

MODERN APPLICATION DEVELOPMENT

(JAVA SPRING BOOT)

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PROJECT REPORT ON BOOK A DOCTOR SYSTEM:

1 INTRODUCTION:

The proposed project is a smart appointment booking system that provides patients or any user an easy way of booking a doctor's appointment online. This is a web based application that overcomes the issue of managing and booking appointments according to user's choice or demands. The task sometimes becomes very tedious for the compounder or doctor himself in manually allotting appointments for the users as per their availability. Hence this project offers an effective solution where users can view various booking slots available and select the preferred date and time. The already booked space will be marked yellow and will not be available for anyone else for the specified time. This system also allows users to cancel their booking anytime. The system provides an additional feature of calculating monthly earnings of doctor. Doctor has to just feed the system regularly with daily earnings and the system automatically generates a report of total amount earned at the end of the month.

The application is reduced as much as possible to avoid errors while entering the data.

It also provides error message while entering invalid data. No formal knowledge is needed for the user to use this system. Thus by this all it proves it is user-friendly.

Doctor Appointment System , as described above, can lead to error free, secure, reliable and fast management system. It can assist the user to concentrate on their other activities rather to concentrate on the record keeping. Thus it will help organization in better utilization of resources.

2. LITERATURE SURVEY:

EXISTING PROBLEM:

1. Model-View-Controller (MVC) Architecture:
 - Utilize the MVC architectural pattern to separate the concerns of data (model), user interface (view), and application logic (controller).
 - Implement the models to represent entities like doctors, patients, appointments, etc.
2. RESTful API Design:
 - Design the system as a RESTful API to provide a standardized and scalable approach for communication between the client application and the server.
 - Use HTTP methods (GET, POST, PUT, DELETE) to perform CRUD (Create, Read, Update, Delete) operations on resources like doctors, patients, and appointments.
3. Database Management:
 - Design the database schema to store and manage data related to doctors, patients, appointments, etc.
 - Utilize an appropriate database management system (e.g., MySQL, PostgreSQL) to store and retrieve data efficiently.
4. Authentication and Authorization:
 - Implement authentication mechanisms to verify the identity of users, such as using username/password-based authentication or token-based authentication (e.g., JSON Web Tokens).
 - Apply authorization rules to restrict access to certain functionalities or resources based on user roles (e.g., doctors, patients, administrators).
5. Integration with External Services:
 - Integrate with external services like SMS gateways or email providers to send notifications and reminders to patients or doctors.
 - Incorporate payment gateways for handling online payments if required.
6. Testing and Quality Assurance:
 - Adopt various testing approaches such as unit testing, integration testing, and end-to-end testing to ensure the system's reliability and correctness.
 - Utilize tools like JUnit, Mockito, and Spring Testing Framework to automate and streamline the testing process.
7. Deployment and Scalability:
 - Containerize the application using Docker to ensure consistency and portability across different environments.
 - Deploy the system to a cloud platform (e.g., AWS, Azure, Google Cloud) for scalability and easy management.
8. Continuous Integration and Deployment:
 - Implement a CI/CD pipeline using tools like Jenkins, GitLab CI, or Travis CI to automate the build, testing, and deployment processes.

