Implementation of Intelligent Biometric Attendance System

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Abstract: The deliver voice calls and SMS messages to parents through the Global System for Mobile Communication, as well as a report to the department head regarding the student's attendance. In this paper a fingerprint sensor is used for monitor the attendance. When a student places his/her finger in the sensor, the sensor reads the impression of the fingerprint and sends a control signal to the microcontroller, which compares the fingerprint to a reference fingerprint stored in the device. If it matches, the matching student's attendance will be registered. If a student's fingerprint is not recorded within a certain amount of time, a text message will be sent to their parents' phone number, and if they are chronically missing for longer than two days, a voice call will be sent to their parents' phone number. Under either event, where an invalid person enters a fingerprint, the fingerprint is shown on the liquid crystal monitor as unmatched.

Keywords: LCD, RFID, Sensor, RS232 and GSM Modem

1. INTRODUCTION

The RFID deployment strategies are combined with biometric sensors to increase protection. In this scheme, use all methods to record correct student attendance. No one is capable of acting as a proxy. This system is to replacing the old paper-based attendance scheme. Increase the protection of their movements needed a computer machine for this. This computer device has dedicated applications built on “Visual Basic” for dealing with various fingerprint and RFID tags. Regular attendance records will be held according to time and place. Only when the data from the RFID reader and the finger print reader fit will the attendance is registered. a fingerprint verification technique-based automated attendance system that is precise, quick, and very effective. A method in which fingerprint authentication is performed utilizing the extraction of minutiae methodology, as well as a system that automates the whole procedure of taking attendance, which is a time-consuming and laborious activity. Managing and storing the documents over a period of time is also a difficult task. They use a fingerprint authentication method that employs the extraction of minutiae technique for this reason. This is very effective at verifying user fingerprints. a device that automatically takes student attendance and keeps track of their records in an academic institute. Taking attendance by hand and keeping track of it for a long period is a daunting process that wastes a lot of time. As a result, an effective structure is designed. A finger-print sensor kit is used to take attendance, and all of the data are stored on a disc [1]-[5].

Both the fingerprint sensor module and the LCD screen are dynamic, meaning they can travel around the space. The student must put his/her finger on the fingerprint sensor module to mark attendance. When a student is identified, his attendance record is updated in the database, and he/she is alerted via LCD screen. Produce a Microsoft excel attendance report on the device using this method. After 15 days, this report will be produced automatically (depends upon user) and will be emailed to the esteemed Head of Department, instructor, and the student's parents. Suggested fingerprint recognition technology cantered on minutiae based fingerprint algorithms used in different techniques. This line of research focuses on extracting minutiae points from model fingerprint images and comparing two fingerprints depending on the amount of minutiae pairings. The paper also shows how to use GSM to design a fingerprint-based student attendance system. This method disregards the need for stationary materials and staff for record-keeping. The use of an updated algorithm on a large scale the National Institute of Standards and Technology (NIST) is a non-profit in government applications. The Fingerprint Picture Quality allows certain people to live in an illicit world while ignoring the identification of altered fingerprints. Since the picture consistency should not decrease by using fingerprint quality evaluation tools, it is impossible to detect the altered fingerprints [6]-[11].

The emphasis of the paper is on the student attendance tracking method of educational institutions. It is, in reality, an automated attendance tracking device that lowers the probability of inaccurate attendance records. It often eliminates issues such as maintaining a paper attendance record, damaging a paper attendance record, or losing a paper attendance record. It can keep track of a subject teacher's and students' attendance for a certain class and subject. The attendance of students will be reported to the appropriate authorities through the GSM

module. The aim of the paper is to implement a paperless attendance tracking scheme in order to save paper and the atmosphere, i.e. to go green. The traditional way of taking attendance by calling names or signing on paper is wasteful since it is time intensive and insecure. As a result, the technology was created by integrating pervasive computer devices into classrooms in order to manage students' attendance using RFID and fingerprint readers. The framework is structured to incorporate an attendance control system focused on RFID and fingerprint reader, in which students must use their student identity card (ID) and finger ID to successfully complete the attendance, with only authentic students being registered during class. Passive RFID tag and scanner pairs are used to independently register student ID cards with this scheme, and a fingerprint reader is used to monitor attendance. This method uses an RFID and finger print computer to take attendance remotely, and the attendance records are kept in a database. The percentages of students who have been called and their personal information can be conveniently seen using a Graphical User Interface (GUI) [12]-[16].

