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A QR-Based Attendance Management System for Educational Institutions

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Abstract: *In this era of technology, smartphones play a significant role in our day-to-day lives. Nowadays smartphones can solve most of the problems very quickly and easily. It has made the life of every person simple and easier with different social apps, commercial apps, problem-solving apps, apps for education and marketing, etc. Following the technology, we created a system that will handle the problem of recording attendance. In response to this challenge, we introduce a revolutionary QR-based attendance system designed to streamline the attendance process for both educators and administrators. This system, is a blend of Android and web platforms, leveraging both the technology to enhance efficiency and accuracy in attendance management. In this report, we delve into the key features, technologies employed, and benefits of our QR-based attendance system, highlighting its significance in modernizing educational institutions.*

Keywords: *QR-Based Attendance, QR Application, Smart Attendance Monitoring, Smart Educational Institute, etc.*

I. INTRODUCTION

The advent of technology has transformed various aspects of our lives, including education. However, many educational institutions still rely on outdated methods for attendance tracking, leading to inefficiencies and inaccuracies. Recognizing the need for a more streamlined approach, we present our QR-based attendance system a comprehensive solution designed to revolutionize attendance management in educational Institutions. This proposed system is a couple of two tasks, one by generating the QR Code for the student by entering the student details such as login credentials, and the second task is taking the attendance on the teacher portal and generating the attendance report in CSV or XLS format [1].

The student will need to scan the QR code of the teacher in which they are enrolled to confirm their attendance. Once, the faculty takes the attendance which is stored in the mobile database. At the time of submission of the attendance report the faculty directly uploads the attendance in the server and does not need third person interaction. This application fetches the details of the courses allotted to the respective faculty and the students enrolled in the courses from the server using the internet connection and stores it in the mobile database [1]. This application stores the attendance in the mobile internal database and the faculty can view and update the attendance whenever required.

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II. LITERATURE REVIEW

Attendance monitoring has undergone significant changes, transitioning from traditional manual methods to modern technological solutions. This review explores this evolution, emphasizing the progression to QR-based attendance systems for their simplicity and effectiveness.

Traditional Methods:

The background history of QR Code-based Smart Attendance Systems is rooted in the evolution of QR code technology and its application in various fields. Here is an overview of how QR codes have been adapted for use in attendance tracking and management systems. QR codes, or Quick Response codes, were originally developed in 1994 by Denso Wave, a subsidiary of the Toyota Group. The initial purpose was to track vehicles during manufacturing; they needed a barcode that could encode more information and be decoded at higher speeds than traditional barcodes.

Historically, attendance management relied on manual processes such as paper registers and verbal roll calls (Smith & Johnson, 2015). These methods were time-consuming and prone to errors, leading to inefficiencies in record-keeping [3].

Yang and Li (2018) extensively explore the transformative potential of QR codes in educational settings, particularly in streamlining attendance tracking processes. Their research emphasizes the efficacy of QR codes in reducing the time and errors associated with traditional roll-call methods. They highlight the simplicity and cost-effectiveness of QR codes, which can be generated and scanned using basic software and mobile devices equipped with cameras [4].

Kumar & Raj (2019) investigate the cost benefits of QR codes compared to other electronic systems like RFID, focusing on their economic and environmental advantages. They argue that QR codes are more accessible and environmentally sustainable, requiring only a smartphone with a camera for scanning. Their study underscores the cost-effectiveness of QR codes, especially in organizations with limited technology budgets [5].

Chen et al. (2020) delve into the security vulnerabilities of QR code-based systems, particularly in attendance tracking applications. They propose various encryption techniques to enhance data security and mitigate the risks of data breaches and unauthorized access. Their research highlights the importance of integrating advanced encryption methods to safeguard the integrity and confidentiality of data transmitted through QR codes [6].

