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DATA LINK INSTITUTE

SCHOOL OF COMPUTER SCIENCE

FINGERPRINT BASED BIOMETRIC STUDENT ATTENDANCE SYSTEM

A CASE STUDY OF DATA LINK INSTITUTE

BY

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JULY, 2017

DECLARATION

This is to declare that, the research work underlying this dissertation has been carried out by us under our supervisor. We and our supervisor certify that the work documented in this dissertation is the output of the research conducted by us as part of our final year project work in partial fulfilment of the requirements for a Bachelor's of Science Degree in Information and Communication Technology.

SAMUEL ADDO LEBI

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Date……

PETER KORLEY SOGBODJOR

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Date……

MR. MARK MENSAH

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Date…….

ACKNOWLEDGEMENT

A thesis of this nature cannot be written without the grace of God Almighty. It is through His mercy that we had the strength, wisdom to write this piece of work.

To our supervisor; Mr. Mark Mensah, we extend our sincere appreciation to him. His sage advice, experience, insightful criticisms, and patient encouragement aided the writing of this thesis in innumerable ways including the completion of the work on schedule.

To be honest, we cannot fail to extend our gratitude to all Faculty members and staff of Data Link, School of Computer Sciences, for offering themselves in spite of their busy schedules to provide much information to enhance our study at the Institute.

To our loved ones and friends, we thank you all for helping us with your encouragements and inspiring us to come up with this work.

DEDICATION

We wish to dedicate this project to our Family and Friends for their love and support that has seen us through these academic years and research successfully.

ABSTRACT

The term 'biometrics' refers to a measurable characteristic that is unique to an individual such as fingerprints, facial structure, the iris or a person's voice. In recent years, there have been rise in the number of applications based on fingerprint based biometric systems and have been successfully applied to different areas as diverse as transportation, health-care, agriculture, and hospitality industry to name a few. In this paper, an attempt is made to solve recurrent lecture attendance monitoring problem in developing countries using fingerprint based biometric technology that records the attendance of the student by using a hand held fingerprint sensor. The application of fingerprint based biometric to student attendance monitoring as developed and deployed in this study is capable of eliminating time wasted during manual collection of attendance, improves the reliability of the attendance records and an opportunity for the educational administrators to capture classroom statistics for allocation of appropriate attendance scores and for further managerial decisions(Karthik, SI, BN, & Adler, 2015).

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CHAPTER ONE

GENERAL INTRODUCTION

1.1 INTRODUCTION

Attendance is a concept that exists in different places like institutions, organizations, hospitals, etc. during the start and end of the day to mark a person's presence. In early days and even now in many places' attendance is recorded manually in attendance registers by calling out the names. This results in waste of time and human effort. Also, there are many fraudulent issues that happen when we use a register. For example, in educational institution, the teacher calls out the names of the student's one after the other and marks their presence after they answer.

The other way that is followed is the teacher passes the attendance sheet around the class for the students to sign besides their names. But these methods have a major drawback where the students tend to answer or sign for their friends who are not present for that day. These fraudulent issues may become more frequent if the class strength is high.

A solution to overcome these problems is by using a system that will record the attendance automatically. In this direction, this paper presents a fingerprint based biometric system that records the attendance automatically. This system consists of a fingerprint sensor which is used to detect the person's identification. For example, in educational institutions, the student needs to place their finger on the fingerprint sensor to obtain their attendance. The fingerprint captured is recorded in a flash memory and then each time it is checked whether the obtained fingerprint matches with the record in the flash memory after which the student gets the attendance. By making use of this system, we overcome the issues such as proxy so no student can give attendance for their friends who are absent(Karthik et al., 2015).

1.2 BACKGROUND OF STUDY

Humans have used fingerprints for personal identification for centuries and the validity of fingerprint identification has been well-established(Jain et al, 1997). A fingerprint is the pattern of ridges and furrows on the surface of a fingertip, the formation of which is determined during the fertile period. They are so distinct that even fingerprints of identical twins are different as are the prints on each finger of the same person. With the development of solid-state sensors, the marginal cost of incorporating a fingerprint-based biometric system may soon become affordable in many applications. Consequently, fingerprints are expected to lead the biometric applications in the near future, with multiple fingerprints providing sufficient information to allow for large-scale recognition involving millions of identities. In its simplest, the fingerprint based biometric student attendance system will work in a way that, when the fingerprint is entered and authenticated, it records the time the student came for the class alongside the course. Also when student is leaving he or she is supposed to sign-out by the same process as entering to be able to record the time the student left. Steps in fingerprint-based identification are:

1. input fingerprint image
2. orientation estimation for input image
3. thinned ridges for input image
4. input minutiae set overlaid on the input image
5. template minutiae set overlaid on the template fingerprint image
6. matching result where template minutiae and their correspondences are connected by red lines (Jain, Hong, & Pankanti, 2000).

1.3 PROBLEM STATEMENT

Attendances in Data Link Institute are recorded manually by the various students and given to the tutor to sign off and therefore are prone to personal errors. In some cases, students record the details of their friends who do not attend lectures so as to meet the score allocated to attendance. Datalink Institute has a policy of ensuring a 70% course attendance by students for a course before likelihood of writing a semester examination for that course. There arises a need for a more efficient and effective method of solving this problem. A technology that can solve this problem and even do more is the fingerprint based biometric technology. Fingerprint based biometric system is an automated identification and data collection technology, that ensures more accurate and timely data entry.

1.4 SCOPE OF STUDY

The Scope of the project will be based on fingerprint based biometric student attendance system in Data Link Institute. The system would help management and lecturers in Data Link Institute monitor and manage the record of attendance of students attending lectures. The project covers the study and the analysis of the existing system, finding its merits and demerits, incorporating its merits into the new system and improving the demerits for use by the new system.

1.5 OBJECTIVES

1.5.1 GLOBAL OBJECTIVES

The Global Objective is to develop Fingerprint based biometric Student Attendance System that will help management and lecturers in Data Link Institute monitor and manage effectively and efficiently the attendance of students.

1.5.2 SPECIFIC OBJECTIVES

1. To reduce the appearance of names of students not present at lectures that occurs during the manual collection.
2. To provide allocation of appropriate attendance scores.
3. To reduce time wasted during manual collection of attendance while lectures are going on.

1.6 SUBJECT AND FIELD OF STUDY

The Subject and Field of study is to develop a fingerprint based biometric student attendance system in the Area of Information and Communication Technology. The fingerprint based biometric student attendance system would be based on an Electronic Circuitry (a micro-controller), controlled by a software.

1.7 METHODOLOGY

1.7.1 SOURCES OF DATA

Data were obtained from both the primary sources which includes; formal and informal interviews, observations, and secondary sources, which includes; journal publications, textbooks, and internet. Secondary data were used to complement the primary data as the primary data is the original work.

1.7.2 LIFE CYCLE MODEL

Due to the scope of the project, the life cycle model to be adopted is the prototyping model. This will help design, develop and implement the system. The Analysis, Design, and Implementation phases will be performed concurrently and, on each cycle, resulting in a system prototype that will be reviewed by the project stakeholders. The cycle will be repeated

continually base on the stakeholders' comments until the prototype successfully meets the requirements.

The last prototype will then be called the system, and then the system will be successfully implemented.

1.8 ORGANIZATION OF STUDY

Chapter One: General Introduction.

Contains the proposal on the topic to be researched on.

Chapter Two: Literature Review.

It talks about the literature review, which gives information of various theories concerning the topic and other researchers' ideology and findings on this topic.

Chapter Three: The Life Cycle Design of the proposed system. It also Talks about analysis of the proposed system and its importance.

Chapter Four: System testing, implementation and documentation

Chapter Five: Conclusion and Recommendations for further research work.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Humans have used fingerprints for personal identification for many centuries and the matching accuracy using fingerprints has been shown to be very high. A fingerprint is the pattern of ridges and valleys on the surface of a fingertip, the formation of which is determined during the first seven months of fertile development. Fingerprints of identical twins are different and so are the prints on each finger of the same person. Today, a finger- print scanner costs about U.S. $20 when ordered in large quantities and the marginal cost of embedding a fingerprint based biometric in a system (e.g., laptop computer) has become affordable in a large number of applications.

The accuracy of the currently available fingerprint recognition systems is adequate for verification systems and small- to medium-scale identification systems involving a few hundred users. Multiple fingerprints of a person provide additional information to allow for large-scale recognition involving millions of identities. One problem with the current fingerprint recognition systems is that they require a large amount of computational resources, especially when operating in the identification mode. Finally, fingerprints of a small fraction of the population may be unsuitable for automatic identification because of genetic factors, aging, environmental, or occupational rea- sons (e.g., manual workers may have a large number of cuts and bruises on their fingerprints that keep changing) (Anil, Arun, & Salil, 2004).

2.2 GENERAL BACKGROUND OF THE STUDY AREA

Automated/Embedded systems are computer systems which mostly interact directly with other systems without the influence of human users. Embedded systems often undertake monitoring, control and optimization tasks in critical applications. In addition to functional properties, automated systems also need non-functional properties such as low energy consumption, high computing power/real-time capability, and reliability and should be of a small size. Consequently, special hard- and software is often developed for embedded systems. For this reason, knowledge in hardware design, processor architecture and the development of hardware-related software for the development of embedded systems is very important. The complete system composed of embedded systems and further mechanical systems is often referred to today as a cyber-physical system. This normally includes several embedded systems which interact with each other and with the environment of the whole system. Typical fields of application are in vehicle technology, aviation, traffic control, logistics, energy supply and the control of complex industrial facilities. The number of embedded systems in these areas has increased dramatically in recent years so that embedded systems have become a driving force for innovation in the sectors mentioned above.

2.3 REVIEW OF EXISTING SYSTEM

In most of the institutions, tracking student's attendance is one of the major issues, because attendance plays important criteria for evaluating a student's hall ticket generation for exams and final grade evaluation in each semester. Ghanaian schools consist of three type of education categories; primary education, secondary education and tertiary education. Student attendance has been recorded or tracked in manual way at most of the schools in Ghana. Investigation on student attendance recording process in the schools has been conducted in one of the tertiary school in Tema Metropolis. Since the attendance does not involve any

system or application, calculation on student attendance and absenteeism remain tedious. Even there is a tendency of wrong calculation due to human error hence it effects the student performance at school. This brings the idea of having some automated method to track and record student's attendance. Therefore, automated computer-based student attendance management system is required to assist the faculty and the lecturer for this time-consuming process.

The following are the detailed analysis of some of the automated computer-based student attendance systems being implemented around the globe.

2.3.1 BARCODE ATTENDANCE SYSTEM

The barcode system is a common type of time and attendance system through which the efficiency of measuring and tracking employees' time could be increased to a great degree. With the automation through barcode technology, the errors previously made in the manual payroll or attendances are eliminated. As a result, the system provides high levels of accuracy and reliability in tracking of employee attendance. In addition, the costs associated with the installation of the system are not too much relative to the cost of payroll or attendance errors. The implementation of the barcode system is easy. Every employee is issued a badge/card in which there is a barcode. In order to check into or out of the company, the badge/card is swapped on the time clock, and the data is captured by the clock. This data from the clock can be downloaded by the manager or the administrator and then used for updating and maintaining time and attendance records. The Universal Product Code (UPC) is a unique 12-digit number assigned to retail merchandise that identifies a product and the vendor. The Universal Product Code (UPC) on a product typically appears adjacent to its barcode, the machine-readable representation of the Universal Product Code (UPC). The UPC for a particular product is always the same. The first six digits is the vendor unique identification

number. All the products that the vendor sells will have the same first six digits in their UPCs. The next five digits identify the product. The last digit is called the check digit. This is used to verify that the UPC for that specific product is correct. Each time that UPC is read, typically, by a scanner reading the barcode, a calculation is done. And, if the check digit is different compared from the one that is calculated, then the computer knows that there is something wrong with the UPC. Fig. 1 is a pictorial diagram of a barcode with its universal product code (UPC)(Thomas, 2004).

