FORM-2

THE PATENTS ACT, 1970

(39 OF 1970)

AND

THE PATENT RULES, 2003

(As Amended)

COMPLETE SPECIFICATION

(SECTION 10; RULE 13)

TITLE

SAHAY: AN INTELLIGENT CONVERSATIONAL AI FOR AUTOMATED APPOINTMENT SCHEDULING

APPLICANT

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The following specification particularly describes the invention and the manner in which it is to be performed.

SAHAY: AN INTELLIGENT CONVERSATIONAL AI FOR AUTOMATED APPOINTMENT SCHEDULING

FIELD OF INVENTION

The present invention relates to Artificial Intelligence, Conversational AI, and Business Process Automation, focusing on improving healthcare appointment management. It introduces an AI-driven system for automating scheduling, rescheduling, and cancellation through intelligent, conversational interfaces. The invention integrates Large Language Models (LLMs) with serverless microservices to ensure flexibility and scalability. It supports multi-modal communication across web and telephony channels for better accessibility. The design emphasizes real-time interaction, secure data handling, and efficient coordination between patients and healthcare providers.

OBJECTIVES OF THE INVENTION

The main objective of this invention is to create an AI-powered conversational system that automates key appointment tasks such as booking, modification, and cancellation through a natural language interface. It aims to provide a multi-modal communication setup where users can interact via web chat or voice calls, ensuring better accessibility for all. The system is designed on a serverless microservices architecture to achieve scalability, modularity, and reliability. By integrating a tool-augmented large language model like Google Gemini, the AI can accurately understand user intent and securely perform backend operations in real time. Data accuracy and consistency are maintained through an ACID-compliant PostgreSQL database managed by Supabase. A real-time administrative dashboard enables healthcare staff to track appointments and performance metrics efficiently. The invention also emphasizes data privacy by isolating AI functions from database operations through secure APIs. It supports future upgrades using technologies such as WebSocket-based communication, React interfaces, and improved speech recognition. The system reduces manual workload, speeds up operations, and enhances the overall user experience in healthcare environments.

BACKGROUND OF THE INVENTION

In healthcare environments, managing patient appointments manually often leads to delays, errors, and poor coordination between patients and hospitals. Traditional web forms or call-based systems lack real-time interaction and require human intervention for every update. Existing chatbots are mostly text-based and cannot perform secure backend actions like booking or rescheduling appointments. They also fail to provide a consistent experience across multiple platforms such as web and phone. The growing demand for faster, automated, and accessible healthcare services highlights the need for an AI-driven solution. Hence, there is a requirement for an intelligent conversational system that automates appointment management while ensuring accuracy, security, and scalability.

SUMMARY OF THE INVENTION

The invention introduces an AI-based conversational assistant designed to automate healthcare appointment scheduling, rescheduling, and cancellation through both voice and text interfaces. It integrates large language models with a serverless backend to enable real-time, intelligent responses and secure data handling. The system connects seamlessly to web and telephony platforms, ensuring accessibility for all users. A PostgreSQL database managed via Supabase maintains reliable, consistent, and error-free transactions. The invention also features an administrative dashboard for monitoring appointments and analyzing system performance. Overall, it enhances efficiency, reduces manual work, and improves the patient experience through intelligent process automation.

DETAILED DESCRIPTION OF THE INVENTION

the present invention, *sahay: an intelligent conversational ai for automated appointment scheduling*, provides a smart, scalable, and secure solution for managing healthcare appointments through artificial intelligence and conversational automation. the system combines large language models, serverless computing, telephony integration, and database-

backed transactions to deliver a unified and efficient experience for patients and healthcare providers.

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1. system overview

the invention consists of multiple interconnected components designed to work together seamlessly. the main modules include:

- conversational interface (web and voice) – enables patients to interact naturally through text or speech using a browser or telephone.
- ai core (google gemini) – interprets user intent, processes queries, and determines the necessary backend action.
- backend logic layer (serverless microservices) – executes core functions such as booking, rescheduling, or cancelling appointments.
- database layer (supabase/postgresql) – manages and secures patient and appointment data with acid-compliant transactions.
- administrative dashboard – provides real-time insights, appointment tracking, and analytics for healthcare staff.

this modular architecture ensures flexibility, scalability, and fault tolerance, allowing each component to operate independently and efficiently.

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2. conversational interface design

2.1 web-based chat interface

the web client offers a simple and intuitive chat interface where patients can type their queries, such as "book an appointment with a cardiologist tomorrow." the ai interprets the request, checks doctor availability, and confirms the booking. the interface uses standard web technologies (html, css, and javascript) and supports speech recognition and synthesis for a hands-free experience.

