**VIRTUAL LECTURE MANAGEMENT SYSTEM**

**(A CASE STUDY OF DEPARTMENT OF COMPUTER SCIENCE, UNIVERSITY OF IBADAN)**

**BY**

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**A PROJECT SUBMITTED**

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**ABSTRACT**

The conventional paper-based method of taking attendance by calling names or signing is very time consuming and insecure. A student who is present can take attendance for his colleague who is absent and this leads to falsification of attendance. Course materials and assignments do not always circulate round to the entire students due to the inefficiency in the part of the class or course representative. Assignment sheets submitted by the student are mutilated and sometimes lost.

This project is developed using ReactNative for the front-end and Laravel with MySQL database for the backend to tackle the above mentioned problems by using GPS technology to mark attendance and all course materials and assignments will be uploaded by the lecturer on the cloud and students will be notified immediately. This will ensure an efficient, safe and secure means of performing the aforementioned operations. **CHAPTER ONE**

**INTRODUCTION**

# BACKGROUND OF STUDY

Students’ lecture attendance, generation of attendance reports and submission of assignments in most academic institutions can be rigorous, inefficient and inaccurate using the conventional method of paper-based system. The conventional paper-based system for capturing student’s lecture attendance, resources and assignment submission have been in use for many years even before the advent of technology and this is not only prone to errors, but also tedious, time-consuming and insecure. The world is gradually going mobile and having to logon to a desktop computer before performing an operation might be uncalled for at times and can be stressful. This project will harness the use of android mobile technology for solving the aforementioned problems.

The use of GPS (Global Positioning System) technology in android phones will be adopted for marking attendance of students in each course. Any student who is not within the coordinate of venue of the lecture will be disabled from taking attendance for any course, thereby eradicating the falsifications that arises when a student mark attendance for students who was absent in class. Generation of attendance reports can also be generated periodically with this platform as this will enable students to know their current attendance percentage and will help them to know if they will most likely write examinations for each course, having reached a minimum of 75% attendance.

Moreso, course materials which might not be able to circulate round in the class will be catered for in this project as students can easily logon to their portal to read and download materials uploaded by the course lecturer.

Finally, submission and grading of assignments on-the-go will also be incorporated into this project, thereby eradicating the loss of any paper assignments.

# PROBLEM STATEMENT

Students’ lectures attendance and assignments are prone to falsification, mutilation, misplacement and even outright loss in cases of natural disaster such as floods and fire-outbreaks.

Lecture resources do not usually get to most students through the course or class representative.

# AIMS AND OBJECTIVES

The aim of this project is to design and implement a mobile and virtual lecture attendance, course materials and assignment management system.

The objectives are:

1. To design a model for a reliable, scalable GPS based attendance management system for students.
2. To implement the proposed model for an accurate report generation for class attendance.
3. To implement an efficient storage system for course materials.
4. To implement a secure and safe system for submission and keeping records of assignments.

# EXPECTED OUTCOME OF THE PROJECT

Upon completion of this project, faster, reliable and efficient means of marking and tracking records of attendance of students will be ensured. It will also provide an efficient storage system for course materials and a secure means of submission and grading of assignments.

**CHAPTER TWO**

**LITERATURE REVIEW**

# 2.1 THEORETICAL BACKGROUND

Attendance maintenance is an important task in all the institutions to check the performance of students. Every institute has its own way to do so. Some use the old paper or file based approach and some have adopted methods of automatic attendance using different techniques. Many systems have been developed to store and maintain the attendance records. These various systems include different methods and technologies. Some attendance management systems are based on Biometric Technology (Seema Rao, Prof. K. J. Satoa, 2013) which marks the attendance using fingerprints and face of students. In some systems, attendance is stored and maintained using RFID technology (Arulogun O. T., Olatunbosun et al, February 2013) and some uses combination of RFID (Radio Frequency Identification) technology and Face Recognition (Unnati A. Patel, et al, 2014).

RFID is a technology that uses radio waves to transfer data from an electronic tag, called RFID tag or label, attached to an object, through a reader for the purpose of identifying and tracking the object. In 1945, Leon Theremin invented an espionage tool (for spy activities) for the Soviet Union which retransmitted incident radio waves with audio frequency information. In computer security, biometrics refers to authentication techniques that rely on measurable physical characteristics that can be automatically checked. There are several types of biometric identification schemes which include retina, hand geometry, vein, voice etc. The computer uses any of these biometric identification schemes to determine who you are, and based your identity. (Mary Catherine O'Connor, 2009). Fingerprint identification refers to specifying one’s identity based on his fingerprints. The fingerprints are captured without any information about the identity of the person. It is then matched across a database contain innumerous fingerprints. The identity is only retrieved when a match is found with one existing in the database.

Moreso, almost all universities include some form of assignment in their courses. The assignments are either carried out in either in groups or individually. Assignment management involves collecting, marking, and redistributing to students. A. Tregobov, 1998, breaks the process down into four stages: submission, recording, marking, and return. To effectively manage these submitted assignments, a well-designed assignment submission system is needed, hence the need for an online assignment submission system to facilitate the distribution, and collection of assignments on due dates. Many submission systems, which have alleviated the tasks of lecturers in several ways, exist. However, most of them could not meet all required criteria for an ideal submission system. The inherent problem with an email based submission system (Godfrey B (1997) lies in its security and its capacity for attaching files. Most existing submission system do not allow for structuring of files, automatic correction of automated assessment (University of Queensland Australia). Also, some cater only for one type of assignment (NYU, Undergraduate Division, Computer Science) while others (Linnaeus University Sweden) do not put emphasis on due dates and students can submit assignments even after submission date is over. All these problems have led to the development of an online submission system with desirable features.

