

OAS: An Advanced Undergraduate Office Automated System for Automate Bank Work Routing

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ABSTRACT

Office automation systems (OAS) have steadily gained popularity as a result of the information technology industry's fast expansion. The promise of office automation, which is meant to increase productivity in the office setting, has caused organizations in both the public and commercial sectors to grow concerned. This issue becomes quite important due to the rising costs of new and enhanced office automation technologies. As a result, industries like banks have improved their front-end client operations using digital solutions. However, a large number of bank processors still depend on personnel and paper. This level of human processing is expensive, sluggish, and may provide results that are highly inconsistent, have significant mistake rates, and pose security risks. Through this research work, our aim is to consider existing significant opportunities in backoffice automation level increase and develop a pilot OAS to work smart with a higher level of efficiency in the office environment. The proposed solution is enriched with image processing methods to authenticate employees to ensure the security of the banking environment by enabling access control and providing a well-accurate employee attendance handling system through web and mobile app facilities which are enabled by GPS and API call technologies. To maintain on-time accurate customer support service, our study has proposed a smart customer handling facility with the help of an AI chatbot and some IoT device materials.

Keywords-- OS, GPS, API Calls, Image Processing, Chatbot, CA, IOT, AI

challenges for the banking sector. The society has increased its demands on the banking sector's operational efficiency as it becomes more intellectual and sophisticated. In order to strengthen both its competitiveness and the economic foundation of the service society, the banking sector must improve its informational and automated architecture. In light of updated computer technology, banking office automation will increase operating effectiveness and modernize management level.

The term "office automation system" is generally considered to refer to the use of integrated computer and communications systems to support administrative procedures in an office environment [1]. IT-enabled functions include both process automation (eliminating the paper usage, digitizing routines, and automating or assisting decision making) and the use of IT solutions to manage remaining manual activities (for an instance, using software for resource planning). By fully using this strategy, banks may often improve customer satisfaction and productivity by more than 50%.

A few institutions have already begun to take action in order to fully capitalize on this opportunity's enormous potential. Numerous systems are being created as automated office systems. Word processing programs, desktop publishing, voicemail, emails, multimedia systems, and other things are a few of them. But in this case, our goal is to increase the overall efficiency of a bank's office setting. The working environment of a bank indicates that there are a number of significant issues that need attention. These sections include personnel handling, money and document storage spaces, and customer services. To boost efficiency, these areas are crucial for banks and other businesses. On the other hand, in an organizational context evaluating employee contribution toward the organizational goals is also a crucial aspect to boost productivity and the productivity of an organization [2].

I. INTRODUCTION

As one of the most significant components of financial institutions today, the banking sector is crucial to both the fast-paced functioning of the society's economy and currency exchange. The global economy has grown quickly as a result of the rapid growth in information technology, which also presents opportunities and

Business enterprises are motivated to think about automated office solutions by two main considerations. The first is the urgent need to lower office expenses, which have increased in the previous several years, and to boost the productivity both of management and clerical staff. The complexity of corporate decision-making and information demands is the second factor driving interest in office automation. It's possible that the more conventional channels of communication, including the phone, mail, and face-to-face meetings, are inefficient for quickly processing vast amounts of information. This technologies may be the only practical means of handling processing of information in organizational contexts that are becoming more complicated and changing quickly in the future.

In light of the debate above The newly proposed OAS for the banking industry is being evaluated in this paper in order to evaluate employee contribution to organizational goal achievement by obtaining effective employee attendance and combining well-occupied mobile and web technologies that are enhanced with GPS, API Calls, Image Processing, and to streamline banking processes while providing an AI chatbot to effectively provide customer service in order to fill gaps in existing solutions.

II. LITERATURE REVIEW

The area of office automation (OA) has recently experienced tremendous growth and is now regarded as crucial and inspirational. The modernization of electronics and communications technology has improved office spaces' efficiency, convenience, and security. The term "office automation" describes the use of information technology to monitor and manage office equipment [3]. With the internet's capability and usage growing quickly, it may be able to manage, watch over, and control various electrical gadgets in office spaces. The automation may be achieved by connecting embedded systems to the internet.

