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RFID Technology: An Upgradation for Society

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Abstract - *The RFID technology is the one which is emerging day by day and also as of its efficiency is increasing the rate of acceptance of the RFID systems are high. The Internet of Things is a collection of capable and intelligent gadgets that are context-aware and connected according to system requirements everywhere around us. Wearable gadgets, metering devices, and environmental sensors are among these devices. As the association of the RFID with these IOT devices makes it more useful and also the implementations of these system in society will also get increased. Chipless RFID, a new innovation in RFID, makes it even easier. The RFID chipless tag can be used to make the purpose of where it can be applied easy while also increasing the system's efficiency. The importance of the IOT devices is also shown in the paper. For the society to meet its needs the RFID based system is needed as it can be the one which will help to overcome the issues prevailing in the existing systems. The efficiency which is considered as the impact factor among society gets increased every time when the upgradation of the RFID tag along with the IOT devices. Also a sample system where RFID can be used is shown in the paper along with a diagram.*

Key Words: **Radio-Frequency Identification, Global Positioning System, Liquid Crystal Display, Global System for Mobile communication, European Telecommunications Standards Institute, Federal Communication Commission, Geographical correlation-based RF-data Collection, Ultra High Frequency, General Packet Radio Service, Near Field Communication**

1. INTRODUCTION

The existence of IoT in conjunction with RFID tags can be investigated, and the implementation system can be applied to a wide range of tasks. Because the Internet of Things is the third great invention in the world of information and communication. It has had a huge impact on humanity. The future depends on RFID plays an important part in the Internet of Things world [1]. The Internet of Things has attracted many researchers due to its rapid advancement, and the implementation of many such IoT-based systems can be made easier by combining other fields of technology. However, the challenges continue to open a new window for research and development of RFID and IoT-based systems and their implementations [12].

As day by day the technology is emerging and this leads to the development of solutions to the existing problems in the field of RFID. The application of IoT is growing across all industries, including health care. For example, a cardiac monitor in an ICU can collect and transmit patient data to clinicians without the need for manual intervention, potentially saving patients' lives with minimal human participation. The goal of these devices is for them to be able to process information, self-configure, and make decisions based on the settings in which they are utilised. RFID has been around for a long time and is utilised in a variety of everyday applications due to its ease of usage. In the modern information and communication era, collaboration and the Internet of Things make it more stable.

2. EXISTING SYSTEM

The existing system which commonly uses are the barcodes and the QR codes which is also easy to use but has limitations too. These systems are ineffective because the QR code system must be able to process a certain number of codes in a specific amount of time, and the scanner must be able to recognize these codes over a short distance[13][14]. This makes it more difficult to execute across a vast area and to ensure that it is effective for a large number of users. In comparison to these RFID tags, they have a significantly longer delay. The current method is unrelated to sophisticated technological sectors, and many of these actions are ineffective. As the reading range of the barcodes is low and also the reader has to be in direct line of the barcode to obtain the information in it. The implementation of these systems where the count of the user is high will lead to the collapse of the entire system. Also the time taken for each customer will make the queue large.

3. WORKING OF RFID TAG

The RFID tag is the main one which communicates with the reader. Antennas communicate with the RFID reader, and the information is stored on a circuit board. For identification, each RFID tag has a unique identity. RFID tags with an IC chip are a well-known and widely used technology [12]. Chipless RFID can be a great way to solve these problems while also improving the RFID system's performance. In a chipless RFID system, the reflected signal from the chipless tag varies depending on the tag's electromagnetic parameters. The Control block is the one where the data from the RFID tag is analyzed and processed. From the reader the system can be connected to a database where the details of the tag can be stored and can control its function. RFID tags have the ability to retain data that can be

used to identify people if necessary. The read range and ability to capture and analyze read data make it more acceptable to the general public. 13.56 MHz is the frequency at which RFID technology can be used.