Fig. 2.1 Pictorial Diagram of a Barcode

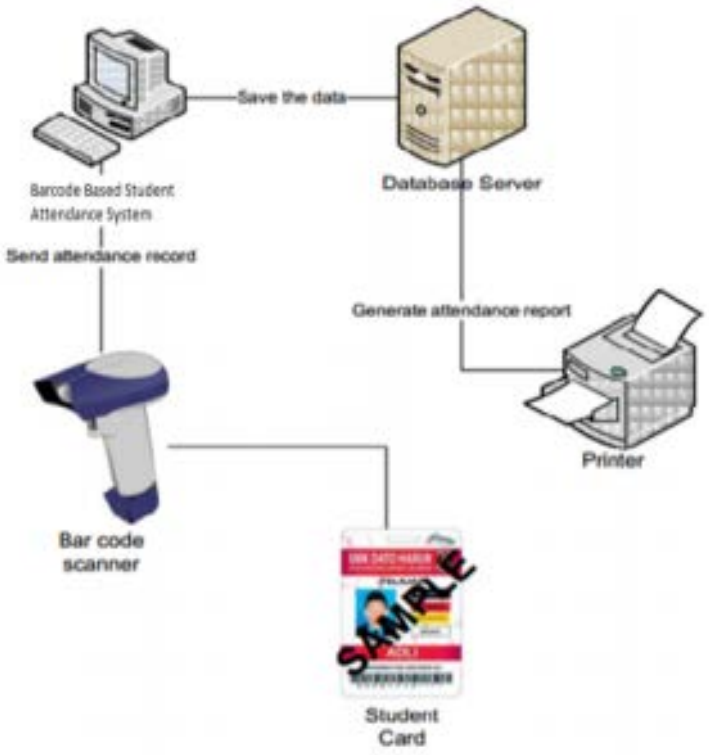


Fig. 2.2 Architecture of the Barcode Attendance System

Barcode scanner is used to scan the student's card which contains the student identification number. The twelve digits are then sent to the attendance system and it will remain displaying student's record for 5 seconds before changing to the state to accept another student card number. Each recorded data will be sent to the database which developed using database processing application. Structured query language (SQL) used to query data to produce various kind of student attendance report.

2.3.2 MAGNETIC STRIPE ATTENDANCE SYSTEM:

In the magnetic stripe attendance system, data is encoded in the magnetic stripe of the employee card. When the card, is swiped through the employee time clock, the information in the card's magnetic stripe is recorded by the time clock. This system also reads one card at a

time and also requires contact with the reader. Figure 3 is a pictorial diagram of a card embedded with magnetic strip.

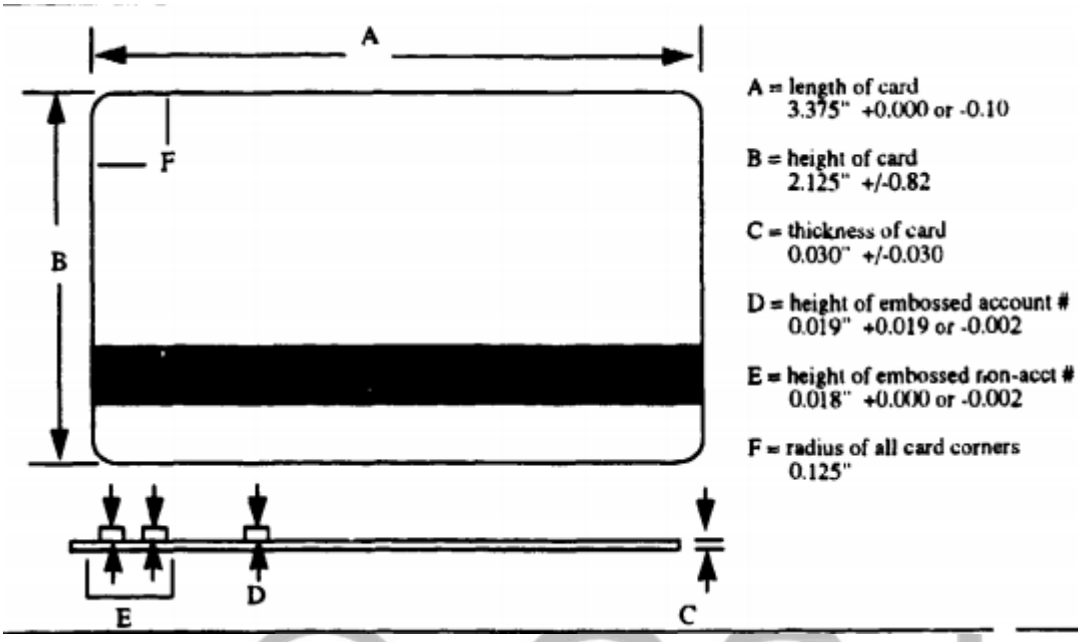


Fig 2.3 Pictorial diagram of a Magnetic Strip Card

2.3.3 RFID ATTENDANCE SYSTEM

Radio frequency identification (RFID) is a technology that transmits data using radio waves from an RFID tag attached to an object by the reader for tracking and identifying objects. RFID system contains two main components; the reader and the tags. The tag is normally attached to the objects to be monitored and carries information in a microchip. The reader on the other hand detects tags that are within its frequency range and writes to or read from the tags (Geoffrey, 2012). The RFID tag is primarily a kind of a memory device that can transmits its contents when being scanned by the reader. The memory consists of binary digits called the bits, and the transmission and receiving of data has a communication channel. The tag can be an electronic circuit with its own power supply (an active device) or

a very low power integrated circuit (passive device) which taps energy from the scanner to transmit its content. In a tag, the transmission power is very low and is measured in millionths of watt i.e. microwatts. Tag can be passive, semi-passive or active. It can also be categorized based on memory type and based on the transmission channel. Passive RFID tags have no internal energy source; energy supplied to the antenna by the incoming radio frequency waves induced enough energy for the CMOS integrated circuit in the tag to get activated and transmits a response. The semi passive tag is similar to passive tag, but has an addition of small power source (battery) which constantly powers the integrated circuit of the tag and the need for an aerial to tap energy from the incoming signal is removed (Mojares, Litan, & Mojares, 2013). Active tags have their own internal energy source which supplies energy for the integrated circuit producing the outgoing signal. They are more sophisticated and reliable due to their ability to conduct a session with the reader. The RFID reader sends a pulse of radio waves to the tags and listens for its response. The tag detects this pulse and sends back a response; the tag ID number and possibly other information as well (Stephen, Sanjay, & John, 2008). The RFID reader can be classified based on the design and technology used (read or read-write) or based on the fixation of the device. The read only RFID reader only reads data from tags, usually a microcontroller based unit with a wound output coil, peak detector hardware, comparators and firmware which are designed to transmit energy to tags and read information back from them by detecting their backscattering modulation. The read/write reader reads data from/to tags. Figure 4 is a schematic diagram of RFID system.

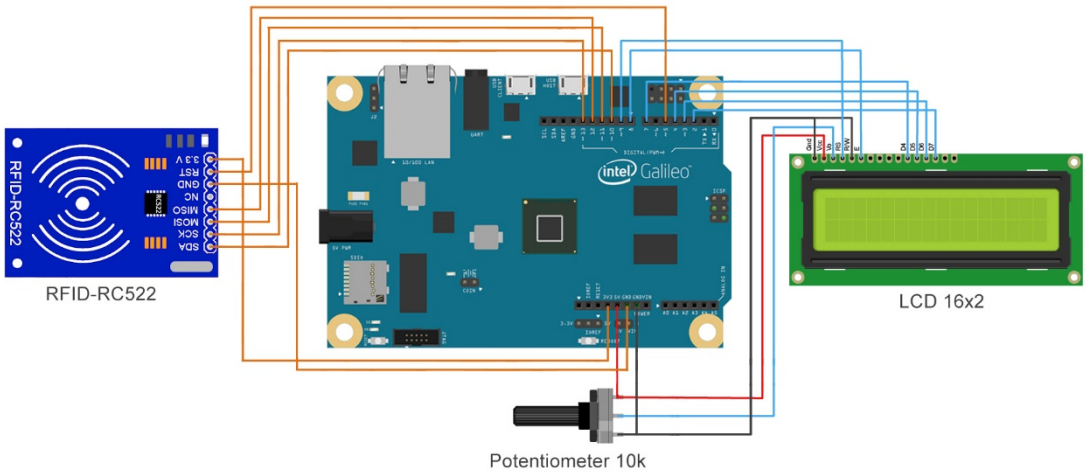


Fig. 2.4 Schematic diagram of RFID system

2.3.4 FACE RECOGNITION ATTENDANCE SYSTEM

Facial images are probably the most common biometric characteristic used by humans to make a personal identification. Identification based on face is one of the most active areas of research, with applications ranging from the static, controlled mug-shot verification to a dynamic, uncontrolled face identification in a cluttered background. Approaches to face recognition are typically based on location and shape of facial attributes, such as the eyes, eyebrows, nose, lips, and chin shape and their spatial relationships; the overall (global) analysis of the face image and its break-down into a number of canonical faces, or a combination thereof. While performance of the systems commercially available is reasonable, it is questionable whether the face itself, without any contextual information, is a sufficient basis for recognizing a person from a large number of identities with an extremely high level of confidence. It is difficult to recognize a face from images captured from two drastically different views. Also it difficult to recognize a face if there is any physical change in the structure of the face. Further, current face recognition systems impose a number of restrictions on how the facial images are obtained, sometimes requiring a simple background or special illumination. In order for the face recognition systems to be widely adopted, they

should automatically detect whether a face is present in the acquired image, locate the face if there is one and recognize the face from a general viewp

Fig. 2.5 Pictorial architecture of face recognition attendance system

2.4 COMPARATIVE STUDY OF REVIEWED SYSTEMS

Fingerprint based biometric system security and access control system is more secure and fast responded as compared to the other system like magnetic strip. By using ZKTeco device it is easy to access and works very quickly while burning the code it is like plug and play device. Users can change the function accordingly. It is easier to use and accurate also. Hence this project can be useful for implementation of access control application for tracking system as well as providing the security benefits.

2.5 CONCLUSION

In this system, the smart attendance system using fingerprint based biometric system can replace the manual system that transformation of information can be delivered without a hitch. This system will ease in schools/colleges to monitor the attendance of student. The system can reduce manpower. Although there are different methods of tracking student but our system is very easy to handle and very convenient for college/university level. This system gives time saving, easy control and reliability.

CHAPTER THREE

LIFE CYCLE DESIGN OF THE PROPOSED SYSTEM

3.1 INTRODUCTION

Fingerprint identification is one of the most well-known and common biometric identification system. Because of their uniqueness & consistency over time, fingerprints have been used for identification over a century, more recently becoming automated due to advancement in computing capabilities.

So, here we are using the fingerprint identification technique for maintaining the attendance record. We plan to maintain a record of the prints of the various students in the database, and they shall be matched and marked present when they place their finger on the fingerprint sensor.

3.2 CRYSTALLIZATION OF THE PROBLEM

Most educational institution's administrators are concerned about student irregular attendance, which may affect the student overall academic performance and finally it affects the students' growth in education. The conventional method of taking attendance by calling names or signing on paper is very time consuming and even insecure because there is possibility of proxy attendance.

Therefore, web-based integrated with fingerprint based biometric system student attendance management system is required to assist the faculty and the lecturer for the time-consuming process. The whole process is controlled using the microcontroller. This paper reviews some of these monitoring systems and proposes a fingerprint based biometric student attendance system. The reports can be generated in real-time processing, thus, provides valuable information about the students' commitments in attending the classes.

3.3 ANALYSIS AND DESIGN OF THE SYSTEM

3.3.1 SYSTEM REQUIREMENTS

This section involves specifying what the new system will require based on the results of the analysis of the current system. Functions that need to solve the problems and the disadvantages of the current system are specified as well as the outputs that are needed to be produced.

The main requirements of the new system can be categorized into the following:

- Functional Requirement
- Non-functional requirement
- Hardware requirements
- Software requirements

The system comes with a simple and easy to use interface at both the server and client side. This makes administration of the system very easy. The graphical interface makes adaptation of the system very easy.

FUNCTIONAL REQUIREMENT

- **Secure:** The proposed system will provide a suite of information security features provided. Security features include the traditional confidentiality, authentication, integrity, availability and accountability. Security features are required in most application.
- **Ubiquitous:** The system will be able to support for wide coverage area. Ubiquitous service requirements include geography, compatibility and service provision.
- **Transparent:** The proposed system will seek to maintain service features, performance, and operation to the user across service and network boundaries.

- **Interoperability:** The system is directly compatible between users and service infrastructure as well as extending features across the service provider and local network domains.

