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ERP System Using L-MVC Architecture

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ABSTRACT: L-MVC framework is a lightweight MVC framework which has been adopted for the small-scale applications. These applications do not generate large amount of data. Though many commercial and non-commercial web frameworks are very popular and applied widely, they are not particularly suitable for small applications. In this paper, an ERP system is generated using L-MVC architecture using AngularJS. In this a single server has been used to make the system lightweight. Also in this we are using Spring MVC framework for server side and AngularJS for frontend. AngularJS is used as it separates the view part from the MVC model. This was applied to create a hospital management system as an example to prove the system is maintainable and efficient.

KEYWORDS: L-MVC framework; small-scale application; ERP; AngularJS; hospital management system; efficient

I. INTRODUCTION

With rapid development in the internet, web development has created boom in the market. With the development of new technologies, web development has also been advanced. Specially in the medical industry it has become one of the needs for the doctors as well as the patient. With the introduction of ERP (Enterprise Resource Planning) the managing and accessing of data has become easy as the data is stored centrally, which can be accessed by all the departments through which we can get accurate data.

Enterprise Resource Planning (ERP) [5] system for more than 20 years has been an ultimate and highly valued solution for many industries, from manufacturing to distribution ones. And healthcare industry is no exception. This software can help improve operations with enhancements to profitability, productivity, expansion and all possible processes within certain industry. Hospitals and healthcare organizations could be interested in improving operational efficiencies, reducing inventory and labour costs and bettering communication and information flow among various departments thus providing correct and timely care. Unlike many conventional industries, missing or inaccurate information can cost people's lives in the healthcare sector. All these problems can be avoided by implementing ERP system.

L-MVC [1] is lightweight Model-View-Controller framework which is based on MVC design pattern and which can be used for small-scale applications which do not have large data. In this paper we are creating this framework using AngularJS and by using this framework we can manage the hospital activities. In order to make the application lightweight we are using a single server which can handle multiple tasks unlike MVC which uses multiple servers for a single application which increases the time as well as cost.

II. RELATED WORK

In the paper [4], Dongping Tang explained how the ERP has created boom in the market. ERP is used to manage all aspects of business operations. Paper [5] explains how we can use ERP in small and medium applications as the traditional ERP is for large scale applications.

AngularJS is popular java script framework for creating front end single page web application and supports model-driven development which is briefly explained in paper [2]. Paper [1] briefly explains about L-MVC framework.

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In this paper they have created online paper submission system using PHP. The paper [3] briefs about the inconsistencies in java script MVC application and how to identify them using AUREBESH tool.

