CHILD VACCINATION TRACKING SYSTEM

Prof.S.S.Bhagat [1], Devika Thosar [2], Manasi Sawant[3], Nikita Sonawane[4]

Assistant Professor, Department of Computer Engineering, TSSM BSCOER NTC, Pune, India[1]

Student, Department of Computer Engineering, TSSM BSCOER NTC, Pune, India[2-4]

Abstract: The Baby Vaccination System project aims to develop a comprehensive platform for managing child vaccination schedules efficiently. It incorporates frontend and backend development to provide users with tools for vaccine registration, tracking, and locating nearby vaccine centres. By targeting efficient management of vaccination schedules, the system contributes to public health initiatives and ensures timely immunization for children. The objectives of the study include assessing the effectiveness of the system, evaluating user satisfaction, and determining the impact on vaccination completion rates. Participants include parents or guardians of children eligible for vaccination, healthcare providers, and system administrators. Ethical considerations include obtaining informed consent, ensuring participant confidentiality, and adhering to relevant ethical guidelines. The study findings will provide insights into the usability and effectiveness of the Child Vaccination System in improving vaccination management**.**

Keywords: Vaccination System, Immunization, Public Health, Technology Integration , Remainder System,Chatbot integration.

I.   INTRODUCTION

Nowadays, vaccination for kids has been a necessity for them and it is one of the responsibilities of parents to completely give all the vaccines for their appropriately on the right date as well. Sometimes due to the busy schedules of the parents they tend to forget about their kids vaccinations. It would be easier if the parents are having a vaccination planner which can be carried along with them wherever they go.

[1] Since internet is playing a big role in our life, it would be easier for the parents to have an online vaccination planner website. So far, there are no websites that are specially been made for vaccination planner but there are existing websites that have vaccination planner as one of their feature only

[2] Child Vaccination Tracking System is being developed to ease the responsibilities of the parents. In addition, this web-based planner is being made specifically for kid's vaccinations only. This Kids Vaccination Planner has features such as vaccination calendar together with a reminder sent via text message

[3] Other than that, this system also has the list of the Paediatricians who are available in the nearest hospital and together with the doctors contact information and specialization as well. Moreover, existing web-based system as database only for the data to be stored .As a conclusion this Kids Vaccination Planner would be essential for all the parents to use it and it will surely be very helpful for them. Besides that, three problems were encountered and the first one is as we all know nowadays we are busy with our daily chores and parents with more than one kid tends to forget some important things such as the dates of their children's vaccination, as we can see there are no proper vaccination tracking planner applications or system in Malaysia which can be used to remind us on when the next vaccination is supposed to be done for their kid.

[4] Secondly, the existing projects up to today do not have online backup so far which would be easier for the user to access, besides they only have data's stored in database only which can only be accessed by admin.

[5] The third problem is that, most of the existing websites and planner applications doesn't provide the information of the pediatrics together with their information, so parents who has a busy schedule finds it difficult to fix an appointment with the doctor to put the vaccination for their kids on time.

II.   LITERATURE SURVE

Child immunization monitoring is essential in order to be certain that vaccination happens in time and thus reduced the incidence of avoidable diseases. Timely vaccinations help save 2-3 million deaths worldwide from epidemic diseases such as measles, diphtheria, and pertussis a year according to WHO. Most parents fail to track their child's vaccination schedule, thereby missing or delaying vaccinating their children. Paper-based traditional records are easily misplaced, erroneous, and not accessible in many rural areas.

To overcome these issues, a number of digital solutions have been developed, such as Electronic Immunization Registries (EIR), mobile-based vaccine reminder apps like Immunize India Vaccination, an African initiative for remote tracking. These systems help in storing child immunization records, sending reminders, and generating reports. However, it also has many limitations, for example, improper integration with hospitals, lack of security, and errors in entering data manually. Despite this, many present systems do not ensure data safety, proper integration with hospitals, and automated reminder scheduling based on the health record of a child. Some reminders do not update in real-time, and there are still most of the systems that are located in hospitals but require manual input, which poses a threat to errors. Additionally, privacy concerns arise when vaccination data is stored without proper encryption. To overcome these issues, the proposed Child Vaccination Tracking System will incorporate automated vaccination scheduling, real-time SMS/email reminders, cloud-based accessibility. This system will provide a mobile-friendly interface for parents and a centralized dashboard for healthcare providers, allowing doctors to update vaccination records in real time. By leveraging modern technologies like cloud computing, role-based access control, and encrypted data storage, the system aims to enhance immunization coverage, reduce manual errors, and improve overall child healthcare.