NON-FUNCTIONAL REQUIREMENTS

Non-functional requirements include elements which are related to the infrastructure environment or capabilities in the service which is going to use the equipment and the architecture of the complete application (that is; the distribution of the signal process and matching functions over the network or to remote servers. Typical examples are the operating system platform, the choice of which might be influenced by the current or legacy environment or by the availability of suitable algorithms for quality and matching of biometric samples and the computing power or main memory which are greater when heavier local processing is foreseen in the application.

HARDWARE REQUIREMENTS

The following parts are required for the overall set up of the system:

- ZKTeco Fingerprint Biometric Device
- Ethernet Cable
- 100-240V Power Adapter

ZK TECO FINGERPRINT BIOMETRIC DEVICE

ZKTeco is an international multinational bio-security company headquartered in Shenzhen, China, that develops, manufactures, supports and sells biosecurity devices and software. Its best known products are fingerprint and facial time attendance devices and access control units. Its flagship software product is ZKTime 3.0, which was published in 2015. It is also

one of the world's biggest bio-security device manufacturers. ZKTeco (previously ZKSoftware) was founded by Quanhong Che at 1985, began research and development on a revolutionary biometric algorithm. It rose to dominate the time attendance markets in the mid-2000s, then turned to the access control devices development. As of 2015, ZKTeco tends to market dominant in both the time attendance and access control software markets. The company also produces a wide range of other new high-tech products and servers, and is active areas including Bio-database, green logo products, facial video surveillance vein attendance devices, time attendance services, and engineering products. It's a bio-metric fingerprint reader that's supposed to provide controlled entrance of personnel and security to facilities.

Fig 3.1 ZKTeco Fingerprint Biometric Device

ETHERNET CABLE

An Ethernet cable is one of the most popular forms of network cable used on wired networks. Ethernet cables connect devices on local area networks such as PCs, routers, and switches.

Types of Ethernet Cables

Ethernet cables normally support one or more industry standards including Category 5 (CAT5) and Category 6 (CAT6).

A crossover cable is a special type of Ethernet cable specially designed for connecting two computers to each other.

By contrast, most Ethernet cables are designed to connect one computer to a router or switch.

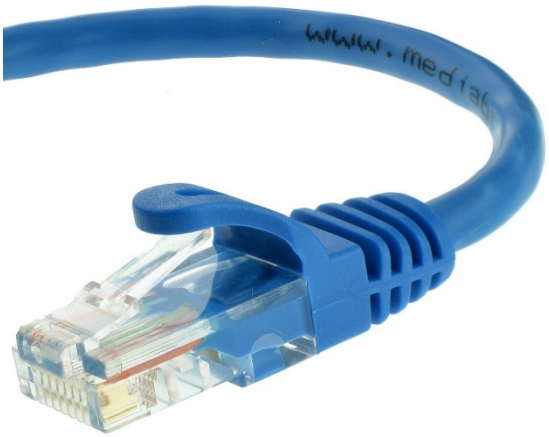


Fig 3.2 CAT6 Ethernet Cable

100-240V POWER ADAPTER

A device that lets you insert a plug into a different socket is an adapter: these are small, cheap and safe. For example, between Britain and Germany, you need only an adapter. You stick your British plug in the adapter, which connects the rectangular phase/live and neutral prongs to the round German ones and puts the ground where the German outlet expects it.

Fig 3.3 100-240V Power Adapter

SOFTWARE REQUIREMENTS

- XAMPP
- Adobe Dreamweaver CS6 or above

XAMPP

XAMPP is a free and open source cross-platform web server solution stack package developed by Apache Friends, consisting mainly of the Apache HTTP Server, MySQL database, and interpreters for scripts written in the PHP and Perl programming languages. XAMPP is a small and light Apache distribution containing the most common web development technologies in a single package. Its contents, small size, and portability make it the ideal tool for students developing and testing applications in PHP and MySQL(Dvorski, 2007). XAMPP stands for Cross-Platform (X), Apache (A), MySQL (M), PHP (P) and Perl (P).

Cross-platform is an attribute conferred to computer software or computing methods and concepts that are implemented and inter-operate on multiple computer platforms.

Apache HTTP Server is a web server software program notable for playing a key role in the initial growth of the World Wide Web. The name Apache was chosen out of respect to the Native American tribe Apache and its superior skills in warfare and strategy. It is web server that allows you to host your websites or any other content for that matter.

MySQL is the world's most popular open source database. It is a Relational Database Management System(RDBMS)- data and its relationships are stored in the form of tables that can be accessed by the use of MySQL queries in almost any format that the user wants. Its

name is a combination of "My", the name of co-founder Michael Widenius' daughter, and "SQL", the abbreviation for Structured Query Language.

PHP is a server-side scripting language designed for web development but also used as a general-purpose programming language. Originally created by Rasmus Lerdorf in 1995, the reference implementation of PHP is now produced by The PHP Group. While PHP originally stood for Personal Home Page, it now stands for Hypertext Preprocessor.

Perl is the Swiss Army chainsaw of scripting languages: powerful and adaptable. It was first developed by Larry Wall, a linguist working as a systems administrator for NASA in the late 1980s, as a way to make report processing easier.

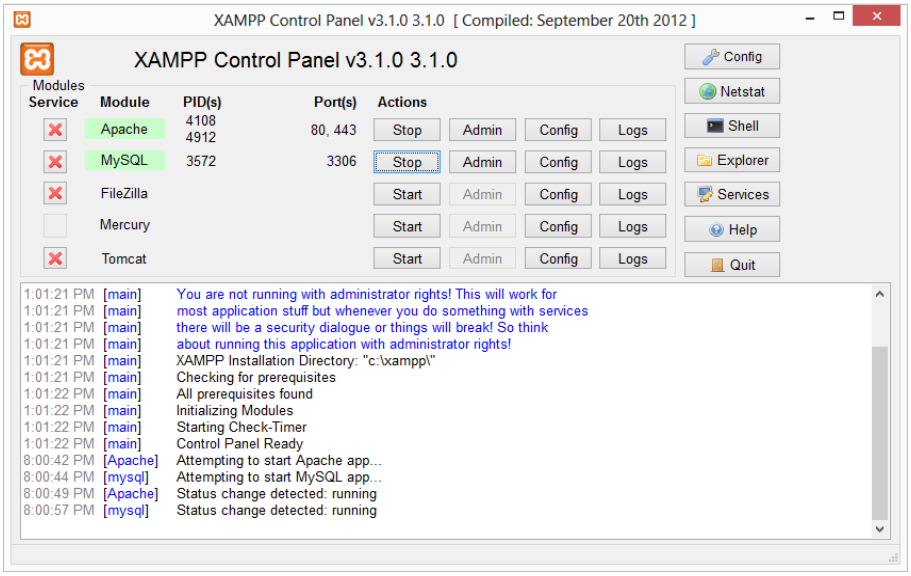


Fig 3.4 Screenshot of XAMMP Control Panel

ADOBE DREAMWEAVER CS6

Adobe Dreamweaver is a proprietary web development tool developed by Adobe Systems. Dreamweaver was created by Macromedia in 1997, and was maintained by them until Macromedia was acquired by Adobe Systems in 2005. Adobe Dreamweaver is available for macOS and for Windows. Following Adobe's acquisition of the Macromedia product suite,

releases of Dreamweaver subsequent to version 8.0 have been more compliant with W3C standards. Recent versions have improved support for Web technologies such as CSS, JavaScript, and various server-side scripting languages and frameworks including ASP (ASP JavaScript, ASP VBScript, ASP.NET C#, ASP.NET VB), ColdFusion, Scriptlet, and PHP. Adobe Dreamweaver CS6 is available in the following languages: Brazilian Portuguese, Simplified Chinese, Traditional Chinese, Czech, Dutch, English, French, German, Italian, Japanese, Korean (Windows only), Polish, Russian, Spanish, Swedish and Turkish.

