Implementation of Android App for Retail Price Statistics

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Abstract—**In the advancing world of technology, mobile applications are a rapidly growing segment of the global mobile market. Mobile applications are evolving at a meteor pace to give users a rich and faster user experience. This paper discusses such mobile application which is used by Directorate of economics and statistics officers in any governmental sector. Retail Price Statistics app is to collect day-to-day data of various retail prices of essential commodities in the Telangana state. To cater to the needs of the directorate and its services as per the national standards of e-governance paper emphasis on data recording, verifying and viewing for different level of users (Mandal, Division and District). Technologies used to develop are Java, Web services (RESTful) and the databases are SQLite & PostgreSQL and with the tools such as NetBeans and Android studio.**

Keywords— **Android, PostgreSQL, SQLite, Java, RESTful web services.**

I. INTRODUCTION

Recently, mobile devices have become an integral part of life of all people throughout the civilized world. Smart Phones has established a framework to conquer the customary desktop based methodology of acquiring data. Among the smart phones operating systems, Android is most dominant operating system which is widely used around the world. The father of Pervasive Computing Mark Weiser, in his paper entitled, 'The Computers of 21st Century, 'imagined that, *"The technology would weave into the fabric of everyday life until they are indistinguishable from it"*. I off late this vision has worked out true as expected in this current 21st century. Following the vision of Mark Weiser, analysts at Carnegie Mellon University in a venture Aura exhibited that; human diversions could be minimized by Ubiquitous frameworks which must be proactive in foreseeing the requests; in this manner self-tuneable to give a superior reaction to the future bothers. The capacity to sense and process a set of frames as the major necessity for a framework to be proactive. Henceforth, planning a context- aware application would be a clear approach to fulfil the future developing prerequisites of the clients[1].

As Smart phone have become a way of life with its evolving technologies, the Government of Telangana State is planning to transform major part of the Web-Based application to Mobile-Based application to reduce administrative burden and improving efficiency in system.

The ensuing app is developed with suitable privileges and the Government data at root level. State Government is planning to distribute Android Tablets for Directorate of economics and statistics officers. In this app, SQLite database of android is used for storing constant data and rarely changeable data by providing updates. PostgreSQL is an object-relational database management system (ORDBMS). The primary function of Postgres as a database server is to store data securely, and for retrieval at the request of other software applications. In this app, Postgres is used for handling large workloads with many concurrent users.

II. EXISTING LITERATURE

Prior study done by the recognised scholars in the Android Application development is reviewed and the issues and challenges along with the solutions are proposed in this paper with a specific reference to android enabled systems[2].

Xianhua et al. in their manuscript have described the anatomy of Android architecture which includes Activity, Services, Content Providers and Broadcast Receivers in order to better the Application development.

Dr. Meenakshi Mahajan, technical director, NIC, in her article has narrated in "Standards for e-governance" standards for application development which are followed in this App.

Amarpreet singh johal have described about performance of web services for android devices. This paved the way to choose RESTful web services for this App.

III. PROPOSED SOLUTION

By considering the drawbacks of web based applications like lack of infrastructure, time consumption, Android app is better solution as it is user friendly, easy to collect and can compile the data from root level and store location coordinates from where the retail prices are collected using GPS[3][4].

Proposed solution is to build an android application for catering the needs of DES officials from the root level.

A. Architecture

The Figure 1 shows the complete architecture of a process for an application. User interacts with android application for performing different tasks. For execution of tasks, app hits the server using restful web services or uses

SQLite database. During the submission of collected data (i.e. Retail Prices) through app, it captures the location coordinates using GPS and also inserts these coordinates along with collected data for successful entry in database.
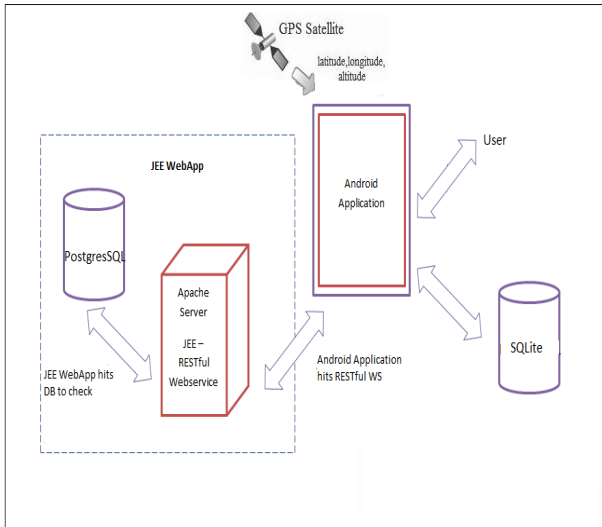

Fig 1 Architecture of Application

B. Design

Designer model is developed to describe the overall layout of the project. Figure 2 illustrates in detail the basic model used as reference during the project implementation.

