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Doctor Appointment Scheduling and Patient Monitoring

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Abstract: ***This IoT-based system optimizes doctor availability management and patient monitoring using an ESP32, RFID, and cloud connectivity. Doctors update their real-time status by scanning RFID cards, which patients can check via a website. A ThingSpeak-linked lamp signals availability, with dark green for available and light green for unavailable. Additionally, temperature and blood pressure sensors monitor ICU patients, displaying vitals on an LCD and uploading data to ThingSpeak for remote access. This system improves communication, reduces waiting times, and enhances healthcare efficiency.***
Keywords: ESP32, RFID, LCD, IOT, Temperature Sensor, Blood Pressure Sensor

I. INTRODUCTION

This project introduces an IoT-based system for improving appointment scheduling and doctor availability management in healthcare settings. It integrates an ESP32 microcontroller, RFID technology, and cloud connectivity via ThingSpeak to provide real-time tracking of a doctor's presence. Doctors use RFID cards to check in or out of their consultation cabins, updating their availability instantly. Patients can access this information through a website, enabling better scheduling decisions. The system includes a color-coded lamp for visual feedback: a dark green light indicates the doctor is available, while a light green light signifies unavailability. Additional features include health monitoring sensors for tracking patient vitals like temperature and blood pressure. The collected data is displayed on an LCD screen and uploaded to ThingSpeak for remote access. This solution enhances communication between patients and healthcare providers, reduces waiting times, and streamlines resource allocation. By leveraging IoT technologies, it supports critical care scenarios, optimizes scheduling, and fosters a more efficient and patient-centered healthcare environment.

II. MOTIVATION

The motivation for this project arises from the pressing need to improve healthcare efficiency, enhance patient satisfaction ,and support timely medical care. In traditional healthcare settings, patients often face long waiting times and uncertainty about doctor availability, leading to frustration and delayed treatment. This project addresses these challenges by creatinga transparent, real-time system for managing doctor availability and appointment scheduling.The integration of RFID technology and IoT connectivity provides an innovative way for patients to check the availability of their preferred doctor before visiting, reducing unnecessary delays and enabling better resource management for healthcare facilities. Furthermore, in critical care scenarios such as ICUs, continuous monitoring of vital signs like temperature and blood pressure is essential for patient safety. This system integrates health monitoring sensors to provide healthcare providers with real-time access to critical patient data, ensuring timely interventions when necessary.

III. ABBREVATIONS

1) ESP- Espress if
2) RFID- Radio Frequency Identified Device
3) IOT-Internet Of Things
4) BPM-Blood Pressure Monitor
5) LCD- Liquid Crystal Display
6) ICU-Intensive Care Unit

IV. LITERATURE REVIEW

An Intelligent Cloud-Based Appointment Scheduling System for Healthcare"
Year Author: 2019,A. Gupta and H. Sharma.The paper presents a cloud-based appointment scheduling system using IoT to improve patient-provider interactions. Patients can manage appointments through a mobile app, while IoT sensors track appointment statuses and patient flow in real time.

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Doctor Appointment System Using the Internet of Things (IoT)
Year Author: 2019,Shukla, P., Shukla, R., and Mehta, N.K.The authors propose an IoT-based doctor appointment system that integrates smart sensors and wearable devices to collect realtime data on patient health, doctor availability, and clinic occupancy. This data is used to optimize appointment scheduling, reduce wait times, and minimize no-shows.

RFID Technology for Asset Tracking
Year Abstrct: 2019 ,Abdul Rahman, Evizal ADIt highlights the automation of data collection, which enhances operational accuracy and reduces errors typically seen in manual inventory management.

Improving Doctor Availability and Appointment Scheduling Efficiency in Hospitals.
Authors: Arthur Hylton III and Suresh Sankaran
Published Year and Journal: International Journal of Computer Theory and Engineering, Vol. 4, August 2012,
Abstract: This paper explores the use of intelligent agents in hospital appointment scheduling systems to enhance efficiency and patient satisfaction. By automating the scheduling process, the proposed system addresses issues such as wait times and overbooking. The intelligent agents analyze patient data and provider availability to create optimal appointment schedules. Simulation results demonstrate significant improvements over traditional methods, highlighting the potential of intelligent agents to modernize healthcare operations.

Medication Reminder And Healthcare – An Android Application.
Authors: Deepti Ameta, Kalpana Mudaliar and Palak Patel
Published Year and Journal: International Journal of Managing Public Sector Information and Communication Technologies (IJMPICT) Vol.6, June2015
Abstract: This paper presents an Android application designed to serve as a medication reminder and healthcare management tool. The application aims to assist patients in adhering to their prescribed medication schedules, reducing the risks associated with missed doses.
By incorporating features such as reminders, dosage tracking, and healthcare tips, the application enhances patient engagement and promotes better health outcomes.

An Intelligent Cloud-Based Appointment Scheduling System for Healthcare"
Authors: A. Gupta and H. Sharma Year: 2019
Abstract: In this paper, Gupta and Sharma introduce an intelligent cloud-based appointment scheduling system that leverages IoT technologies to facilitate seamless interactions between patients and healthcare providers. The system allows patients to schedule, modify, or cancel appointments through an intuitive mobile application, integrated with cloud computing to manage patient data securely.