III. METHODOLOGY

The methodologies and technologies used in the Child Vaccination Tracking System incorporate a range of tools and frameworks to achieve secure, scalable, and efficient vaccination tracking. Below is a breakdown of the key methodologies and technologies employed:

3.1 Backend Development (Spring Boot & Java)
Spring Boot, a lightweight and scalable framework for Java, is used to develop the backend infrastructure for managing vaccination records and automating reminders. The backend has user authentication, scheduling of vaccinations, sending reminders, and safe data management. RESTful APIs are built with Spring Boot for smooth communication between the frontend, database, and third-party services.

3.2 Front-end Development
The user interface is developed using HTML, CSS, and JavaScript, either using React.js or Vanilla JS, for a responsive and interactive experience. It offers dashboards for parents and healthcare professionals to track vaccinations, update records, and receive notifications.

3.3 Database Management (MySQL)
MySQL, a relational database management system, is used for secure storage, retrieval, and management of child vaccination records. The database schema includes tables for users, children, vaccination schedules, and notifications. Indexes and foreign keys are used to improve query efficiency and maintain referential integrity.

3.4 Notification System (Twilio)
Twilio API is integrated for SMS notifications, reminding parents of upcoming vaccination dates.
JavaMail API is used for email alerts, ensuring timely updates on child vaccination schedules.

3.5 API Development (RESTful Services with Spring Boot)
The system exposes RESTful APIs for seamless interaction between different modules. APIs handle user authentication, vaccination scheduling, reminder notifications, and data retrieval. API is documented using Swagger (OpenAPI) for easy testing and integration.

3.6 Chatbot Integration (Dialogflow)
Dialogflow, a natural language processing (NLP) platform by Google, is integrated to develop an AI-powered chatbot for assisting users with vaccination-related queries.

The chatbot provides real-time responses to common questions about vaccination schedules, missed doses, and general immunization information. The chatbot is integrated into the system's web interface for seamless user engagement. It enhances accessibility by reducing manual inquiries and improving the overall user experience.

IV. SYSTEM DESIGN

1. Architecture Overview :
Presentation Layer (Frontend) : Handles user interactions via a web-based interface.
Business Logic Layer (Backend) : Manages vaccination records, scheduling, authentication, and notification services.
Data Layer (Database) : Stores child profiles, vaccination records, schedules, and notification logs.