III. PROBLEM STATEMENT

Traditional attendance tracking methods in educational institutions and organizational settings are plagued by inefficiencies, inaccuracies, and reliance on manual processes, leading to time-consuming administrative tasks and potential errors. These methods often involve paper-based or manual entry systems, which are prone to human error and subjective biases. There is a pressing need to address

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these challenges and modernize attendance tracking systems to enhance operational efficiency, accuracy, and reliability. The development of a QR Code-based Attendance System aims to provide a solution by automating the attendance recording process, ensuring uniformity, accuracy, and real-time data availability, while also offering cost-effectiveness through reduced reliance on paper and minimal hardware requirements.

IV. KEY FEATURES AND BENEFITS

Our QR-based attendance system offers plenty of features aimed at simplifying the attendance marking process and ensuring accuracy. One of the standout features is QR code scanning, integrated into the Android application. This feature allows students to effortlessly mark their attendance by scanning a QR code upon entering the classroom.

Moreover, the web-based component of our system provides real-time QR code display, empowering teachers to create attendance sessions for each class dynamically. This ensures precise tracking of student attendance and eliminates the need for manual entry.

The system also incorporates SQL PHP admin and teacher login mechanisms, guaranteeing secure access to attendance data. Teachers have the flexibility to create courses and define attendance timings, further enhancing the accuracy and reliability of the system [7]. Finally, a report of the student's attendance on a weekly and monthly basis is generated as desired. The main objective of the automated attendance system is to computerize the traditional way of recording attendance and provide an efficient and automated method to track attendance in institutions.

V. TECHNOLOGIES EMPLOYED

To seamlessly integrate the Android application and web-based system, we utilized a combination of powerful technologies such as:

Setting Environment: Client-Side System Specification

Hardware Requirements

Item Name	Specification
Laptop/Desktop	Minimum Intel Pentium IV or AboveMinimum RAM: 512 MB or more Minimum Hard disk: 1 GB free space.

Software Requirements

Particular	Specification
Operating System	Minimum Windows 7 or above
Browser(s)	Google Chrome 5 or Higher Mozilla Firefox 3.6 or HigherInternet Explorer 9 or Higher & other browsers with compatible Version.

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Server-Side Specification

Server	Xampp 8.1.12
Language	Php Language
Database	MySQL 8.0.30
Browser(s)	Google Chrome 5

For the Front end we use;

- HTML
- CSS
- JavaScript
- Bootstrap

For the Backend we use;

- PHP

And for the database we use;

- My SQL Server

JavaScript was utilized to create a dynamic, real-time display of QR codes on the web application, while the Apache server ensured the reliability and accessibility of the hosted web application. HTML and CSS were utilized to design an intuitive and user-friendly interface for the web application, enhancing the overall user experience [8].

VI. METHODOLOGY

Use Case:

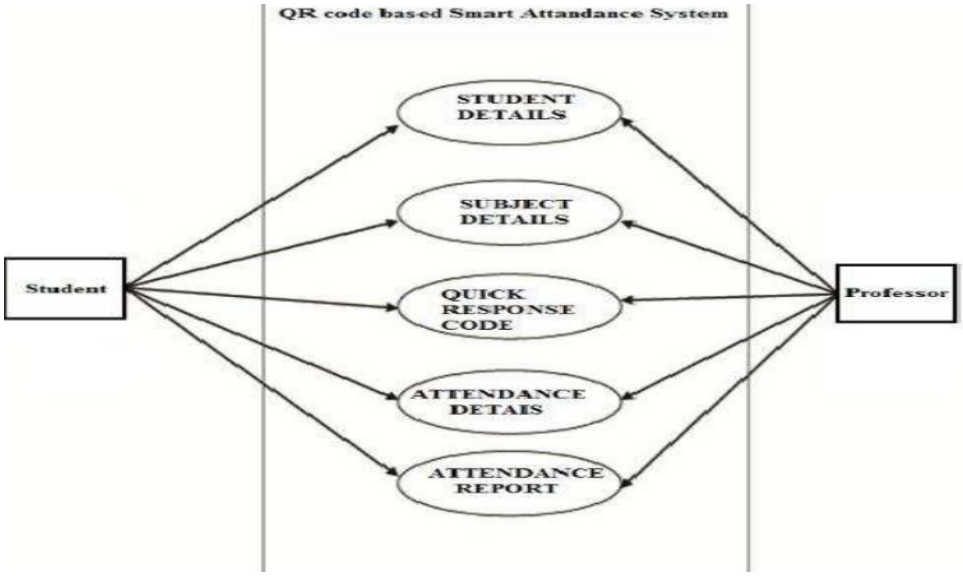

Figure 1: Use case Diagram [1]

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Data Flow Diagram:

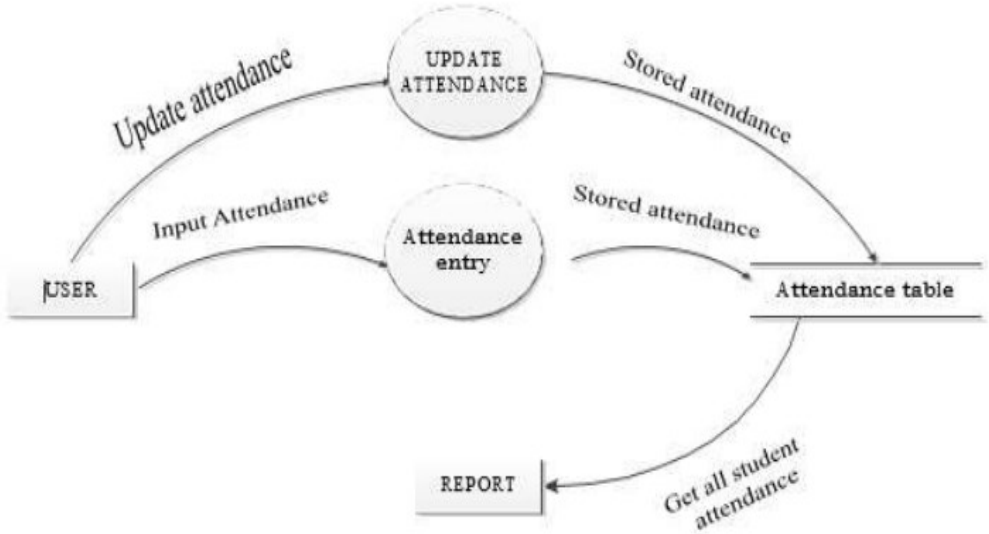
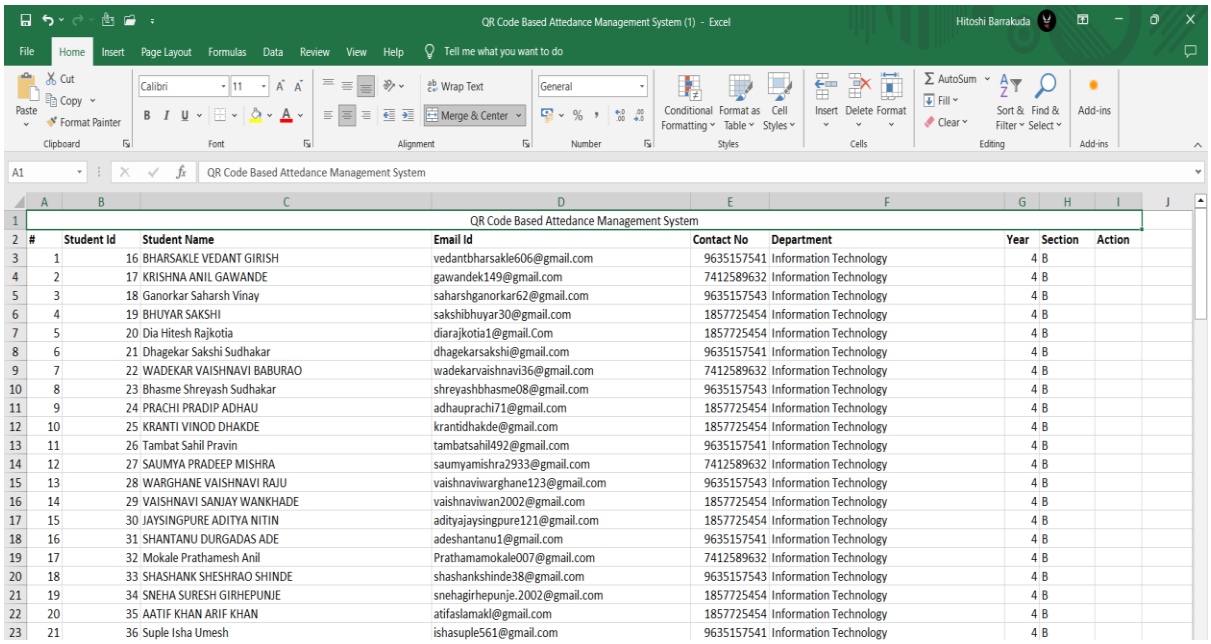