Only authenticated users can perform their respective activities. Depending on the user login details, they are navigated to the respective activities. Activities are connected to Postgres server for retrieval and storing the data.
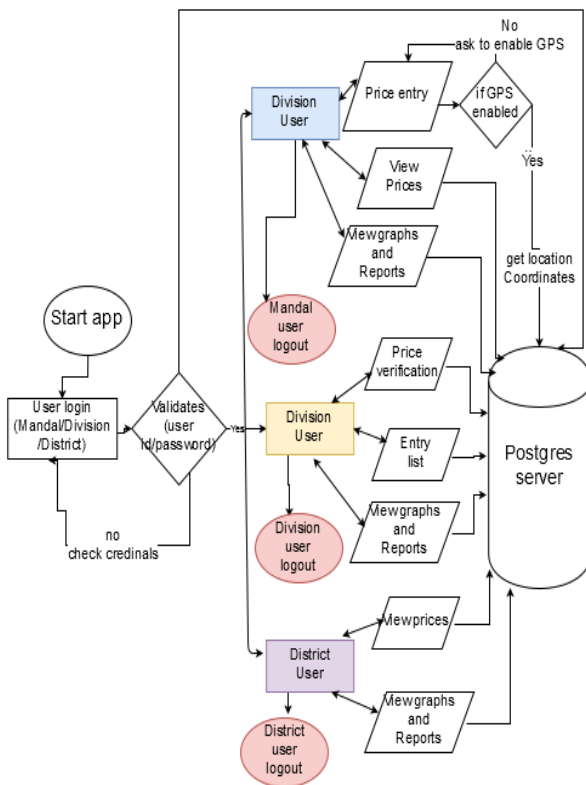

Fig 2 Application flow

IV. IMPLEMENTATION

This application is developed for the benefit of DES (Directorate of economics and statistics) officers. The following are the requirements or permissions needed during application development.

A. Server connection

Interaction between android application and database server is done through RESTful web services. Here AsyncHttp requests are made to get the required data from server in response to JSON objects and arrays since large data can be sent in the form of JSON objects in RESTful web services.

Any android project which is developed in Android Studio has to provide all th dependencies which are used by application. Hence, in the dependency for accessing the functionalities of AsyncHttp, the following is added or compiled.

```
'com.loopj.android:android-async-http:1.4.9'
```

For accessing internet facilities in application the following user permissions are to be added to the application Manifest file.

<uses-permission android:name ="android.permission.INTERNET" />

B. Location and Network Services

For capturing GPS location and network state, the below are user permissions that should be added to application android Manifest file.

<**uses-permission android:name="android.permission.ACCESS_FINE_L OCATION"** />

<**uses-permission android:name="android.permission.ACCESS_COARS E_LOCATION"** />

<**uses-permission android:name="android.permission.ACCESS_NETW ORK_STATE_LOCATION"** />

<**uses-permission android:name="android.permission.ACCESS_NETW ORK_STATE"** />

Location information is retrieved with the help of Location Manager System by invoking the command getSystemService (Context.LOCATIONSERVICE). Code for invocation is shown below:

lm = (LocationManager) getSystemService (Context.LOCATION_SERVICE);
locationListener = new MyLocationListener();

lm.requestLocationUpdates(
LocationManager.GPS_PROVIDER, 0, 0,
locationListener);

C. Databases

Main PostgreSQL database is maintained (by National Data centre) at server side and PostgreSQL is connected to RESTful web service with the help of dependency jdbc jar file (postgresql-9.4-1206-jdbc4).

Frequent interactions through RESTful web services can reduce the performance of the application. Hence, for this purpose a secondary SQLite database is maintained in the application itself.

SQLite database at application side is used to store constant data or rarely changeable data for which the application need not communicate with server such as all the commodities details which are needed at entry level and viewing time of retail prices.

A SQLite DatabaseHelper class helps in creating, retrieving, updating and deleting data from SQLite Database. In a week, 3 times this SQLite database is updated.

D. Graph jar

For developing graphs, we used GraphView as the dependent jar in this project. The compilation is carried out as **`'com.jjoe64:graphview:4.1.0'`** to access the functionalities of the graph view.

