EFFICIENT ATTENDANCE SYSTEM

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Statement of Submission

Efficient Attendance System

using RFID technology

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Abstract

Technologies have been continuously benefitting the mankind in every way possible. Old systems are being replaced by new techniques in terms of technology. The never ending research is underway to make the system compact and durable. Similarly, we have focused on an attendance system that can be used at universities as well as companies to maintain daily basis records of attendance.

The main purpose of the system is to provide an easy and comfortable approach to the user, so that handmade task can be achieved electronically. There are so many ways to implement such idea into real means, and we have used dual technology approach to maintain attendance by the user.

We have generated EAS (Efficient Attendance System) which uses the Radio Frequency Identification technology in maintaining student's attendance. EAS not only can mark attendance via radio frequency identification tags, and also through the keypad. The student attendance can also be sent to the serial interface either online or offline mode to the host computer.

This efficient system makes it easy for the user to handle electronic attendance in an efficient way, so that the company/university can integrate the system with their database. This will maximize management of records to assess according to the academic performance.

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Chapter 1
Introduction

1.1 Introduction

Survey has shown that there is a significant correlation between student's attendances and their academic performances. There was also a claim stated that the students who have poor attendance records will generally link to poor academic careers.

Attendance is a significantly better predictor of grade than any other factors. Attendance records have primarily become the proxy to determine the success of the students in most of the higher academic institutions. In most of the higher academic institutions, the recording of the student's attendances are mainly done by pen and papers. The attendance sheets will be distributed in the classes for the students to sign and this practice of course, will consume a lot of time. With the manual system, the process will become more difficult for the management to regularly update the record and manually calculate the percentage of classes attended. All of these limitations regarding the manual system indicate the needs to improve the process of attendance recording and reporting.

1.2 Technologies

Many applications have now become one of the preferable technologies that are used to ease the process of managing data and records. There are many ways to implement such a system by using various technologies such as (*Biometric, IR, Barcode, and Magnetic tape*).

Biometric System: The drawback of this system is that criminals have been known to remove fingers to open biometric locks. Biometrics requires a lot of data to be kept on a person, these systems are not always reliable as human beings change over time if you are ill; eyes puffy, voice hoarse or your fingers are rough from laboring for example it may be more difficult for the machinery to identify you accurately. Every time you use Biometrics you are being tracked by a database bringing up a range of privacy issues. The final disadvantage is the expense and technical complexity of such systems [1].

IR: Infrared technologies require line of sight communication, so transmitters and receivers must be almost directly aligned (i.e. able to see each other) to communicate. It can be blocked by common materials such as people, walls, plants, etc, and such blocks may disrupt transmission. Infrared has short range and performance drops off with longer distances. Infrared is light and weather sensitive, so direct sunlight, rain, fog, dust, pollution can affect transmission. Its speed and data rate transmission is not high enough as compared to other wireless devices [2].

Barcode: While using barcode technologies there are many things to consider such as damaged labels bar code readers cannot read labels/ID's that are wrinkled, dirty or smudged. Issues may occur when any specific person makes an entrance and was actually not allowed to enter; the reason being that barcode system was not updated. Trainings are essential when beginning to use bar codes. The most important problem of the barcode system is its printer requirements. Dot matrix and ink jet printers cannot print high-quality bar codes [3].

Magnetic Tape: Magnetic tapes may have benefitted in the past, but there are many reasons for not using magnetic tape such as the physical contact with the recording heads,

causing friction and wear. Magnetic tape is an analog medium, even when digital data is being stored. Tape can stretch or break, or lose its magnetic data due to age, heat or the Earth's magnetic field [4].

RFID: Radio frequency (RF) technology is commonly used to transmit and receive information without wires. A wide variety of electronic devices such as television, radio, and wireless telephone use radio frequency technology to transmit or receive information. RFID can be used in helping one's business track inventory and equipment. RFID tags contain microelectronic circuits that stores information. The tags transmit this information to a remote RFID receiver [5].

The optical nature of barcode requires labels to be "seen" by lasers. That line-of-sight between label and reader is often difficult, impractical, or even impossible to achieve in industrial environments. In order to function properly, a barcode reader must have clean, clear optics, the label must be clean and free of abrasion, and the reader and label must be properly oriented with respect to each other. RFID technology enables tag reading from a greater distance, even in harsh environments. In addition, the information imprinted on a barcode is fixed and cannot be changed. RFID tags, on the other hand, have electronic memory similar to what is in your computer or digital camera to store information about the inventory or equipment. This information can be dynamically updated [5].

Why RFID (Radio Frequency Identification) [5]

- No line of sight requirement.
- The tag can stand a harsh environment.
- Long read range.
- Portable database
- Multiple tags read/write.
- Tracking people, items, and equipment in real-time.

This advanced (RFID) technology can be integrated with the online database systems at companies and universities in order to achieve a strong attendance system. Radio Identification is the efficient system which makes it easy for the teacher/management to handle electronic attendance by use of EAS (Efficient Attendance System).