The physical copies of files were difficult to deal with. There were a number of problems that are faced by keeping hard copies of course materials. It might be stolen, misplaced or mutilated. On top of this, there was a threat of disaster such as flood or fire outbreak. With the advent of technology, course materials can be uploaded in the cloud by the lecturer, while the student can download and read at any time.

# 2.2 DEFINITION OF TERMS

In a bid to under what lecture management systems is, it is expedient that we explain the individual sub-systems that make up this system, alongside some definition of the following terms:

**VIRTUAL:** This simply refers to something that is simulated on a computer or on-line rather than really existing.

**LECTURE:** This is an oral presentation intended to present information or teach people about a particular subject. Usually, the lecturer will stand at the front of the classroom and recite information relevant to the lecturer’s content.

**ATTENDANCE:** This refers to the concept of people, individually or as a group, appearing at a location for a previously scheduled event.

**COURSE:** This is a unit of teaching that typically lasts one academic term, is led by one

or more instructors and has a fixed roster for students. Students receive a grade after the completion of the course.

**COURSE MATERIALS:** This consists of lecture notes, supplementary reading or exercises, and links to other online resources.

**ASSIGNMENT:** This refers to a set of tasks assigned to students by their lecturers to be completed outside the class and must be submitted on a definite date and time.

**SYSTEM:** A system is an interrelated set of business procedures (or components) used within one business unit, working together for some purpose (Valacich, Fulelr & George, 2008). Information on the other hand can be viewed as a type of input to an organism or system (Dusenberyy, 1992).

# 2.3 COMPONENTS OF LECTURE MANAGEMENT SYSTEMS

Various lecture management systems exist today that are continually updated to ensure the efficiency, accuracy and security of how various operations such as marking of attendance, dissemination of course materials and submission of assignments are performed.

The advent of mobile technology has automated a lot of manual and herculean tasks and has cancelled a lot of conventional, paper-based systems of operations.

# 2.3.1 ATTENDANCE MANAGEMENT SYSTEM

Attendance is a daily activity performed by every institute and college to maintain the records of student’s attendance. This record is then used by the faculty of the college whenever needed. In most universities, teachers take attendance by calling out the names and surnames of students, and then marking them. This practice has its drawbacks, in the sense that, friends of absent students may write down their names and surnames. Thus practice place university teachers and their institutions at considerable disadvantages when it comes to taking attendance.

The features of many systems have been developed to store and maintain the attendance records will be discussed here.

# 2.3.1.1 RFID BASED ATTENDANCE MANAGEMENT SYSTEM

Radio-frequency identification (RFID) is a technology that uses radio waves to transfer data from an electronic tag, called RFID tag or label, attached to an object, through a reader for the purpose of identifying and tracking the object. RFID is a matured technology that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to uniquely identify an object, animal, or person. RFID chips contain a radio transmitter that emits a coded identification number when queried by a reader device. Some RFID tags can be read from several meters away and beyond the line of sight of the reader.

The tag's information is stored electronically. The RFID tag includes a small RF transmitter which transmits an encoded radio signal to interrogate the tag, and receiver which receives the message and responds with its identification information. Some RFID tags do not use a battery. Instead, the tag uses the radio energy transmitted by the reader as its energy source. RFID can be used in many applications. A tag can be affixed to any object and used to track and manage inventory, assets, people, etc. For example, it can be affixed to cars, computer equipment, books, mobile phones, etc. The Healthcare industry has used RFID to reduce counting, looking for things and auditing items. Many financial institutions use RFID to track key assets and automate compliance. Also with recent advances in social media RFID is being used to tie the physical world with the virtual world. RFID in Social Media first came to light in 2010 with Facebook's annual conference (Amirjan Bin Nawabjan, 2009).

The RFID attendance system is an automatic embedded system used in taking attendance of registered persons in a particular organization. The RFID attendance system offers an organization, the efficiency and convenience associated with RFID technology at a low cost. This method is fast as well as simple. Each employee or student uses an RFID card and the reader records the data when the employee enters or exits. RFID devices and software must be supported by a sophisticated software architecture that enables the collection and distribution of location based information in near real time. RFID system is used to record the numbers of employees’ or students’ attendance automatically. The ID cards of the employees is embedded with RFID tag which is read by a reader. This RFID system is interfaced to a database through a computer. This method is more effective to prevent problem encountered when getting attendance manually. Below is the block diagram of an RFID attendance system.

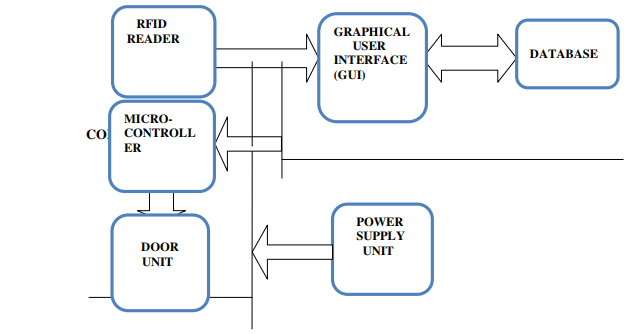


Fig 2.1 Block diagram of RFID attendance system with door unit.

# 2.3.1.1.1 APPLICATIONS OF RFID TECHNOLOGY IN NIGERIA

The RFID technology has been suggested to be applied in various sectors in Nigeria to reduce corruption. These sectors include:

* The monitoring of crude oil.
* Tracking the movement of money.
* Drug agencies and monitoring containers entering the country.

