2025 Volume: 01 Issue: 07 www.ijrpa.com ISSN 2456-9995 Research Article

International Journal Research Publication Analysis

Page: 01-07

AI-AUGMENTED DIGITAL NOTICE BOARD WITH FLASK MIDDLEWARE AND FIREBASE BACKEND

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Article Received: 13 November 2025
Article Revised: 03 December 2025
Published on: 23 December 2025

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Students Dept of CSE,SEA College of Engineering & Technology,Bangalore-560049. DOI: https://doi-doi.org/101555/ijrpa.5788

ABSTRACT

The rapid digitization of campus communication systems has increased the demand for intelligent, real-time, and easily maintainable notice dissemination platforms. This paper presents an **AI-Augmented Digital Notice Board** that integrates a **Flask-based middleware** with a **Firebase backend** to enable seamless creation, management, and delivery of notices across institutional environments. The system leverages Flask as a lightweight web framework to handle user authentication, role-based access, and API-driven content management, while Firebase provides scalable cloud services including Realtime Database, Cloud Storage, and Cloud Messaging for instant updates.To enhance user experience and operational efficiency, AI modules are embedded for **text classification**, **automated summarization**, and **priority tagging** of notices. This enables intelligent filtering and personalized delivery of information to students, faculty, and administrators. The proposed architecture supports multimedia notices, multi-device accessibility, secure user authentication, and real-time synchronization across digital displays and mobile devices. Experimental results demonstrate improved notice retrieval speed, reduced manual workload for administrators, and enhanced relevance of information delivered to end users. The system showcases a modern, scalable approach to campus communication through the effective integration of AI, Flask middleware, and Firebase cloud services

KEYWORDS: Digital Signage, Notice Board, Web Application, Cloud-Based, Raspberry Pi.

INTRODUCTION

Notice board is an important information gathering system in our life. In our day to day life

we see notices boards in many places like schools, colleges, banks etc. Notice board is a mode to communicate between teaching staff, non-teaching staff and students. Now-a-days a separate person is needed to print and stick the notices on the notice board. Maintaining the notices manually creates wastage of paper, ink and manpower. Smart notice board will play vital role in displaying notices digitally. The problems faced by this traditional type of notice board are resolved by the smart notice board. Smart Notice Board is a concept of sending the notices digitally to the screen at real time. This project is implemented by using the concept of digital signage. Digital signage is a concept of displaying notices on the screen digitally. This project is implemented using raspberry pi, a web application to control the notices and cloud for storage. The Liquid Crystal Displays (LCD) or Light Emitting Diodes (LED) monitors is connected with Raspberry-pi to display notices digitally. An authenticated user will be sending the notice with the help of web application and this notice will get displayed on screen. The notice can be in the form of text, images or videos. The admin can perform CRUD operations and can schedule the notices as required. Thus it will result in an advanced and efficient method for sending notices.

METHODOLOGY

a) System Overview

Figure mentioned below shows the Block diagram for the proposed system. The main objective is to develop a wireless notice board which can display notices in the form of image, text, and videos. There will be an admin dashboard operated by using web application. An authorized user will login with valid authentication. The notices can be sent from anywhere in the world with the help of internet. The system will send the notices to cloud and at the user's end the notices uploaded on the cloud will be fetch and displayed on the Screen. The cloud used for this purpose is Google Firebase. Raspberry pi is used as a processor and will be connected with a LCD/LED display. The processor, process it and notices will be displayed on the screen.

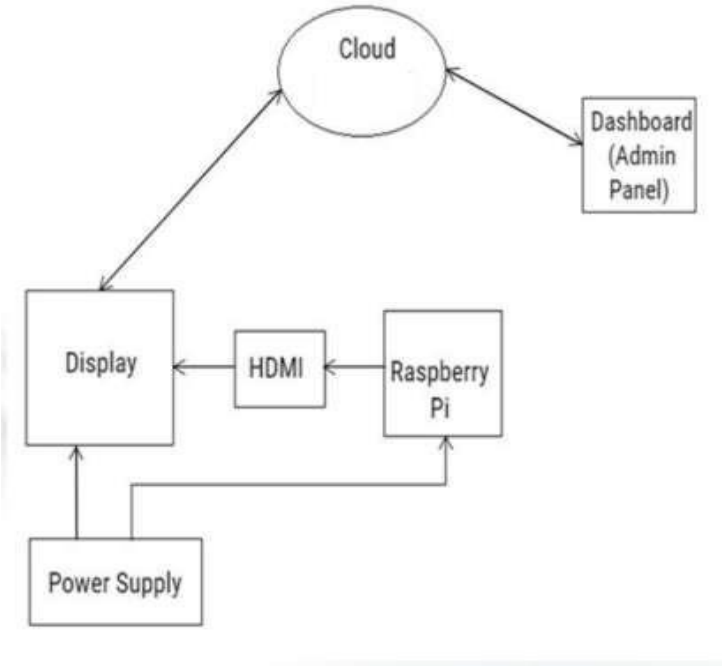

Figure-1: Block Diagram.

b) Implementation

This section states the path to execute the system architecture discussed in the last section. The web application is fueled by a strong database backbone: Firebase Google's real time syncing cloud database. The real time database is cloud-hosted NOSQL database. In Google Firebase data is stored in Json format and synced across connected devices in milliseconds.