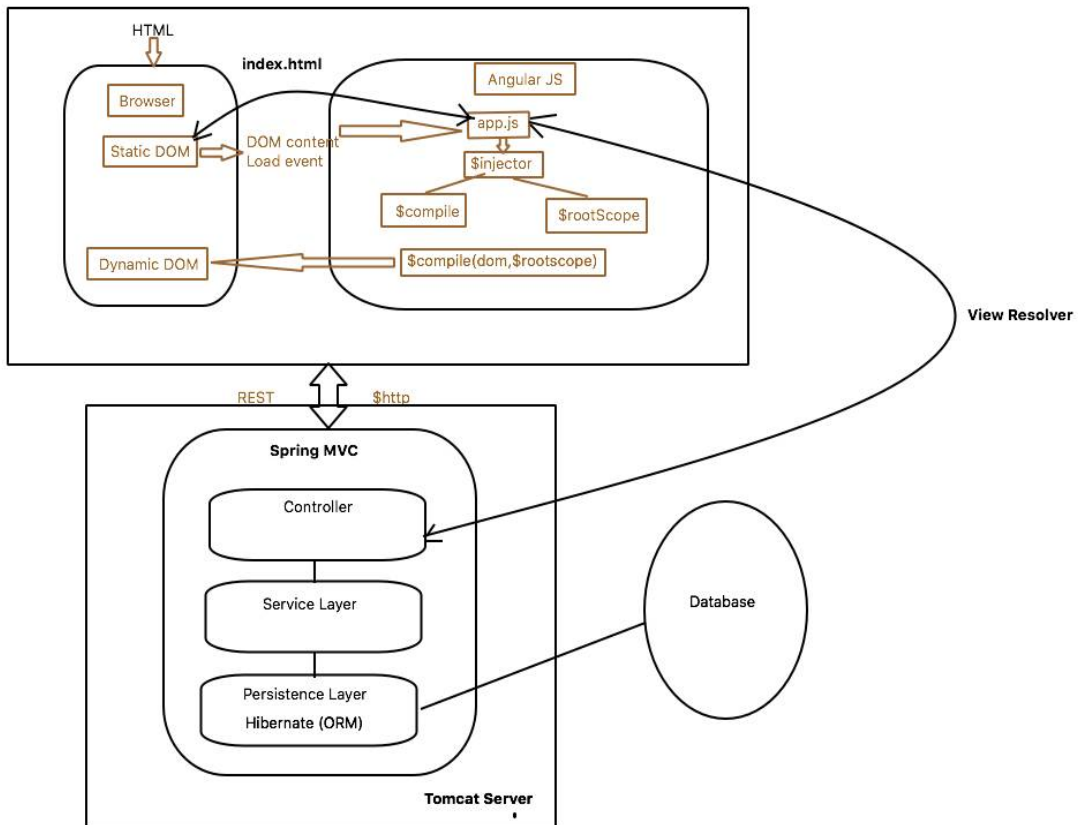
III. PROPOSED SYSTEM

In the following system we are creating a ERP system using L-MVC framework. We are making the system lightweight by using single server. Traditionally, the MVC framework uses separate server for frontend as well as the backend. In this system we are using the single server for the frontend as well as the backend, this makes the system lightweight as for small scale application we won't need multiple server and all the operations can be managed within a single server which reduces the overall load.

The frontend and the backend of the application is separated by AngularJs framework as this gives more richer options for the frontend of the application. Modern single page web applications can perform many tasks, animations and fetch data in incremental amounts without constantly refreshing or re-rendering the pages.

In this system we are using separate AngularJs for the frontend so that we can separate the view part from the MVC model. It is the best option for the micro-service architecture implementations. Traditionally JSPs uses server for it processing, while in AngularJs the UI processing is shifted to client side thus reducing the server load.

There are different technologies serving different purposes. For the server side MVC framework we are using Spring MVC which handles routing, database connection and APIs and for the client side MVC framework, AngularJs is used which does the client side routing, making AJAX requests, dynamic template rendering and others. Hence these two MVC frameworks are combined together in this system.



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Fig 1. Architecture Diagram

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A) *index.html*

The request is initiated from the browser using html. It stimulates the static DOM (Data Object Model) to send request to AngularJS. In AngularJS, app.js is an absolute path to the root of the project.

a) *\$injector*

It invokes function by analyzing their dependencies and passing the correct parameters by fetching the proper service instances. Angular creates a single *\$injector* when it bootstraps an application and uses the single *\$injector* to invoke controller functions, service functions, filter functions and any other functions that might need dependencies as parameters.

b) *\$compile*

It is a service used for compilation. Invoking *\$compile* against markup will produce a function which can be used to bind the markup against particular scope. After linking, DOM elements can be placed into the browser.

c) *\$rootScope*

It is a parent object of all “*\$scope*” angular objects created in a web page. *\$scope* is created with ng-controller while *\$rootScope* is created with ng-app. A property assigned with *\$rootScope* can be used anywhere. *\$scope* is the binding part between the html and the JavaScript.

B) *\$http*

The *\$http* service is a function which takes a single argument that is used to generate an HTTP request and returns a promise that is resolved (request success) or rejected (request failure) with a response object. It is a protocol of RESTful service. The RESTful resources with HTTP protocol, the URL of the resource serves as the resource identifier and GET, PUT, DELETE, POST and HEAD are the standard HTTP operations to be performed on that resource.

C) *SpringMVC*

It helps in building flexible and loosely coupled web applications. In this the request goes through the controller, service layer and the ORM. The controller accepts the request from the AngularJS and processes it. The role of service layer is it processes the POJO objects of the model. The persistence layer is based on Hibernate in order to achieve the ability to run on any major DBMS. Hibernate abstracts the underlying DBMS away and let you define the database connection properties.

IV. APPLICATION

To demonstrate this application, we take healthcare ERP system as an example. In this application we are managing the hospital activities through ERP system using L-MVC architecture. As this is a small-scale application and not much of data is generated in this type of system hence we are making it lightweight for more efficiency.

In this application all the hospital activities can be managed such as patient information, staff information, bill generation, etc. As it is an ERP system the data is managed centrally and is transparent to all the working staff. This application is divided into five modules.