Figure 2: Data Flow Diagram [1]

VII. DATABASE

The database of student attendance is managed using MySQL. The database stores the student's ID, student's name, email, contact number, department, section and attendance status. The database table is shown below:



QR Code Based Attedance Management System

#	Student Id	Student Name	Email Id	Contact No	Department	Year	Section	Action
1	16	BHARSAKLE VEDANT GIRISH	vedantbharsakle606@gmail.com	9635157541	Information Technology	4	B	
2	17	KRISHNA ANIL GAWANDE	gawandek149@gmail.com	7412589632	Information Technology	4	B	
3	18	Ganorkar Saharsh Vinay	saharshganorkar62@gmail.com	9635157543	Information Technology	4	B	
4	19	BHUYAR SAKSHI	sakshibhuyar30@gmail.com	1857725454	Information Technology	4	B	
5	20	Dia Hitesh Rajkotia	diarajkotia1@gmail.Com	1857725454	Information Technology	4	B	
6	21	Dhagekar Sakshi Sudhakar	dhagekarsakshi@gmail.com	9635157541	Information Technology	4	B	
7	22	WADEKAR VAISHNAVI BABURAO	wadekarvaishnavi36@gmail.com	7412589632	Information Technology	4	B	
8	23	Bhasme Shreyash Sudhakar	shreyashbhasme08@gmail.com	9635157543	Information Technology	4	B	
9	24	PRACHI PRADIP ADHAU	adhauprachi71@gmail.com	1857725454	Information Technology	4	B	
10	25	KRANTI VINOD DHAKDE	krantidhakde@gmail.com	1857725454	Information Technology	4	B	
11	26	Tambat Sahil Pravin	tambatsahil492@gmail.com	9635157541	Information Technology	4	B	
12	27	SAUMYA PRADEEP MISHRA	saumyamishra2933@gmail.com	7412589632	Information Technology	4	B	
13	28	WARGHANE VAISHNAVI RAJU	vaishnaviwarghane123@gmail.com	9635157543	Information Technology	4	B	
14	29	VAISHNAVI SANJAY WANKHADE	vaishnaviwan2002@gmail.com	1857725454	Information Technology	4	B	
15	30	JAYSINGPURE ADITYA NITIN	adityajaysingpure121@gmail.com	1857725454	Information Technology	4	B	
16	31	SHANTANU DURGADAS ADE	adeshantanu1@gmail.com	9635157541	Information Technology	4	B	
17	32	Mokale Prathamesh Anil	Prathamamokale007@gmail.com	7412589632	Information Technology	4	B	
18	33	SHASHANK SHESHRAO SHINDE	shashankshinde38@gmail.com	9635157543	Information Technology	4	B	
19	34	SNEHA SURESH GIRHEPUNJE	snehagirhepunje.2002@gmail.com	1857725454	Information Technology	4	B	
20	35	AATIF KHAN ARIF KHAN	atifaslamakl@gmail.com	1857725454	Information Technology	4	B	
21	36	Suple Isha Umesh	ishasuple561@gmail.com	9635157541	Information Technology	4	B	