An RFID technology company in Nigeria started providing anti-money laundering (AML) solutions to banks. The technology tracks the movement of money and alerts the Nigerian Financial Intelligence Unit of any suspicious activities. The company is providing the service to five major Nigerian banks. This technology has been used by NAFDAC to reduce the importation and distribution of counterfeit drugs. (Bermuda's RFID Vehicle Registration System, 2008).

# 2.3.1.2 FINGERPRINT BASED ATTENDANCE MANAGEMENT SYSTEM

Fingerprint belongs to a group that is called "Biometrics". Biometrics represents automated methods for person identification based on a physiological or behavioral characteristic. Among the features measured are: facial features, fingerprints, iris and retina features, hand veins, hand geometry, handwritten signature, keystroke dynamics and voiceprint. Fingerprints are represented by the pattern of ridges and furrows on the surface of a fingertip. The fingerprints are unique and the patterns remain unchanged throughout life. Fingerprints are so distinct that even the ones of identical twins are different. The prints of each finger of the same person are also different.

The fingerprint scanner captures an image of the fingerprint and uses complex fingerprint identification algorithms to either convert the image into a unique "map" of minutiae points or analyze the pattern. Fingerprint technology has been spread widely in various fields in the life. The main field historically was the criminal investigations in which, fingerprints of criminals are recorded in database in order to specify their identities later on.

# 2.3.1.2.1 FINGERPRINT ACQUISITION PROCESS

The fingerprint acquisition process can be divided into three parts, namely:

* The enrolment process.

This is done once for each person. Each person would be required to register their fingerprint pattern by placing his thumb finger on the fingerprint scanner. The scanner takes the image of the finger and determines the unique characteristics of the fingerprint image. The fingerprint contains ridges and valleys which have different kinds of breaks and discontinuities. It is the various ridges and valleys that form the basis for the loops, arches, and swirls that are easily seen on fingertips. After the capturing of the ridge pattern of the fingerprint, a template is created, and the fingerprint is encrypted into series of numbers. These series of numbers will be different for each fingerprint pattern. After the process must have been completed, the fingerprint scanner sends the result of the encryption to a memory location or database.

* The verification process.

This is the second and the most repeated process. It is a done each time the user wants to make use of the fingerprint controlled device. When he places his finger on the fingerprint scanner surface, the fingerprint would be processed by the fingerprint scanner. The fingerprint pattern that has been obtained would be compared against the stored enrolment template that is already stored in the database or memory location where the enrolment process was executed. When the fingerprint pattern passes the comparison process, it shows an acknowledgement in its display and grants the user access.

* The data collection process.

The last process that will be done is the data collection process. The data about the fingerprint device usage or record can be collected after a period of time and can be used as a form of record to know the attendance of a person or to know the number of times a restricted.

# 2.3.1.2.2 FINGERPRINT RECOGNITION ALGORITHM

Generally, fingerprint readers operate on one of two fingerprint recognition algorithms, which are:

* **Fingerprint identification**: This is to specify one person’s identity by his fingerprint(s). Without knowledge of the person’s identity, the fingerprint identification system tries to match his fingerprint(s) with those in the whole fingerprint database. It requires more processing since the applied fingerprint is to be compared with those in the whole fingerprint database. This process could take significant time, especially in the case of large databases such in case of faculty or university containing thousands of students.
* **Fingerprint verification:** This is to verify the authenticity of one person by his fingerprint. The user provides his fingerprint together with his identity information like his ID number. The fingerprint verification system retrieves the fingerprint template according to the ID number and matches the template with the real-time acquired fingerprint from the user. This requires less processing since the applied fingerprint is to be compared with a single template in the database specified by the ID. So fingerprint verification algorithm is preferred in case of attendance system with large database on base of time consuming (but on the other hand fingerprint identification could be more convenient in the case of small database since student is to fingerprint only. Small databases can be applied if each device is dedicated for a group of students but this will be costly).

# 2.3.1.2.3 COMPONENTS OF FINGERPRINT-BASED SYSTEM

* **SCANNER:** The most important part in any fingerprint-based system is the scanner or sensor which is the 'gate' of the fingerprint into the system.

Two types of scanners have been viewed:

* **Optical Scanner**: Optical scanners use a CCD or charge couple device much like the ones used in camcorders and digital cameras. The CCD makes use of photo sites that are sensitive to light. Each photo site generates an electrical signal in the presence of photons produced by light emitting diodes. These photo sites are very small they cover the entire screen where a user will place his or her finger.

Since photo sites only emit electricity in response to the presence and the strength of light, the overall result will be an inverted image of the finger. This image is converted into digital form and checked for clarity and sharpness before being compared to the saved images of other prints in the database.

* **Capacitance scanners**: This make use of electrical current to form a fingerprint image. The sensor part of the capacitance scanner is made up of tiny plates that act as conductors. These conductors are then overlaid by an insulating film. These form the cells that make up the sensor's semiconductor chip or chips. An inverting operational amplifier is then used in conjunction with an electrical circuit and the sensor to determine the relative differences in capacitance and voltage value of the different areas of a finger. A scanner processor is then used to separate the valleys and the ridges in the resulting data. This results in a reverse image of a fingerprint. From previous context it can be shown that capacitance scanners are more secure than optical ones since they have higher ability to detect fake fingerprints. This is due to that capacitance scanners depend on the resulting capacitance of the portions of the finger that are in contact with the sensor plus the air capacitance on the ridges of a finger instead of just relying on the amount of reflected light like what the optical scanners do. A picture of a fingerprint pressed onto the sensor, can trick an optical scanner that it is processing a real fingerprint. On the other hand, optical scanners have advantages of:

1. Resistance to shock and extreme weather.
2. Lower maintenance cost.
3. Bigger sensing area leading to better resolution.