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1) Patient Information

Admin inserts the patient information such as name, address, mobile number, etc. In this the admin can modify the patient information as well as delete information. This includes detailed information of the patient and creates a unique patient number for every patient. It contains another module as indoor patient in which the details of the admitted patients are stored such as ward number and other bed details, doctor assigned, admit details, status of the patient, etc.

2) Invoice Generation

After the patient is registered and undergoes through the treatment bill is generated. This is a detailed bill containing charges according to the departments. Adding all of this a total amount is generated that is the final amount. This bill includes all the department charges such as bed charges, doctor charges, lab charges, nursing charges, medicine charges, etc.

3) Payment Entries

Once the bill is generated, the amount paid by the patient is updated in the table. The patient is identified by patient number and once the amount is paid, that is updated in the database and if the patient does not pay. The whole amount at once, then the difference is displayed as remaining amount. In this it also saves the transaction details.

4) Doctor Information

This module contains the availability of the doctors on daily basis. The table is updated on the charges depending on the specialty and the number of patients visited on that day.

V. RESULTS AND CONCLUSION

A lightweight MVC framework is designed for a small scale application using AngularJS. The needs of every application are different, hence considering the healthcare industry we have created a ERP system using the lightweight MVC framework. Implementing this system, helps to bring healthcare providers under one platform and keeps all the crucial information centralized and within the scope of organization. This application can be deployed on any platform. After thorough testing of the system, it can be said that all the functionalities of the proposed system satisfy the requirements of the application. This makes the overall application user-friendly, faster processing, efficient and reliable.