E. Modules

Different level of officers can perform different set of actions or access data relevant to them. Such as, retail prices are to be submitted only by Mandal Officers. Similarly a Division officer has access to update the Prices of their respective Mandals which are previously submitted by Mandal officers. A District user or officer can only view the data of all respective mandals. Mandal user can view reports and graph which are generated for their respective mandal only, whereas division user can view all the reports and graphs of mandals which belongs to that particular division[5].

1) Login: User has to provide user and password in their respective fields in the login form and when they are submitted, they hit web services for validation. If the credentials are correct, necessary user details will be sent to the app along with a success tag. Based on the designation of the officer or user, they are directed to their respective activity which they can perform.

2) Mandal Level User or Officer: Following are the activities which can be performed by mandal level user:
- *User Details:* Respective mandal user details are displayed.
- *Price Entry:* Retail prices are entered daily at mandal level by mandal user.
- *View Prices:* Entered prices can be viewed of any day.
- *Graphs for Mandal User:*
  i.   *Daily Prices graph:* Bar graph which exhibits prices of all commodities.
  ii. *Deviation graph*: Bar graph show deviations in prices.
  iii. *Weekly price trends graph:* Line graphs price show trends of all commodities for a particular week.
- *Reports:* Weekly and monthly reports of respective mandal are displayed[6].

3) Division Level User or Officer: Following are the activities which can be performed by division level user:
- *User Details:* Respective division user details are displayed.

- *Price Verification:* Prices of respective mandals which belong to that division can be viewed and verified against the paper report of each mandal. If prices are not entered by mandal, division user is subjected to enter the price values which are provided by the mandal through telephone or paper report from the mandal.
- *Graphs for Division User:*
  i.   *Month graph*: Line graph shows the price trends of a particular month.
  ii. *Mandal daily graph*: For selected mandal, respective present day retail prices and previous day retail prices are viewed in bar graph.
- *Reports:* Weekly and monthly reports of respective mandal are displayed.

4) District Level User or Officer: Following are the activities which can be performed by district level user
- *User Details:* Respective mandal user details are displayed.
- *View Prices:* Retail prices can be viewed with respect to divisions or mandals that belong to district.
- *Graphs for District User:*
  i.   *Highest prices graph:* Bar graph shows highest prices recorded according to each commodity.
  ii. *Average graph:* Bar graph shows average prices of weekly or month of all commodity prices of a mandal.
- *Reports:* Weekly and monthly reports of respective district are displayed[7].

V. RESULTS AND DISCUSSIONS

Following are the screenshots of different activities carried out in application.
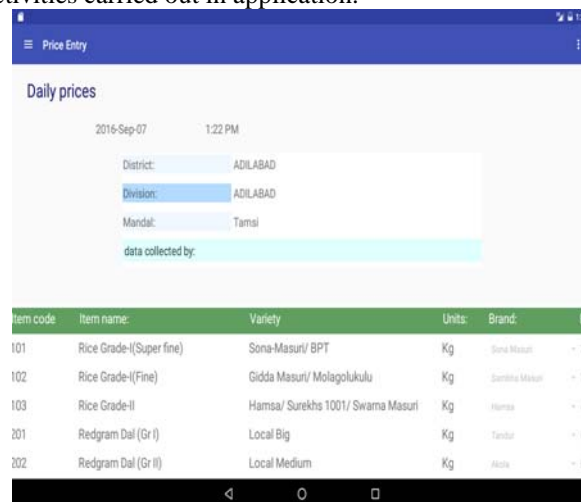

Fig 3 Daily Price entry form

Figure 3 and 4 shows the table containing all commodity details and the respective prices for the day are to be entered by Mandal ASO. Location details along with prices are sent via web service to the server for prices insertion into database.

Similarly, a division ASO would verify the prices entered by Mandal ASO.

The division ASO can view number of entries made by a mandal belonging to that division and can view