2. EXISTING METHOD

This framework would provide records for student enrolment, instructors, topics, and personal information. As an IDE, Microsoft Visual Studio and Microsoft SQL Server are used to build this programme. This system is written in the C# programming language. The GSM-based architecture approach is used for a compact fingerprint-based student attendance scheme. The terminal fingerprint acquisition module and the attendance module are included in this framework. It may perform tasks such as fingerprint data collection, retrieval, wireless transfer, fingerprint matching, and attendance reporting automatically. After taking attendance, this device sends each student's attendance to their parent's mobile phone via GSM. The attendance method makes it easier to check a student's attendance in a certain class. This method removes the need for stationary records-keeping supplies and resources. a multimodal biometric recognition device focused on human finger features. We present a modern biometric approach to personal identity based on RD-LDA features derived from four digit print sprints of digits between the first and third phalanx and four fingerprints, with fusion added at the matching-score stage. The studies were carried out on a database of 1840 hand photographs, which represents approximately 184 individuals. The system's 100% accurate detection score shows that it should be used in medium/high-security settings.

If the student does not enrol their fingerprint in the fingerprint scanner, the current procedure is used to deliver a text message to their parents. The fingerprint module is used to validate the fingerprints of different people. The edge detection feature is then used to detect the edges along the image. Fingerprint Module had been included. The fingerprint that needs to be matched is already in the fingerprint module's memory. Fingerprints are stored for a certain amount of time before being scanned. The fingerprint module began comparing the findings and passed the hex codes to the microcontroller for further processing. Based on the findings from the finger print module, the microcontroller begins sending the power to GSM. There will be no SMS sent to the individual whose fingerprint is matched. The fingerprints of those who did not get their fingerprints taken were taken, and SMS could only be sent to those numbers. The scanning would not take effect if an anonymous person's fingerprint is held for scanning. When an anonymous person's fingerprint is saved, the note "Not Identified" appears. This allows parents to receive information regarding their children's arrival at college or education. Fingerprints are one of the most reliable identification systems since they are difficult to forge. This can be seen in practice by extending the time span and keeping track of the students' participation.

3. PROPOSED BIOMETRIC TECHNOLOGY

One of the most innovative developments of biometric technologies is the attendance control method. It is difficult to forge, many universities are going down the biometric path to check the time and attendance of their students and staffs as the incorporation and usage of biometric technologies becomes easier. The device also includes a GMS Modem, which can be used to automatically transfer students' attendance details to their parents. By utilizing a serial communication protocol, an embedded device with a small LCD user interface may be connected to a CPU. This paper is to use GSM to submit SMS alerts and voice calls to parents. The students' fingerprints are collected and processed in a computer archive. The fingerprint picture is collected during enrolment, and a control signal is sent to the microcontroller. The enrolled fingerprint may be matched with samples placed in the database by the microcontroller. Attendance is recorded whether the fingerprints fit. If a student does not register their fingerprint in the sensor for one day, a text message would be sent to their parents via GSM modem. If a pupil is out on two or three days, their parents may get a voice message.

The student’s fingerprints are collected and processed in a computer archive. The fingerprint picture is collected during registration, and a control signal is sent to the microcontroller. The enrolled fingerprint may be matched with samples placed in the database by the microcontroller. The keypad is used to provide feedback to the microcontroller. The LCD is used to track and view the whole operation. Attendance is recorded whether the fingerprints fit. If the fingerprints do not fit, the microcontroller scans to see if the student has been missing for more than two days. If a pupil is missing for one day, a text message would be sent to the parent's cell phone via

GSM. A voice call would be received if the student is out for longer than two days. The APR 9600 is used to record the speech and is connected to the microcontroller through the address line.