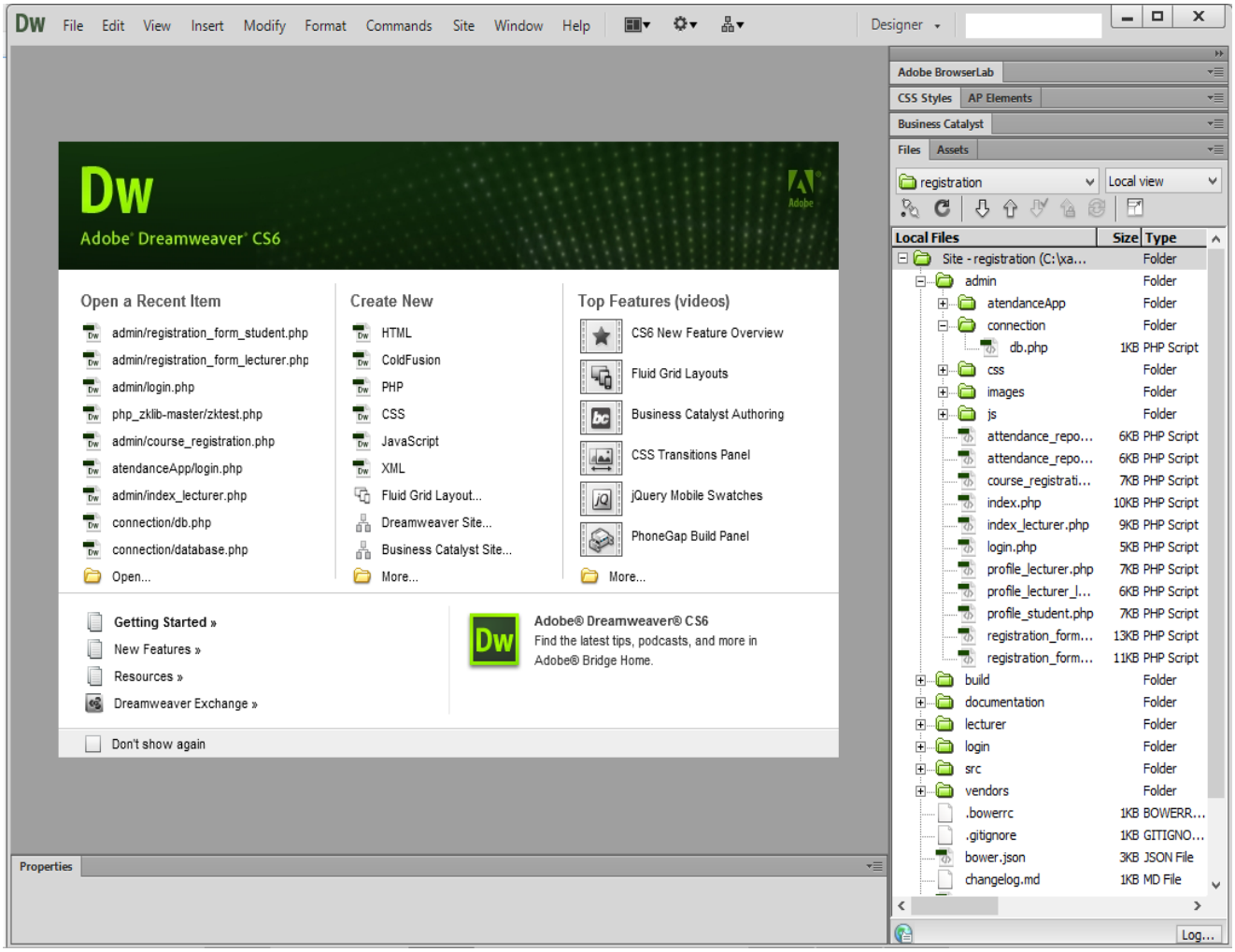
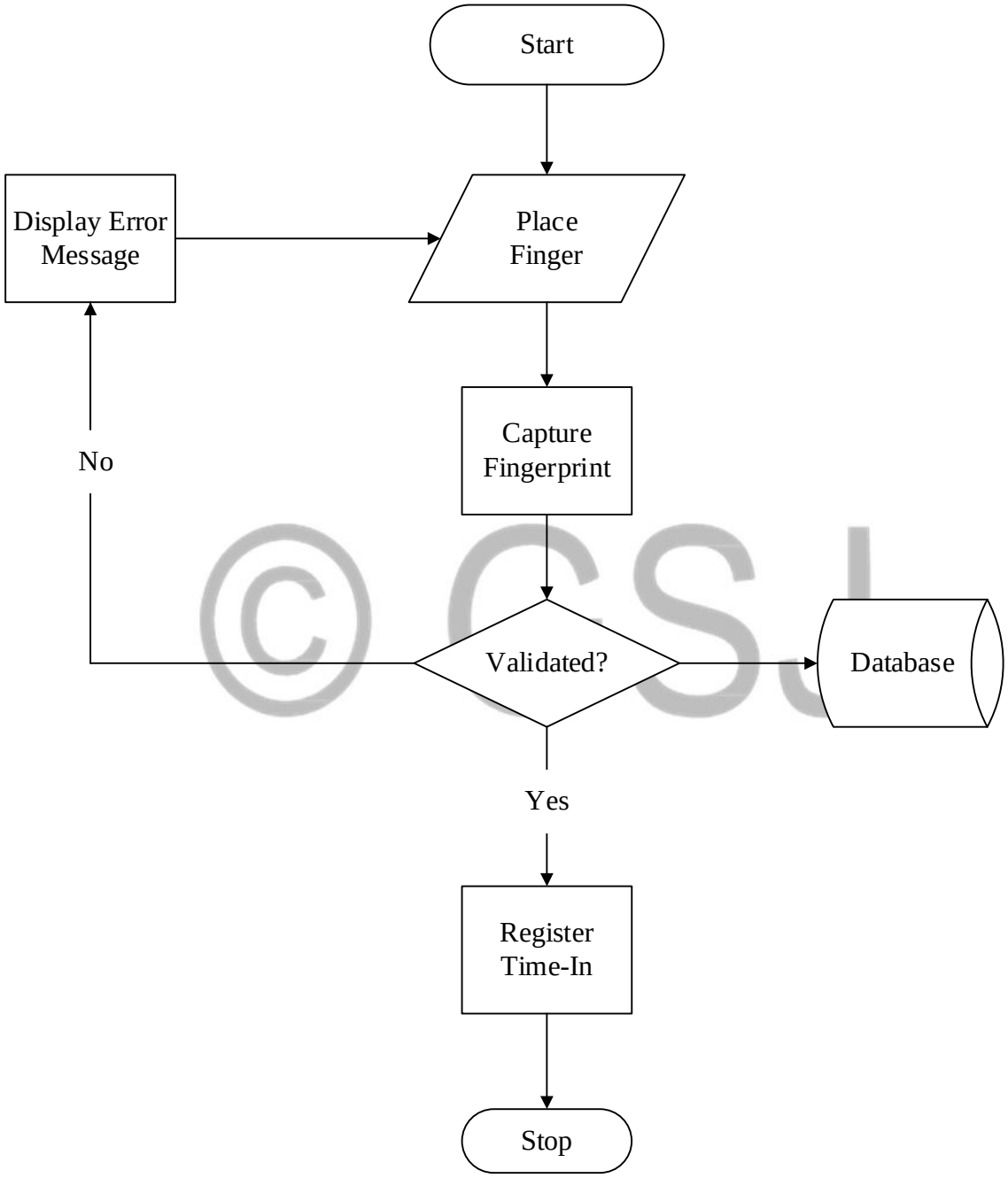
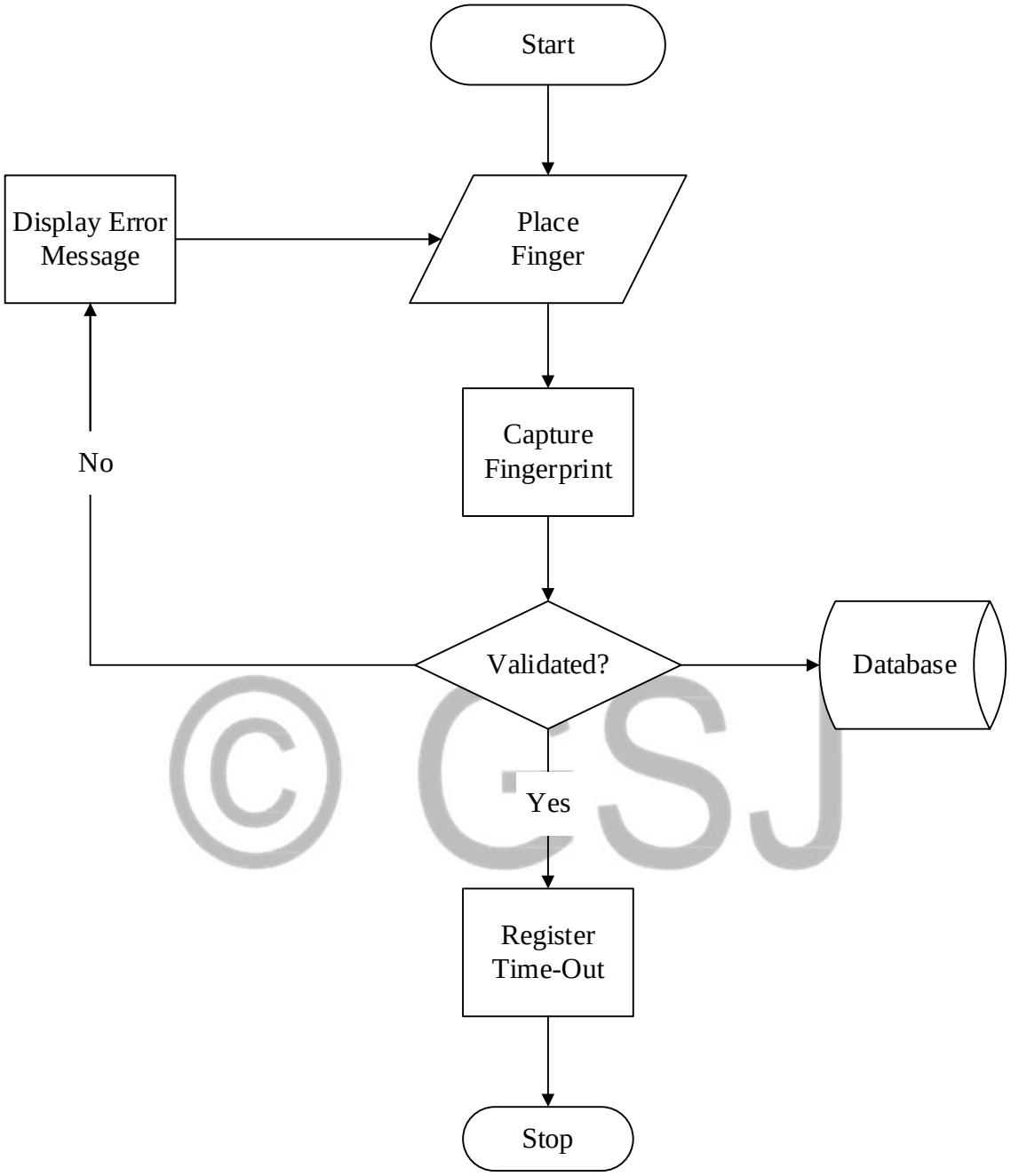


Fig 3.5 Screenshot of Adobe Dreamweaver CS6

3.4 FLOW CHART DIAGRAMS

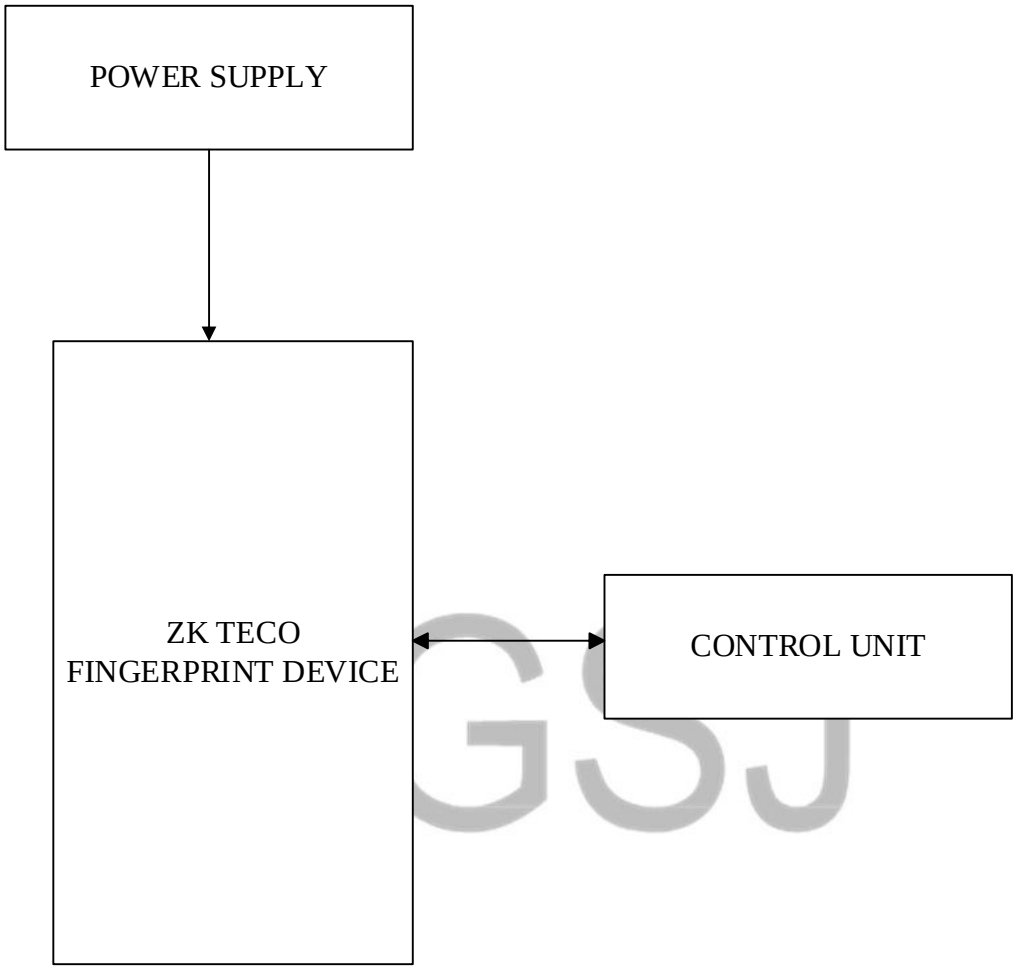


Flowchart of system (Time-In)

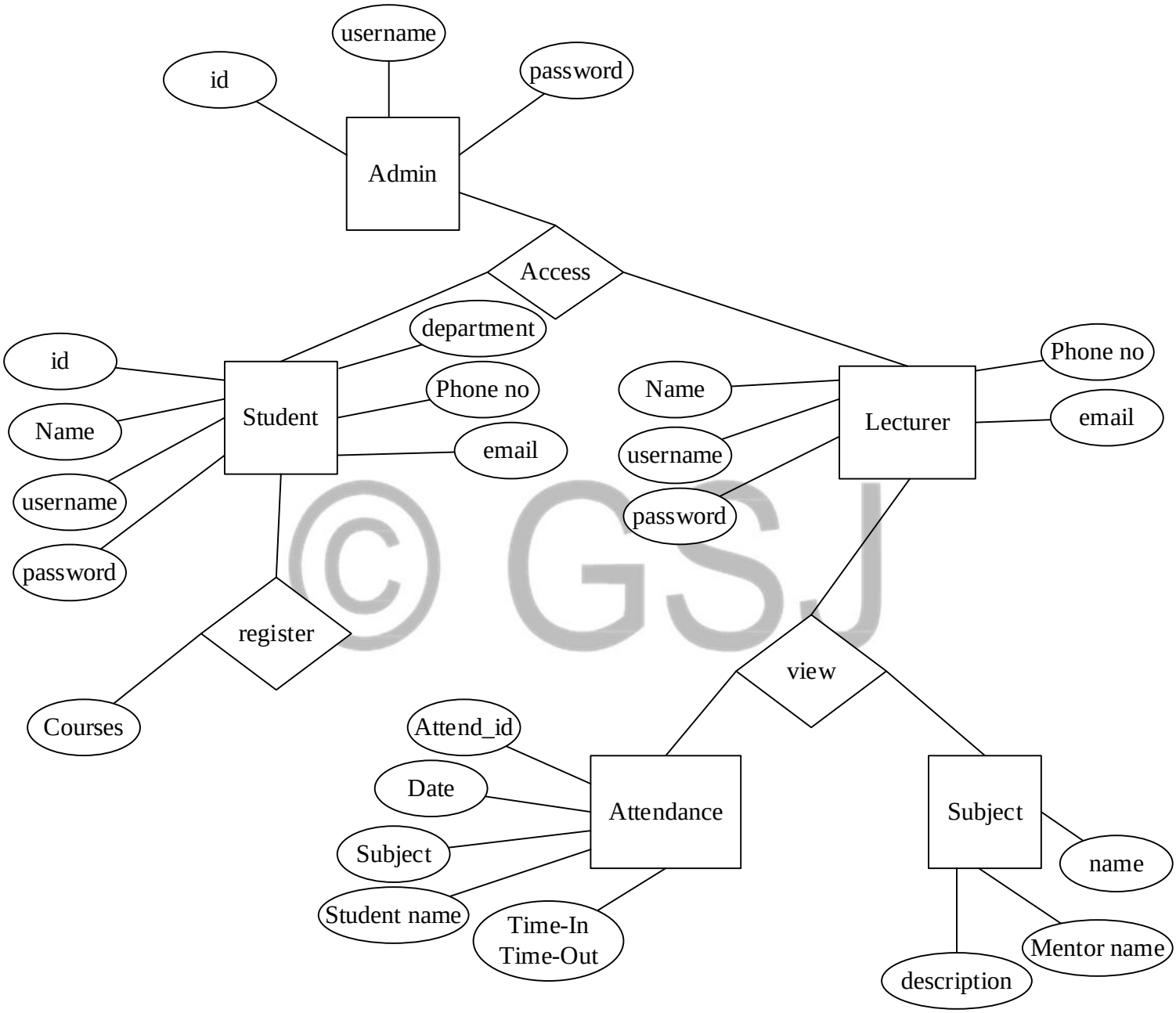


Flowchart of system (Time-Out)