In 2017, Vijay Jadhav and his team proposed and developed an OAS with an attendance system with the help of IoT for an existing office area without disturbing majorly to the current structure of that office. This RFID-based attendance system has been tied up with IoT technologies and office automation concepts and it implied the advantages and the accuracy of such a system. Compared to other systems like biometric, an attendance system based on RFID is more secure and quick to react. The RFID system's benefit is that it is contactless and operates outside of a line of sight [3].

The hotel industry makes considerable use of biometric systems. A research is created by taking into account hotel guests' opinions on the use of biometric technologies [4]. The travel and tourism sector, of which

hotels make up a major portion [5] [6], is known for its widespread use of biometric systems to provide security. The extent to which biometric systems have been implemented in hotel chains has altered how the attendance system is managed [7]. Research using ethical procedures for ensuring attendance has been made possible by the use of biometry in attendance.

Varad Parndit and team in 2017 had designed an Intelligence Security Lock Prototype which acts as a smart door lock system using face recognition technology. Face recognition in the app offers secure authentication. All lock/unlock operations are recorded, along with the date and time. Additionally, it offers real-time camera monitoring and notifications for intrusion detection via the app [8]. Therefore, the lock is a special fusion of the many security aspects listed above, offering a perfect solution to the security issue. The lock therefore provides a definitive solution to the security problem by combining the aforementioned security features in a singular way. However, after gaining unauthorized access, they made no further hints or took any similar actions.

An auto-switching magnetic door lock system based on face recognition was created in 2012 by a team from the University of Technology MARA. In order to turn on and off the magnetic lock for the door lock security system, a Graphical User Interface (GUI) based on a face recognition system and a Peripheral Interface Controller (PIC) as an input/output carrier has been developed [9]. The work is put into practice by connecting a microcontroller and a GUI created in MATLABR2009a to an auto-switching magnetic lock for a door lock security system. The GUI and PIC microcontroller are connected through USB serial connection, allowing the GUI to transmit input data to the microcontroller. The created system demonstrates how a USB serial communication cable, together with a PIC microcontroller, are used to accomplish auto-switching mode transmission. It was also discovered that when an approved picture from the GUI database is detected, GUI may successfully turn on and off the magnetic lock.

The extent to which an organizational member contributes to the achievement of the organization's goals is commonly defined as performance in the workplace. Performance evaluation is defined as "the process of recognizing, analyzing, and developing an employee's work performance in order to effectively meet organizational goals and objectives while also benefiting workers in terms of recognition, feedback, and career direction" [2]. The ability to measure is the foundation for evaluating the efficacy of other capabilities. However, the author claims that defining performance assessment is difficult because businesses often have various and often contradictory goals. The procedure is sometimes referred

to as 'performance assessment,' 'performance evaluation,' and 'performance management'.

In this article, Kaur and Kaur [12] developed a fuzzy logic technique to evaluate industrial personnel. All tagged personnel are observed and rated for three days in an IoT-enabled setting utilizing co-location mining and a fuzzy decision-making technique, and the findings are made by computing the Overall Performance Index (OPI). Their technique is capable of eradicating bias, discrimination, and unhappiness among employees, allowing the sector to benefit.

Kaur and Sood [10] developed an IoT-based automatic employee evaluation using a game theory-based method. The technology enables the utilization of data collected by IoT devices for employee appraisal. Using the assessment information, the industry strives to optimize its profit by inspiring personnel to work for the industry's growth. Their approach demonstrated that it can successfully motivate staff as well as analyze their performance. Using their technology strengthens the link between the worker and the industry.

Conversational agents (CAs), sometimes referred to as AI chatbots or conversational agents of artificial intelligence (AI), are viewed as software programs that can interact with humans and machines by using natural language [11]. Due to recent advances in artificial intelligence and machine learning, as well as the 2016 launches of frameworks by Microsoft and Facebook for the integration of CA on their platforms, CA has begun to be deployed on a broad scale [12] [13]. During the latter two years of the COVID-19 epidemic, the development of this particular IT-enabled service was widespread, with 2021 being a pivotal year for the incorporation of AI CA/chatbot technology into customer support operations.