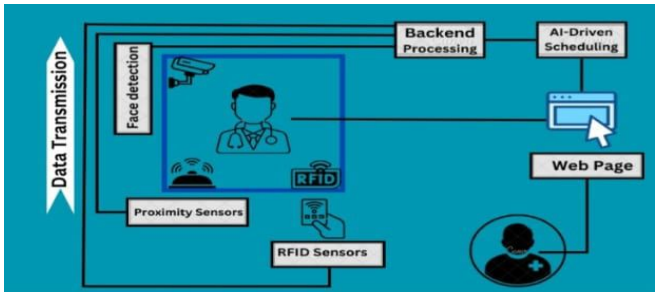
A Mobile Based Medical Appointment and Consultation (MMAC) System" Author: Adekunle Ajasin University, Akungba-Akoko, Ondo State, Nigeria, Health Centre Unit 2019
Abstract: This research focuses on developing a real-time appointment scheduling system that allows patients to book appointments with available doctors and conduct live online consultations. The system leverages mobile technology to provide accessibility and convenience. The MMAC System is a mobile application designed to revolutionize healthcare access and efficiency.

Applications of intelligent Agents in Hospital Appointment
Authors: Arthur Hylton III and Suresh Sankaran
Published Year and Journal: International Journal of Computer Theory and Engineering, Vol. 4, August 2012,
Abstract: This paper explores the use of intelligent agents in hospital appointment scheduling systems to enhance efficiency and patient satisfaction. By automating the scheduling process, the proposed system addresses issues such as wait times and overbooking. The intelligent agents analyze patient data and provider availability to create optimal appointment schedules.

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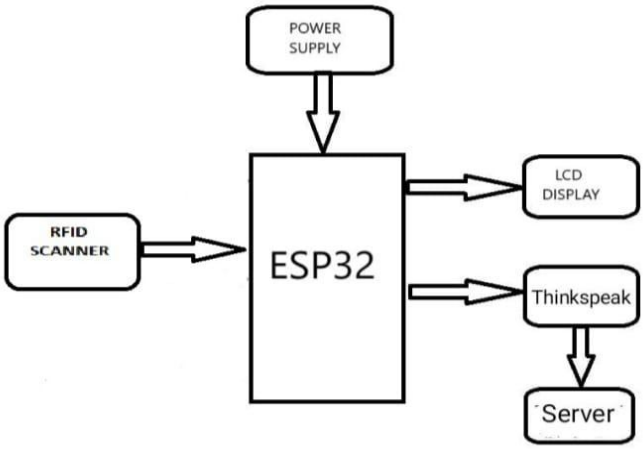
V. METHODOLOGY



A. *Work Flow*

1) Power Supply: ESP32 is powered by a 5V supply and operates on low power in standby mode, using Wi-Fi for data communication.
2) RFID Reader Integration: Scans doctor's RFID card to update their availability status (Available or Not Available).
3) LCD Display: Shows doctor's availability status ("Available" or "Not Available").
4) ThingSpeak Integration: ESP32 sends doctor availability and appointment data to ThingSpeak via Wi-Fi.
5) Website Integration: Patients can check availability and book appointments online, with data processed by ESP32 and sent to Thingspeak.
6) Data Visualization: ThingSpeak visualizes doctor availability and patient info, allowing remote monitoring by healthcare professionals.
7) Temperature Sensor (DS18B20): Measures body temperature (Celsius, can convert to Fahrenheit) via 1-Wire bus.
8) Blood Pressure Sensor (BMP180): Estimates blood pressure from barometric pressure using I2C/SPI.
9) Data Processing: ESP32 processes sensor data, applies corrections and filtering for accuracy.
10) LCD Display: Real-time temperature and blood pressure data shown on LCD (e.g., "Temperature: 36.5°C", "Blood Pressure: 120/80 mmHg").
11) Thing Speak Integration: Processed data sent to ThingSpeak for storage and access.
12) Data Visualization: ThingSpeak displays trends, with alerts for abnormal readings like high blood pressure, notifying healthcare providers.