The information on the RFID tag is extracted using the frequency sweeping technique. It sends the gain of the received signal to the control section, which is proportional to the bandwidth's interrogation signal. The chipless RFID system takes the appropriate action based on the tag's authenticity, while the reader prepares for the next frequency sweep. The RFID system is a master-slave architecture, in which the reader is the master because it controls the signal and the tag is the slave since it responds to the reader's signal. The RFID system's decoding range is controlled by reader antennae. It is this feature, the reading capability of the RFID can be varied which will make it more acceptable.

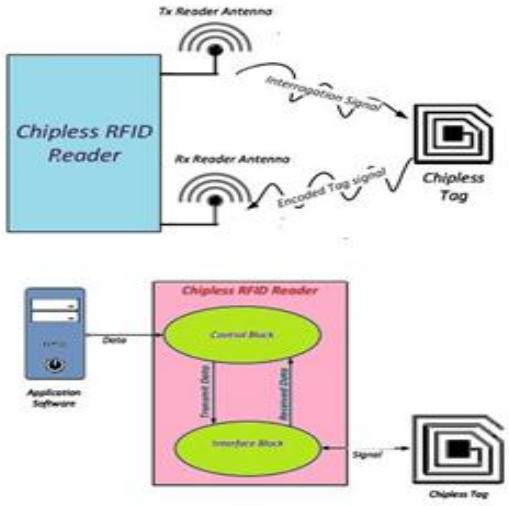

Fig -1: Diagram of the Chipless Tag and Reader

4. WHY RFID

RFID has wide range of acceptance because it can be used in many ways like RFID-Based Vehicle Localization Scheme in GPS-Less Environments [13]; they provide a UHF-RFID-based vehicle localization approach in GPS-less conditions. [13]. In a vehicle localization scenario, RFID tags can be used as anchor points on the road (sides), and each tag can be univocally identified by the reader installed on the vehicle, offering a robust hardware solution for data collection and association. RFID technologies are more reliable than GPS and vision-based solutions in extreme settings with weak satellite signals, low lighting conditions, or industrial sites or mines filled with smoke or dust [13]. The reader can always recognize at least three RFID tags by changing the angle of the RFID reader antenna on the car, as well as the placement direction and spacing of RFID tags on the roadsides, resulting in vehicle localization and association.

A visualized design and implementation of RFID location system [14], the application of RFID was widely used, including visual system of material, space locating and tracking, important equipment management, supply chain management, transportation management, access control management, anti-theft, and so on. The RFID system can help managers and authority people better control demand and direction based on real-time conditions by making the transportation process more visible. Tag readers can identify tags and extract in-formation within the read range, but they can't locate the exact location of tags-equipped objects. This research study presented a visible RFID locating system that uses LEDs, as well as the terminal software that goes with it. An intelligent bus monitoring and management system using RFID and communication technologies [15] they discuss how Radio frequency identification is a wireless identifying technology that can be used for a variety of purposes, such as solid waste bin monitoring, human, animal, products, and object tracking, and street tree management.

Thanks to a machine learning system fed into an intelligent system, the entire system can classify current events on its own. In addition to feeding a learning machine into the system, an intelligent system can also consist of a fundamental formula that provides a series of inputs and outputs that can be processed by a state machine. Money as a global medium of exchange and a means of payment began to be phased out in favor of magnetic card cards, according to a Web-based canteen payment system [16] with RFID technology. This is exemplified by the employment of Automated Teller Cards as a transaction tool. This allows ATM users to avoid making cash payments. Because RFID cards can contain more data than other types of cards, they can be used to replace cash.

Design and Research of Virtual Payment System in Colleges and Universities[16], discuss how campus intelligence has improved, bringing innovative changes to the functions and technology of the campus card system, as well as the rapid development of a new generation of information technologies such as "virtual card, aggregation payment, big data, artificial intelligence, block chain, and mobile Internet," with a large number of new demands from teachers and students springing up in school service management. The RFID tag and reader system is employed in a new Internet of Things based Smart Shopping Centre [17]. The system's main goal is to assist customers while they shop and save time and energy. The device is made up of a microcontroller, an RFID reader, and an Android application that is connected to the microcontroller through Bluetooth. This will aid in the detection of products in trolleys, with the RFID reader sending these facts to a mobile application through Bluetooth. The customer can see their billing information and finish their payment online through their mobile application.