This assistive mobile application's Chatbot feature functions as a sentient touch point and presents a unique possibility to enhance accessibility and user-friendliness. A chatbot is a form of virtual assistant capable of graphical, textual, and spoken communication with human users. The automated, user-friendly chatbot is implemented for their convenience. In addition, it seeks to enhance the user experience by expediting user answers and replying to all inquiries.

III. METHODOLOGY

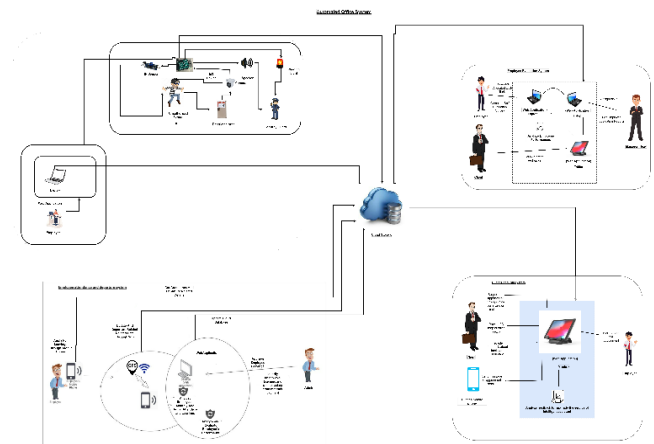


Figure 1: Overall System Diagram

High-Level Srchitecture

The solution's overall design (figure 1) and development are summarized in this section. The conceptual basis of the system's capabilities and other aspects are looked examined. The recommended solution is then presented to the audience together with its aesthetic requirements, technological design, and overall system architecture.

The "OAS: An Advanced Undergraduate Office Automated System for Automate Bank Work Routing" system research focuses on how the framework makes use of IoT-based image processing technologies with API calls, GPS, and AI chatbot with web and mobile solutions for bank back office automation to secure the office environment and to effectively streamline the process.

- A. Attendance Marking and Leaving managing
- B. Unauthorized access detection security Management
- C. Automated Employee Performance Evaluation System
- D. Intelligent assistant

The proposed OAS for the banking sector to help speed office processes and safeguard office environments consists primarily of four components, as detailed below;

A. Attendance Marking and Leaving Managing

To make all of the components of this automated office system function together as a system, we chose to create a web application that can properly handle all of the accomplishments. A mobile application is also required for one component. In this component, we proposed tracking employee attendance with GPS technology via a mobile application. To accomplish so, we must first register all of the employees in the system via the online application. Then, as the following stage, we create a mobile application for Android cell phones using the Dart programming language to track staff attendance and leave. Similarly, we create an absence management system within this mobile application to manage and request leave.

Employees must install the program on their smart phone, link it to the internet, and enter the workplace area to track their attendance and exit. The mobile application sends an API call to the system every 10 minutes to determine if the employee is in the vicinity or not using GPS. The system will then keep all of the attendance and leaving information gathered from the departing monthly wage allocations and deductions based on their leavings. If an employee does not come into the office on a working day, the system will mark that person as absent and check to see if that employee has authorization to be absent. If the employee has the necessary permissions, the system will record the absence in the database as a leave for that day. And if that employee hasn't, the system marks him as absent for that day and deducts some money from his monthly income.

Similarly, employees may use the absence management system to see, apply for, and cancel their leaves using the mobile application. In this system, administrators may forecast the fulfillment of each employee's monthly objectives based on their attendance routing, as well as who should be kicked out of the office or encouraged to use their attendance after 3 months of working. To produce these predictions, I'm utilizing the decision tree algorithm with data sets from employee attendance and workload.



Figure 2: Camera Module

B. Unauthorized Access Detection Security Management

For this component, we opted to utilize an IoT device with an ESP 32 Camera model to obtain facial recognition, and we used an IR sensor to detect human activity near the entrance. Face recognition access allows individuals to unlock the restricted area door. After gaining access to the restricted area, employees can alter their availability status. When the IR sensor detects unnatural activity near the entrance, the IoT device sends a feedback to the system, and the system checks the employee's status. After that, if the IR detects human activity and an employee is present in the room/cabin, the system will

send an alert to the employee's computer alerting them that "Client is waiting at the door." The employee is then able to unlock the door over the web. If the employee is not present in the room, the system will identify an unlawful entry. We program the IR sensor inhuman detection for a short time period in order to identify unwanted access. When the system detects illegal access, it will transmit an alert to security management. Finally, activate the buzzer and send a message alert to the employee who had access to it.