A step-down transformer is used to step down the power from the AC source. The power supply device is then given the alternating current. Two power supply systems are used to supply power to all of the other units. Alternating current is transformed to pulsating direct current in the power supply unit. To transform pulsating DC to pure DC, a voltage regulator is required. FPC's HSPA-method also provides for a proprietary protective coating that is 25 to 30 times thicker than other manufacturers, allowing FPC's sensors to endure static electricity and wear and tear well above the European Community Standard Class 4 criterion of 15kV. The potential to carry an electrical charge is known as capacitance. Tens of thousands of tiny capacitive surfaces, each with its own electrical circuit embedded in the chip, make up FPC's sensor. As the finger is positioned on the sensor, incredibly weak electrical charges are produced, forming a pattern between the ridges and valleys of the finger and the plates of the sensor. The block diagram is shown in Figure 1.

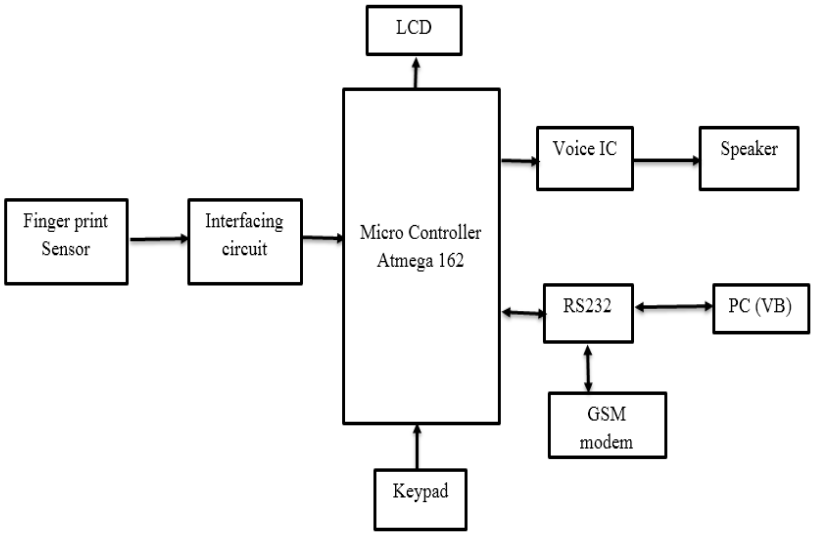

Figure.1. Block Diagram

The capacitance pattern around the surface is measured by the sensor using these charges. The sensor converts the calculated values into digital data, which is then submitted to the microprocessor. The capacitance between these plates and the fingerprint contour is measured by a capacitive sensor's surface, which is a tidy collection of plates. By actually adding an electrical charge to the layer, this can be accomplished. The Active measuring process, also known as Reflective or Inductive capacitive measurement, is the method used by FPC and it has a number of advantages. It is possible to read from and adapt the sensor reception to various skin types and environments using the programmable logic built into the capacitive sensor design. Another significant advantage is that the improved signal connections between the fingerprint surface and the sensor plates allow for the application of a solid, defensive coating layer on the sensor surface that is up to 25-30 times thicker than other suppliers. As one of the few sensor vendors, FPC is able to withstand up to and far beyond the criteria for 15kV electrostatic discharge (ESD), as well as wear time checks for over one million sensor touches.

The method of matching two instances of friction ridge skin impressions, from human fingertips, the palm of the hand, or even toes, to ascertain if these impressions may have originated from the same person is known as dactyloscopy, or hand print identification. Fingerprints are an infallible form of personal identity that can be registered on a regular card or digitally and electronically sent to the FBI for reference. Because of the versatility of friction ridge tissue, no two fingers or palm prints are ever identical in any detail; including two impressions taken from the same hand within seconds of each other. Fingerprint recognition, also known as individualization, entails a human or a computer device deciding if two friction ridge impressions are probable to have come from the same finger or palm using threshold scoring laws (or toe or sole). Friction ridges are normally recorded with black printer's ink rolled over a contrasting white backdrop, such as a white card. Friction ridges may also be digitally captured utilizing a method known as Live Scan. The chance recording of friction ridges deposited on the surface of an item or a wall is known as a "latent print." Latent prints are opaque to the human eye, while “patent prints” or “plastic prints” can be seen using a magnifying glass. To be rendered visible, latent prints are often fragmentary and involve the use of a chemical process, powder, or alternate light sources. An ordinary bright spotlight will often reveal a latent print.