1.3 Project Block Diagram

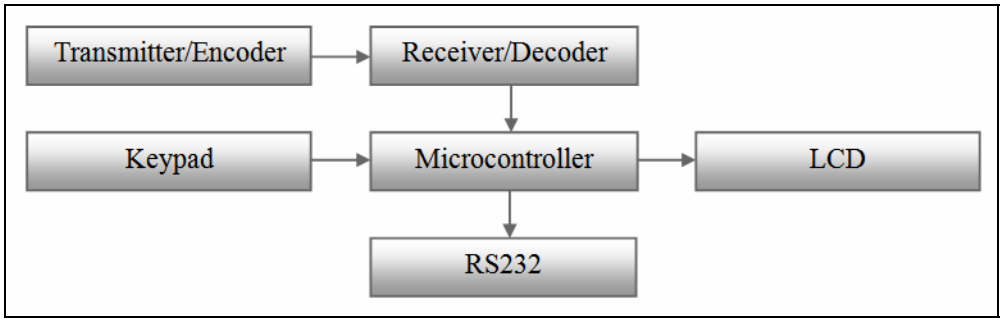

Figure 1.3.1: Project Block Diagram

1.4 Aim of the project

The aim of the project is to design a system that is low power, portable, easy access and dual attendance marking system (tag and keypad). This will enable multiple benefits to the user to move the technology to his office remain in the lecture rooms to transfer the data to the computer system. Dual marking of attendance will ensure that in case of failure of any transmitter keypad can be used for attendance.

Efficient Attendance System (EAS) that is used with the RFID technology to maintain the attendance at real-time that can be monitored on Database server of the university. The system will further require the database to be integrated with the EAS, and from anywhere anyone can access (parents) to view records of attendance of their student.

1.5 Concept

Every room or hall of the university will have an Efficient Attendance System (EAS) system integrated with the computer. This system will be light weighted and easily portable comprising of main board attached with the serial interface of the host computer in a room/hall.

There may be more than one transmitter, but there will be only one receiver included with the main board of our system. The teacher may use his transmitter to initiate attendance, and students will start marking their attendance. In case of failure of tag, additional feature of the EAS may be used which is punching ids via keypad.

The EAS has the feature to mark attendance online as well as in offline modes, thus transferring the acquired data to the computer for further manipulation by the existing database of the university.

1.6 Motivation

A problem that is faced in various manufacturing and service sector industries is the difficulty in tracking and identifying people and objects that are mobile in nature. Most of the time record keeping is done using various database management systems. But despite of this automation in place the initial data entry into a computer is by and large done manually. There is no smart way of automatically entering and updating data as soon as it is changed. While humans are excellent in performing intelligent work they are not very

good at doing repetitive work without errors. As a result errors and defects in manual systems are usually traced back to initial incorrect data entry. Therefore there was a need for an automatic system that can track and identify items without getting in touch with them. This is only possible with a contact less technology that can work from a distance to retrieve data wirelessly while the things are on the move.

Chapter 2
Efficient Attendance System
using RFID

2.1 Efficient Attendance System

An Efficient Attendance System (EAS) makes it easier for anyone to electronically maintain attendance of individuals. Due to its design and reliability it can be used at any organizations planning for e-attendance. The system is specifically designed for the college or university, and identification number of individual is generated for the computer system to acquire and manipulate the data into the database.

Efficient Attendance System uses various devices to make the system work, and their detail will be clarified in the chapters. EAS uses Radio Frequency Identification Technology (RFID) explained in the next topic.

2.2 What is an RFID?

Radio frequency identification (RFID) is a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object or person wirelessly, using radio waves. It's grouped under the broad category of automatic identification technologies [5].

Unlike bar-code technology, RFID technology does not require contact or line of sight for communication. RFID data can be read through the human body, clothing and non-metallic materials [5].

2.3 Basic System of RFID

A basic RFID system consists of three components [6]:

- An antenna or coil
- A transceiver (with decoder)
- A transponder (RF tag) electronically programmed with unique information
- The antenna emits radio signals to activate the tag and to read the data.
- The reader emits radio waves in ranges of anywhere from one inch to 100 feet or more, depending upon its power output and the radio frequency used. When an RFID tag passes through the electromagnetic zone, it detects the reader's activation signal.
- The reader decodes the data encoded in the tag's integrated circuit (silicon chip) and the data is passed to the host computer for processing.

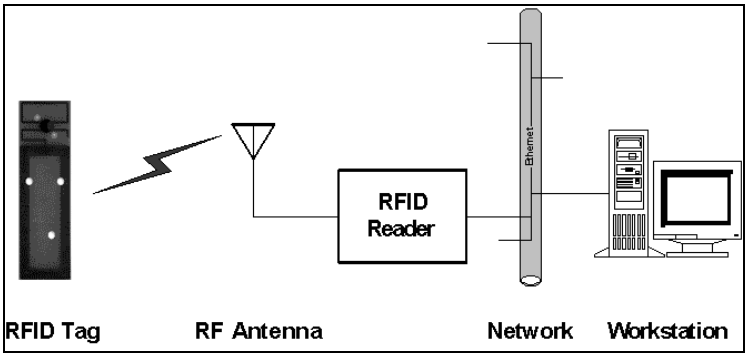

Figure 2.3.1: Basic Diagram of RFID [7]

The purpose of an RFID system is to enable data to be transmitted by a portable device, called a tag, which is read by an RFID reader and processed according to the needs of a particular application. The data transmitted by the tag may provide identification or location information, or specifics about the product tagged, such as price, color, date of purchase, etc. RFID technology has been used by thousands of companies for a decade or more. . RFID quickly gained attention because of its ability to track moving objects. As the technology is refined, more pervasive - and invasive - uses for RFID tags are in the works [6].