the details which shows list of mandals which did not enter prices up till that time. Figures 5, 6 ,7 and 8 depicts the price lists and trends pertaining to the mandals , division and its deviations respectively[8][9] .
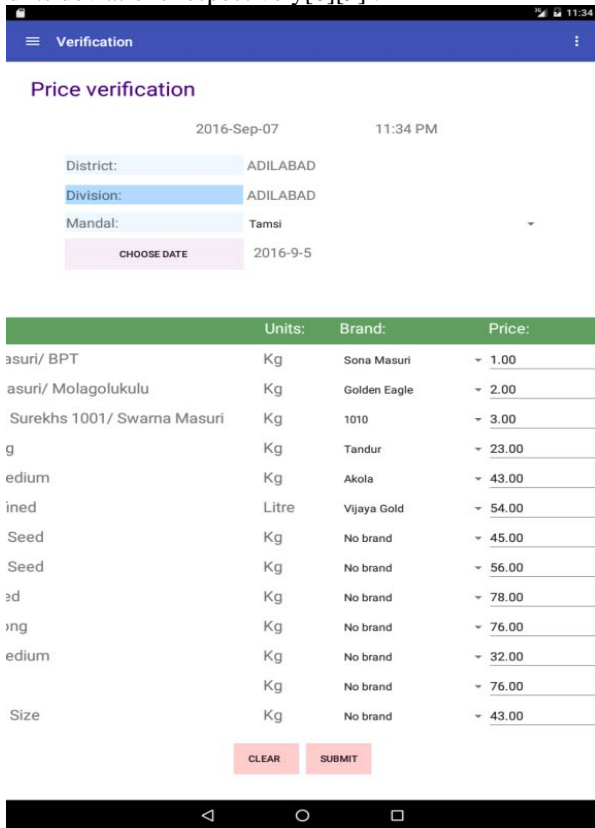

Fig 4 Prices Verification form

Fig 5 Entry list form

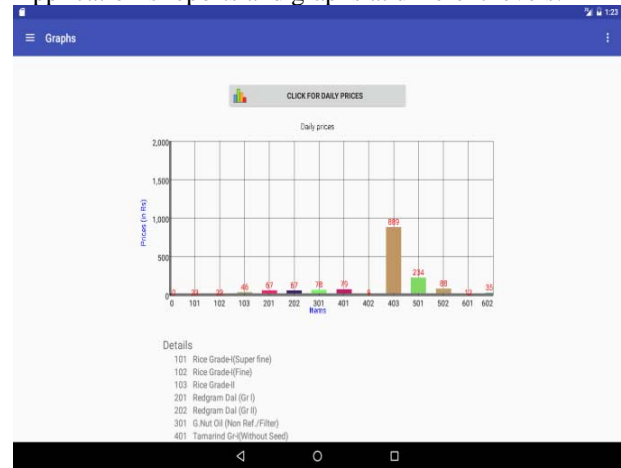Application's reports and graphs at different levels:

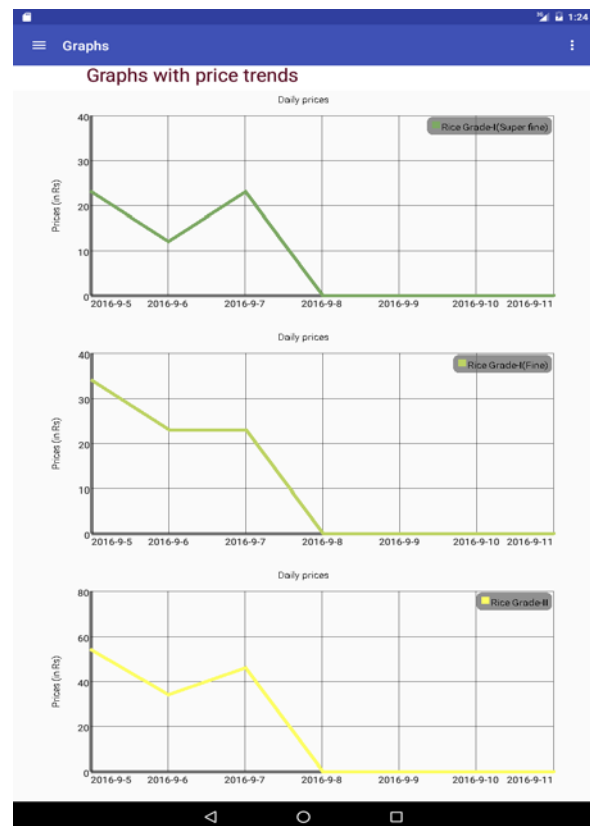Fig 6 Daily Prices Bar graph at Mandal level

Fig 7 Weekly Price trends graph at mandal and Division level.

Fig 8 Price deviation report at mandal level.

VI. CONCLUSION

In the present mobile era with internet resources that are available at distinct areas also , Directorate of economics and statistics of Telangana has come forward to make their tasks easier by providing this application to every distinct mandals in the state. Statistics of retail prices will be further maintained to conclude statistical reports of the particular year. Thus, this application is developed for catering to the needs of DES officials.

Further development can be made, such as:

- Data which is provided to plot time series graphs can be used to predict future prices and their trends.

- Offline entry of data can be developed as a future enhancement of application.

- Feature such as downloading the reports in the form of PDF or excel sheet can also be considered.

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