The Firebase Database has been majorly used to store the credentials of the admin in Authentication Database who will be sending the notices with the help of Web Application, the notices uploaded in real time database and the multimedia including images, videos in Storage Database.

The implementation process is mainly elaborated with two major sub-systems LED sub-system and the Web Application for Admin and User (Display). The LED sub-system is used to only display notices at any level like schools, colleges or public places, etc. The sub-system consists of the LED display interfaced with Raspberry- Pi, installed with operating system. The Raspberry-Pi is connected with Ethernet port to access the notices.

MODELING AND ANALYSIS

Web Sub-System(Admin)

This system interacts with the Firebase for synchronization of notices and authenticated

logins. The Admin firstly goes through the authentication process of logging. Based on the credentials provided by the admin the Firebase Authentication Database checks the values assigned to the admin and directs him/her to the page where he/she can send the notices. Here the admin gets the option to schedule the notices as per the date as shown in the figure below.

Figure-2: Screen for Scheduling Notices.

As shown in the figure above admin gets directed to above pages after the authentication process. Here the admin can feed the text notices in the text format and the Marquee text (scrolling) which will be displayed at the bottom of the page. Date option is also available where he/she can scheduled the notice as required. The feeding of notice is as mentioned below in the figure.

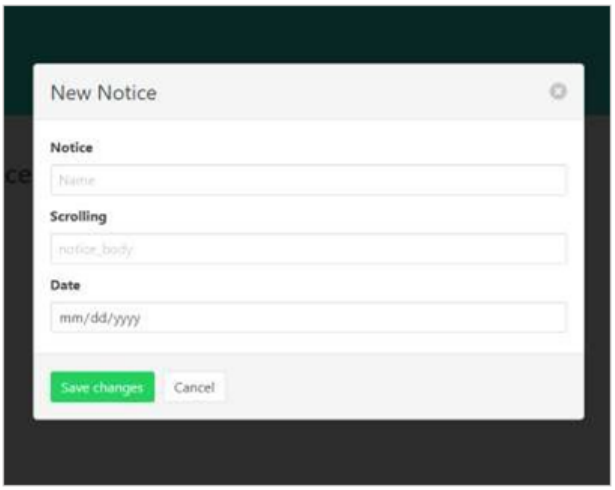

Figure-3: Screen for Notice Feed Page for the Admin.

In the same page Admin also has the option to upload notice in the image format which can also be scheduled as per date required. After uploading the images the table gets created

which displays the images with their sr.no, name and also the option to Delete image is provided which deletes the image from the database storage. The name here by default is save by **date_imagename** so that admin can easily recognized the scheduled images. At a time admin can upload multiple number of images which will get displayed at the user side in the form of image slider i.e. images will get change at an interval of 3 sec. The images get stored in the real time database in Google Firebase. One can upload the image from the images available in the system and scheduled as per date as shown in the figure below.

Web Sub-System(User)

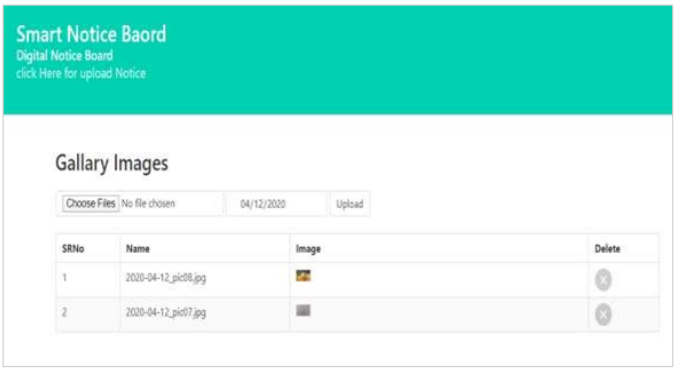

Figure-4: Screen For uploading and deleting Image Notice.

RESULTS AND DISCUSSION

In this Sub-System the user will be the audiences who will be viewing the notices from the Display Screen. The display screen is divided into three parts i.e. firstly Important Notice were notices in the text format are displayed second the slider where the images gets displayed continuously at time interval of 3sec and last at the Marquee Text at the bottom of the screen as shown in figure below.

Figure-5: Screen For Notice Display.

CONCLUSION

The AI-Augmented Digital Notice Board proposed in this study demonstrates a modern, efficient, and scalable approach to institutional communication by integrating **Flask middleware**, **Firebase backend services**, and **AI-based automation modules**. The system successfully streamlines the creation, storage, and distribution of notices while ensuring real-time synchronization across multiple digital platforms. The incorporation of AI for text summarization, classification, and priority tagging significantly enhances the relevance and accessibility of information delivered to different user groups.Results indicate that the solution reduces administrative effort, minimizes communication delays, and provides a secure and user-friendly interface for managing campus-wide announcements. With its cloud-backed architecture and cross-platform compatibility, the system offers a reliable alternative to traditional manual notice boards. Future enhancements may include incorporating advanced NLP models for multilingual support, integrating QR-based quick access features, and expanding analytics for monitoring notice engagement. Overall, the proposed digital notice board system serves as an effective framework for smart campus communication in the era of digital transformation.

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