Fig 2.2 Image of a fingerprint

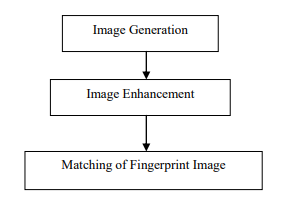


Fig 2.3 Flowchart to identify fingerprint image

# 2.3.1.3 BARCODE BASED ATTENDANCE MANAGEMENT SYSTEM

Barcode Based Student Attendance System is a software which utilizes barcode scanner to record and maintain the attendance of the students. The main hardware that is to be used is the barcode scanner. This barcode scanner is used in order to read a barcode. A Barcode is a machine readable representation of information in a visual format. A bar code consists of a series of parallel, adjacent bars and spaces.

The types of Barcode are:

* **Linear Barcodes:** A first generation, "one dimensional" barcode that is made up of lines and spaces of various widths that create specific patterns.
* **Matrix Barcodes:** A matrix barcode, also termed as a 2D barcode or simply a 2D code, is a two-dimensional way to represent information. It is similar to a linear (1-dimensional) barcode, but can represent more data per unit area. These barcodes are read using a device called as the barcode scanner.

There are different types of Barcode Scanners:

* + **Pen-type readers:** This consist of a light source and photodiode that are placed next to each other in the tip of a pen or wand. It is the cheapest barcode scanner available in market.
  + **CCD Reader:** CCD readers use an array of hundreds of tiny light sensors lined up in a row in the head of the reader. Each sensor measures the intensity of the light immediately in front of it.
  + **Smartphone Cameras:** Smartphone cameras have the ability to read both QR codes (which automatically take you to a website URL) as well as scanning a barcode to bring up product information such as price comparisons and user reviews.
  + **Handheld Scanner:** It is a scanner with a handle and typically a trigger button for switching on the light source.
  + **Automatic reader:** A back office equipment to read barcoded documents at high speed.

(T.S.Lim, M.Kassim et al, 2009)

The barcodes would be attached at the back of each student’s ID card and the information that would be embedded in the barcodes will contain unique data of the student such as matriculation number, department, faculty, year and all other important information about the student. Students are able to participate in the class attendance only by swiping their identity card through the barcode reader. They can view their attendance percentage which will motivate them to control their class attendance reputation. With real time clock capability of the system, attendance taken will be more accurate since the time for the attendance taken will be recorded (Seideman T, 2009).

# 2.3.1.4 FACIAL RECOGNITION BASED ATTENDANCE MANAGEMENT SYSTEM

Face recognition is a technique of biometric recognition. It is considered to be one of the most successful applications of image analysis and processing; that is the main reason behind the great attention it has been given in the past several years. The facial recognition process can be divided into two main stages: processing before detection where face detection and alignment take place (localization and normalization), and afterwards recognition occur through feature extraction and matching steps. This system uses the face recognition approach for the automatic attendance of students in the classroom without student’s intervention. This attendance is recorded by using a camera that captures images of students, detect the faces in images, compare the detected faces with the database and mark the attendance.

The main elements of this technology are:

* **Face Detection:** The main function of this step is to determine whether human faces appear in a given image, and where these faces are located at. The expected outputs of this step are patches containing each face in the input image. In order to make further face recognition system more robust and easy to design, face alignment are performed to justify the scales and orientations of these patches. Besides serving as the pre-processing for face recognition, face detection could be used for region-of-interest detection, retargeting, video and image classification, etc.
* **Feature Extraction**: After the face detection step, human-face patches are extracted from images. Directly using these patches for face recognition have some disadvantages, first, each patch usually contains over 1000 pixels, which are too large to build a robust recognition system. Second, face patches may be taken from different camera alignments, with different face expressions, illuminations, and may suffer from occlusion and clutter. To overcome these drawbacks, feature extractions are performed to do information packing, dimension reduction, salience extraction, and noise cleaning. After this step, a face patch is usually transformed into a vector with fixed dimension or a set of fiducial points and their corresponding locations. In some literatures, feature extraction is either included in face detection or face recognition.
* **Face Recognition**: After formulizing the representation of each face, the last step is to recognize the identities of these faces. In order to achieve automatic recognition, a face database is required to build. For each person, several images are taken and their features are extracted and stored in the database. Then when an input face image comes in, we perform face detection and feature extraction, and compare its feature to each face class stored in the database. There are two general applications of face recognition, one is called identification and another one is called verification. Face identification means given a face image, we want the system to tell who he / she is or the most probable identification; while in face verification, given a face image and a guess of the identification, we want the system to tell true or false about the guess.