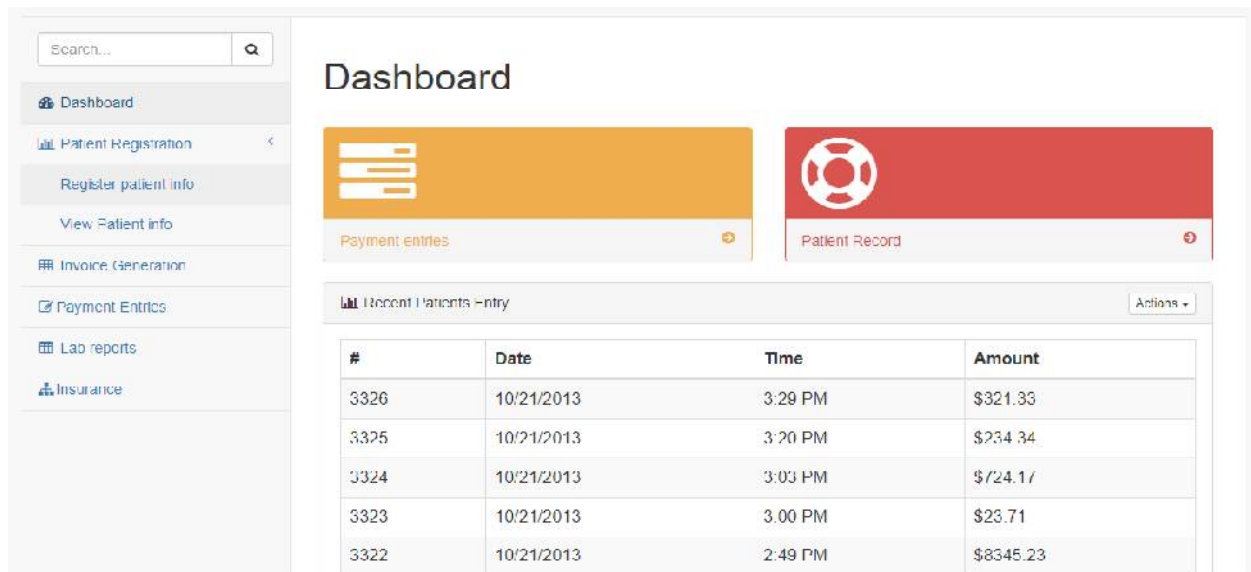
Fig.2 Admin Login

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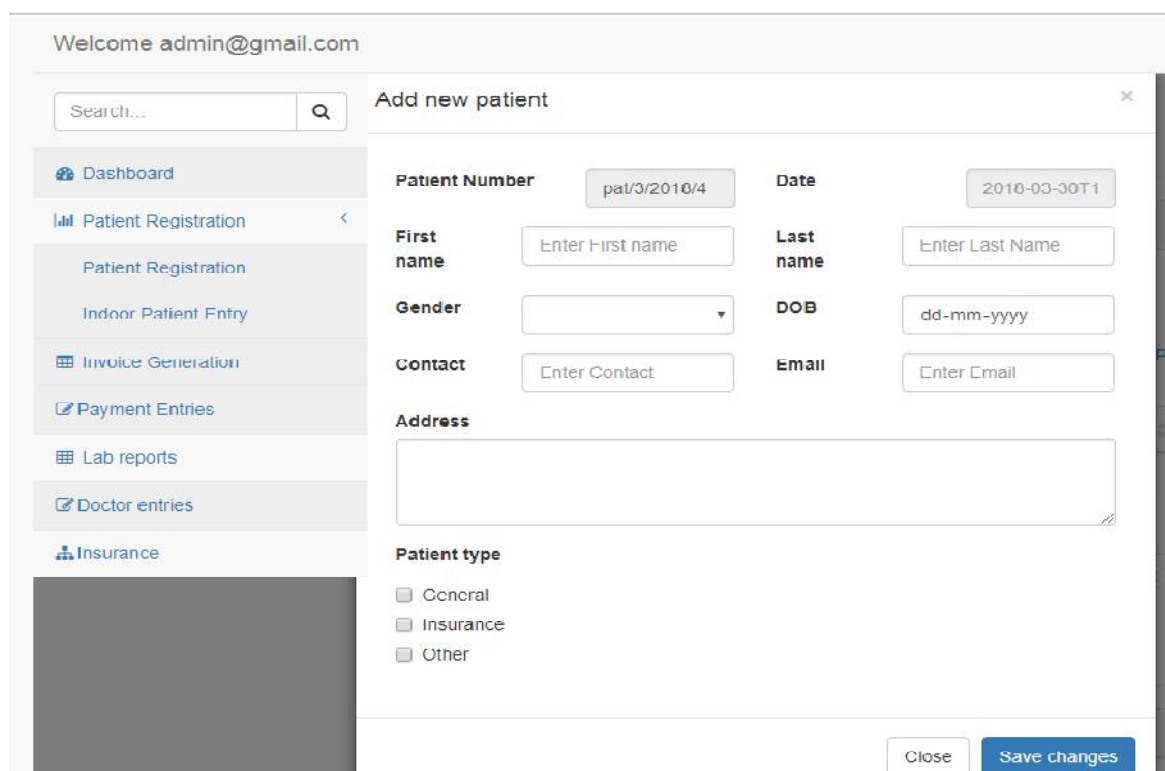
Dashboard

Payment entries Patient Record

Recent Patients - Entry

#	Date	Time	Amount
3326	10/21/2013	3:29 PM	\$321.33
3325	10/21/2013	3:20 PM	\$234.34
3324	10/21/2013	3:03 PM	\$724.17
3323	10/21/2013	3:00 PM	\$23.71
3322	10/21/2013	2:49 PM	\$8345.23

Fig.3 Dashboard



Welcome admin@gmail.com

Search...

Add new patient

Patient Number: Date:

First name: Last name:

Gender: DOB:

Contact: Email:

Address:

Patient type

General
 Insurance
 Other

Close Save changes

Fig.4 Add New Entry

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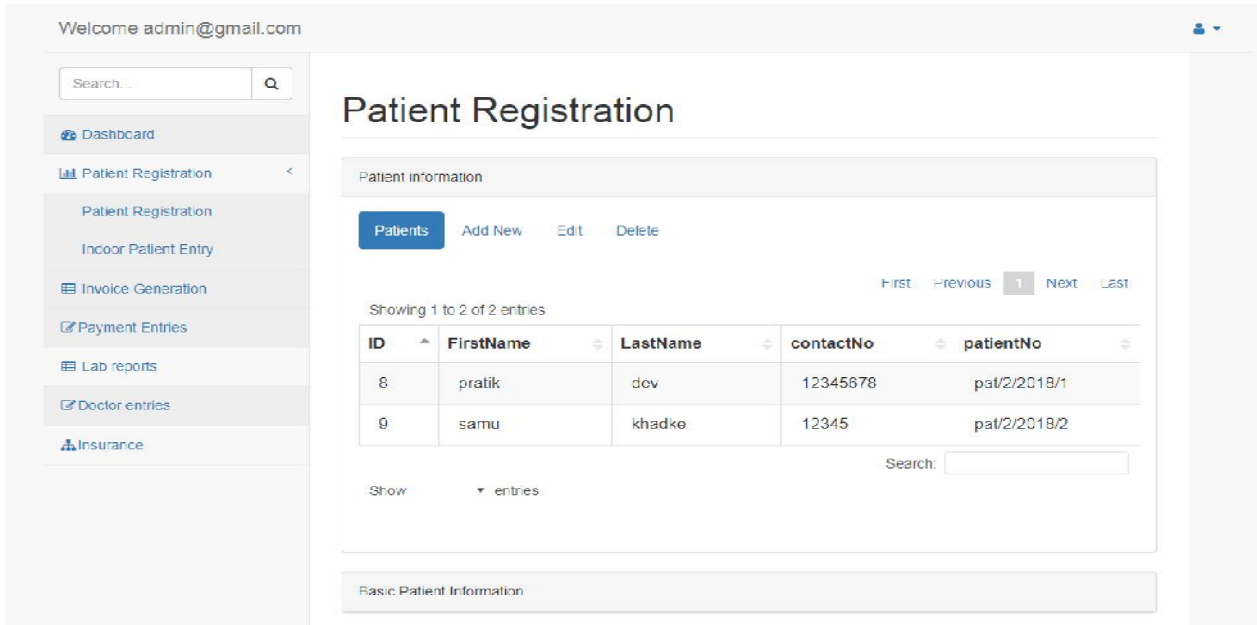


Fig.5 Registration Details

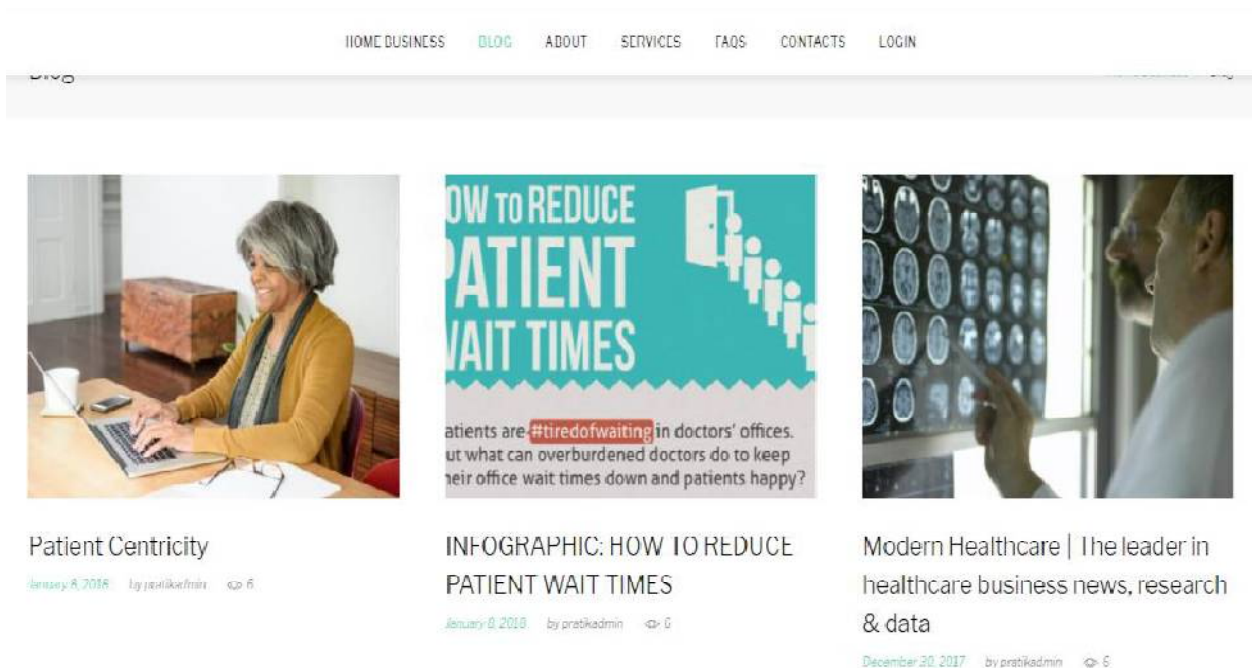


Fig.6 Blog Page

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VI. FUTURE WORK

Many more functionalities can be added to this system, such as SOS facility. In this we can connect to hospital from wherever we are. The blood bank facility can also be added in this system such that the availability of blood according to blood type can be seen centrally by the hospital organization.

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