Stuff on the friction ridges, such as perspiration, dirt, saliva, paint, or blood, will be added to the surface as they come into touch with a surface that will take a print. There are numerous factors that influence the

consistency of friction ridge experiences. The substrate from which the surface is produced, the roughness of the surface, and the content accumulated are only some of the myriad variables that can trigger a latent print to look differently than every other documented recording of the same friction ridges. Per instance of friction ridge deposition has its own set of circumstances that are never repeated.

Fingerprint examiners are expected to receive rigorous preparation for these purposes. Applying a thin coat of ink to a finger and rolling it from one end of the nail to the other when rubbing the finger against a paper card may be used to gather finger print results. On the fingerprint card, this will result in an inked “rolled” fingerprint impression. The resultant fingerprint impression will only include a narrower central region of the finger rather than the whole fingerprint, resulting in an inked “flat” or “plain” fingerprint impression. Perspiration and chemicals on the skin result in the appearance of a digit being deposited on a surface where that finger has reached. Chemically or mechanically formed “latent” prints may be electronically collected or manually “lifted” from the surface using specific chemical, physical, and lighting techniques.

Tape may be used to lift the formed fingerprint, or it can be photographed. These latent fingerprints also only include a portion of the friction ridge information present on the digit, resulting in a "partial" fingerprint. By scanning the inked card, raise, object, or image, fingerprint impressions formed and retained using either of the above methods may be digitized. “Off-line” photographs are digital images obtained through this process. Typically, fingerprint scanners are not built for fingerprint applications in mind. Since the early 1970s, fingerprint scanners have been developed that can capture a “live scan” optical fingerprint picture directly from a finger without the use of ink or a paper card in the centre. Though off-line fingerprint images are still used in some forensic and government applications, on-line fingerprint images are becoming more common. The resolution area, number of pixels, geometric precision, contrast, and geometric distortion are the key characteristics of a digital fingerprint picture.

Because of inconsistencies and non-uniformity in the impression taken, as well as differences in the skin and the appearance of scars, humidity, soil, and other factors, the image obtained from the scanner is often of poor quality. Various methods are used to solve these issues, minimize turbulence, and improve the concept of ridges against valleys. The foreground and background regions of a picture are separated using image segmentation. The transparent fingerprint area that includes the ridges and valleys is referred to as the foreground areas. This is the topic of discussion. The background regions are the areas beyond the main fingerprint area that do not contain any significant or accurate fingerprint data. Applying the minutiae extraction algorithm to the Background regions of the picture allows for the extraction of noisy and incorrect minutiae. As a consequence, segmentation is a method for removing these context areas, resulting in more accurate minutiae point extraction. We're going to use a variance thresholding approach. The foreground regions have a very low grey-scale variation, while the shadow regions have a very large variance. The picture is first separated into blocks, and the grey-scale variation for each block is measured. The block is allocated to the context area if the difference is smaller than the global threshold.

The next stage in the fingerprint enhancement phase is image normalization. Normalization is the method of standardizing the strength values in a picture such that they fall into a predetermined set. It's achieved by changing the image's set of grey-level values. The local orientation of the ridges found in a fingerprint picture is described by the orientation field of the fingerprint image. Since the subsequent Gabor filtering stage relies on the local orientation to effectively enhance the fingerprint image, orientation estimation is a critical phase in the enhancement method. Raymond's least mean square estimate method is used to calculate the orientation picture. We have opted to expand their approach into a pixel-wise system, which provides a more precise estimate of the orientation area, rather than estimating the orientation block-wise. The local ridge frequency is another significant parameter that can be used in the construction of the Gabor filter, in addition to the orientation picture. The frequency picture represents the local frequency of the ridges in a fingerprint. The first move is to split the picture into W x W blocks. The grey-level values of each pixel within each block are then projected in a position perpendicular to the local ridge orientation. This projection yields a wave with a nearly sinusoidal form, with the local minimum points indicating the fingerprint's ridges. It entails smoothing the predicted waveform with a W x W Gaussian low pass filter, which reduces the influence of noise in the projection. The ridge spacing is then determined by measuring the median number of pixels between the predicted waveform's consecutive minima points.