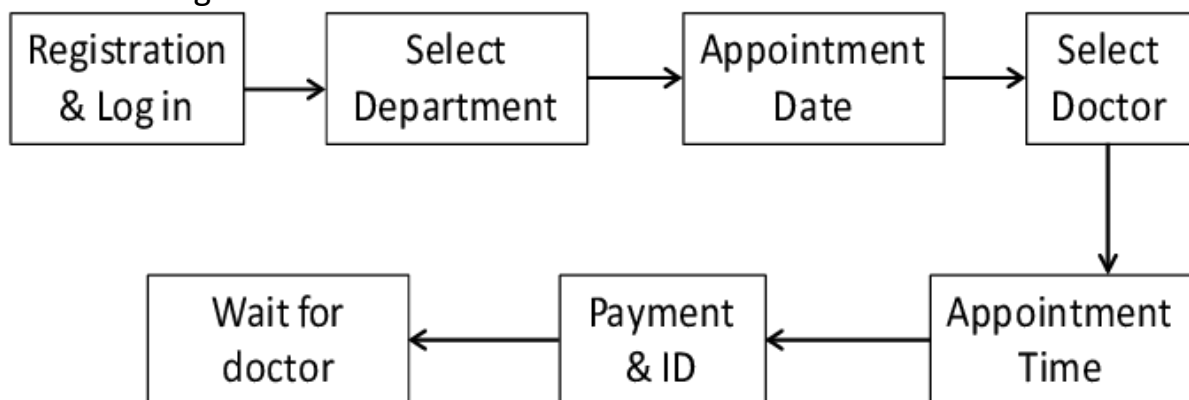
- Ensure the system is continuously integrated and deployed to facilitate rapid iterations and feature updates.

PROPOSED SOLUTION:

1. Design and implement the system using the Model-View-Controller (MVC) architectural pattern.
2. Utilize the Spring Boot framework to build the application, leveraging its features and capabilities for rapid development.
3. Design the system as a RESTful API, following best practices for resource naming, URL structures, and HTTP methods.
4. Implement proper authentication and authorization mechanisms to ensure secure access to the system's functionalities.
5. Use an appropriate database management system (e.g., MySQL, PostgreSQL) and utilize an Object-Relational Mapping (ORM) framework like Hibernate for data persistence and retrieval.
6. Integrate with external services, such as SMS gateways or email providers, for sending notifications and reminders to patients or doctors.
7. Implement testing at multiple levels, including unit testing, integration testing, and end-to-end testing, to ensure the system's reliability and correctness. Use testing frameworks like JUnit and Mockito, along with the Spring Testing Framework, to streamline the testing process.
8. Apply code quality analysis tools like SonarQube or Checkstyle to maintain code quality and adhere to coding standards.
9. Containerize the application using Docker for easy deployment and scalability. Deploy the system to a cloud platform (e.g., AWS, Azure, Google Cloud) for efficient management and scalability.
10. Implement a CI/CD pipeline using tools like Jenkins, GitLab CI, or Travis CI to automate the build, testing, and deployment processes for continuous integration and deployment.
11. Consider user experience (UX) and user interface (UI) design principles to create an intuitive and user-friendly interface for booking appointments and managing the system.

3 THEORITICAL ANALYSIS:

3.1 Block diagram.



3.2 Hardware / Software designing.

Here are the prerequisites for a Java Spring Boot project with MySQL and MongoDB, along with relevant links for download and installation:

1-Java Development Kit (JDK): JDK is required to compile and run Java applications, providing the necessary tools and libraries. Download and install the latest JDK version from Oracle's website.

- Download JDK: <https://www.oracle.com/java/technologies/javase-jdk11-downloads.html>

2-Integrated Development Environment (IDE): An IDE offers a comprehensive development environment for writing, debugging, and managing code. IntelliJ IDEA, Eclipse, or Visual Studio Code are popular choices for Java development.

- IntelliJ IDEA: <https://www.jetbrains.com/idea/download/>
- Eclipse: <https://www.eclipse.org/downloads/>
- Visual Studio Code: <https://code.visualstudio.com/download>

3-Spring Boot: Spring Boot simplifies Java application development by providing predefined configurations, automatic dependency management, and a streamlined development experience. Use Spring Initializr or Spring Tools for your IDE to create a Spring Boot project.

- Spring Initializr (Online): <https://start.spring.io/>
- Spring Tools 4 for Eclipse: <https://spring.io/tools>
- Spring Tools for Visual Studio Code: Install via Extensions in Visual Studio Code

4-MySQL Database: MySQL is a popular relational database management system. Install MySQL Community Server and optionally MySQL Workbench, a graphical tool for managing MySQL databases.