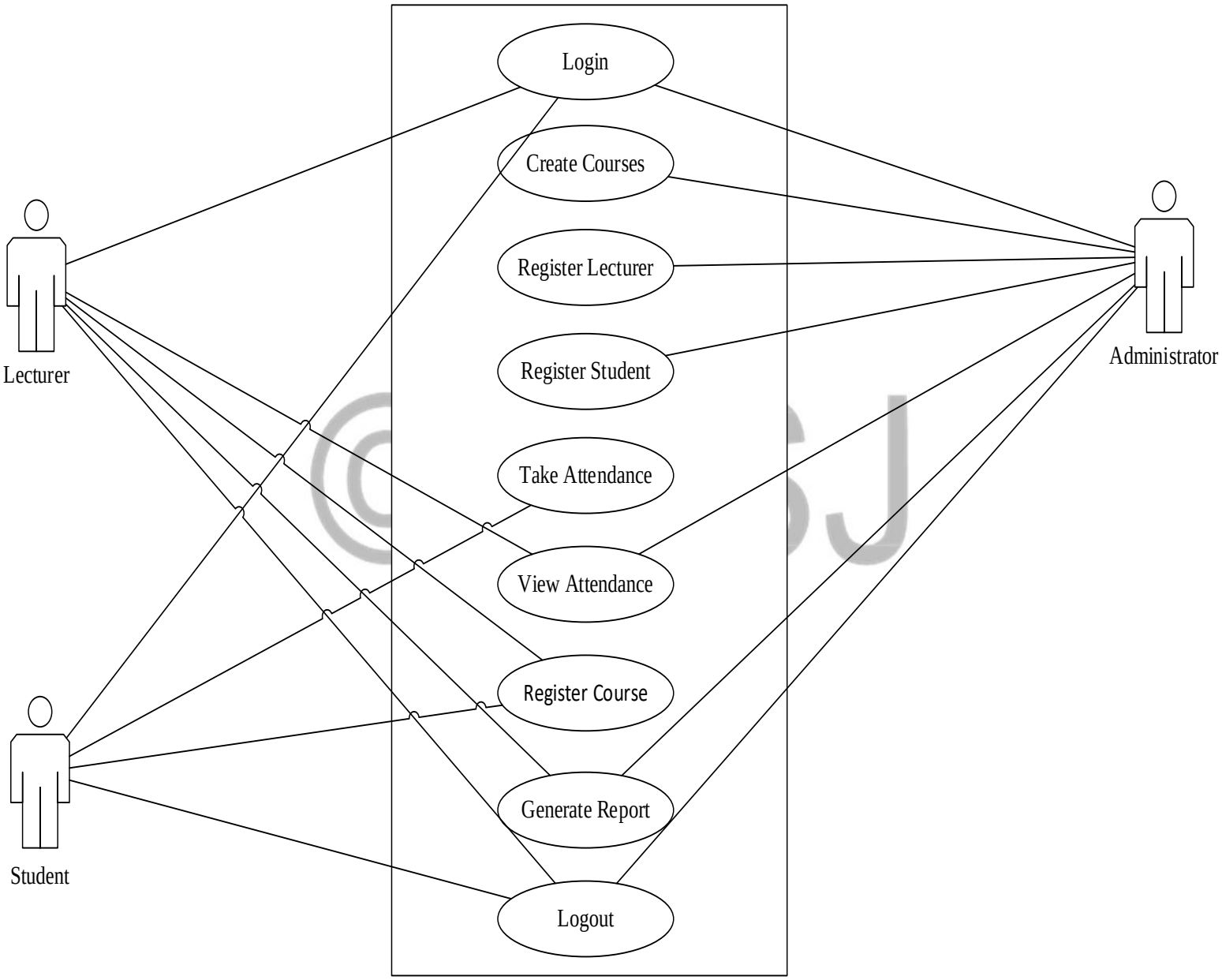
3.4.1 CONTEXT FLOW DIAGRAMS



3.4.2 DATA FLOW DIAGRAMS



3.4.3 USE CASE DIAGRAMS



3.5 TOOLS USED

HARDWARE TOOLS

- ZKTeco Fingerprint Biometric Device
- Ethernet Cable
- 100-240V Power Adapter

SOFTWARE TOOLS

- XAMPP
- Adobe Dreamweaver CS6 or above

3.6 CONCLUSION

As the fingerprint based biometric technology evolves, more sophisticated applications will use the capability of fingerprint based biometric to receive, store and forward data to a remote sink source. Fingerprint based biometric system has many applications as can be imagined. In this project, we have utilized the versatility of fingerprint based biometric system in implementing functional and automatic student attendance recording system that allows students to enter the in-time and out-time just by using the finger on the fingerprint sensor which is located at the entrance of the lecture room with a considerable degree of success.

We hope that this system can shift the paradigm of students' attendance using register and provide a new, accurate, and less cumbersome way of taking students' attendance in the college.

CHAPTER FOUR

SYSTEM TESTNG, IMPLEMENTATION AND DOCUMENTATION

4.1 INTRODUCTION

System testing, implementation and documentation is all about testing the system to verify if it meets the required specification, after which it is implemented in the proposed environment using the interface, device and power supply.

4.2 TESTING OF THE NEW SYSTEM

4.2.1 UNIT TESTING

Unit testing is a software testing method by which individual units of source code, sets of one or more computer program modules together with associated control data, usage procedures, and operating procedures, are tested to determine whether they fit to use.

4.2.1.1 Login Page

The login page should display a text area for the username and password as well as a login button. If the username and password for an admin is inputted, after the login button is clicked it will take you to the admin homepage. Also when a wrong username or password is entered it prompts the user wrong username or password. The same approach can be used for the lecturer too.