2.2 voice-based interaction via telephony

through integration with the exotel cloud telephony platform, users can interact with sahay over a regular phone call. incoming calls trigger webhook events that connect to the backend ai

system, allowing real-time voice conversations. the ai responds using text-to-speech technology, ensuring accessibility for users who prefer phone communication over digital platforms.

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3. ai core and decision-making

3.1 tool-augmented LLM

the ai brain of the invention is powered by google gemini, a large language model capable of understanding natural language and invoking specific backend "tools." these tools are modular functions—such as *bookappointment*, *getdoctordetails*, *rescheduleappointment*, and *cancelappointment*—that perform actual system operations.

3.2 secure invocation mechanism

instead of directly accessing the database, the llm calls these tools through an orchestrator function that validates the request. this ensures data privacy, prevents unauthorized actions, and maintains the logical separation between ai reasoning and data handling.

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4. backend architecture

4.1 serverless microservices design

the backend is built using netlify functions, following a serverless microservices approach. each function operates independently, performing a single task such as retrieving doctor data or updating appointment records. this design enables automatic scaling, reduces infrastructure costs, and improves performance.

4.2 workflow execution

when a patient sends a request, the system passes it through the following flow:

1. the ai core identifies intent and selects the relevant function.
2. the corresponding microservice performs the required operation.
3. the database stores or updates the result.
4. the ai generates a confirmation message for the user.

5. data management and security

5.1 database integrity

all appointment data is stored in a supabase-managed postgresql database. the system enforces data consistency and prevents double bookings using acid transaction rules. tables are designed with relationships linking doctors and appointments, ensuring structured and reliable data storage.

5.2 privacy and compliance

the invention ensures data confidentiality by using isolated apis and encrypted communication between modules. sensitive data such as patient names and contact details are handled under strict access controls.

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6. administrative dashboard

the dashboard serves as a real-time monitoring and control panel for hospital staff. it displays appointment records, doctor schedules, and key performance indicators such as daily bookings and cancellations. staff can filter data by doctor, date, or department, making it easier to analyze system performance. the dashboard also enables audit trails, helping administrators ensure operational transparency and compliance.

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7. scalability and future enhancement

the system is designed to evolve with emerging technologies. future updates include integrating websocket-based real-time communication for instant response, rebuilding the dashboard using react for better interactivity, and enhancing speech-to-text accuracy through cloud-based apis. the architecture supports easy addition of new modules, such as patient reminders, doctor availability tracking, or integration with electronic health records.

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8. advantages of the invention

- provides 24/7 automated appointment handling through ai.
- reduces manual workload and administrative errors.
- offers multi-modal interaction across web and telephony.

- ensures secure, consistent, and reliable transactions.

- enables scalable, cost-effective deployment through serverless computing.

- enhances patient satisfaction by delivering faster and more personalized service.

BRIEF DESCRIPTION OF DRAWING

The drawing represents the overall architecture and data flow of the *Sahay* system, illustrating how different modules interact to automate appointment management. It begins with the user communicating through either a web chat or a voice call. The message or voice input is processed by the AI core, which identifies the user's intent and connects to the appropriate backend microservice. These microservices handle specific operations such as booking, rescheduling, or cancelling appointments. The processed data is stored securely in the PostgreSQL database, managed via Supabase. The flow concludes with a response sent back to the user through the same channel, while the administrative dashboard updates in real time to reflect the latest changes. This diagram highlights the seamless integration between the conversational interface, AI engine, backend services, and data management components that together enable a smooth, automated healthcare scheduling process.

FUTURE WORK AND EXTENSIONS

1. **Real-Time Communication:** Implement WebSocket-based communication to enable instant, two-way interaction between the AI assistant and users, reducing response delay during live conversations.

2. **Enhanced Voice Processing:** Upgrade to advanced speech recognition and synthesis services like Google Cloud Speech-to-Text and Text-to-Speech for improved accuracy, multilingual support, and natural voice output.

3. **Dashboard Modernization:** Rebuild the administrative dashboard using React to provide better scalability, interactive data visualization, and smoother management of hospital operations.

4. **Integration with Health Records:** Extend the system to connect with Electronic Health Record (EHR) systems, allowing doctors to access patient histories and manage follow-ups directly through the platform.

