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| **Registration Number** | **NIT/BIT/2020/1229** |
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| Student Score *(tick one)* | **Low** | **Average** | **High** |
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**1.0 Project Title:** **Automated Location Based Time and Attendance Tracking System**

**1.1 Main Objective:**

* The objective of this project is to Design and Develop automated student location based time and attendance tracking system

**1.2 Specific Objectives:**

* + 1. Design and develop mobile application and web based system,
    2. Capturing the student’s current position in a specific time (GPS and Data and Bluetooth),
    3. Check the location of the students and Save students credential for automation,

**2.0 Literature Review:**

**2.1 Definition of Key Terms**

**BLUETOOTH**

* Bluetooth started as a short-distance cable-replacement technology to replace wires in devices such as a mouse, a keyboard, or a PC.
* There are two types of Bluetooth devices: one is referred to as Bluetooth Classic (BR/EDR), used in wireless speakers, car infotainment systems, and headsets, and the other is Bluetooth Low Energy (BLE).

**BLUETOOTH LOW ENERGY (BLE)**

* Bluetooth low energy (BLE) is a wireless computer network technology designed and marketed as Bluetooth Smart.

**BEACONS**

* In general terms, a beacon is a small, battery-powered, wireless device that uses Bluetooth low energy technology (Bluetooth Smart) to advertise its presence and services. The beacon technology doesn’t require an internet connection and acts as a broadcaster within a short range radius. The transmission distance is typically around 10-30 meters for interior.

**2.2 Existing Works (Systems)**

1. **FINGERPRINT TECHNOLOGY**

**Definition:**

* + Fingerprint attendance is one type student attendance that uses fingerprint as the media. A fingerprint is one of unique human identities for each individual.
  + The steps for performing fingerprint attendance are also accessible. In the beginning, students only need to register a few fingerprint. Once registered, students stick their registered fingers when they enter or leave the venue.

**Weakness of Fingerprint Technology**

* + 1. **Issues with recognition of damaged fingerprint technology:** There is lack of flexibility to identify person in case of cut or wound or when fingerprints are smudged with dirt or grease.
    2. **Deployment can be Expensive:** Fingerprint attendance systems are entirely dependent on hardware and peripherals. It is often expensive to scale these systems as you will need to install hardware at every location.
    3. **Not ideal for remote and field works:** Dependence on standalone machines is one of significant disadvantage of finger print identification. Company cannot deploy standalone kiosks at fields or remote locations.
    4. **System Failure:** Scanners are subjected to the same technical failures and limitations as all other electronic identification systems such as power outages,errors,and environmental factors.

1. **BARCODE READER TECHNOLOGY**
   * The system that takes down student’s attendance using barcode. Every student is provided with a card containing unique bar-code. And Every bar-code represent unique id of students.
   * The system uses Barcode method for authenticating the student with a unique barcode that represents their unique id.

**Weakness of Barcode reader**

* + 1. **Cost:** For barcode technology a barcode reader must be purchased which is a quite Expensive compared to beacons .
    2. **Range:**  In order for a barcode reader to be able to function it should note be kept above 15 feet from the barcode label. If place more than that the barcode reader will have problem scanning. For some applications this shorter range can cause difficulties.
    3. **Physical Damages:** Barcode readers are easily vulnerable to physical damages. Similar to other equipments, it is too subjected to wears and tears.
    4. **Label Damages:** Typically barcode are printed labels which is always exposed to outer world. This makes it easily prone to environment damages. Even if one part of the label is damages, it can pose problems while scanning
    5. **Information:** Barcode readers are able to scan only limited number of information. Those Information are only about the product and manufacturers.
    6. **Security:** Not all Barcode reader are genuine. If a user happens to scan a malicious barcode, the system could pontentially be taken over by hackers.

1. **FACE RECOGNITION**
   * A face recognition based attendance system is the technology to identify or verify an individual using their facial features. This system can be used to recognize people in images, videos, or in the real-time event.

**Weakness of Face Recognition**

* + 1. **Image Quality:** The quality of reference image plays an important role in the identification process. If the resolution of the image is not high enough, it can cause camera to tricked into believing that the person being scanned is not the same as in the photo.
    2. **Storage:** Depending on the quality of the input data a system would need an appropriate amount of storage.
    3. **Angles:** Many non-premium facial recognition systems cannot account for faces that are captured at angles other than straight into the capturing camera.
    4. **Biased performance:** There is possibility that facial recognition system might be able to identify women or people of color
    5. Facial recognition can be Expensive

**2.3 Preview of Proposed Work (System)**

* Automated Location based Time and Attendance Tracking System provides many benefits to an institute. It enables an lecturer to have full control of all students who attend in his or session. It helps control student attendance by reducing errors of the existing system that is the use of paper or Manual attendance system , which are often caused by human error.
* In this system I will use the Internet of things (IOT) knowledge in order to provide good operation of the system. IOT idea into work on the use of Bluetooth Low Energy (BLE) beacons.

**STRENGTH OF PROPOSED SYSTEM OVER OTHER SYSTEMS.**

1. **Cost:** The cost of the proposed system is very low compared to facial recognition,barcode reader and fingerprint attendance systems.
2. **Storage:** The system need very little storage in the process of storing student information in the server compared to facial recognition attendance system.
3. **Range:** The beacon can advertise signal 70 meters to 100 meters this is the best over large area that attendance is needed for each students.
4. **Information:** The system will be able to provide the full information of the student and the information of the beacon and its location.