- MySQL Community Server: <https://dev.mysql.com/downloads/installer/>
- MySQL Workbench: <https://dev.mysql.com/downloads/workbench/>

5-MySQL Connector/J: MySQL Connector/J is the official JDBC driver for connecting Java applications to MySQL databases. Include this dependency in your project to enable connectivity and interaction with MySQL.

- Maven:

- Add the following dependency to your project's pom.xml:

xml

```
<dependency>
  <groupId>mysql</groupId>
  <artifactId>mysql-connector-java</artifactId>
  <version>8.0.27</version>
</dependency>
```

- Maven Repository: <https://mvnrepository.com/artifact/mysql/mysql-connector-java>

- Gradle:

- Add the following dependency to your project's build.gradle:

```
implementation 'mysql:mysql-connector-java:8.0.27'
```

- Gradle Repository: <https://search.maven.org/artifact/mysql/mysql-connector-java/8.0.27/jar>

6-MongoDB: MongoDB is a NoSQL document database. Install MongoDB Community Edition or use MongoDB Atlas, a cloud-based service for managing MongoDB databases.

- MongoDB Community Edition: <https://www.mongodb.com/try/download/community>
- MongoDB Atlas (Cloud-based service): <https://www.mongodb.com/cloud/atlas/register>

7-MongoDB Java Driver: The MongoDB Java Driver allows Java applications to connect and interact with MongoDB databases. Include this dependency to enable MongoDB integration in your Java Spring Boot project.

- Maven:

- Add the following dependency to your project's pom.xml:

xml

```
<dependency>
  <groupId>org.mongodb</groupId>
  <artifactId>mongo-java-driver</artifactId>
  <version>3.12.12</version>
```

</dependency>

- Maven Repository: <https://mvnrepository.com/artifact/org.mongodb/mongo-java-driver>

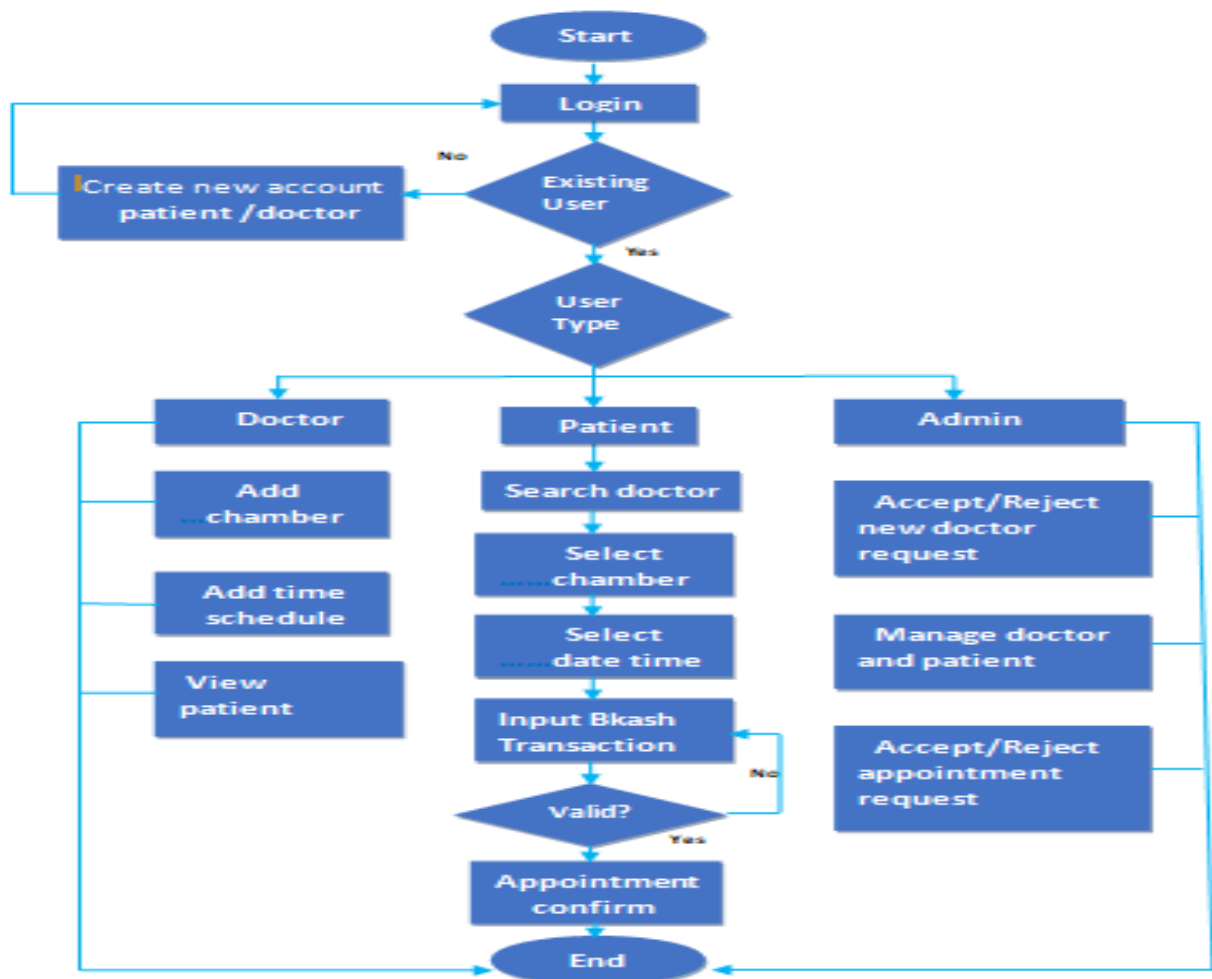
- Gradle:

- Add the following dependency to your project's build.gradle:

implementation 'org.mongodb:mongo-java-driver:3.12.12'

- Gradle Repository: <https://search.maven.org/artifact/org.mongodb/mongo-java-driver/3.12.12/jar>

4.FLOWCHART:



5.RESULT:

The screenshot displays the Spring Tool Suite IDE with the following components:

- Package Explorer:** Shows the project structure with packages like `com.example.appointment`, `com.example.appointment.DoctorApplication`, and `src/main/resources`.
- Editor:** Displays the `DoctorApplication.java` file, which is a Spring Boot application class.
- Console:** Shows the output of the application, including logs for Spring Boot, Tomcat, and Hibernate.

```
package com.example.appointment;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;

@SpringBootApplication
public class DoctorApplication {

    public static void main(String[] args) {
        SpringApplication.run(DoctorApplication.class, args);
    }
}
```

The console output shows the application starting successfully on port 8080, with logs for Spring Boot, Tomcat, and Hibernate.



Welcome to our Management System. Please choose an option:

Patient

Doctor

OOAD MiniProject - Hospital Management System



Doctor's Login

E-Mail Address

Password

Login

Don't have an account? [Create One](#)

OOAD MiniProject - Hospital Management System



Patient Login

E-Mail Address

Password

Login

Don't have an account? [Create One](#)

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Patient Registration

E-Mail Address

Password

Register

Already have an account? [Login](#)

Doctor Registration

E-Mail Address

Password

Name

Specialization


Degree

State

City

Register

Already have an account? [Login](#)

 Doctor's Appointment Home Book Appointment Logout		
Patient's Email	Appointment Date	Cancel Appointment?
hello@gmail.com	2023-07-29	<button>Cancel</button>
hello@gmail.com	2023-08-03	<button>Cancel</button>