C. Automated Employee Performance Evaluation System

Employees' daily job allocations will be computerized as part of an automated system to evaluate employee performance. The manager or task assignor logs onto the web program as an administrator and assigns daily duties to each employee. There are two approaches for assigning jobs to employees. Admin can assign established jobs from the system to workers or create new ones manually. When an employee begins to complete a task, he can mark the time, and when he completes the task, he can mark it as completed, and the system will take the time from the beginning to the end of that period, then calculate and take how long it will take the appropriate employee to complete that type of task. For predictions, we use machine learning methods such as decision trees and the ID 3 Algorithm.

The system forecasts the quality of a finished work. Aside from that, the system collects customer input for each employee, and consumers may grade them based on the service they received from that particular individual. The technology will forecast customer feedback based on historical data. We should also employ machine learning methods such as decision trees and the ID 3 Algorithm in this case. The system then collects all of the aforementioned data and analyzes it to determine the best-rated employee and sends a notice to the management advising him/her to award him/her. This technique can also detect underperforming staff. This approach allows you to identify them and then give them motivational messages and schedule sessions to help them improve their productivity, efficiency, and abilities.

D. Intelligent Assistant

Create a virtual receptionist, also known as an intelligent assistant, with this suggested system. A web application will serve as the intelligent assistant. The intelligent assistant will provide assistance with natural languages. It will make advantage of natural language processing (NLP). The client may be able to access the service of an intelligent assistant via a monitor or tablet computer. The intelligent assistant may be able to schedule an appointment for the customer. The intelligent assistant may be able to aid the customer in meeting the client's demands. According to the system, when a client arrives for a service, the first step is for the client to book

an appointment using a touch system display or voice instructions. To make that appointment, the customer must first choose the proper category that he or she is looking for, and then follow the system's instructions to create the appointment. When an appointment is scheduled, the system will produce a token number for each appointment and provide it to the customer. After reviewing the appointment queue, the system will use the machine learning ID3 algorithm to anticipate the client's appointment time. The system will warn the client if there are too many appointments. After verifying the appointment queue, the system sends an SMS message to the appropriate client's mobile phone roughly ten minutes before the appointment. As a result, the customer will not have to stay in the office for much longer. He/she may return to the office when the time comes. Furthermore, clients may check which personnel are accessible in each department before and after scheduling appointments. In this system, after making appointments, customers might be given a 2D road map to help them figure out where the appointment sheet is made for them. Similarly, consumers may file complaints about their service and, if required, offer feedback on the service of an intelligent assistant. After studying the input, the service of the intelligent assistant may be improved.

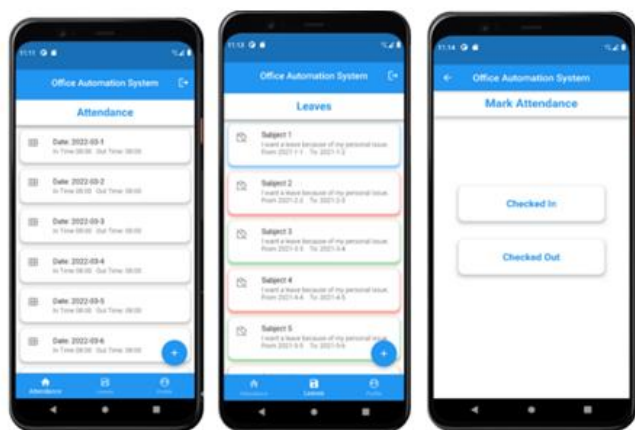


Figure 3: Sample GUI's of attendance marking and leaving managing system

The ID3 Algorithm

ID3 is an abbreviation for Iterative Dichotomiser 3. ID3 is the predecessor algorithm of the C4.5 method and is commonly used in machine learning and natural language processing (NLP). ID3 is a classification technique that builds a decision tree in a greedy manner by picking the optimal attribute that delivers the most Information Gain (IG) or the least Entropy (H).