A microcontroller is a single integrated circuit that contains a full microprocessor device. Microcontrollers were created to fill a gap in the market for low-cost microprocessors. Since the microprocessor is a natural way to execute multiple things, installing a full microprocessor device on a single chip eliminates the cost of creating simple products that use the microprocessor's power to implement their feature. As a result, the concept of utilizing a microprocessor for low-cost goods is often discussed. Each component has a monetary expense. And if a product design only necessitates a very basic device, the parts required to render this system a low-cost product are numerous. Single chip microcontroller is used to address this issue in a microprocessor device. Since the IC contains many of the main components, it may be considered a microcomputer. They are often referred to as microcontrollers and they are used to execute control functions. A regular MICROPROCESSOR, ROM,

RAM, I/0, CLOCK, TIMERS, and SERIAL PORTS are all implemented on the microcontroller. Microcontrollers are often referred to as "systems on a chip," "single chip microprocessor systems," and "computers on a chip."

A microcontroller is a single-chip device, also known as a computer-on-a-chip. The word micro denotes a tiny computer, while controller denotes that the device could be used to manipulate artifacts, operations, or events. Since the microcontroller and its supporting circuitry are often integrated into, or incorporated in, the systems they power, another name for a microcontroller is embedded controller. Microcontrollers are also widely used in a broad range of intelligent devices. Most machine keyboards, for example, are controlled by a microcontroller. Scanning, Debounce, Matrix Decoding, and Serial transfer circuits are also replaced. Microcontrollers are used in a variety of low-cost devices, including toys, electric drills, microwave ovens, VCRs, and a slew of other commercial and industrial items. The compounds used in liquid crystal displays incorporate the characteristics of both liquids and crystals. They have a temperature spectrum within which the molecules are just as mobile as they would be in a liquid, but are clustered together in an orderly structure similar to a crystal. A liquid crystal display (LCD) is made up of two glass panels of liquid crystal content sandwiched between them. Transparent electrodes are coated on the inner surface of the glass surfaces, defining the character, marks, or patterns to be reflected. Between the electrodes and the liquid crystal, polymeric layers are present, allowing the liquid crystal molecules to retain a given orientation angle.

Outside both of the two glass plates, one polariser is pasted. The light rays going through these polarisers will be rotated to a certain angle and in a certain direction. When the LCD is turned off, light rays are rotated by the two polarisers and the liquid crystal, resulting in light rays exiting the LCD with no orientation, giving the LCD a translucent appearance. The liquid crystal molecules would converge in a certain direction if enough voltage was added to the electrodes. The polarisers will spin the light rays going through the LCD, causing the appropriate characters to be enabled or highlighted. The LCDs are thin and compact, measuring just a few millimeters wide. LCDs are compatible with low-power electrical circuits which can be operated for long periods of time since they use less power. Since LCDs do not produce light, light is required to read the display. Reading in the dark is feasible with the aid of backlighting.