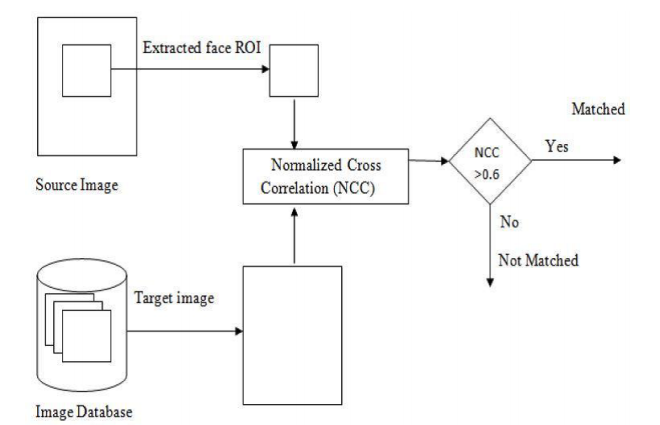


Fig 2.3 Stages of face detection

# 2.3.1.5 GPS BASED ATTENDANCE MANAGEMENT SYSTEM

GPS (Global Positioning System) is a satellite-enabled locating system that allows users to determine their location, regardless of topography, weather or time of day, anywhere on the globe, provided the GPS receiver is not physically obstructed. GPS was originally designed for military purposes but is now commonly used in cars and on boats. GPS receivers utilise a minimum of three of the 24 network satellites to triangulate a user’s location. In the case of marine equipment, this is converted into a two dimensional display overlayed on electronic charts provided within the equipment. (Kennedy, M. (2002)).

The components of GPS include:

* **Space Segment**: The satellites orbiting the earth and transmitting timing and ranging messages. This consists of constellation of spacecraft and the signals broadcast by them which allow users to determine position, velocity and time.

The basic functions of the satellites are to:

1. Receive and store data transmitted by the control segment stations.
2. Maintain accurate time by means of several onboard atomic clocks.
3. Transmit information and signals to users on two L-board frequencies.

* **Control Segment:** This monitors the health and position of the satellites in the space segment and transmits correction information back up to the satellites.

This is used for maintaining the satellites and their proper functioning.

* **User Segment:** This is typically referred to a GPS receiver, processes the L-band signals transmitted from the satellites to determine PVT.

# 2.3.1.5.1 HOW GPS WORKS

GPS systems in Australia rely on a combination of satellites placed in orbit around the Earth and the landbased DGPS broadcasting system. Individual signals sent by each satellite and transmission station allow the GPS software to determine its relative location to each signal source and calculate a position. This relative position is then displayed using the base datum included in the GPS unit.

Usually, current software installed on a GPS unit includes geographic reference and can include aids to navigation marks and, in more advanced models, link to depth sounders to provide indications of water depth. Recent incidents involving vessel collisions with maritime or navigation infrastructure have been caused by an overreliance on GPS technology or the use of an inconsistent datum applied to the GPS unit, or the electronic chart not being updated. People are becoming more confident with road-based GPS units and are applying that same level of trust to the GPS unit onboard their vessel. On the road an inaccuracy in a GPS system can easily be recognised by the driver through referencing visual landmarks like buildings or the street. This ready reference is often not available to the vessel operator on the water and keeping a proper lookout is still vitally important. Prudent navigators use all available cues to maintain situational awareness and never rely exclusively on a single source of navigation data. It is best to remember a GPS unit is an aid to navigation not a substitute for the human eye and common sense.

# 2.3.1.5.2 APPLICATION OF GPS

The United States government created the system, maintains it and makes it freely accessible to anyone with a GPS receiver. The global positioning system provides critical capabilities to military, civil and commercial users around the world.

The following are the few applications of GPS:

* **Road Traffic Congestion:** A navigation device has a GPRS receiver for receiving real time information about or slow average speed on a stretch of motorway, indicating congestion. The device calculates a new itinerary to avoid the congestion, based on historically record speeds on secondary roads weighed by the current average speed in the congestion area.
* **Tectonics:** GPS enables direct fault motion measurement of earthquake between earthquake GPS can be used to measure crustal motion and deformation to estimate seismic strain build up for creating seismic hazard maps.
* **Terrorism:** GPS is very important to determine the location of terrorist attacker‟s. For example, on the Gurudaspur strike, Indian intelligence agencies had determined that the GPS sets used by the terrorist were first turned on in Sargodha a home to Pakistans largest airbase-on July 21, 2015, six days before the attack. The set were then programmed with digital waypoints, which led the attackers the border to their targets in Punjab. (The Indian Express, October 27, 2015).
* **Mining:** The use of RTK GPS has significantly improved several mining operations such as drilling, shovelling, vehicle tracking and surveying, RTK GPS provides centimetre-level positioning accuracy.
* **Tours:** Location determines what content to display, for instance, information about an approaching point of interest.
* **Navigation:** Navigators value digitally precise velocity and orientation measurements. With the help of GPS roads or paths available, traffic congestion and alternative routes, roads or paths that might be taken to get to the destination. If some roads are busy (now or historically) the best route to take, The location of food, banks, hotels, fuel, airports or other places of interests, the shortest route between the two locations, the different options to drive on highway or back roads.
* **Cellular Telephony:** Clock synchronization enables time transfer, which is critical for synchronizing its spreading codes with other base stations to facilitate inter-cell hand off and support hybrid GPS/ cellular position detection for nibble emergency calls and other applications.
* **Surveying:** Surveyors use absolute locations to make maps and determines property boundaries. The surveying and mapping community was one of the first to take advantage of GPS because it dramatically increased productivity and resulted in more accurate and reliable data. Today, GPS is a vital part of surveying and mapping activities around the world. (Branford, W, et all, 1996).

# 2.3.2 ASSIGNMENT SUBMISSION MANAGEMENT SYSTEM

Many submission systems, which have alleviated the tasks of lecturers in several ways, exist. However, most of them could not meet all required criteria for an ideal submission

system. The inherent problem with an email based submission system lies in its security and its capacity for attaching files (Godfrey B 1997). Most existing submission system do not allow for structuring of files, automatic correction of automated assessment. Also, some cater only for one type of assignment while others do not put emphasis on due dates and students can submit assignments even after submission date is over. All these problems have led to the development of an online submission system with desirable features.