IV. RESULT AND DISCUSSION

Below user interfaces demonstrate the attendance marking and leave management components of the proposed system, which were created using Java spring boot technology. This user-friendly component, as previously described, allows users to register with the system and mark their attendance with an RFID card. In order to achieve the study's main goal of providing an accurate solution for collecting employee attendance and departure details, the developed mobile application performs well and demonstrates the capability of storing collected data in a cloud-based DB while indicating a paperless process with reduced manual process. Considering the vantage need of securing bank environment from unauthorized access, the proposed solution "Unauthorized Access Security Management" component capable to notify accurately unauthorized access in office environment areas like restricted areas like office cabins, safes.



Figure 4: Sample results of unauthorized access detection

The component proposed to measure employee performance accurately in specific period and to streamline the work routine implies the capabilities of easy employee handling and work allocation and evaluating process. Below figure implies a sample result of task assigning and task completion of an employee.

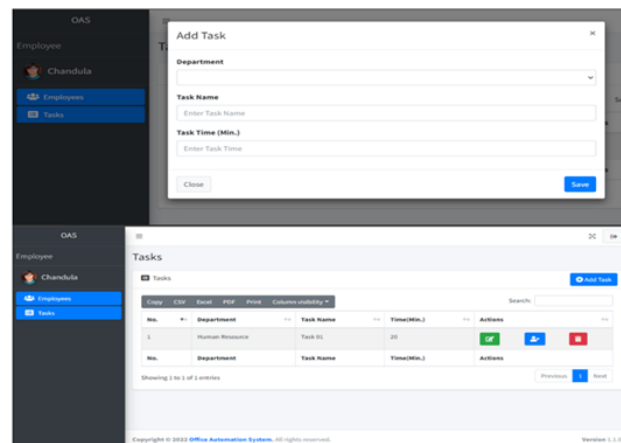


Figure 5: Sample results of employee task assigning and completion

IOT based chatbot which enabled voice commands implies the capabilities of its features that can improve client experience by providing various features such as make appointment, meeting location notification with 2D maps etc.

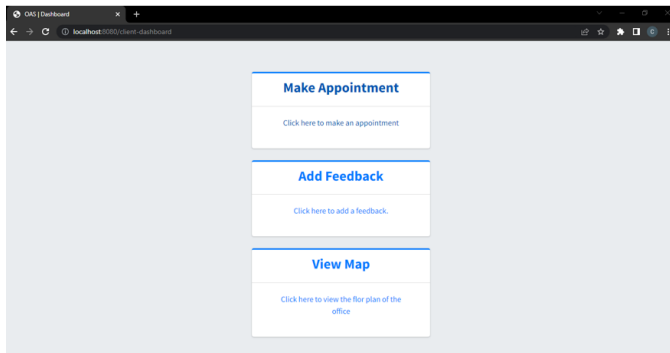


Figure 6: Sample Web UI of Intelligent assistant

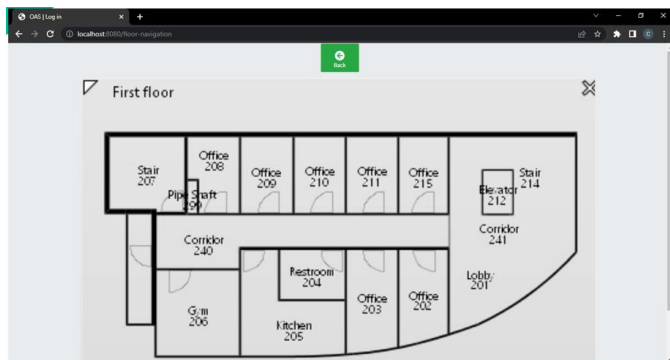


Figure 7: Sample 2D map result for location notification

V. CONCLUSION AND FUTER WORK

The suggested automated office system was able to manage several major government office requirements that were not addressed by existing office systems. The system was able to carry out the intended functions.