5. **AI Personalization:** Introduce adaptive learning models that can remember user preferences, analyze appointment patterns, and provide personalized reminders or recommendations to enhance patient engagement

SYSTEM ARCHITECTURE

Brief description of Drawing
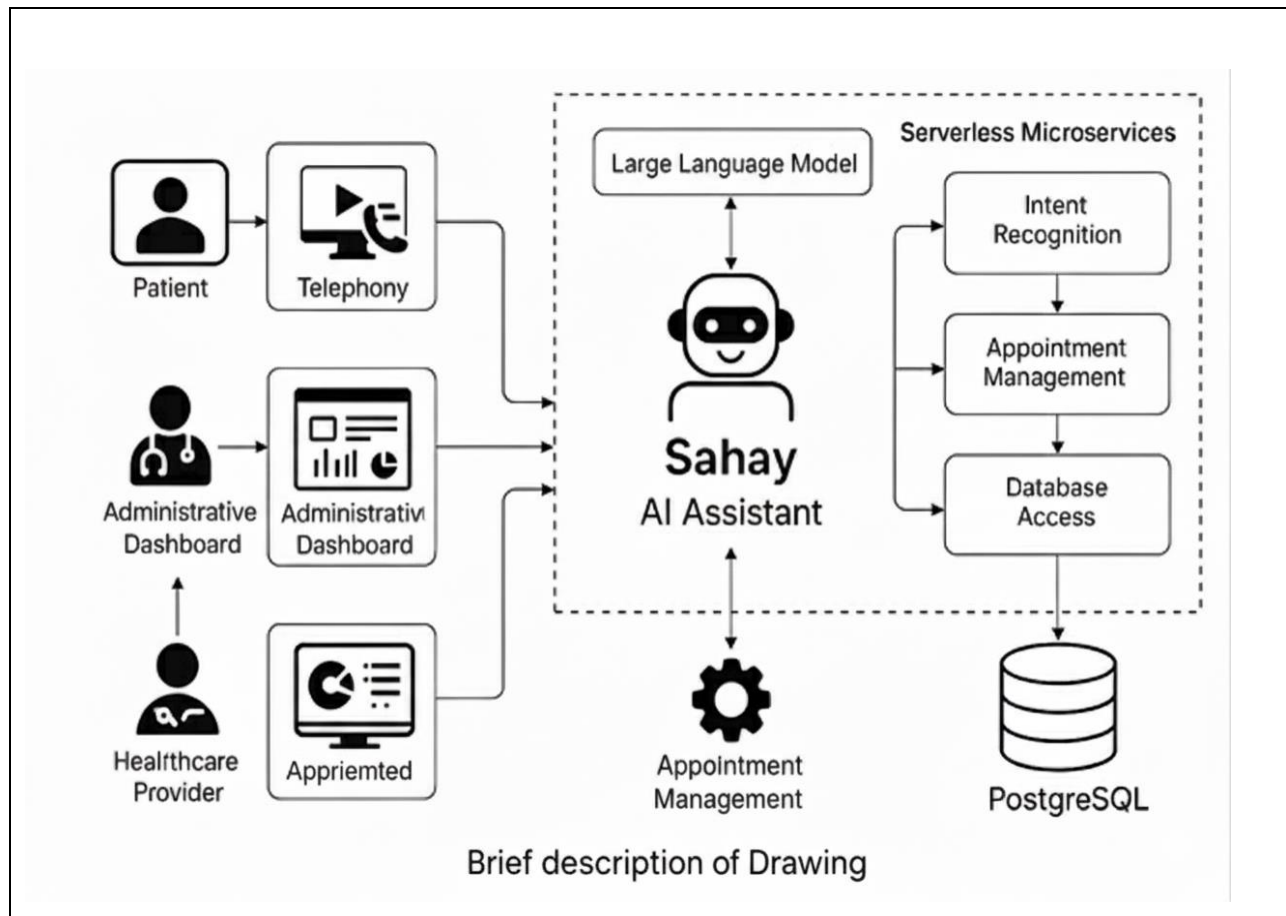
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Abstract

The invention *Sahay: An Intelligent Conversational AI for Automated Appointment Scheduling* introduces an AI-powered system that simplifies and automates healthcare appointment management. It enables patients to book, reschedule, or cancel appointments using both text and voice-based conversations through web and telephony interfaces. The system integrates a large language model with serverless backend microservices to process user requests securely and efficiently. Data is managed through an ACID-compliant PostgreSQL database, ensuring accuracy and consistency in transactions. A real-time administrative dashboard provides hospital staff with visibility into appointments and performance metrics. This invention reduces manual workload, improves operational speed, and enhances patient convenience by offering an intelligent, scalable, and accessible appointment management solution.

4 Claims & 1 Figure