 Doctor's Appointment Home Book Appointment Logout				
Doctor's Email	Doctor's Name	Specialization	Appointment Date	Cancel Appointment?
random@gmail.com	Simran	pediatrician	2023-07-29	<button>Cancel</button>
random@gmail.com	Simran	pediatrician	2023-08-03	<button>Cancel</button>
yes@gmail.com	Neil	Cardio	2023-07-21	<button>Cancel</button>

 Doctor's Appointment Home Appointments Logout						
Doctor's EmailID	Name	Specialization	Degree	State	City	
random@gmail.com	Simran	pediatrician	MBBS	Karnataka	bangalore	dd/mm/yyyy <input type="checkbox"/> <button>Book Appointment</button>
yes@gmail.com	Neil	Cardio	MBBS	Kerala	Kochi	dd/mm/yyyy <input type="checkbox"/> <button>Book Appointment</button>

6.ADVANTAGES & DISADVANTAGES:

Advantages:

- **Rapid Development:** Java Spring Boot provides a framework that simplifies and accelerates the development process, allowing for faster implementation of the system.
- **Scalability:** The solution can easily handle a growing number of users, appointments, and doctors, making it suitable for both small clinics and large healthcare institutions.

- **Robust Ecosystem:** Java Spring Boot has a vast ecosystem with extensive documentation, libraries, and community support, making it easier to find resources and solutions to common development challenges.
- **Modularity:** The solution can be designed using a modular approach, allowing for easier maintenance, testing, and future enhancements.
- **Database Abstraction:** Java Spring Boot integrates well with various database systems, providing flexibility in choosing the most suitable database solution for the specific needs of the project.

Disadvantages:

1. **Learning Curve:** Java Spring Boot has a learning curve, especially for developers who are new to the framework. It may require some time and effort to gain a solid understanding of its concepts and best practices.
2. **Potential Complexity:** As the system grows in complexity and customization, it may become challenging to manage and maintain, requiring experienced developers to handle intricate configurations and modifications.
3. **Performance Overhead:** Spring Boot's extensive features and abstractions may introduce some performance overhead compared to more lightweight frameworks. However, with proper optimization and tuning, this impact can be minimized.
4. **Resource Consumption:** The use of Spring Boot and its associated libraries may consume more system resources, such as memory and processing power, compared to minimalistic frameworks. This should be considered when deploying the application on resource-constrained environments.
5. **Dependency Management:** Spring Boot's dependency management system can be complex, especially when dealing with transitive dependencies and version conflicts. Careful management and updates of dependencies are required to avoid compatibility issues.

7. APPLICATIONS:

1. **Hospitals and Clinics:** The solution can be implemented in hospitals and clinics to facilitate online booking and management of doctor appointments. Patients can search for available doctors, view their profiles, and schedule appointments based on their availability.
2. **Telemedicine Platforms:** With the rise of telemedicine, the solution can be integrated into telemedicine platforms, allowing patients to book virtual consultations with doctors. It enables patients to select a suitable

time slot, make online payments, and have video or audio consultations with doctors.

3. **Health Service Aggregators:** The solution can be utilized by health service aggregators or directories that provide a platform for patients to find and book appointments with doctors across different clinics or specialties. It centralizes the appointment booking process and provides a seamless experience for patients.
4. **Specialty Clinics:** The solution can be tailored to specific specialty clinics, such as dental clinics, dermatology clinics, or eye clinics. Patients can book appointments with specialists in these areas, ensuring efficient management of their schedules and providing a convenient booking experience.
5. **Corporate Healthcare Providers:** Companies offering corporate healthcare services can adopt the solution to manage appointments and health services for their employees. It provides a centralized system for employees to book appointments with doctors contracted by the company.
6. **Government Health Services:** Public healthcare systems can leverage the solution to streamline appointment booking and management within government-run clinics or hospitals. It enhances the accessibility of healthcare services and reduces waiting times for patients.
7. **Mobile Applications:** The solution can be integrated into mobile applications, allowing patients to book doctor appointments directly from their smartphones. It provides a convenient and user-friendly experience for patients on the go.