Figure 3: Database of a Particular Subject

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Sequence Diagram:

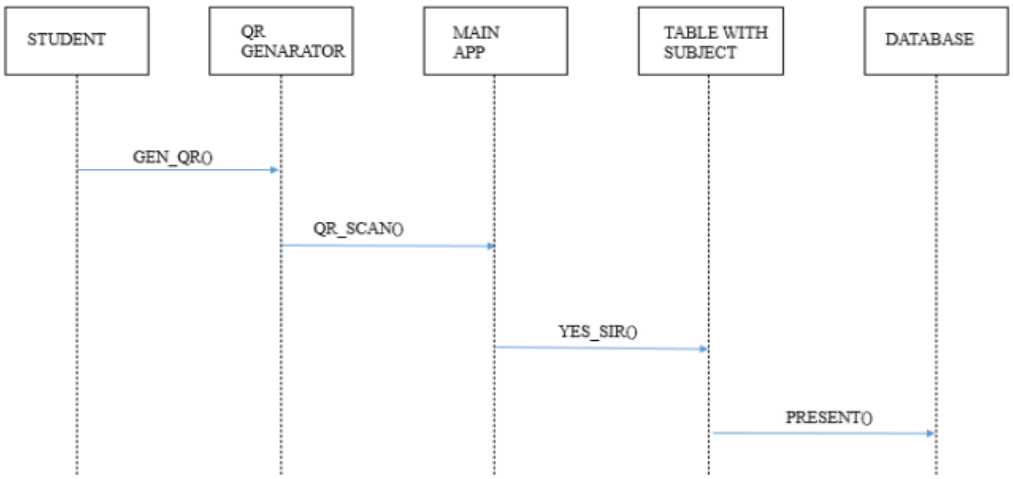

Figure 4: Sequence Diagram [2]

Flow Chart:

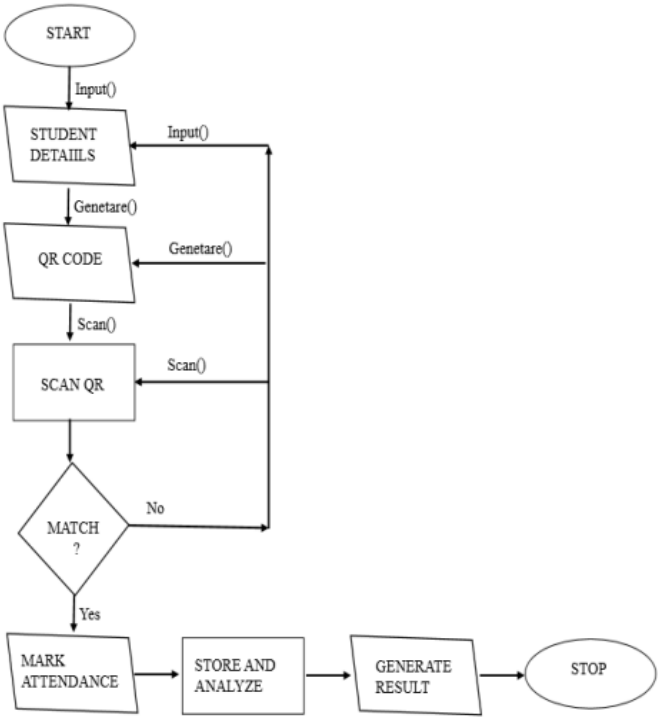

Figure 5: Flowchart of the Application [2]

VIII. RESULT

The Attendance Monitoring System offers two main modules: one for administrators and another for teachers. In the admin module, administrators have access to advanced tools tailored for attendance management. They can oversee the entire system, ensuring its smooth operation and handling any issues that may arise.

