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Smart Hi-Fi Attendance using Palm Veins

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Abstract: In our academics' attendance plays a significant role where it is taken in the traditional way, which consumes a lot of time and manpower and the process is hectic. There comes the automated attendance system to solve these problems in the conventional way, but these automated systems also face some drawbacks such as processes time, accuracy, and contact attendance systems (fingerprint), which leads to the next generation of attendance systems, which overcomes all these issues with the help of palm vein and RFID (Radio-Frequency Identification) sensors. The palm vein sensor uses an infrared camera that captures the student's palm vein image when placed in front of the camera. After that, the image was extracted to reveal biological palm vein data that is unique for each human, even for identical twins as per research. The extracted biological features are then compared with previously stored features in the database. And to avoid cheating and malpractices, we are verifying the student again (two-step authentication) with the help of RFID cards when the student crosses the RFID transmitter If both conditions are met, then it allows the system to mark students with attendance.

I. INTRODUCTION

Information technology, as we all know, is essential to every area of our life. Within the last 10 or more years, it has drastically risen. In order to stay up with that speed and outpace other countries in the world, we must incorporate technology into every area of our existence. Attendance is seen as a vital and crucial aspect, particularly at prominent institutions. It demonstrates disciplined individuals and compels attendees. The science of identifying persons is known as biometric technology. The Greek words bio (life) and metric are where the name "biometrics" comes from (to measure). We will utilize, Biometrics is a term for the technologies used to measure and examine a person's behavioral or physiological characteristics. These qualities are particular to Consequently, people might be utilized them to confirm or identify a person. Some illustrations of various biometrics are Face, Voice, Fingerprint, Palm, Hand DNA, Iris, Retina Scan, Voice, Geometry Keystrokes, Gaits, and Signatures are used in various applications, both governments and businesses are using mobile biometrics to fulfill this need and difficulty. Various governments and private organizations use different types of bio metrics for authentications. Our idea proposes to have a touchless and paperless attendance system with the technologies that make things happen easier and faster. The idea which implemented here is to have a Palm Vein Sensor and RFID to have the attendance system to compromises the management of college and institution with the automation process. During pandemic, there were Biometrics which involved contacted attendance system that made condition worse. So, the SMART HI-FI device helps to overcome this complication and derives a solution and it includes the two major components that is Palm Vein Sensor and RFID. Using of this technology things will make automated and easier. Students and Teachers just have to place their palm to the NIR Sensor and bypass the entry point using RFID tags and sends the data to the backend Database. In addition, the sensor identifies the individuals body temperature. So, this device satisfies the problem that students can't cheat and attendance taken in Smart way.

II. TECHNOLOGY USED

1) *Radio Frequency Identification (RFID):* The radio frequency identification Reader is a tool to retrieve data from RFID tags where the data obtained from an RFID tag is utilized in where ever it is used. The reader is a device with one or more antennas that emit radio waves and receive signals from the RFID tag. RFID tags can store a range of information from one serial number to several pages of data. The viewer does not necessitate direct line-of-sight contact with tags. The RFID tag is still picked up by the reader even if anything is between the Card and the Reader. An antenna for sending and receiving signals, as well as an RFID chip (also known as an integrated circuit, or IC) that holds the tag's ID and other data, make up an RFID tag. Items are given RFID tags so that they may be tracked with the help of an RFID reader and antenna. Tags, which use radio waves to communicate their identity and other information to nearby readers, can be passive or active. Passive RFID tags are powered by the reader and do not have a battery. Active RFID tags are powered by batteries. We have used a passive tag for verification purposes.

2) *Arduino Uno:* The Arduino Uno is an open-source microcontroller board created by Arduino.cc that is based on the Microchip ATmega328P microprocessor. It was first launched in 2010. It is a microcontroller board based on 8-bit ATmega328P. In addition to ATmega328P, it also contains other components like serial communication, crystal oscillator, voltage regulator, etc. It has 6 analogue and 14 digital pins. A USB connection and a reset switch are also present on the board. It also has a 1kb EEPROM which stores the data.

3) *Vein Scanning Technology:* Researchers have concentrated their attention on a new development in biometrics called vein-based identification. The main reason to focus on the palm vein is that the majority of the body's vein patterns end there, according to the study, making it simple to examine the vein's features using either a structure-based or texture-based analysis. This biometric technology offers a high level of accuracy at a fair price. The process of palm vein authentication compares the vein pattern in the palm (which Authentication of a person using a pattern stored in a database. According to Fujitsu research, even healthy individuals have distinct vascular patterns. Patterns vary between identical twins. Also, because the vascular patterns are present within, they cannot be stolen using voice recordings, photographs, or fingerprints, Consequently, this biometric authentication technique is more secure than others.

III. DEVELOPMENT ENVIRONMENT

A fourth-generation programming language and multi-paradigm numerical computing environment, Matlab R2008a. We used it in our project to process the image and extract its PCA-based biometric features, which are used for student registration and attendance tracking. PhpMyAdmin an open-source relational database management system (RDBMS) which is used as database, PHP is a server-side scripting language made for development of the website. They helped us create the database that stores various student, administrative, and instructor data. Palm Secure is an introduction tool that scans the veins in the palm. In our project, we used it to register and take attendance of the students by taking a vein from their palm.