An online assignment handling is a system designed to cater for the department's needs in terms of receiving assignments from students, making them available to tutors to mark, returning grades, comments and marked work to Universities, Polytechnics, and colleges of education are considered the main provider of knowledge in various fields. Various courses of studies are taught in institutions, covering several fields including applied Sciences, Math, Computer, Human Resource, and Accounting. Most courses at universities consist of theoretical as well as practical subject matter. To evaluate the level of understanding and degree of comprehension among students, assignments are often given (Paul Darbyshire, 2013).

Assignments are submitted by students either individually or in groups. Assignment management involves collecting, marking, and redistributing to students. According to Tregobov (1998), assignment submission breaks the process down into four stages: submission, recording, marking, and return. This involves the use of internet and computers to aid this process. The most obvious advantage is that it offers faster transportation of assignments questions from the lecturers to the student and submission of their solutions from the students to the lecturers than the traditional, physical, paper-based methods.

# 2.3.3 COURSE MATERIALS STORAGE SYSTEM

Cloud computing, which is a medium by which files are stored and retrieved on the internet is adopted for the concept of passing across course materials from the lecturer to the student offering the courses. This eliminated the problem of course materials not been able to circulate round the whole class due to insufficient information from the class or course representative. The course material(s) are uploaded by the course lecturer and all students offering such course are notified.

# 2.4 SYSTEM DEVELOPMENT APPROACH

System Development Life Cycle (SDLC) is referred to a methodology used by software industry to design, develop and test high quality software. It is aimed at producing a high quality software that meets or exceeds customer satisfactions, reaches completion within times and cost estimates. It produces a consistent framework of tasks and deliverables needed to develop systems. The SDLC methodology may be condensed to include automated or manual, whether it is a new system, or an enhancement to existing system. The SDLC methodology tracks a project from an idea developed by the user through feasibility study, system analysis and design, programming, pilot testing, implementation and post implementation analysis.

The development method that intend to use for the Virtual Lecture Attendance System is the incremental development, where the software will be designed, implemented and tested incrementally until the product is finished. This approach combines the elements of waterfall model with the iterative philosophy of prototyping.



Fig 2.4 Stages of System Development Life Cycle

# 2.4.1 INCREMENTAL DEVELOPMENT

Incremental development is based on the idea of developing an initial implementation, exposing this to user comment and evolving it through several versions until an adequate system has been developed (Figure 2.2). Specification, development, and validation activities are interleaved rather than separate, with rapid feedback across activities.

Incremental software development, which is a fundamental part of agile approaches, is better than a waterfall approach foremost business, e-commerce, and personal systems. Incremental development reflects the way that we solve problems. We rarely work out a complete problem solution in advance but move toward a solution in a series of steps, backtracking when we realize that we have made a mistake. By developing the software incrementally, it is cheaper and easier to make changes in the software as it is being developed.

Each increment or version of the system incorporates some of the functionality that is needed by the customer. Generally, the early increments of the system include the most important or most urgently required functionality. This means that the customer can evaluate the system at a relatively early stage in the development to see if it delivers what is required. If not, then only the current increment has to be changed and, possibly, new functionality defined for later increments.

Incremental development has three important benefits, compared to the waterfall

model:

* The cost of accommodating changing customer requirements is reduced. The amount of analysis and documentation that has to be redone is much less than is required with the waterfall model.
* It is easier to get customer feedback on the development work that has been done. Customers can comment on demonstrations of the software and see how much has been implemented. Customers find it difficult to judge progress from software design documents.
* More rapid delivery and deployment of useful software to the customer is possible, even if all of the functionality has not been included. Customers are able to use and gain value from the software earlier than is possible with a waterfall process.

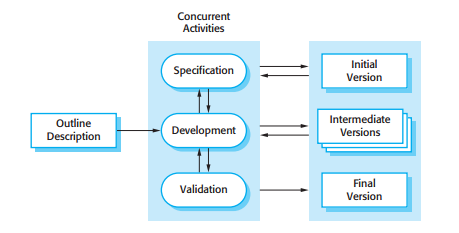


Fig 2.4 Incremental Development

# 2.4.2 JUSTIFICATION OF INCREMENTAL DEVELOPMENT SELECTION

The methodology selection brings many benefits towards the final delivery of the proposed system. The selected methodology ensures that there is a working model of the system at a very early stage of development, which makes it easier to find functional or design flaws. Finding issues at an early stage of development enables to take corrective measures in a limited budget.

The selection of Incremental Development will ensure that some working functionalities can be developed quickly and early in the life cycle in order to check the requirements of the project and designs can be easily corrected at the early stage before more work are done. Progress can be measured against the increments and more increments will be agreed upon between the project supervisor and the student with a day of delivery.

# 2.5 WEB DEVELOPMENT TOOLS

Even though this project is a mobile based application, some web technologies are used for developing the APIs (Application Programming Interface) necessary for sending requests to and retrieval of information from the database.

The following are the web technologies that are used in this project:

# 2.5.1. LARAVEL

Laravel is an open-source PHP framework, which is robust and easy to understand. It follows a model-view-controller design pattern. Laravel reuses the existing components of different frameworks which helps in creating a web application. The web application thus designed is more structured and pragmatic.

Laravel offers a rich set of functionalities which incorporates the basic features of PHP frameworks like CodeIgniter, Yii and other programming languages like Ruby on Rails. Laravel has a very rich set of features which will boost the speed of web development.

Amongst the benefits of Laravel are:

* The web application becomes more scalable, owing to the Laravel framework.
* Considerable time is saved in designing the web application, since Laravel reuses the components from other framework in developing web application.
* It includes namespaces and interfaces, thus helps to organize and manage resources.