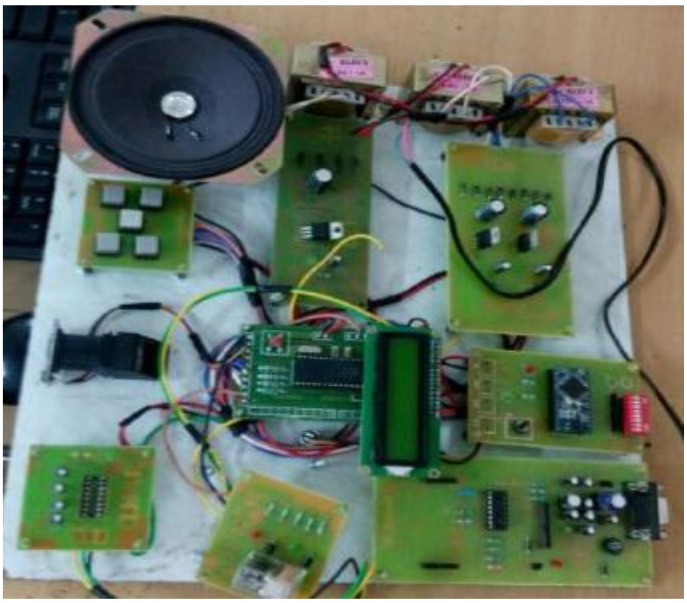

Figure.2. Prototype Attendance Monitoring System

Figure.2 shows prototype attendance monitoring system. The LCDs have a long life span and can operate in a large variety of temperatures. LCDs are more customers oriented since changing the display size or layout size is very easy. Easy seven-segment screens with a small number of numeric details are found primarily in clocks, calculators, and measurement instruments. Recent technological advancements also culminated in improved legibility, increased information display capability, and a broader temperature spectrum. LCDs are still widely used in telecommunications and entertainment electronics as a consequence of these advancements. LCDs have also begun to replace cathode ray tubes in text and graphics displays, as well as in limited TV devices. To shield the polarizer, cover the display surface with a translucent protective plate. Do not use your bare hands or other rough surfaces to strike the show board. The show area will become stained, and the insulation between terminals will deteriorate. Chemical solvents cannot be used to clean the show panel because they can damage the tape. Instead, use absorbent cotton and petroleum benzene. The processing of the claws of

the metal plate, or even a minor deformation, will affect the correlation of the output signal, resulting in an irregular display.

A modem is a system that encodes digital information by modulating an analogue carrier signal and then demodulates the carrier signal to decrypt the transmitted data. The aim is to create a signal that can be quickly transmitted and decoded, allowing the original digital data to be reproduced. Modems may be used to send analogue signals through any medium, from light emitting diodes to radio. A speech band modem, for example, converts digital data from a personal device into modulated electrical signals that travel in the voice frequency range of a telecommunications line. These signals may be sent over phone lines and demodulated by a second modem at the receiver to retrieve the digital data. The sum of data a modem will transmit in a given unit of time, normally represented in bits per second, is used to classify them. Alternatively, modems may be graded based on their symbol rate, which is calculated in baud. The baud device denotes the amount of symbols sent per second, or the number of times the modem receives a new signal per second. To hold 300 bits per second using 300 baud, the ITU V.21 format used audio frequency-shift keying, which means tones of various frequencies, with two potential frequencies referring to two separate symbols or one bit per signal. The original ITU V.22 standard, which could send and receive four distinct symbols of two bits each, could accommodate 1,200 bits per second by sending 600 symbols per second at 600 baud using phase shift keying.

Today's traditional modem has two physical parts: an analogue section for signal generation and phone use, and a digital segment for setup and power. Nowadays, this feature is frequently combined into a single chip, but the distinction still exists in principle. The modem can operate in one of two modes: data mode, where data is transmitted to and from the device via the phone lines, or order mode, where the modem listens for instructions from the computer and executes them. A standard session entails turning on the modem, which is mostly located within the device and automatically enters command mode, and then giving it the command to dial a number. The modem automatically switches is to data mode after the link to the remote modem is made, allowing the user to send and receive data. When the user is done, the modem can be returned to command mode by sending the escape sequence accompanied by a brief delay, followed by a command to hang up the handset. Notice that on certain modem controllers, orders may be issued to bypass the escape chain, preventing data from being transmitted from triggering the modem.

4. CONCLUSION

Intelligent biometric attendance method utilizing GSM" is the main part of the work. Any illiterate parents are unable to read SMS, however they may understand voice calls and learn about their children's attendance at college. GSM technology is often used to deliver university results to their guardians. The paper also reports on GSM-based wireless transmission. The GSM used in our work is built in such a way that it can send a message to many people at the same time. If the student obtains advance approval from the head, it will be manually entered, and no text messages or phone calls will be sent to their parents' phone numbers.

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