A typical RFID tag consists of a microchip attached to a radio antenna mounted on a substrate. The chip can store as much as 2 kilobytes of data. To retrieve the data stored on an RFID tag, you need a reader. A typical reader is a device that has one or more antennas that emit radio waves and receive signals back from the tag. The reader then passes the information in digital form to a computer system.

2.4 RFID Tags

There are two types of RFID tags in common use [6]:

1. Active RFID tag

2. Passive RFID tag

These tags have advantages as well as disadvantages which are explained in detail as follow.

2.4.1 Active tag

2.4.1.1 Advantages

There are advantages if RFID Active tag which is as follows [9]:

- It can be read at distances of one hundred feet or more, greatly improving the utility of the device.

- It may have other sensors that can use electricity for power.

2.4.1.2 Disadvantages & Problems

Some disadvantages of Active RFID tag are as follows [9]:

- The tag cannot function without battery power, which limits the lifetime of the tag.

- The tag is typically more expensive.
- The tag is physically larger, which may limit applications.
- The long-term maintenance costs for an active RFID tag can be greater than those of a passive tag if the batteries are replaced.
- Battery outages in an active tag can result in expensive misreads.

2.4.1.3 Features

Some features of RFID tag are as follows [6]:

- Longest communication range of any tag
- The capability to perform independent monitoring and control
- The capability of initiating communications
- The capability of performing diagnostics
- The highest data bandwidth

Active RFID tags may even be equipped with autonomous networking; the tags autonomously determine the best communication path [6].

2.4.2 Passive Tag

A passive tag is an RFID tag that does not contain a battery; the power is supplied by the reader. When radio waves from the reader are encountered by a passive RFID tag, the coiled antenna within the tag forms a magnetic field. The tag draws power from it, energizing the circuits in the tag. The tag then sends the information encoded in the tag's memory [6].

2.4.2.1 Advantages

- The tag functions without a battery; these tags have a useful life of twenty years or more.
- The tag is typically much less expensive to manufacture.
- The tag is much smaller (some tags are the size of a grain of rice). These tags have almost unlimited applications in consumer goods and other areas [6].

2.4.2.2 Disadvantages

- The tag can be read only at very short distances, typically a few feet at most. This greatly limits the device for certain applications.
- It may not be possible to include sensors that can use electricity for power.

- The tag remains readable for a very long time, even after the product to which the tag is attached has been sold and is no longer being tracked [6].

2.5 Applications of RFID

Some of the applications of RFID are discussed below, and will further elaborate about this great technology [6].

- ***Asset Tracking***: Asset tracking is one of the most common uses of RFID. Companies can put RFID tags on assets that are lost or stolen often, that are underutilized or that are just hard to locate at the time they are needed. Just about every type of RFID system is used for asset management. It chose a real-time locating system that uses active RFID to locate container to within few feet's [6].

- ***Manufacturing***: RFID has been used in manufacturing plants for more than a decade. It's used to track parts and work in process and to reduce defects, increase throughput and manage the production of different versions of the same product [6].

- ***Supply Chain Management***: RFID technology has been used in closed loop supply chains or to automate parts of the supply chain within a company's control for years. As standards emerge, companies are increasingly turning to RFID to track shipments among supply chain partners [6].

- ***Retailing***: Retailers such as Best Buy, Metro, Target, Tesco and Wal-Mart are in the forefront of RFID adoption. These retailers are currently focused on improving supply chain efficiency and making sure product is on the shelf when customers want to buy it [6].

- ***Payment Systems***: RFID is all the rage in the supply chain world, but the technology is also catching on as a convenient payment mechanism. One of the most popular uses of RFID today is to pay for road tolls without stopping. These active systems have caught on in many countries, and quick service restaurants are experimenting with using the same active RFID tags to pay for meals at drive-through windows [6].

- ***Security and Access Control***: RFID has long been used as an electronic key to control who has access to office buildings or areas within office buildings. The first access control systems used low-frequency RFID tags. Recently, vendors have introduced 13.56 MHz systems that offer longer read range. The advantage of RFID is it is convenient (an employee can hold up a badge to unlock a door, rather than looking for a key or swiping a magnetic stripe card) and because there

is no contact between the card and reader, there is less wear and tear, and therefore less maintenance [6].

As RFID technology evolves and becomes less expensive and more robust, it's likely that companies and RFID vendors will develop many new applications to solve common and business problems [6].

Chapter 3
Hardware Components