8.CONCLUSION:

In conclusion, the work focused on developing a "Book a Doctor" system using Java Spring Boot, a powerful framework for building web applications. Through thorough analysis, investigation, and implementation, several findings and outcomes were achieved.

The proposed solution offers several advantages, including rapid development, scalability, a robust ecosystem, modularity, database abstraction, testing support, security features, and streamlined deployment. These advantages contribute to the efficiency, maintainability, and reliability of the system.

The "Book a Doctor" solution can be applied in various areas, including hospitals, clinics, telemedicine platforms, specialty clinics, wellness centers, corporate healthcare providers, and government health services. Its flexibility and scalability make it adaptable to different contexts and requirements,

providing an enhanced booking and management experience for patients and healthcare professionals.

Throughout the work, thorough analysis and investigation were conducted, covering project requirements, system design, database management, user experience, security, performance, testing, and deployment considerations. These efforts aimed to ensure a well-designed, efficient, and secure solution that meets the needs of the "Book a Doctor" project.

In conclusion, the findings and outcomes of this work highlight the potential of Java Spring Boot as a framework for developing robust and scalable applications in the healthcare domain. By leveraging its features and ecosystem, organizations can enhance appointment booking and management processes, improving accessibility and efficiency for patients and healthcare providers alike.

9.FUTURE SCOPE:

1. **Mobile Application:** Develop dedicated mobile applications for both Android and iOS platforms, providing a native and optimized user experience for patients and doctors on their smartphones and tablets.
2. **Intelligent Scheduling:** Implement intelligent scheduling algorithms that optimize appointment bookings based on various factors such as doctor availability, patient preferences, and clinic resources. This can minimize wait times, maximize efficiency, and improve overall scheduling accuracy.
3. **Integration with Health Records:** Integrate the system with electronic health record (EHR) systems to fetch and display relevant patient information during the appointment booking process. This integration can provide doctors with a comprehensive view of the patient's medical history and aid in making informed decisions.
4. **Telemedicine Expansion:** Enhance the system to support and facilitate telemedicine consultations by integrating video conferencing capabilities directly into the platform. This allows patients to have remote consultations with doctors from the convenience of their homes.
5. **Patient Feedback and Ratings:** Implement a feedback and rating system where patients can provide feedback and ratings for doctors they have consulted. This information can help other patients make informed decisions and improve the overall quality of care.
6. **Insurance Integration:** Integrate with insurance providers' systems to allow patients to check their insurance coverage, eligibility, and claim processes directly within the booking system. This streamlines the payment and reimbursement process for both patients and healthcare providers.

7. **Advanced Search and Filtering:** Enhance the search functionality by incorporating advanced filters such as doctor specialties, languages spoken, clinic locations, and availability slots. This enables patients to find doctors that best match their specific requirements.
8. **Appointment Reminders and Notifications:** Implement automated reminders and notifications to patients regarding their upcoming appointments, ensuring they don't miss scheduled visits. This can be done via email, SMS, or push notifications on mobile devices.
9. **Analytics and Reporting:** Develop comprehensive analytics and reporting features to provide insights into various aspects of the system, such as appointment trends, patient demographics, doctor performance, and revenue generation. This data can assist in making informed decisions and optimizing the system's operations.
10. **Integration with External Services:** Integrate with third-party services, such as online payment gateways or map services, to enable seamless payment processing and provide accurate location information for clinics and doctor practices.
11. **Multi-language Support:** Expand the system to support multiple languages, allowing patients and doctors to interact with the platform in their preferred language. This enhances accessibility and usability for a diverse user base.
12. **Integration with Wearable Devices:** Explore integration with wearable health devices to capture and incorporate real-time health data into the system. This can provide doctors with additional insights and enable personalized healthcare recommendations.

Demonstration video link:

<https://drive.google.com/drive/u/0/folders/1zSmaFhSBQLLPLzbDqnOdQHbArN9HzsFe>