Amongst the features of Laravel are:

**Modularity**

Laravel provides 20 built in libraries and modules which helps in enhancement of the application. Every module is integrated with Composer dependency manager which eases updates.

**Testability**

Laravel includes features and helpers which helps in testing through various test cases. This feature helps in maintaining the code as per the requirements.

**Routing**

Laravel provides a flexible approach to the user to define routes in the web application. Routing helps to scale the application in a better way and increases its performance.

**Configuration Management**

A web application designed in Laravel will be running on different environments, which means that there will be a constant change in its configuration. Laravel provides a consistent approach to handle the configuration in an efficient way.

**Query Builder and ORM**

Laravel incorporates a query builder which helps in querying databases using various simple chain methods. It provides ORM (Object Relational Mapper) and ActiveRecord implementation called Eloquent.

**Schema Builder**

Schema Builder maintains the database definitions and schema in PHP code. It also maintains a track of changes with respect to database migrations.

**Template Engine**

Laravel uses the Blade Template engine, a lightweight template language used to design hierarchical blocks and layouts with predefined blocks that include dynamic content.

**E-mail**

Laravel includes a mail class which helps in sending mail with rich content and attachments from the web application.

**Authentication**

User authentication is a common feature in web applications. Laravel eases designing authentication as it includes features such as register, forgot password and send password reminders.

**Redis**

Laravel uses Redis to connect to an existing session and general-purpose cache. Redis interacts with session directly.

**Queues**

Laravel includes queue services like emailing large number of users or a specified Cron job. These queues help in completing tasks in an easier manner without waiting for the previous task to be completed.

# 2.5.2 MYSQL

There are two regions in a website design: the front-end and the back-end. The front-end is the site design and interface users see when they open the site. The back-end is the database. The database is the power horse for an application. It houses all the data and information needed by the front-end. Webmasters have several options when choosing a database, and one of these options is MySQL.

Before you understand MySQL, it helps to understand database functionality. A database is made up of tables, stored procedures, and functions. These three parts drive the back-end of your application.

Tables are the database engine's storage components. Architecture of database storage is extremely technical, but an easy way to envision a database table is to visualize a spreadsheet. Spreadsheets have columns and rows. Where these columns and rows intercept are fields. The fields contain one item of data.

MySQL isn't popular just because it's free. Most free software isn't associated with high-end enterprise solutions, but MySQL is an exception to this rule. MySQL can be used with small startups or high-traffic enterprise applications. Banks, social networks, universities and government agencies use MySQL as their database solution.

Because companies can go from small startup to large enterprise without changing its database solution, MySQL is scalable. Scalability is often disregarded when startups have tight budgets, but since MySQL is free, it's a good option for a startup that expects growth. It's also high performance. Performance is paramount to application stability. Small databases with only a few records will normally function well even if they are poorly designed. However, if the database tables grow to millions of records, application performance and stability can be affected, which then affects your customers and employees.

MySQL is also secure. Security is a sensitive issue, since the protection of your customer and employee records should be a major concern. With MySQL, administrators can encrypt data and set up authentication to protect all company assets.

There are several more open-source database applications on the market that were deployed after MySQL. MySQL's success is partly due to the numerous hosting companies that offer services with unlimited MySQL database services. Oracle and SQL Server are expensive platforms, and most hosting companies only offer 1 SQL Server if you choose to work with it instead of an open-source database solution. Since MySQL is free and open-source, hosting companies offer unlimited databases with a lower cost than Microsoft platforms. This type of marketing gave MySQL its strong foundation in application development in global cloud and desktop applications.

MySQL is a relational database. These systems offer data integrity. They are distinct from systems such as Mongo that relies on document style records. Relational databases are used in numerous applications, but the major reason they are used to create applications is for data integrity and transactional style record manipulation.

Relational databases work on the concept of a primary and foreign key relationship. The primary key is the main unique field that identifies a record. This unique identifier is then stored in other tables to build a relationship between a main table and a secondary related table. Each customer has its own unique identifier, and then this identifier is stored in the order table. When you need to query MySQL with a list of customers and related orders, you join the two tables using specific SQL syntax.

MySQL is also a transactional database, which means that you can roll back changes to your database. For instance, suppose you want to delete a customer but you don't want to delete the customer if there are active order records associated with the customer. You attempt to delete the customer, but MySQL's relational foreign key constraints give you an error when you attempt to delete it. You can then roll back any changes you made based on commit and rollback features. You commit changes if there were no errors found, or you can roll back previous statements if an error is thrown by the database server.

Data integrity is what sets MySQL and other relational databases apart from more modern databases such as NoSQL. NoSQL databases such as Mongo are used for analytical data and capturing any number of unstructured data. MySQL requires your data to be more structured, so it's a reliable database system for people who want to secure the structure and relationship between tables.

In bigger businesses, MySQL and NoSQL databases work together. The MySQL database stores structured data such as orders and customer information, and the NoSQL database stores unstructured data such as marketing and traffic numbers. You can export data from a MySQL database to a NoSQL database to work with them both for their best features.

# 2.5.3 JAVASCRIPT

Javascript is a dynamic computer programming language. It is lightweight and most commonly used as a part of web pages, whose implementations allow client-side script to interact with the user and make dynamic pages. It is an interpreted programming language with object-oriented capabilities.

JavaScript was first known as LiveScript, but Netscape changed its name to JavaScript, possibly because of the excitement being generated by Java. JavaScript made its first appearance in Netscape 2.0 in 1995 with the name LiveScript. The general-purpose core of the language has been embedded in Netscape, Internet Explorer, and other web browsers.