Beginning with group creation, the GitHub contribution predictor forecasts future contributions from students. Furthermore, the meeting documentation procedure allows students to review past meeting specifics. Finally, the peer review proved useful in the assessment phase of a project management process. Because the suggested project management system was capable of covering main project management processes. Even if the system is functional as described, it may be improved further with new technologies and features. The majority of project management systems in use today are largely for general purposes. Because institutes have varying requirements, developing a flexible project management system is far more beneficial. It is far more beneficial for an educational setting to build such a system. Students can

learn from other students beginning with the formation of student groups since the grouping process creates not just well-balanced groups, but also different teams. This grouping procedure may be enhanced by increasing the number of criteria utilized to determine which student is most useful to a given group. Increasing the number of variables increases group variety, which aids in the formation of well-balanced groups. The client portal allows the system to be upgraded to assist students in improving productivity by creating solutions for external clients. This will have a direct impact on their educational abilities as well as their industrial experience. Similarly, when it may be used as a professional credential, the GitHub contribution predictor and peer review capabilities should be improved. Which may be utilized in an interview where students can discuss their contributions to projects inside the school as well as their supervisors' assessments. This leads to the major conclusion, which is that the suggested solution is far more beneficial than existing project management systems.

REFERENCES

- [1] H. JunHua. (2011). *Research the office automation system software based on workflow technology*.
- [2] R. Lansbury. (1988) Performance management: A process approach. *Human Resource Management*, pp. 46-55.
- [3] M. K. Vijay Jadhav. (2017). Office automation and attendance system using IoT. *International Research Journal of Engineering and Technology (IRJET)*, 04(07), 3112-3115.
- [4] C. Morosan. (2012a). Theoretical and empirical considerations of guests' perceptions of biometric systems in hotels: extending the technology acceptance model. *Journal of Hospitality & Tourism Research*, 36(1), 52-84.
- [5] C. Morosan. (2012b). Biometric solutions for today's travel security problems. *Journal of Hospitality and Tourism Technology*, 3(3), 176-195.
- [6] B. B. K. & B. B. Kang. (2007). Biometrics for hospitality and tourism: A new wave of information technology. *Hospitality Review*, 25(1), 1-9.
- [7] A. K. E. C. C. & O. F. Bilgihan. (2013). Research note: Biometric technology applications and trends in hotels. *Hospitality Review*, 31(2), 9-24.
- [8] V. Pandit, P. Majgaonkar, P. Meher, S. Sapaliga & S. Bojewar. (2017). Intelligent security lock. In: *International Conference on Trends in Electronics and Informatics (ICOEI)*, Tirunelveli, India.
- [9] R. A. B. A. T. F. M. Harnani Hassan. (2012). Face recognition based on auto-switching magnetic door lock system using microcontroller. In: *International Conference on System Engineering and Technology*, Bandung, Indonesia.

- [10] S. S. Kaur N. (2015). A game theoretic approach for an IoTbased automated employee performance evaluation. *IEEE Syst J.*, 11(3), 1385-1394.
- [11] R. O. B. E. R. T. Dale. (2016). The return of the chatbots. *Natural Language Engineering*, 22(5), 811-817.
- [12] M. Skjuve, I. Haugstveit, A. Følstad & P. Brandtzaeg (2019). Help! Is my chatbot falling into the uncanny valley? An empirical study of user experience in human-chatbot interaction. *Hum. Technol*, 15, 30-54.
- [13] E. Adamopoulou & L. Moussiades. (2020). Chatbots: History, technology, and applications. *Mach. Learn. Appl*, 2, 100006.
- [14] "Coronavirus," 2021 . [Online]. Available: https://www.who.int/health-topics/coronavirus#tab=tab_1.
- [15] J. M. H. a. P. J. Khakurel. (2018). Tapping into the wearable device revolution in the work environment: a systematic review. *Information Technology & People*, 31(3), 791-818.
- [16] H. C. K. K. U. U. Vibhutesh Kumar Singh. (2020). IoT-Q-Band: A low cost internet of things based wearable band to detect and track absconding COVID-19 quarantine subjects. *EAI Endorsed Transactions on Internet of Things*, 6.