New inventions are being developed to make our lives easier, more relaxing, and more enjoyable. Also, the globe is paying attention to newly developed technologies because they can improve the environment in which we live. The RFID-based Automated Toll Collection System [19] is proposed as a solution to traffic difficulties, with the goal of making payments simple and easy to understand, as well as maintaining transparency in the toll collection system through easy payment tracking. Automation is becoming increasingly popular since it allows for the cost-effective and efficient management of numerous systems. The use of an automated toll collection gate will assist in improving toll service by saving time, fuel, and money. The amount of employees the system's efficiency is the reason for its existence and acceptance by people.

The figure shows the use of RFID tag in clothes which will help in preventing theft in textile shops and also in shopping malls. The system is very effective in nature as the reading range if the system can be enhanced. The system is now widely applied in many shops as it is easy to detect the tag by the RFID reader and also the theft can be prevented. Mobile Payment Scheme and Safe Protocol [21], is where the study is based on RFID and uses RFID to create a safe payment technique for micro and big value payments. Near field communication is enabled by combining the RFID tag with the SIM card. The high prices of hardware for NFC technology in on-site mobile payment transactions may not be acceptable, because you must replace your mobile terminal with one that has an NFC chip.

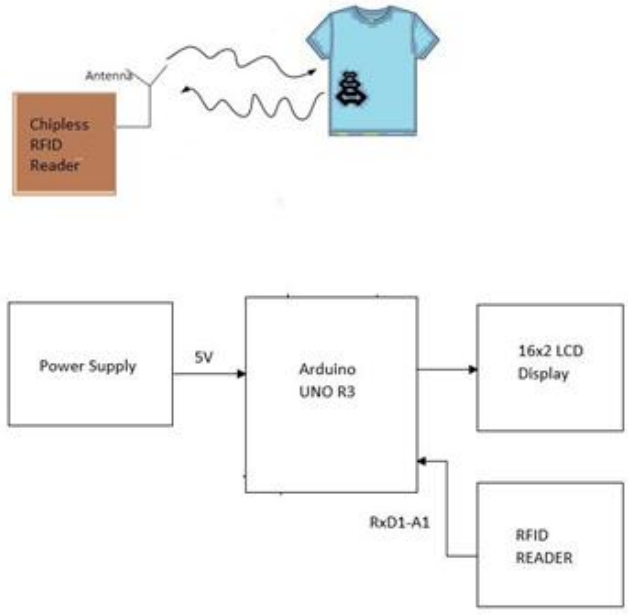

Fig -2: RFID Systems for Theft Prevention

Everyday things can now be endowed with computational power and communication capabilities, allowing objects to communicate with each other from anywhere. Many systems' efficiency will be determined by the IoT device that is chosen. The Shop GO: An IoT based solution for smart shopping[22], where RFID tag will help to make payments to the items taken by the customer and can make online payment through a certain gateway. This will help to make efficient payment system and also helps to save time. It is proposed to develop a dual-band Ultra High Frequency Radio Frequency Identification sensor-tag that can function on metallic surfaces [23]. This UHF RFID sensor tag can operate in both the European Telecommunications Standards Institute and the Federal Communication Commission's primary RFID frequency bands. Covering both frequency bands becomes a non-trivial issue when the environment around the UHF RFID tag is filled by conductive materials, such as metals and water, because the metallic environment of the tags imposes some uncontrolled resonances and detuning effects. The UHF RFID sensor-dual-band tag's operation is based on a very basic concept: by flipping it on a metallic surface, it can operate in either the ETSI or FCC RFID frequency bands.