# 2.5.3.1 CLIENT-SIDE JAVASCRIPT

Client-side JavaScript is the most common form of the language. The script should be included in or referenced by an HTML document for the code to be interpreted by the browser.

It means that a web page need not be a static HTML, but can include programs that interact with the user, control the browser, and dynamically create HTML content.

The JavaScript client-side mechanism provides many advantages over traditional CGI server-side scripts. For example, you might use JavaScript to check if the user has entered a valid e-mail address in a form field.

The JavaScript code is executed when the user submits the form, and only if all the entries are valid, they would be submitted to the Web Server.

JavaScript can be used to trap user-initiated events such as button clicks, link navigation, and other actions that the user initiates explicitly or implicitly.

# 2.5.3.2 ADVANTAGES OF JAVASCRIPT

* Less server interaction − You can validate user input before sending the page off to the server. This saves server traffic, which means less load on your server.
* Immediate feedback to the visitors − They don't have to wait for a page reload to see if they have forgotten to enter something.
* Increased interactivity − You can create interfaces that react when the user hovers over them with a mouse or activates them via the keyboard.
* Richer interfaces − You can use JavaScript to include such items as drag-and-drop components and sliders to give a Rich Interface to your site visitors.

# 2.6 MOBILE DEVELOPMENT TOOLS

# 2.6.1 ANDROID STUDIO

Android Studio is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems. It is a replacement for the Eclipse Android Development Tools (ADT) as primary IDE for native Android application development.

The following features are provided in the current stable version:

* Gradle-based build support
* Android-specific refactoring and quick fixes
* Lint tools to catch performance, usability, version compatibility and other problems
* ProGuard integration and app-signing capabilities
* Template-based wizards to create common Android designs and components
* A rich layout editor that allows users to drag-and-drop UI components, option to preview layouts on multiple screen configurations.
* Support for building Android Wear apps.
* Built-in support for Google Cloud Platform, enabling integration with Firebase Cloud Messaging (Earlier 'Google Cloud Messaging') and Google App Engine.

# 2.6.2 REACTNATIVE

React Native is a framework developed by facebook that builds a hierarchy of UI components to build the JavaScript code. It has a set of components for both iOS and Android platforms to build a mobile application with native look and feel. was developed by Facebook using the same design principles, except designing interfaces.

React Native lets you build mobile apps using only JavaScript. It uses the same design as React, letting you compose a rich mobile UI from declarative components.

With React Native, you don't build a mobile web app, an HTML5 app, or a hybrid app; you build a real mobile app that's indistinguishable from an app built using Objective-C or Java. React Native uses the same fundamental UI building blocks as regular iOS and Android apps.

The features of Reactnative are:

* React: This is a Framework for building web and mobile apps using JavaScript.
* Native: You can use native components controlled by JavaScript.
* Platforms: React Native supports IOS and Android platform.

The benefits of using Reactnative are:

* JavaScript: You can use the existing JavaScript knowledge to build native mobile apps.
* Code sharing: You can share most of your code on different platforms.
* Community: The community around React and React Native is large, and you will be able to find any answer you need.

**CHAPTER THREE**

# 3.1 DESCRIPTION OF THE EXISITING SYSTEM

The existing system is a paper-based system for capturing students’ lecture attendance, course materials and assignments. A sheet that contains the list of all the students offering a particular course will be pass round during the lecture and students present in the class will append their signature on the space provided in front of their names.

Course materials are always delivered by the lecturer to the class representative who will circulate it round to his class members. Assignments can be dictated by the lecturer in the class or given to the class representative in a soft copy format, who then circulate it round to his classmates as well.

# 3.2 PROBLEM OF THE EXISITING SYSTEM

* Students’ lectures attendance and assignment management are prone to falsification, mutilation, misplacement and even outright loss in cases of natural disaster such as floods and fire-outbreaks.
* Lecture resources do not usually get to most students through the course or class representative.

# 3.3 THE PROPOSED SYSTEM

In order to overcome the drawbacks in the existing system, an android mobile application is developed to proffer a lasting solution to the problems mentioned above.

The attendance system will adopt the usage of GPS technology and facial recognition.

The GPS technology will get the current location of the student and compare it with the location of the lecture’s venue, if there exist any match, then, the student will be granted access into the attendance page. Facial recognition will be used to get the face of the logged in student with the registered on in the database before a final access will be granted to the student to successfully mark the attendance for that course. Reports are generated on weekly, monthly, bi-semester and semester basis for both students and lecturers.

Course materials will be uploaded by the lecturer-in-charge, after which all the students offering the course will be notified to download the material.

Assignments (in pdf, docx and ppt format) will be uploaded by the lecturer-in-charge, after which all the students offering the course will be notified to download, answer and submit their solution back on the mobile app. The lecturer then grades each student’s assignment.

The administrator will be in charge of adding students, lecturers and courses details.

The advantages of the proposed system over the existing ones are:

* Non-falsification and security of taking attendance.
* Accurate and efficient way of generating attendance reports.
* Security of submitted assignments by the students.
* Proper circulation of course materials to all students.

# 3.3 SOFTWARE MODELLING DIAGRAMS

Modelling diagrams helps you to understand, clarify, and communicate ideas about codes and the user requirements that the software system must support.

# 3.3.1 USE CASE MODEL



# 3.3.2 CONTEXT DIAGRAM



# 3.3.3 LEVEL 1 DIAGRAM



# 3.3.4 E-R DIAGRAM