**3.0 Methodology:**

**3.1 Data Collection Methods**

* + **Data collection** is defined as the procedure of collecting, measuring and analyzing accurate insights for research using standard validated techniques. In most cases, data collection is the primary and most important step for research, irrespective of the field of research. In the proposed system I will use the following method or techniques in data collection
    - * **Observation** is a data collection technique which entails use of senses to collect data from the internal environment. Observation mainly entails looking at the behavior of an individual, a group or a thing. This means that observation does not consider the attitudes and opinions held by parties under observation. The Observation will be done National Institute of Transport on CCT department as the case study for the proposed system.
      * Interview An interview is a face-to-face conversation between two individuals with the sole purpose of collecting relevant information to satisfy the proposed system. Interviews are of different types namely; Structured, Semi-structured and unstructured with each having a slight variation from the other. This data collection method will be used in order to what does the student and the lecturer need to see in the proposed system.

**3.2 Data Analysis Methods**

* + **Data analysis** is defined as a process of cleaning, transforming, and modeling data to discover useful information for business decision-making. The purpose of Data Analysis is to extract useful information from data and taking the decision based upon the data analysis.
  + Data analysis Methods are:

### ****Descriptive Analytics:**The goal of descriptive analytics is to find out** what happened?. It’s the first layer of information that you can get from the data you’ve collected, either with or without adding data from other sources.

### **Diagnostic analytics:** When you have an overview of what is in your data and what your sample looks like, you might want to know why certain things are happening. With diagnostic analytics, we can go one step deeper and ask the question:Why did this happen?.

### **Predictive analytics:** By the time you know why something happened, we might go as far as predicting what is likely to happen next, given our knowledge of previous events. Predictive analytics tries to answer the question: What is likely to happen?.

### Prescriptive analytics: Now that you have an idea of what is likely to happen, you might want to know what the best course of action is. Prescriptive analytics tries to answer the question: What should be done?or what can I do to make ... happen?.

**3.3 System Development Life Cycle (SDLC) Chosen (***including its phases, and advantages****)***

SDLC is a process followed for a software project, within a software organization. It consists of a detailed plan describing how to develop, maintain, replace and alter or enhance specific software.

**SDLC Model For Proposed System**

**AGILE METHODOLOGY**

* + Agile is an approach to software development that seeks the continuous delivery of working software created in rapid iterations.
  + Agile is an iterative way of managing projects and developing software that makes it easier for teams to deliver value to their customers more quickly and effectively. The agile development process is aligned to deliver the changing business requirement. It distributes the software with faster and fewer changes.
  + **Agile Principles**
    1. **Customer Satisfaction:** The customer needs to be satisfied with the quick delivery of the product.
    2. **Welcome Change:** Even late in the development process, changing needs need to be addressed.
    3. **Deliver Frequently:** Focus on a shorter timescale, and ensure products are delivered frequently.

### **Face-to-face:** Having face-to-face interactions is one of the most effective forms of communication.

* + 1. **Motivated Team:**  Team members must be motivated and trusted to complete the project successfully and on time.
    2. **Working Software:** Having working output is an indication of the progress mad towards the final product.

**Advantages of Agile**

## **Fast feature development:** The first great benefit of agile software development is that new features can be released at a fast pace.

## **Continuous customer involvement:** A second benefit, continuous customer involvement is closely linked to and complements the first. The capture of continuous user feedback means they are incorporated into the sprints of a feature development.

## **Constant improvement:** A third great benefit, is that not only does your feature improve after each iteration, but also your team work.

## **Flexibility:** Agile software development is that it is an innovative and flexible methodology. If the path forward for a new feature is not certain, it allows you to iterate, try things out and then gradually evolve and improve your feature. This also allows you to be flexible and adapt towards a changing environment.

## **Customer satisfaction:** Agile software development generates customer satisfaction. Subsequent sprints could focus on improving and developing the new feature to its full potential by observing user interactions.

**PHASES OF PROPOSED PROJECT**

1. **Concept** 
   * The first phase of the agile development life cycle is the concept. In this phase, the stakeholder will determine the objective and scope of the software. In this the phase the main objective of the proposed project is to Design and Develop automated student location based time and attendance tracking system and its scope is that the system will be developed to operate on only smartphones and web browsers.

### ****Inception or Requirement Identification****

### **Once you have a clear idea of the scope of your project, then the second step will be to determine the best way to finish it. The best way to finish the project according to the objective and the scope is through using different technology in the implementation. These technology are flutter, angular nodejs and the beacons that user Bluetooth low energy.**

### ****Iteration or Development****

* + **Once your initial plan is defined and accepted by the development team, you will begin to work on the initial iteration.**
  + **The fundamental workflow in this phase is:**
    - **Requirements –** Confirm requirements based on the product backlog and stakeholder feedback.
    - **Development –** Design the product on the specifications.
    - **Testing –** Perform QA tests to verify the functions and find any problems.
    - **Delivery –** Produce a functional product.
    - **Feedback –** Collect feedback from customers and stakeholders to determine the specifications for the next version.

### ****Release****

### After several repetitions, you’re ready to decide to release the final product. In the release phase, you’ll perform final testing and quality control to discover any issues or defects, address them, and complete the user manual before the release into production.

* + Finish up this software iteration with the following steps:
    - * ****Test the system:**** Your quality assurance (QA) team should test functionality, detect bugs, and record wins and losses.
      * ****Address any defects.****
      * ****Finalize system and user documentation:**** Lucidchart can help you visualize your code through UML diagrams or demonstrate user flows so everyone understands how the system functions and how they can build upon it further.
      * ****Release the iteration into production.****

### **Production**

### Your product is now available to the world! The production phase indicates that your product is now live. Ensure your team provides ongoing monitoring and support to ensure that your system is in good working order and that users know how to use it.

### ****Retirement****

* + **During the retirement phase, you remove the system release from production, typically when you want to replace a system with a new release or when the system becomes redundant, obsolete, or contrary to your business model.**