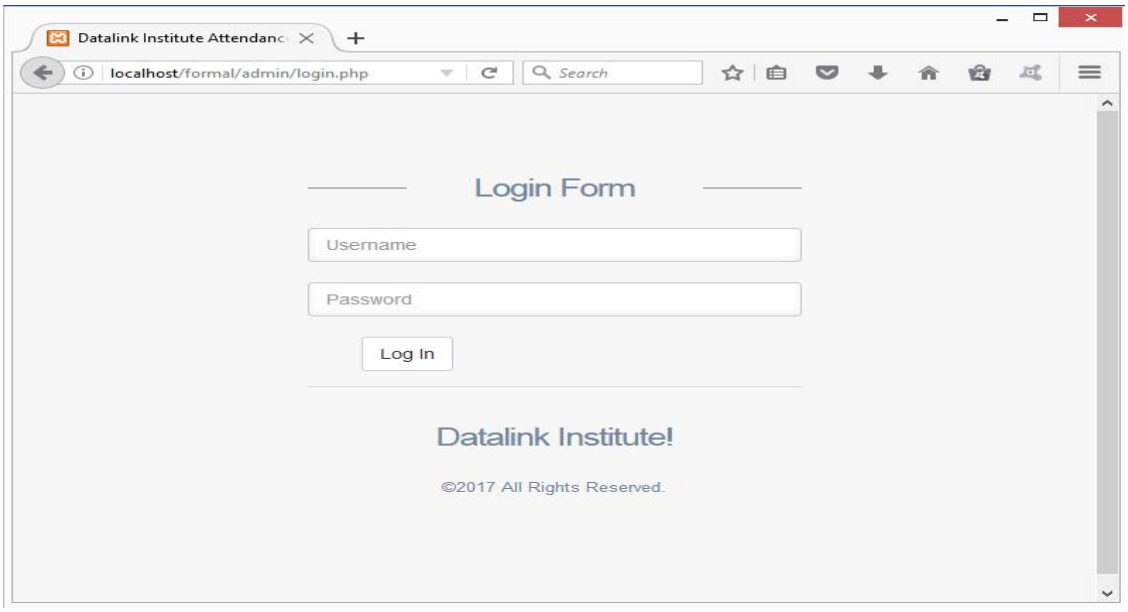


Fig 4.1 Login Page

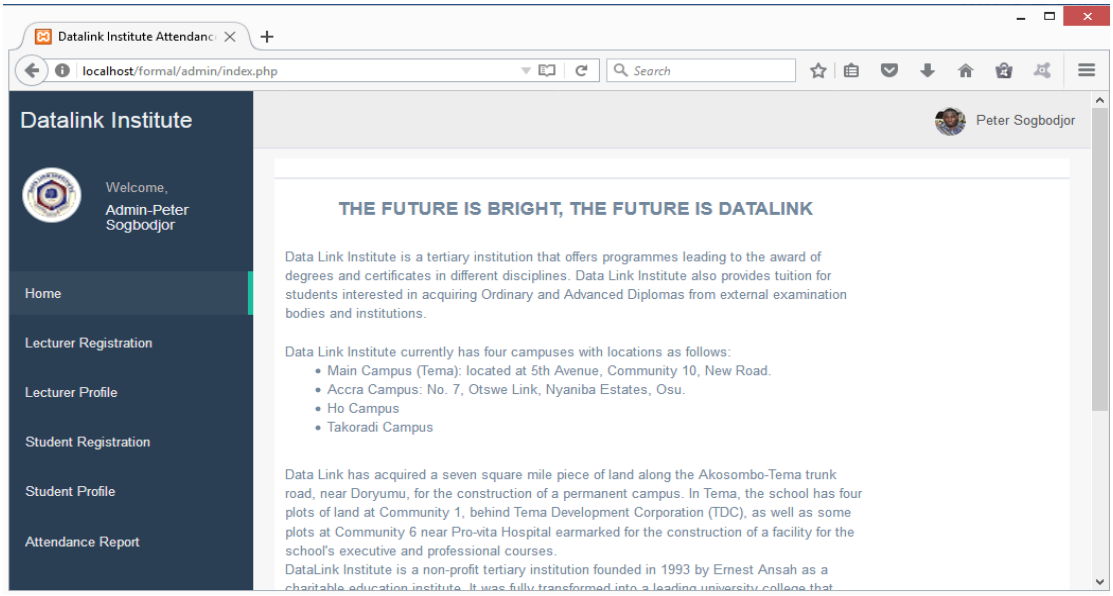


Fig 4.2 Homepage for Admin

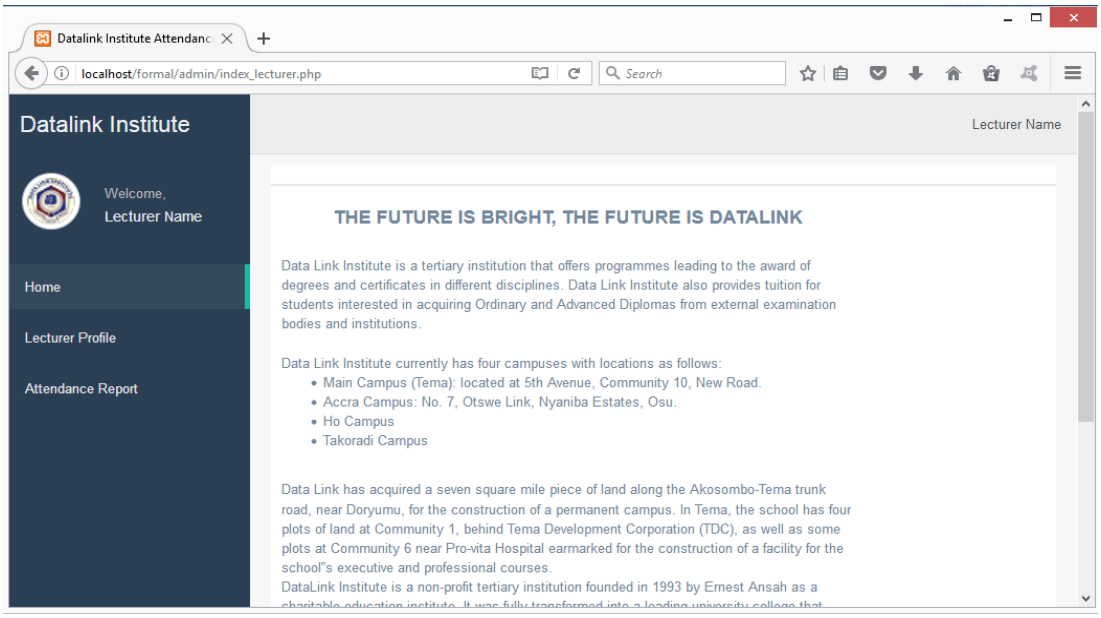


Fig 4.3 Homepage for Lecturer

4.2.1.2 Admin Home Menu

The admin home page is the default page that opens when an admin username or password is logged in with. When the home menu on any of the admin pages is clicked on, it takes you to the admin home page.

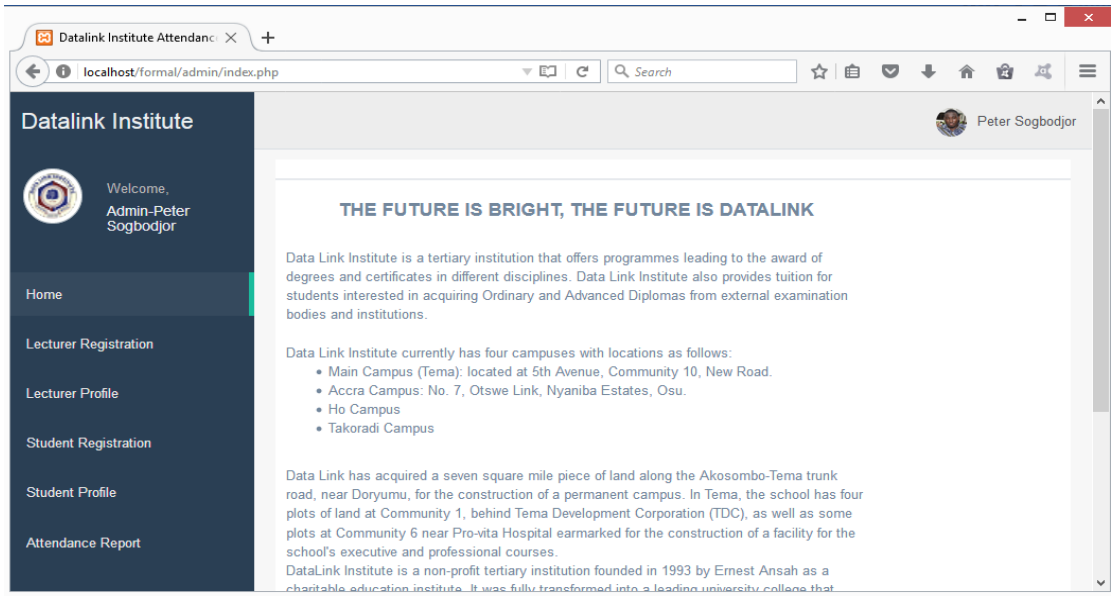


Fig 4.4 Admin Home Page

4.2.1.3 Lecturer Registration Menu

The lecturer registration page is where the registration of lecturers is done. When the lecturer registration menu is clicked on, in any of the admin pages, it takes you to the lecturer registration page that will display the registration form.

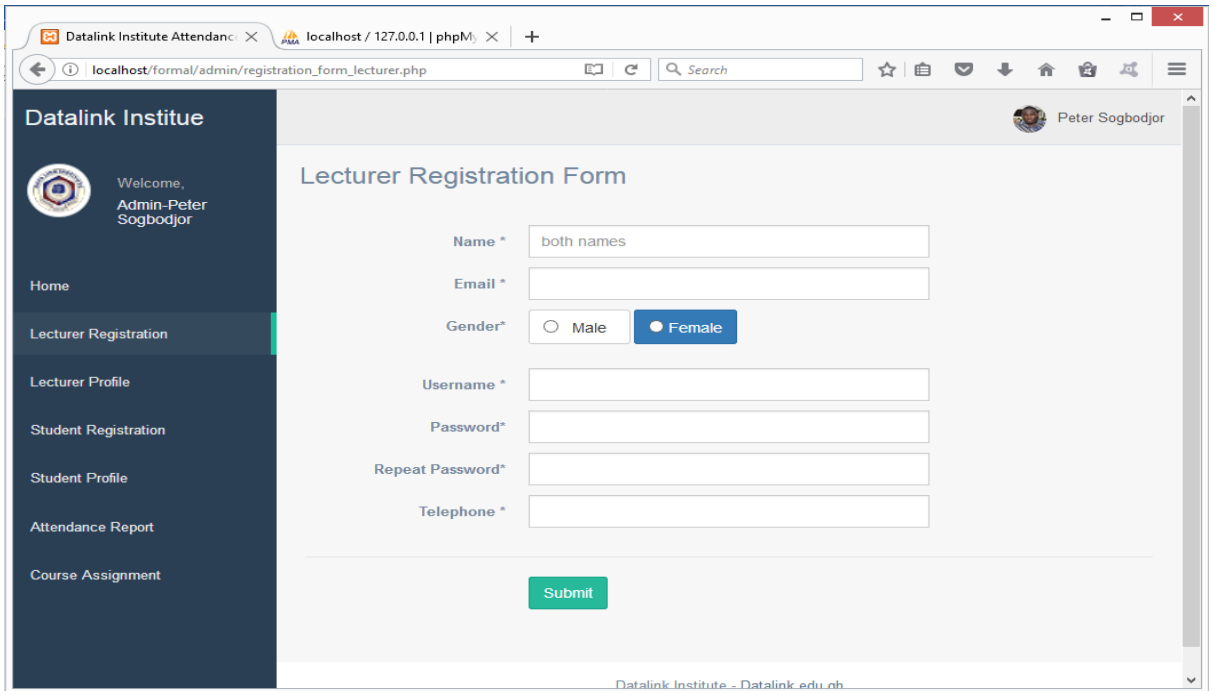


Fig 4.5 Lecturer Registration Page

4.2.1.4 Student Registration Menu

The student registration page is where the registration of students is done. When the student registration menu is clicked on, in any of the admin pages, it takes you to the student registration page that will display the registration form.

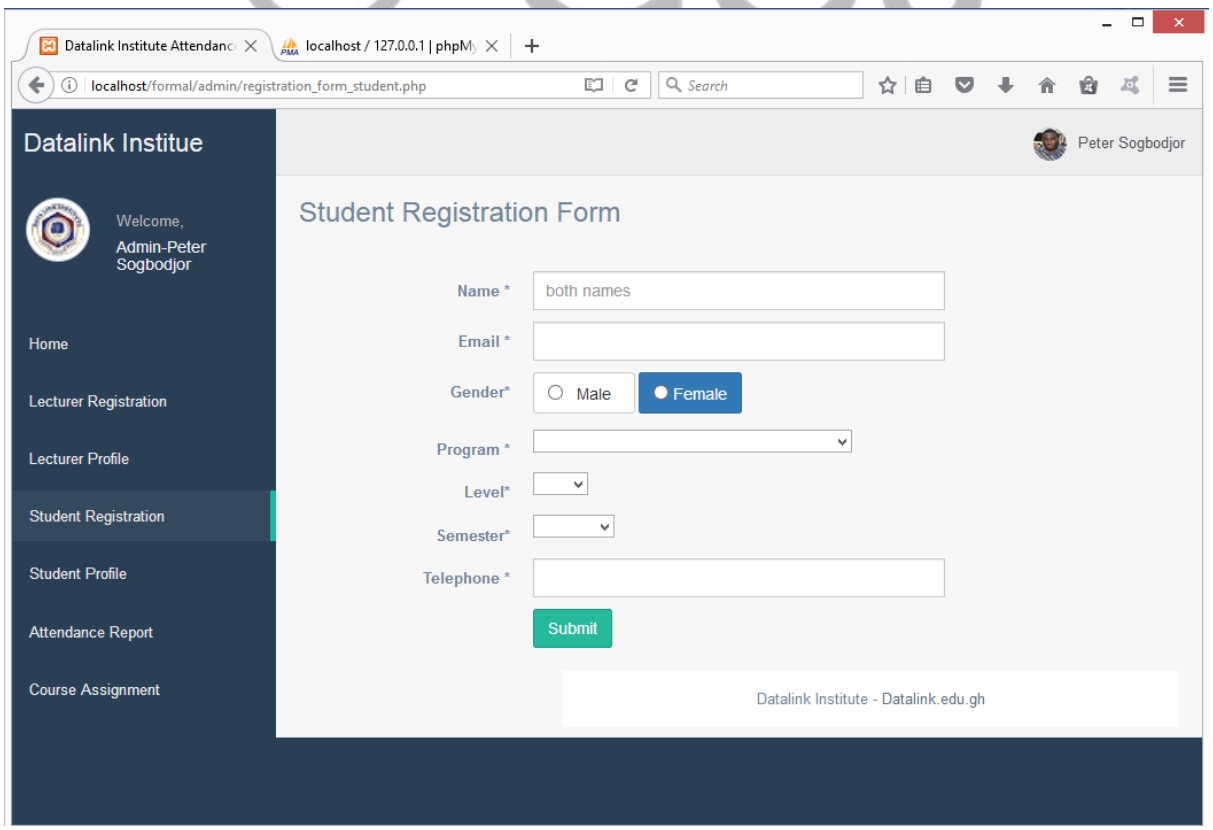


Fig 4.6 Student Registration Page

4.2.1.5 Device Information Menu

The Device Information page is where the Biometric device readings is processed. When a student uses the biometric device to record its attendance for reporting for lectures the device sends the information to a page where it directs itself to the database. This page is programmed to refresh every five minutes so that multiple student's information can be processed in order without data redundancy.