2. System Components:

User Management Module: Handles registration, authentication, and role-based access control.
Vaccination Scheduler: Automates vaccination reminders based on child's birthdate.
Notification System: Uses Twilio API for SMS reminders.
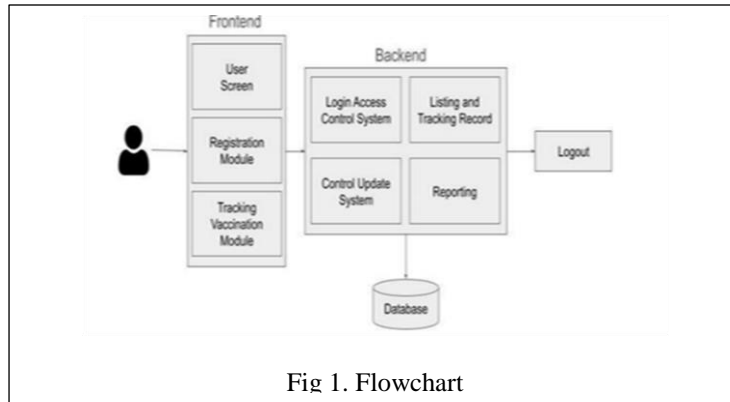Report Generation: Generates vaccination history and upcoming schedule reports.
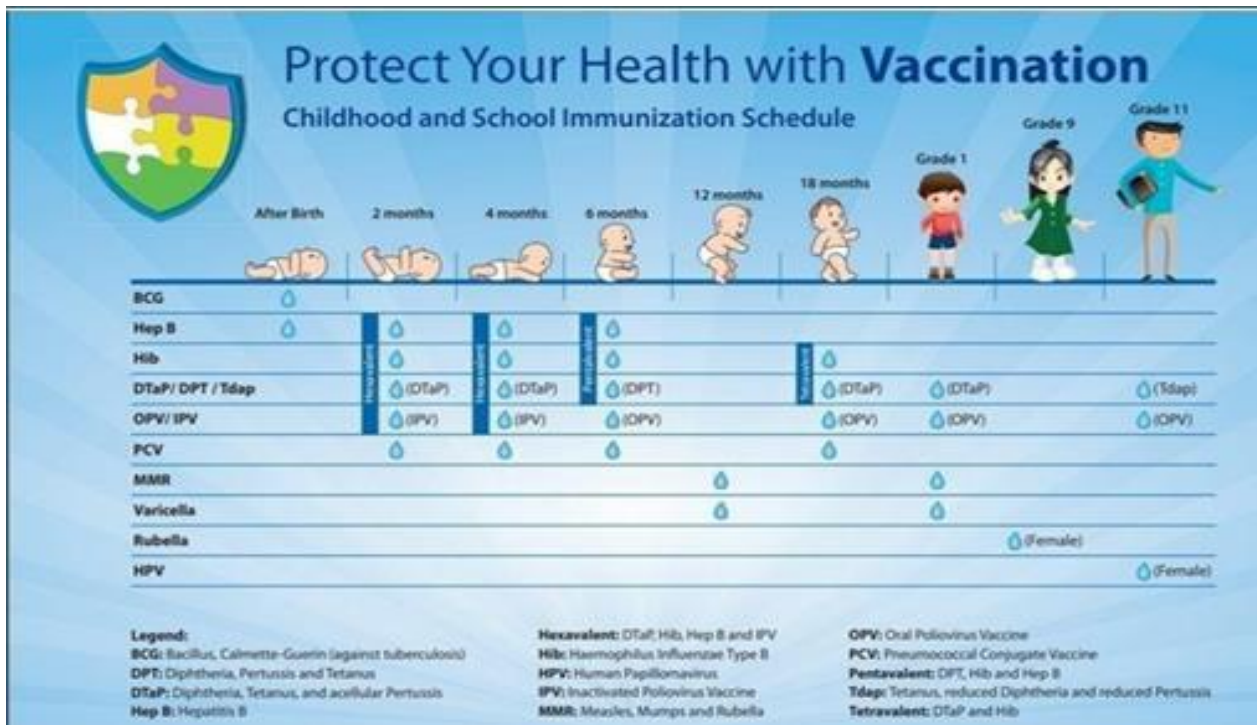

Fig 1. Flowchart

Fig 2. Protect your health with Vaccination

V.   DESIGN AND IMPLEMENTATION

1. Parent Module:

The parent module of a baby vaccination application is designed to assist parents in managing their child's vaccination schedule and accessing information related to vaccinations. Here are some key features and functionalities for the parent module.

2. Registration and Authentication :

The front-end module would likely include functionality for user registration and authentication. Parents would create accounts to access the system, and they would need to log in securely to view vaccination schedules, schedule appointments, or update their child's information.

3. Vaccine Tracking :
Registered users will have access to a vaccine tracking feature that displays their child's vaccination schedule. Real-time updates on upcoming vaccinations, completed doses, and reminders will be provided to ensure timely immunization.

4. Message Sending via Twilio :
The system integrates Twilio API to send automated SMS notifications, ensuring that parents receive timely reminders about their child's vaccination schedule. Parents receive alerts for upcoming vaccinations, missed doses, and rescheduled appointments. Twilio ensures secure message delivery with high reliability.

5. Find Nearest Vaccine Center :
A feature will be implemented to help users find the nearest vaccine center based on their location. This functionality enhances accessibility and convenience for parents and guardians seeking vaccination services.

6. Vaccine Data Management :
Administrators will have control over vaccine data, including updating vaccine information, adding new vaccines, and managing vaccine schedules. Changes made in the backend will reflect dynamically on the frontend for users to access updated information.