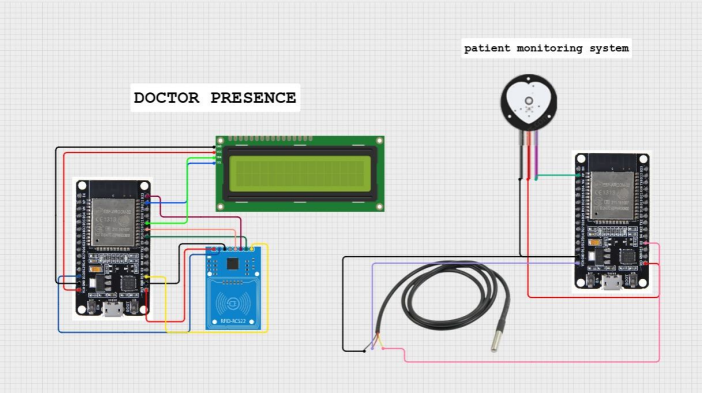
VI. BLOCK DIGRAM



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1) Real-Time Doctor Availability: Patients can check the availability of doctors instantly, reducing uncertainty and unnecessary waiting times.
2) Improved Appointment Scheduling: By integrating RFID technology and IoT connectivity, the system streamlines the scheduling process, allowing patients to book appointments based on real-time data.
3) Enhanced Patient Experience: The system minimizes delays, reduces overcrowding in waiting areas, and improves overall communication between patients and healthcare providers, leading to higher satisfaction.
4) Visual Indicators: The use of color-coded lamps (dark green for availability and light green for unavailability) provides immediate, easy-to-understand feedback for both patients and staff.
5) Continuous Health Monitoring: Sensors monitor vital signs such as temperature and blood pressure in real-time, particularly beneficial for ICU patients requiring constant care

VII. SIMULATION



VIII. CONCLUSION

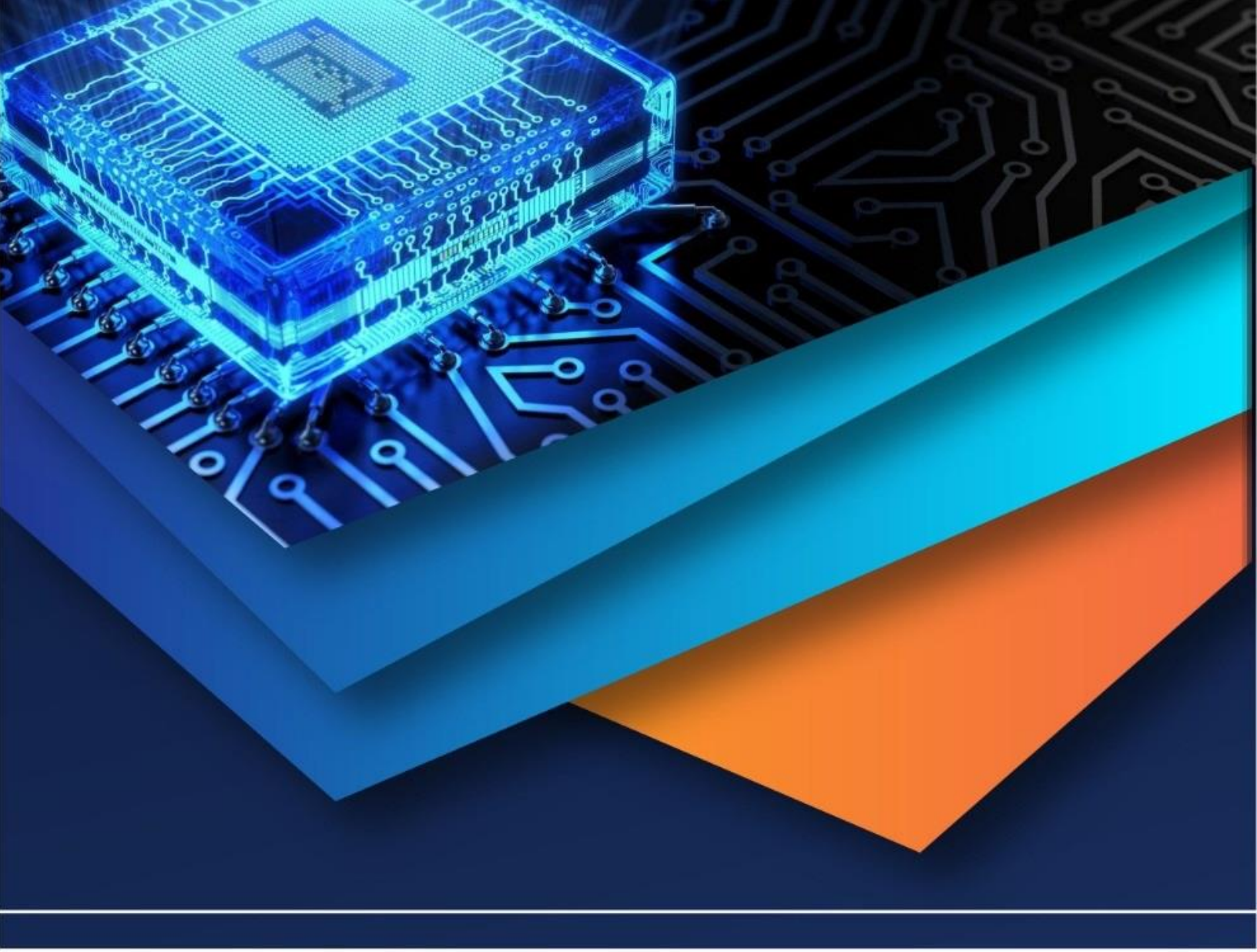
This IoT-based system streamlines doctor appointment scheduling and patient monitoring by providing real-time updates on doctor availability and vital signs. Integrating ESP32, RFID, and ThingSpeak ensures efficient communication, reduced waiting times, and better resource management. The system enhances patient care, supports remote monitoring, and creates a more organized and patient-centric healthcare environment, making it ideal for clinics, hospitals, and telemedicine platforms.

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