The one major issue is the cost of the tag and also tag reading range. By breaking the linearity feature, the read range can be expanded. If the chipless system cannot be treated as a linear time-invariant system [24], the bound depends on the transmitted power and can reach dozens of meters. There are only two ways to get this effect. The first is to add a nonlinear element to chipless tags so that power can be generated at multiples of the fundamental frequency. Breaking the invariance property to create power around the carrier frequency is the second way. Data Collection for Sensor-augmented RFID Systems Using Geographical Correlations investigates the practical topic of data collection for sensor-augmented RFID systems. The existing RFID data gathering techniques [25] have two major drawbacks: execution time is proportional to the number of tags, and none of them are compliant with the C1G2 standard. GRC methodology can predict the sensing data of un-sampled tags using a small number of gathered data from sampled tags, allowing for precise information collecting.

RFID stands for radio frequency identification, and it allows a wireless RFID tag or transponder to connect with a wireless RFID tag reader [26]. By the help of these tag we can make use of it in public transportation and also for many other places as a key to the house door and as payment card. As customers become accustomed to the convenience that RFID provides and businesses realize that RFID may substantially cut operating expenses, there has been a boom in interest in using RFID for micropayments. Many passive RFID devices, on the other hand, lack adequate cryptographic protection, presenting security problems. However the RFID can be used for making micropayments where the amount is low and the place where security can be low too. Companies like Nokia and others are integrating RFID systems with mobile phones, either in tag mode, reader mode, or both. These phones will be able to make online

transactions using RFID credit cards [28] in the near future, but they must first ensure that the information is secure. While much research is focused on in-person transactions utilizing RFID credit cards and the security issues that come with them, there is a need to look into the use of contactless credit cards for exceptionally secure electronic payments.

The detecting range of the system is 5 to 30 cm. IoT may connect to different things with RFID's help, streamline operations, share data, and support faster decision-making when RFID tags are used in conjunction with IoT devices. RFID tags are used to build an RFID-based payment system in the college hostel canteen and for bus transportation. The user will receive an RFID tag with a unique identification number, which will be recorded in a database and used to construct an e-wallet-like system for each user. Because we are in the midst of the Covid19 pandemic, users can feel safe by using RFID tag-based payment, which requires no touch. Long-range reading, non-line-of-sight reading, and automated identification are all advantages of RFID technology over barcode technology. Because the read range of a good RFID reader is high, it can read within a short distance as well, the user can keep a specific distance from the reader. RFID still has a long way to go before it realizes its full potential.

5. RESULT

The RFID system, which consists of RFID tags and readers, as well as other IoT devices, will aid in the development of a contactless system in which the user can touch the RFID tag near the reader to perform payments and other transactions. The RFID tag, in conjunction with IoT devices, can send data to a reader, which can then transfer it to a database or cloud storage. The cost effective system is day by day evolving which makes it more acceptable and also the features of the RFID system are enhancing too.

6. CONCLUSION

RFID technology is now being used by corporate firms to track goods inventory and transportation. Chipless tags can be used in long-range IoT applications as well as in local fields. Payment transactions, security, logistics, supply, distribution, health care, and asset tracking are all possible applications. It might be crucial to create optimal storage conditions, locate an item, prevent human error, and increase security facilities, especially in inventory and warehouse management. Reading range, received signal strength, dependability and sensitivity, and operational mode are all advantages of chipless RFID. The whole RFID system, in conjunction with other IoT devices, can improve communication and application purpose.

7. FUTURE WORK

RFID technology is constantly evolving in various areas, including tag size, reading range specifications, fabrication cost, and so on. RFID tags will continue to evolve since they still have a long way to go before reaching their full potential. Future RFID tag development will focus on three important areas: big coding capacity, compact size, and configurability. The configurability allows RFID tags to be reused and recycled, cutting the cost per use, and the small size makes it easier to use in more places. As a result, new features will be able to be added to these systems.

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