7. Managing Nearest Vaccine Center :
Administrators will be able to manage and edit information regarding the nearest vaccine centers. This includes updating center details, modifying operational hours, and adding new centers as necessary. Changes made will be reflected in the frontend for user accessibility.

8. Chatbot Integration :
A Dialogflow-powered chatbot is integrated to assist parents with vaccination-related queries and schedule tracking. Provides real-time responses to common vaccination questions. Reduces manual workload for healthcare professionals by handling routine inquiries. This chatbot enhances user engagement and ensures that parents stay informed about their child's immunization schedule.
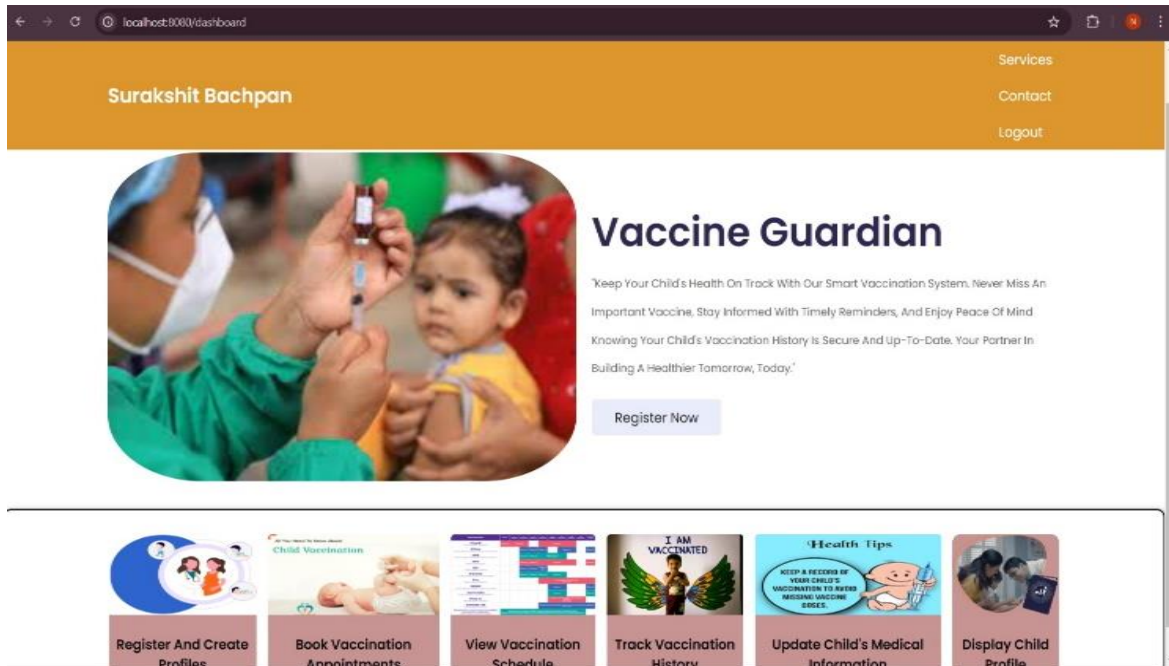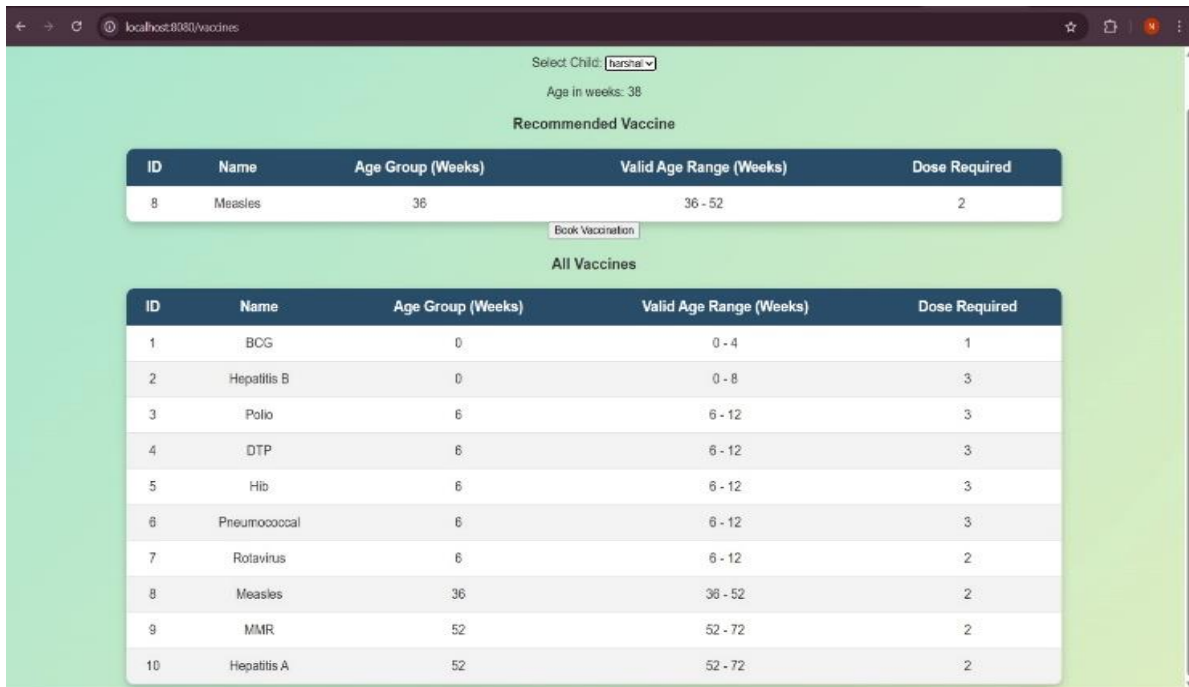