IV. PALM VEIN APPROACH

Because human vein patterns are internal to the body and cannot be stolen, palm vein technology has attracted the attention of researchers. It is extremely accurate. Spoofing attacks cannot be used against vein patterns. The fact that the palm vein patterns do not alter with aging, roughness, or injury is another benefit. Although their palm vein patterns are different, even identical twins' DNA patterns will be the same.

It is less prone to changing its skin tone. Temperature, humidity, and other variables can have an impact on how well you can identify palm veins. The global feature approach, structure-based approach, and hybrid-based approach are the main three methods for extracting palm prints. The entire palm's veins are taken into account as a feature set in global features, and features are extracted using PCA, LDA, etc. The Gabor transform is also used to extract distinguishing characteristics from the palm vein image histogram. In comparison to unimodal biometrics, multimodal biometrics (the use of multiple biometric features to identify a person) offers a higher recognition rate, greater accuracy, and more dependable performance. Principally distinguishing characteristics found in structure-based veins include major lines, wrinkles, grease, and minute details. Because human vein patterns are internal to the body and cannot be stolen, palm vein technology has attracted the attention of researchers. It is extremely accurate.

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V. RFID APPROACH

Numerous conventional approaches to managing student attendance required more time, a larger workforce, and duplication of effort in that order. On the other hand, these mechanisms raised and improved educational standards and changed how effectively students learned in academic settings like colleges and universities. Here we had made a suggestion for a student attendance management and information service system. By combining RFID technology and Palm Vein Scanner with a web-based application, the system eliminates the need to manage student records and offers the capabilities of tracking student attendance, supporting an information service about student grading marks, daily timetable, lectures time and classroom numbers, and other student-related instructions that provided by faculty department staff. Data management, student tracking, report-sending, record-monitoring, record-maintenance, and information services are all included in the system's functionality.

VI. IMPLEMENTATON

A. Palm Vein Scanning Phase

Due to the prior issues, we are recommending in this project that a class attendance system be designed and implemented using palm vein biometric data.

The system functions by recognizing the vein patterns in a person's hand that are subcutaneous (beneath the skin). The procedure begins with the user holding their hand in front of an infrared camera, which records images that display vein maps. A schematic of the imaging module is shown in Figure 2.

The process of authenticating a user via his/her palm consists of the following steps:

Acquiring the image: where the user places his/her hand on a scanner or a camera where his/her vines pattern will be captured using a completely safe near-infrared light.

Pre-processing tasks: contrast, brightness, edge information, noise removal, sharpens image, etc.

Extraction of the pattern: This is unique for each user.

Matching and recognition: comparing the captured image of the user's palm against the one that is stored in the database –one to many matching- as illustrated

B. RFID Phase

In this stage, the student's ID is read using an RFID reader (Reading Process), and the student's information is then transmitted to the Wamp server using an Ethernet shield card and an Arduino UNO (Microcontroller Process). In order to determine student ID and send student information to the screen, a server (MySQL and PHP) is used. The student scans the RFID Tag to the RFID Reader, which reads the student's ID and sends it to the server side (MySQL and PHP) where it searches for the specific student's ID and retrieves his information from the database before displaying it on the screen or LCD. The components of the RFID reader are connected to the Arduino's pins as follows: the first pin is connected to 3.3 volts, the second pin is designated as reset, the third pin is designated as ground, the fourth pin is not used, the fifth pin is designated as MISO, the sixth as MOSI, the seventh as SCK, and the last pin is designated as SAD. Arduino device is configured with an Ethernet device. The Arduino processes the signal that is fed into it. With the aid of the graphical user interface for student information via web-based application, MySQL is used to archive the student records and information, in which it will be displayed by using PHP and Arduino IDE.

VII. RESULT

The proposed system accomplishes two goals: The first is to check the authenticity of the student's presence through the palm vein scanner and then as a two-step verification by registering, tracking, and managing a student's attendance using an RFID tag; the second is to provide student information services, such as timetables, lecture times, classroom numbers, and other student-related data displayed on screens or LCDs. The standard procedure for gathering student absence data on the advertisement wall typically involves paperwork and handwriting. Therefore, the paperwork approach necessitates a workforce, causes effort duplication, and imposes time-consuming and inefficiency.

Parameters	Human Interference	Time Consuming	Efforts Spend	Speed	System Security	Resources (Documents)	Data Accuracy	Registration Time	User Friendly
Traditional System	Yes	More than 5 minutes	Yes	Slow (human)	More vulnerable	More paper work	Low	More than 8 minutes for each student	No
Proposed System	No	Less than 2 minutes	No	High (computer)	Authenticated persons only	Only one electronic record	High Accuracy	1-2 minute	Yes

VIII.   CONCLUSION

To manage student data and provide capabilities for tracking student attendance, grading student marks, and providing information about the timetable, lecture time, room number, and other student-related information, student attendance and information system are designed and implemented. Additionally, the proposed system makes things easier for the staff by eliminating the need for extra paperwork. The system's development innovation, which made use of a palm vein scanner to scan plan veins and RFID technology, and a microcontroller board, produced results that supported its suitability for use as a reliable attendance management system for the academic sector. It is a successful implementation, in my opinion.

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