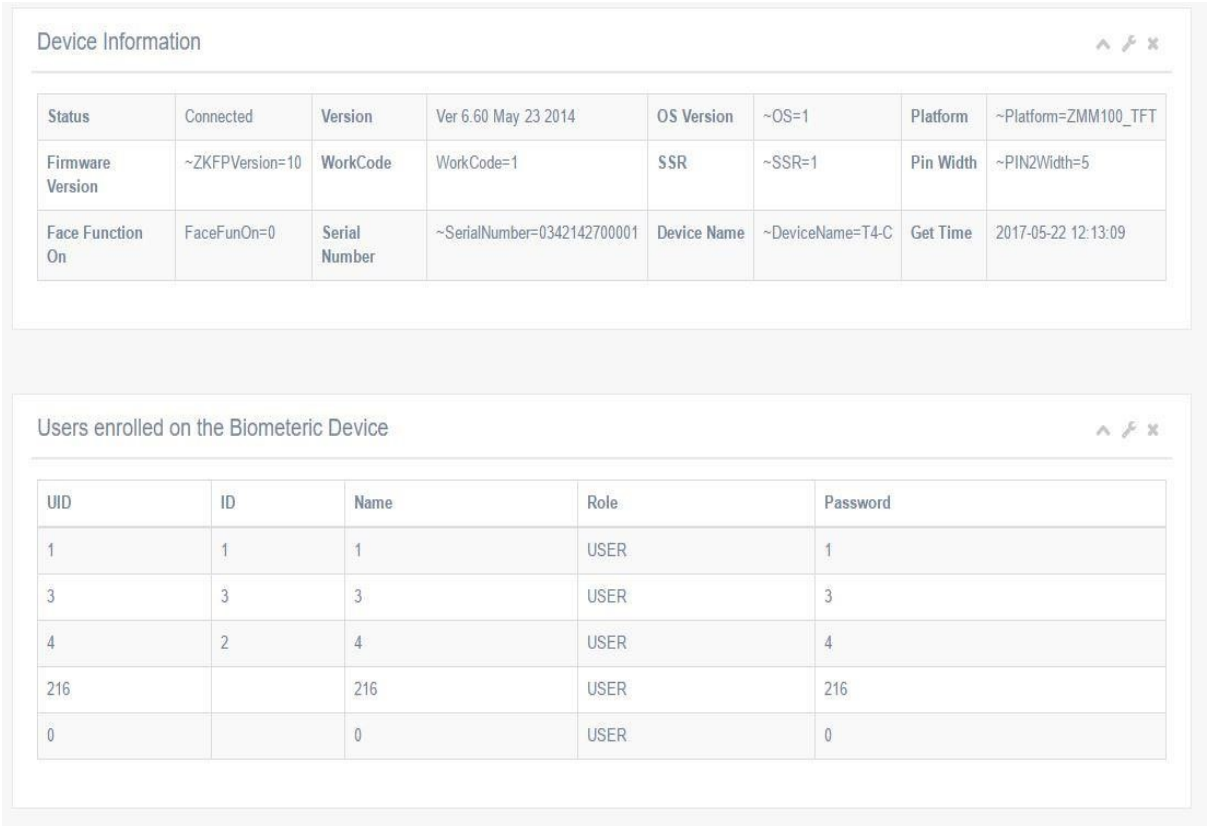


Fig 4.7 Device Information Menu

4.2.1.6 Course Assignment Menu

The course assignment page is the page where the various lecturers are assigned to the various courses. When opened the course assignment form is displayed. When the course

assignment menu on any of the admin pages is clicked on, it takes you to the course assignment page.

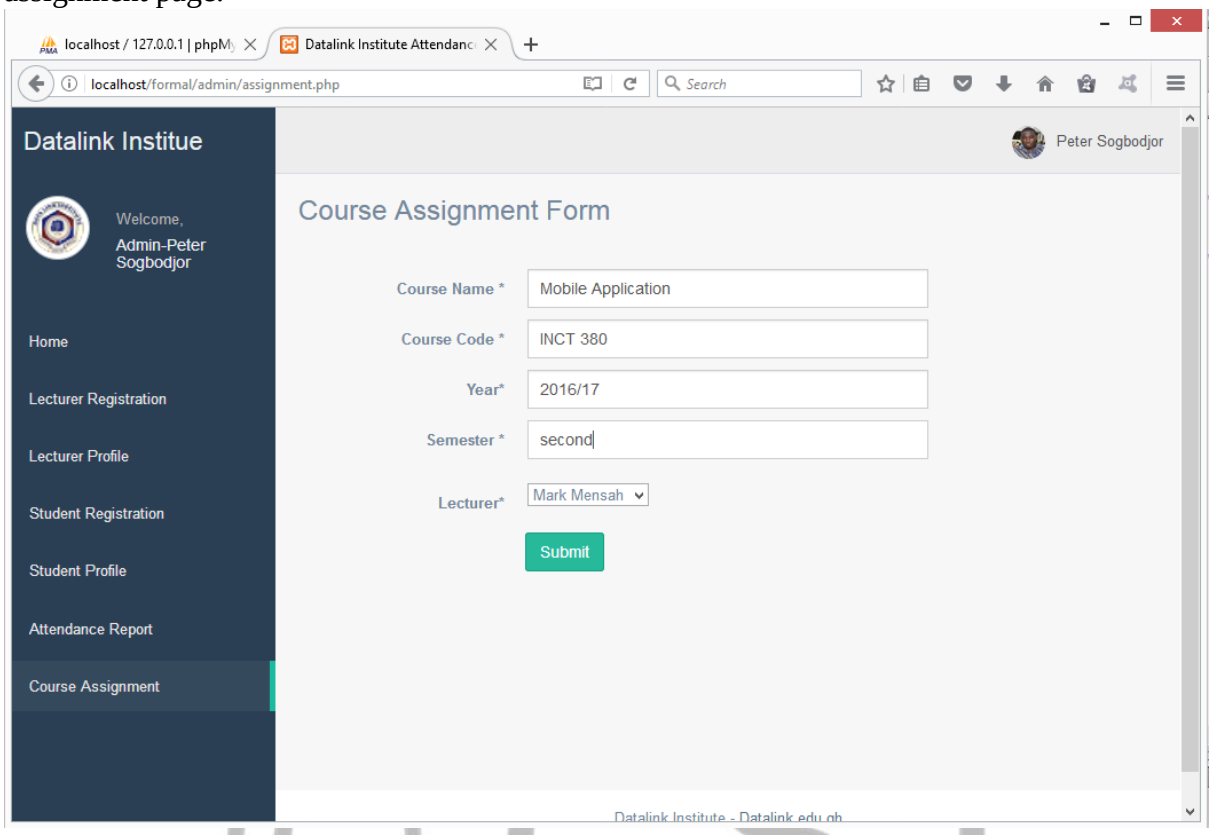


Fig 4.8 Course Assignment Page

4.2.1.7 Lecturer Home Menu

The lecturer home page is the default page that opens when a lecturer username or password is logged in with. When the home menu on any of the lecturer pages is clicked on, it takes you to the lecturer home page.

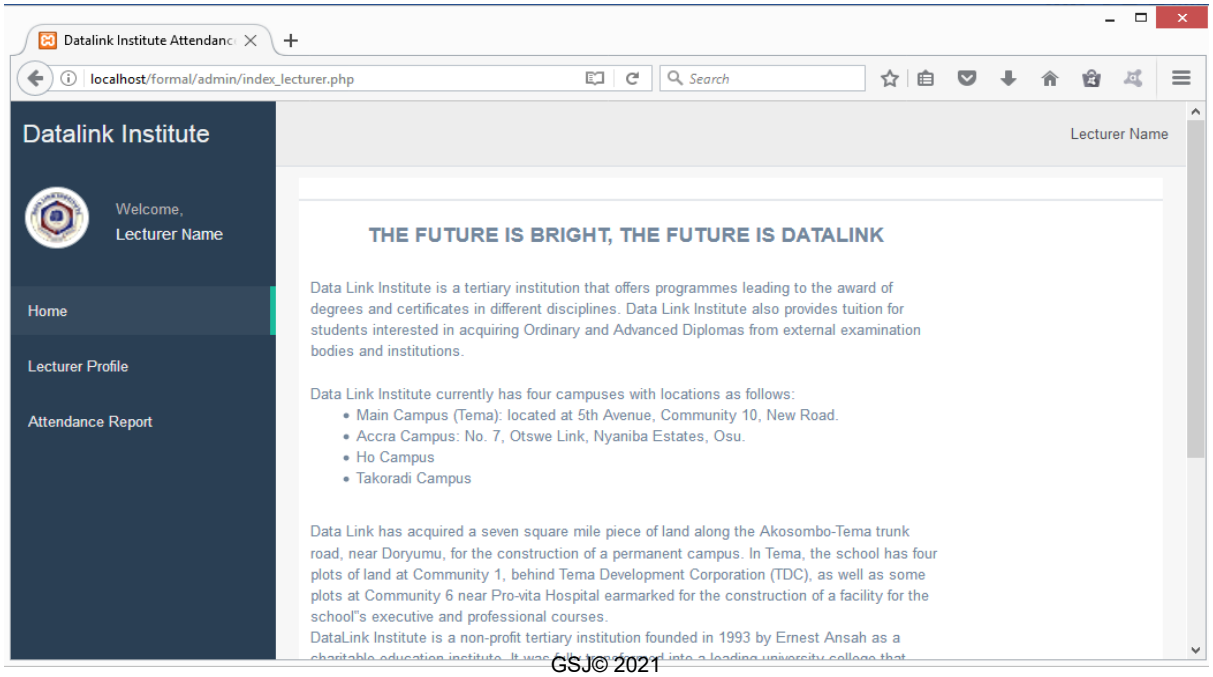


Fig 4.9 Lecturer Home Page

4.2.2 FUNCTIONAL TESTING

Functional testing means testing the application against business requirements. Functional testing is executed using the functional specifications given by the client or by the design specifications according to use cases given by the design team. Role of functional testing is to validate the behaviour of the application.

This system is to reduce the appearance of names of students not present at lectures that occurs during the manual collection. Since the attendance uses the biometric form, someone cannot sign in for a friend who is not in class for the fear of not getting the marks for attendance.

In Datalink Institute, scores are given for frequently attending lectures. This system is to provide allocation of appropriate attendance scores. With this system, the lecturer can know if a particular student is frequent class for him or her to give the appropriate attendance score.

In the old and manual system which is currently used, time is wasted in the collection of attendance in class because, the paper must go around from one student to another which sometimes distracts the class. This system is ready to reduce time wasted during manual collection of attendance.

4.3 IMPLEMENTATION OF THE NEW SYSTEM

Systems implementation is the process of construction of a new system and the delivery of that system into production. In the implementation of this system the phased implementation approach will be used.

4.3.1 PHASED IMPLEMENTATION

Functional testing means testing the application against business requirements. Functional testing is executed using the functional specifications given by the client or by the design specifications according to use cases given by the design team. Role of functional testing is to validate the behaviour of the application.

This system is to reduce the appearance of names of students not present at lectures that occurs during the manual collection. Since the attendance uses the biometric form, someone cannot sign in for a friend who is not in class for the fear of not getting the marks for attendance.

In Datalink Institute, scores are given for frequently attending lectures. This system is to provide allocation of appropriate attendance scores. With this system, the lecturer can know if a particular student is frequent class for him or her to give the appropriate attendance score.

In the old and manual system which is currently used, time is wasted in the collection of attendance in class because, the paper must go around from one student to another which sometimes distracts the class. This system is ready to reduce time wasted during manual collection of attendance. approach.

4.4 SYSTEM DOCUMENTATION

The system documentation describes mainly the process, the structure and the use of the system. It includes general flows of the program that explain what goes on in the system. The documentation guide users to navigate through the system once the user enters the system.

4.4.1 ABOUT THE SYSTEM

About the system describes mainly what the system does. What this system does is that, when a student comes for lectures and fingerprint on the biometric device, the date and time of that student is sent to the database. After the class, the lecturer can login to his or her portal and check the attendance for lectures that particular day which will help in the allocation of

appropriate attendance score. All of this cannot take place unless both the lecturer and student are registered by the admin. In this system, the admin is the one who has the authority to do registration of lecturers and student, assigning courses to lecturers, viewing different students and lecturers profile based on what is searched for, viewing attendance report and managing and monitoring the attendance.

4.4.2 USER ACCESS LEVEL

User access level describes the access every user of this system has. In this system, the main users are; students, lecturers and admin. The student is only allowed to take attendance with their fingerprint. The lecturer is also allowed to login into the lecturer portal, view attendance for lectures and also view his or her profile. The access the admin also has in this system is that, he or she can login to the admin portal, register lecturers and students, view lecturers and students profile, view and monitor attendance and also assign courses to the lecturers.

4.4.3 GETTING STARTED

Getting started elaborates on the various users can navigate around the system.

4.4.3.1 Lecturer

After you have been registered, you then open your browser and type the uniform resource locator (url) of the file directory which is **http://localhost/formal/admin/login.php** and then enter to take u to the login page. You type in your username and password and either click on the login button or press enter which takes you to your home page. To view your profile u will just click on the lecturer profile menu and it will take u to a page where you can view it. To also view the attendance for the class, you click on the attendance report menu which will take u to a page where you can view the attendance report for the class. When you are done with all what u want to do on the portal u click on the log out button that ends the session and takes u back to the login page.