Fig 3 : Login Page
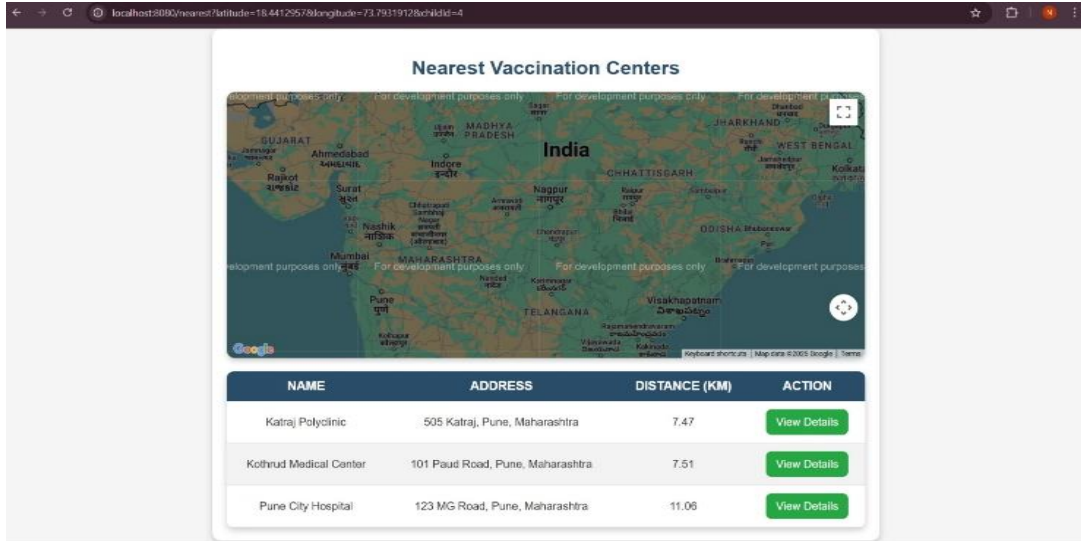
Fig 4 : Dashboard

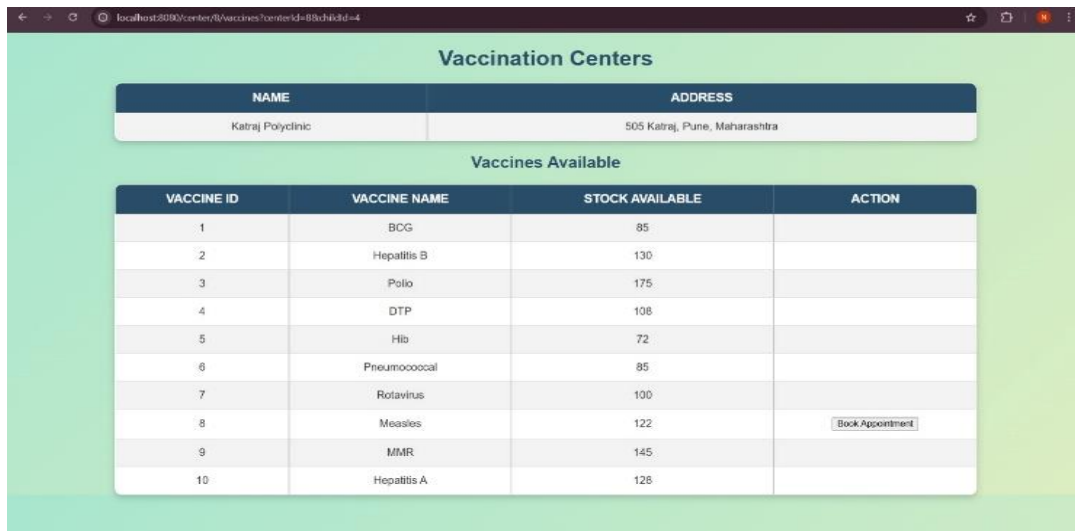Fig 5 : Recommended Vaccine
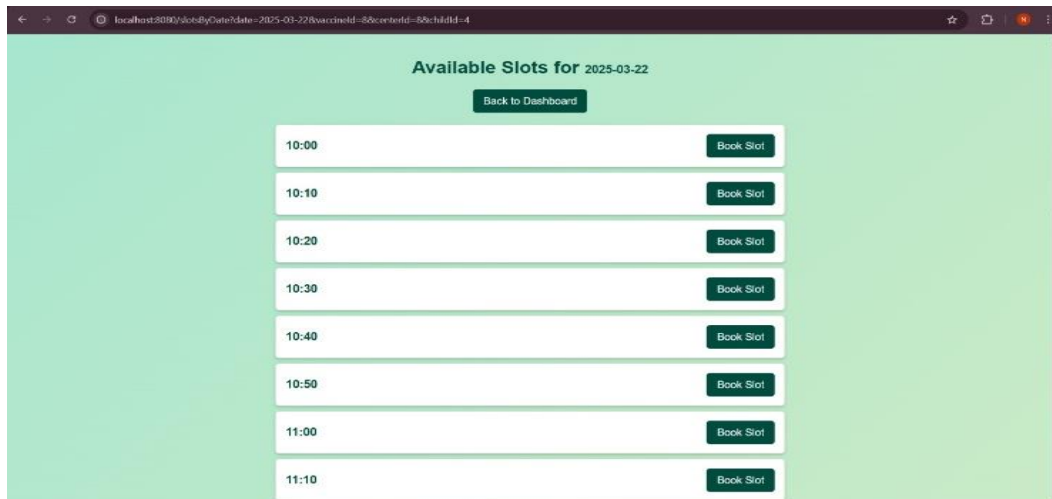
Fig 6 : Nearest Vaccine

