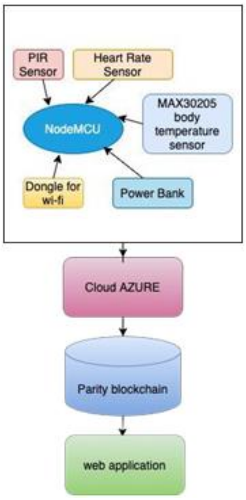
There are open source prototyping board designs available for the NodeMCU firmware. "Node" and "MCU" (micro-controller unit) are combined to form the term "NodeMCU". [8] Strictly speaking, the firmware—rather than the related development kits—is referred to as "NodeMCU". [Reference required] Firmware and prototyping board designs are freely available.[8]

The scripting language Lua is used by the firmware. The firmware was developed using the Espressif Non-OS SDK for ESP8266 and is based on the Lua project. Numerous open source projects are used, including SPIFFS and lua-cjson[9]. [10] Owing to limited resources, customers must choose the modules that are pertinent to their project and create a firmware that meets their requirements. Additionally, support for the 32-bit ESP32 has been included.NodeMCU is available in two versions: 0.9 and 1.0. ESP-12 is included in version 0.9, while ESP-12E—the E standing for "Enhanced"—is included in version 1.0.[11]

Working Principles

1. Vital signs including body temperature and heart rate in beats per minute are sensed by the MAX30205 sensor and the optical heart rate sensor, respectively.
2. As an added feature, a PIR sensor detects movements of people around the wearer of smart clothing.
3. Data gathered from the aforementioned sensors—which are integrated into clothing—is subsequently sent to the AZURE cloud, where Node MCU and Google Geo location are used to track it.
4. The Antares IOT platform integrates geographic coordinates, body temperature (in Fahrenheit), and heart rate BPM on the AzURE cloud.
5. After being hashed, the cloud data is kept on the Parity blockchain, which functions as a database.
6. Each security personnel's position and vitals are saved in Parity and analyzed to ascertain their status.

7. Monitoring centers can get these details using a centralized web application connected to the database.
8. The authorities can readily monitor the data thanks to the internet app. Data in the web app is updated often. They can also react to casualties faster because to it.



CONCLUSION

These days, wearable technology is being used in many different industries and applications. The purpose of this paper is to outline the advancement pattern for creative administrations to security forces and warriors, and to abridge the genuine savvy attire in the military field where conditions could be essential for well-being and security. Furthermore because conductive yarns are used to create interwoven circuitry, today's smart clothing is pricey. We think that our concept for making smart clothing can be implemented at a reasonable cost and offer accurate location and psycho-physiological data about the wearer without sacrificing security and privacy.

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