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Meanwhile, in the teacher module, educators can efficiently monitor student attendance and access reports to stay updated on attendance trends. This simplifies the process of tracking when students are present in class, achieved by QR codes.

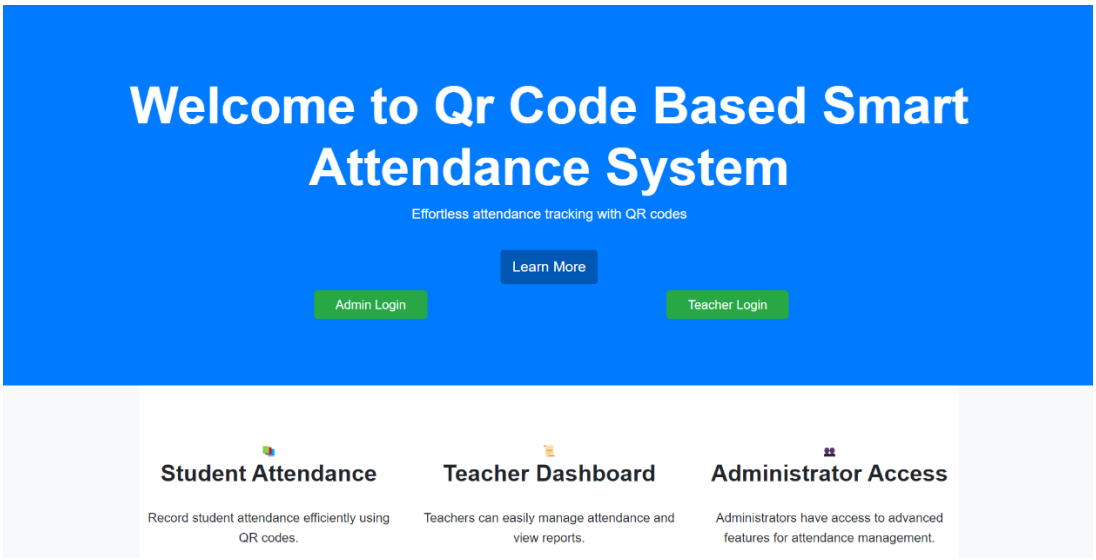

Figure 6: Home Page

The footer highlights key features and the significance of the Attendance Monitoring System. It emphasizes the system's capability to simplify attendance tracking using QR codes in educational institutions, particularly in B.E. colleges. This includes automated attendance recording through student QR code scanning and easy access to attendance records for teachers and administrators via a secure dashboard. The system's detailed reports aid in analyzing attendance trends and identifying patterns, contributing to effective monitoring and management of student attendance.