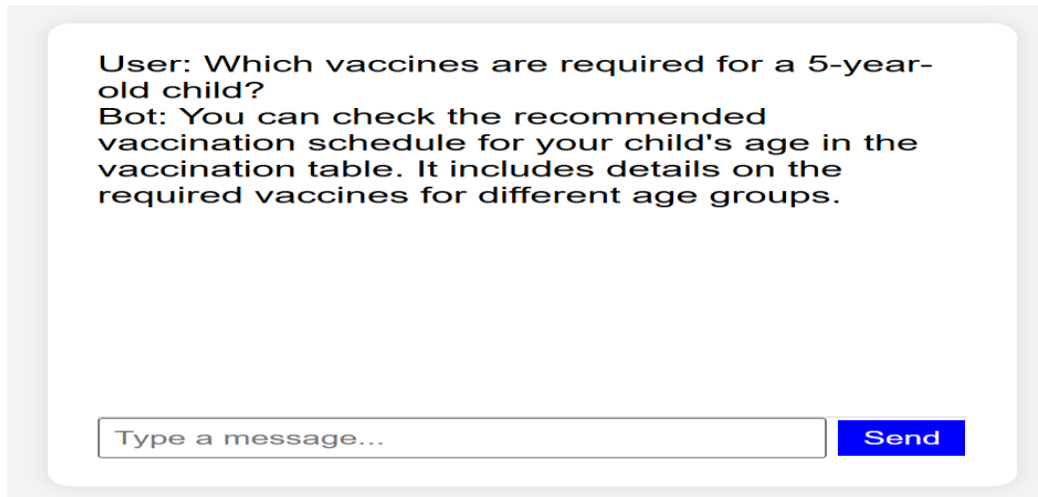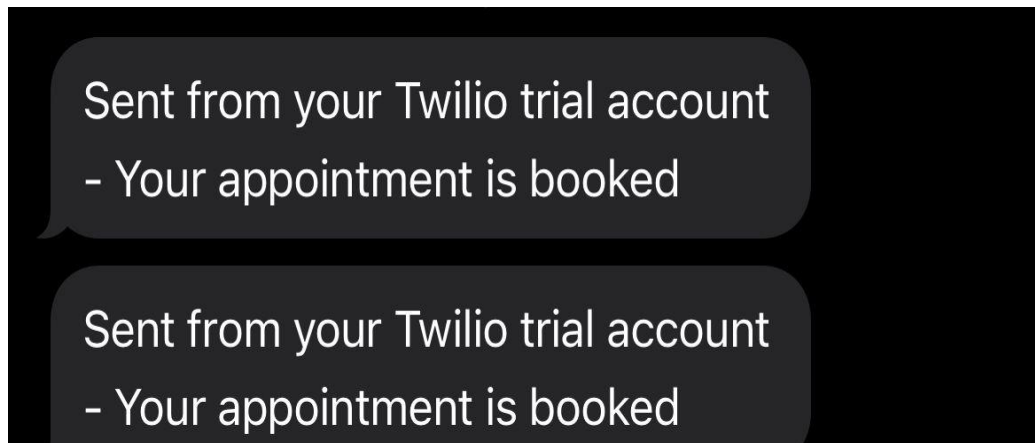Fig 7 : Vaccine Centre

Fig 8 : Available Slot

Fig 9 : Chatbot

Fig 10 : SMS Sending

VI.   CONCLUSION

In conclusion, the Baby Vaccination System project has successfully addressed the challenges associated with vaccine management and accessibility, delivering a user- centric platform that enhances vaccination coverage rates and promotes public health. Through collaborative efforts and innovative solutions, the project has achieved its objectives and demonstrated the potential of technology to improve healthcare delivery. Proposed System is designed to protect young children before they are likely to be exposed to potentially serious diseases and when they are most vulnerable to serious infection. Creation of awareness about vaccination increases the rate of vaccination and thus prevents great reduction of vaccine preventable diseases. It is an useful web application which can help a lot of rural people. The use of this application helps parents not to memorize the list of vaccinations to be given to their child. It also has a user-friendly interface and self-explanatory. The user of this web application will not miss any of the vaccines and hence prevents the child from suffering any serious diseases in the future. Apart from the vaccination notification, it allows the users to check the child's growth (like height, weight) rather than visiting the hospital every week or month. It reduces the time of parents to search and visit the hospitals for vaccinating their child in case of any emergency.

ACKNOWLEDGMENT

FUTURE SCOPE

The Child Vaccination Tracking and Reminder System has significant potential for future enhancements to improve efficiency, security, and accessibility.

1. AI-Based Predictive Analysis – Utilizing AI and machine learning to predict vaccination trends, detect missed schedules, and recommend the best vaccination timing based on a child's health history.
2. Blockchain for Secure Records – Implementing blockchain technology to store vaccination records securely, ensuring data integrity, privacy, and tamper-proof access.
3. IoT Integration – Connecting with wearable health devices to monitor a child's health metrics and provide automated vaccination recommendations.
4. Government & Hospital Integration – Seamless integration with national healthcare systems and hospital databases for real-time updates and nationwide immunization tracking.
5. Mobile Health (mHealth) Expansion – Enabling telehealth consultations, remote doctor recommendations, and online vaccination counselling for better accessibility.
6. Multilingual & Voice Assistance – Adding support for multiple languages and voice-assisted reminders to ensure accessibility for all parents, especially in rural areas.

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