4.4.3.2 Admin

You open your browser and type the uniform resource locator (url) of the file directory which is **http://localhost/formal/admin/login.php** and then enter to take u to the login page. You type in your username and password and either click on the login button or press enter which takes you to the admin home page. To register lecturers into the system, u click on the lecturer registration menu which takes you to the lecturer registration page where a form is displayed which after all the fields are filled and the submit button clicked, the information goes into the database. To register students into the system, u click on the student registration menu after which the same process for registering lecturers is done. The admin can view the attendance report for the whole day by clicking on the attendance report menu. The admin can assign courses to the various lecturers by clicking on the course assignment menu which will open the course assignment page and display the form.

4.4.3.3 Student

All what the students are to do is that, you use the finger that was registered in the system to fingerprint on the biometric device when you come to class. When class closes, the same process must be done to ensure that you attended the class.

4.5 CONCLUSION

This system was able to meet requirement according to the objectives. It can be easily accessed and user friendly. The lecturer can view his or her profile and check the attendance for the class. The admin is also able to register lecturers and students, assign courses to lecturers, view students and lecturers profile and also view attendance report.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

The "**Fingerprint Based Biometric Student Attendance System**" has been designed and tested successfully. It has been developed by integrated features of all the hardware components used. In the course of this project, important facts that can be incorporated were pointed out, areas such as adding a student portal, to help with convenience in students registering for their courses. Another area noted and implemented is the course assignment for the lecturers. This chapter summarizes the findings recommendation and conclusions based on the analysis and research of the results of the study conducted.

5.2 SUMMARY

This system is capable of accepting fingerprints of the various students as attendance and will help the efficient monitoring and managing of attendance.

5.3 RECOMMENDATION

During system testing users made significant comments and recommendations about possible ways of improving this system. Some of these recommendations include; adding a student portal which will make the students register for the courses by themselves, the assignment of courses to the lecturers by the admin which is now implemented, also the power in the device should have a solar module power up as soon as the main electricity goes off and lecturers using the fingerprint device to prove they attended lectures.

5.4 CONCLUSION

With the development of this system, we will like to conclude by saying that it will improve the attendance of lectures by students. The system designed met requirement and the necessary corrections has been made.

REFERENCES

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9. Thomas, G. C. (2004). Feds approve human RFID implants. Retrieved 30-01-2017, from http://www.theregister.co.uk/2004/10/14/human_rfid_implants

APPENDIX A-B

Fingerprint Device

```
<?php
$servername = "localhost";
$username = "myuser";
$password = "mypassword";
$databasename= "websyt";
$connection = mysqli_connect($servername, $username,
$password, $databasename);
?>

<html>
  <head>
    <title>Attendance Report</title>
  </head>    <script>
      var time = new Date().getTime();

      function refresh() {
```

```
        if(new Date().getTime() - time >= 60000)              window.location.reload(true);
else
            setTimeout(refresh, 1000);
        }

        setTimeout(refresh, 1000);
    </script>
    <body> <?php
    include("zklib/zklib.php");

    $zk = new ZKLib("192.168.10.120", 4370);

    $ret = $zk->connect();    sleep(1);    if (
$ret ):
        $zk->disableDevice();        sleep(1);
    ?>

        <table    border="1"    cellpadding="5" cellspacing="2">          <tr>
            <td><b>Status</b></td>
            <td>Connected</td>
            <td><b>Version</b></td>
            <td><?php echo $zk->version() ?></td>
            <td><b>OS Version</b></td>
                                <td><?php                    echo                    $zk->osversion()
?></td>
```

```
            <td><b>Platform</b></td>
            <td><?php echo $zk->platform() ?></td>
        </tr>
        <tr>
            <td><b>Firmware Version</b></td>
                                <td><?php echo $zk->fmVersion()
?></td>
            <td><b>WorkCode</b></td>
            <td><?php echo $zk->workCode() ?></td>
            <td><b>SSR</b></td>
            <td><?php echo $zk->ssr() ?></td>
            <td><b>Pin Width</b></td>
            <td><?php echo $zk->pinWidth() ?></td>
        </tr>
        <tr>
            <td><b>Face Function On</b></td>
            <td><?php echo $zk->faceFunctionOn()
?></td>
            <td><b>Serial Number</b></td>
            <td><?php echo $zk->serialNumber()
?></td>
            <td><b>Device Name</b></td>
            <td><?php echo $zk->deviceName();
?></td>
            <td><b>Get Time</b></td>
```

```
            <td><?php echo $zk->getTime() ?></td>
        </tr>
    </table>
    <hr />
    <table border="1" cellpadding="5" cellspacing="2" style="float: left; margin-
right:
10px;">
        <tr>
            <th colspan="5">Data User</th>
        </tr>
        <tr>
            <th>UID</th>
            <th>ID</th>
            <th>Name</th>
            <th>Role</th>
            <th>Password</th>
        </tr>           <?php
try {

            //$zk->setUser(1, '1', 'Admin', '',
LEVEL_ADMIN);
            $user = $zk->getUser();            sleep(1);            while(list($uid,  $userdata)
        = each($user)):
                if ($userdata[2] == LEVEL_ADMIN)
                    $role = 'ADMIN';
```

```
elseif ($userdata[2] == LEVEL_USER)
    $role = 'USER';  else
    $role = 'Unknown';
  ?>
  <tr>
    <td><?php echo $uid ?></td>
    <td><?php echo $userdata[0] ?></td>
    <td><?php echo $userdata[1] ?></td>
    <td><?php echo $role ?></td>
    <td><?php echo $userdata[3] ?> </td>
  </tr>  <?php
endwhile;
  } catch (Exception $e) {  header("HTTP/1.0 404 Not Found");
header('HTTP', true, 500); // 500 internal server error
  }
  //$zk->clearAdmin();
  ?>
</table>

<table  border="1"  cellpadding="5" cellspacing="2">  <tr>
    <th colspan="6">Data Attendance</th>
```

```
        </tr>
        <tr>
          <th>Index</th>
          <th>UID</th>
          <th>ID</th>
          <th>Status</th>
          <th>Tanggal</th>
          <th>Jam</th>
        </tr>
        <?php
        $attendance = $zk->getAttendance();            sleep(1);
        while(list($idx, $attendancedata) = each($attendance)){
          if ( $attendancedata[2] == 14 )                $status = 'Check Out';
else
            $status = 'Check In';
        ?>
        <tr>
          <td><?php echo $idx ?></td>
          <td><?php echo $attendancedata[0]
?></td>
          <td><?php echo $attendancedata[1]
?></td>
          <td><?php echo $status ?></td>              <td><?php echo  date( "d-m-Y",
strtotime( $attendancedata[3] ) ) ?></td>
          <td><?php echo date( "H:i:s",
```

```
strtotime( $attendancedata[3] ) ) ?></td>
        </tr>
        <?php
        $u = $attendancedata[3];
        $q = $attendancedata[1];
        $sql = "INSERT INTO `checkin`(`biolog`,
`id`, `date`) VALUES ('$idx', '$q', '$u')";
        $result = mysqli_query($connection,$sql);          }
        ?>
      </table>

   <?php
      $zk->enableDevice();       sleep(1);
$zk->disconnect();    endif ?>
   </body>
</html>
```


PHP CODE FOR LOGIN

```
<?php include 'connection/db.php';?>

<?php
if(isset($_POST['submit'])){   $username                    =
$_POST['username'];
```

```
$password = $_POST['password'];
$resultlecturer = mysqli_query($connection,"SELECT * FROM `lecturer` WHERE `user_name`='$username' AND `password`='$password'");
$numrowlecturer = mysqli_num_rows($resultlecturer);

$resultadmin = mysqli_query($connection,"SELECT * FROM `admin` WHERE `username`='$username' AND `password`='$password'");
$numrowadmin = mysqli_num_rows($resultadmin);

$resultstudent = mysqli_query($connection,"SELECT * FROM `student` WHERE `username`='$username' AND `password`='$password'");
$numrowstudent = mysqli_num_rows($resultstudent);
if($numrowlecturer>0){

header('location: index_lecturer.php');
}elseif($numrowadmin>0){

header('location: index.php');
}
elseif($numrowstudent>0){
```

```
                                    header('location: course_registration.php');
                }
                 else{
                                echo "incorrect username or password";
                }
}
?>
```

ADMIN HOMEPAGE

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
    <!-- Meta, title, CSS, favicons, etc. -->
    <meta charset="utf-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">    <meta name="viewport"
content="width=device-width, initialscale=1">

    <title> Datalink Institute Attendance Portal </title>

  <body class="nav-md">
    <div class="container body">
      <div class="main_container">
        <div class="col-md-3 left_col">
```

```
<div class="left_col scroll-view">
 <div class="navbar nav_title" style="border: 0;">
  <a href="index.php" class="site_title"><span>
Datalink Institute</span></a>
 </div>

 <div class="clearfix"></div>

 <!-- menu profile quick info -->
 <div class="profile clearfix">
  <div class="profile_pic">
   <img src="images/Datalink-Logo.png" alt="..." class="img-circle profile_img">
  </div>
  <div class="profile_info">
   <span>Welcome,</span>
   <h2>Admin-Peter Sogbodjor</h2>
  </div>
 </div>
 <!-- /menu profile quick info -->

 <br />

 <!-- sidebar menu -->
  <div id="sidebar-menu" class="main_menu_side hidden-print main_menu">
  <div class="menu_section">
```

```
<ul class="nav side-menu">
<li><a href="index.php"></i> Home </a>
</li> <li><a
href="registration_form_lecturer.php">Lecturer
Registration</a>
</li>
<li><a href="profile_lecturer.php"></i>
Lecturer Profile</a>
</li> <li><a
href="registration_form_student.php">Student Registration</a>
</li>
<li><a href="profile_student.php"></i>
Student Profile</a>
</li>
<li><a href="attendance_report.php"></i>
Attendance Report</a>
</li>
<li><a href="assignment.php"></i> Course
Assignment</a>
</li>
</ul>
</div>
</div>
<!-- /sidebar menu -->
```

```
 </div>        </div>

<!-- top navigation -->
<div class="top_nav">
 <div class="nav_menu">
  <nav>

   <ul class="nav navbar-nav navbar-right">
    <li class="">
     <a href="javascript:;" class="user-profile dropdown-toggle" data-
toggle="dropdown" aria-expanded="false"> <img
src="images/DSC_0378.png"alt="">Peter
Sogbodjor
     </a>
     <ul class="dropdown-menu dropdown-usermenu pull-right">
      <li><a href="login.php"> Log Out</a></li>
     </ul>
    </li>
   </ul>
  </nav>
 </div>
</div>
<!-- /top navigation -->
```

<!-- page content -->

<h2 align="center" >THE FUTURE IS BRIGHT, THE FUTURE IS DATALINK</h2>

Data Link Institute is a tertiary institution that offers programmes leading to the award of degrees and certificates in different disciplines. Data Link Institute also provides tuition for students interested in acquiring Ordinary and Advanced Diplomas from external examination bodies and institutions.

Data Link Institute currently has four campuses with locations as follows:

Main Campus (Tema): located at 5th Avenue, Community 10, New Road.

Accra Campus: No. 7, Otswe Link, Nyaniba Estates, Osu.

Ho Campus

Takoradi Campus

Data Link has acquired a seven square mile piece of land along the Akosombo-Tema trunk road, near Doryumu, for the construction of a permanent campus. In Tema, the school has four plots of land at Community 1, behind Tema Development Corporation (TDC), as well as some plots at Community 6 near Pro-vita Hospital earmarked for the construction of a facility for the school's executive and professional courses.

DataLink Institute is a non-profit tertiary institution founded in 1993 by Ernest Ansah as a charitable education institute. It was fully transformed into a leading university college that offers programs leading to degrees, university access programs and certificates in other disciplines with the motto

"Ploughing minds for service".

The institute is currently headed by Professor J.J. Nortey as the president and Dr. Benjamin Ghansah as the Vice President.

Datalink Institute is affiliated with the Kwame Nkrumah University of Science and Technology in Ghana, the University of Northampton (United Kingdom).

It currently has schools of Computer Science, Business Administration and Graduate Studies.

```
            </div>
          </div>

        </div>
        <br />

<div class="row">

       </div>


        <div class="row">

          <div class="col-md-8 col-sm-8 col-xs-12">


            <div class="row">

            </div>
            <div class="row">
```

```
<!-- footer content -->
<footer>
 <div align="center">
                    Datalink Institute - <a
href="http://www.datalink.edu.gh/">Datalink.edu.gh</a>
 </div>
 <div class="clearfix"></div>
</footer>
<!-- /footer content -->
</div>
</div>


</body>
</html>
```