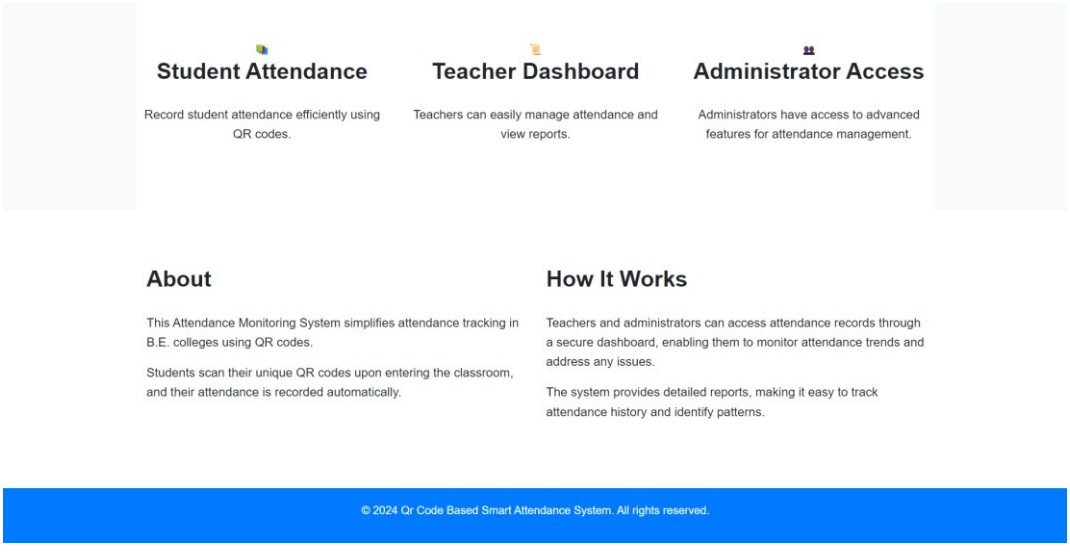

Figure 7: Footer Page

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The admin portal prominently features a login page with fields for username and password, facilitating secure access to administrative tools. Two buttons are provided for logging in and returning to the home page, ensuring user-friendly navigation.

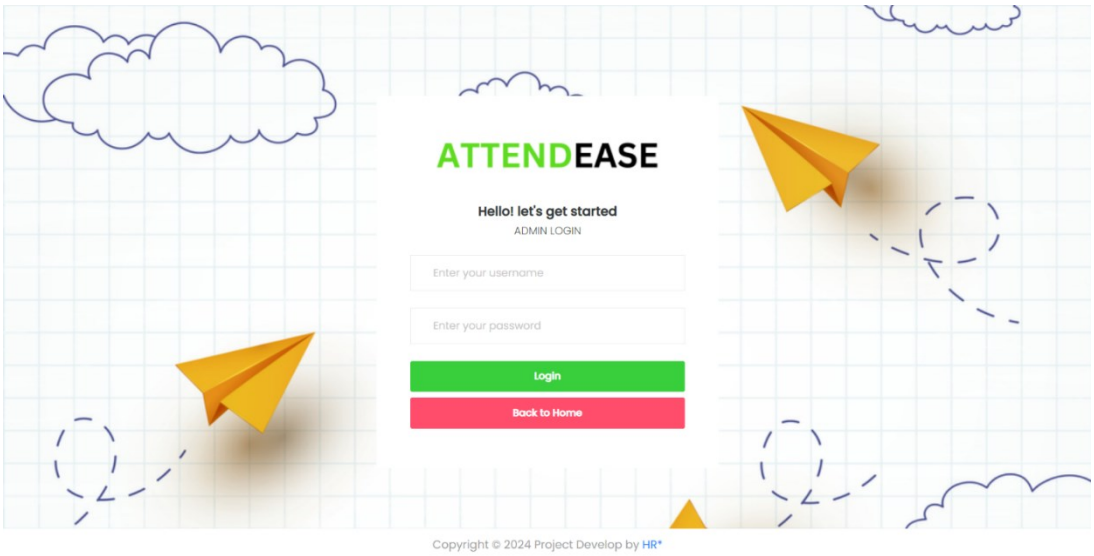

Figure 8: Admin Login Page

Significance and Future Implications:

Our QR-based attendance system represents a significant advancement in attendance management for educational institutions. By harnessing the power of technology, we have streamlined the attendance tracking process, saving time for educators and administrators while ensuring accuracy and reliability. As technology continues to evolve, our system serves as a blueprint for the future of attendance management in the educational system, we will focus on providing a pop-up message to the parents on their respective numbers if the student is absent. Secondly, we are trying to use NFC technology for marking attendance in colleges and the corporate world.

IX. RESULT

The proposed system offers a comprehensive solution to the challenges associated with traditional attendance tracking methods. With its intuitive interface, robust features, and seamless integration of technology, our system is poised to revolutionize attendance management in educational institutions. Embracing innovation is key to staying ahead in today's digital age, and our system represents a significant step towards modernizing educational practices for the benefit of educators and students alike.

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