

# Expense Manager: An Expense Tracking Application using Image Processing

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**Abstract** - We present an intelligent expense tracker to efficiently manage the monthly expenses. Our system will help everyone who are planning to know their expenses and save from it. The user will be given the facility to set a monthly limit and if the user crosses that limit our app will notify the user about the same. The user can give receipts as an input, using AI our app will sort it into different categories. Here user can also define their own categories like food, clothing, rent and bills and the user can also set limits for a particular category. User will be provided with visual statistics of expenses by transaction date or by category. This project is not indented for a particular user or age group but anyone and everyone who wants to track their expense can use this app. So, the general idea of this Project is to help people view and study their overall expenditure pattern by developing a mobile application to analyse all the purchases made by the user by simply scanning the receipts.

**Key Words:** Android Application, Receipt Recognition, Image Processing, Expense Management.

## 1. INTRODUCTION

In order to trace their expenses, People generally use traditional paper system to stay the record of their income and expenditures. this sort of traditional system is burdensome and takes longer. So, there must be a management system which must help us to manage our daily earnings and expenses easily, and also helps us to find the records efficiently. So, we puzzled out the simplest way to eliminate the normal system with digital, portable, easier and easy to record these data in precisely few clicks with our Android application called "Expense Manager". The thought of this Project is to assist people view and study their overall expenditure analysis with the assistance of a mobile app to research all the purchases made by the user by simply scanning all the bills and receipts. The User should just click a picture of a receipt or choose one from the Gallery and track their payments. Using machine learning, the app is able to group items category-wise, for example- food, clothes, stationery, etc. The User can monitor his/her expenses and analyse them categorically using graphs and tables, enabling them to raised understand their expense patterns and help them spend intelligently. Using this app, the users may set monthly limits over specific categories helping them to avoid over-spend on those items. The app also will prompt users after they overspend or make repeat purchases. Our main

aim is to create our users capable of achieving Personal Life goals by giving them the flexibility to – monitor their expenses; analyse the buying trends; and assess their account's future transactions. And hence, the most objectives of developing this intelligent expense tracker are to supply a higher sense of expenditure to our users thereby promoting savings.

## 2. RELATED WORK

### A. Family Expense Manager Application in Android

There is numerous app within the markets now to trace & keep recorder of our spending's. applications like spend book, pocket graud, home budget, Wally, level money, spendee, every dollar so forth. an intensive a part of these application screens our money related adjust and learn the expenses by that. All those applications have only record of bill paid. This work like dairy & save your & your family bill record which has been settled or in pending to [1]. we will mark the status of our bill. this is often suitable for socio-economic class people that always don't use to settlements and find things on credits [1].

### B. Deep Learning Approach for Receipt Recognition

Automatically identifying and extracting key texts from scanned structured and semi-structured receipts and saving them as structured data can function a really beginning to enable a range of applications. Although there are significant improvements of OCR in many tasks receipt OCR continues to be challenging thanks to its higher requirements in accuracy to be practical. Therefore, fast and reliable OCR has to be developed so as to scale back or maybe eliminate manual works. during this paper, a deep learning approach for text detection and recognition are presented. CTPN for text detection and AED for text recognition were employed. Moreover, preprocessing and OCR certification were employed to extract small receipt and take away handwriting, respectively [4].

### C. OCR Text to Extract Receipt Data and Classify Receipts with Common Machine Learning Algorithm

Most companies have some type of system to handle

receipts from differing kinds of purchases for the corporate. Usually, the receipts are handled manually and entered into a database [2]. This sequence requires time which makes it a fashionable process. A more practical solution can be to convert this manual process to an automatic one. this might be done by taking a picture of the receipt so let a program automatically extract the knowledge and input that data on to the database. Extracting the text from the image can be done by common machine learning algorithm.

### 3. Proposed System

The application will provide the following functionalities: -

- Upload a receipt by clicking an image or choosing from Gallery and directly convert them into expenses by items.
- The Application will categorize these items in specific categories (such as Groceries, Clothes, Stationery, etc.) which will help the user to manage their budget wisely ensuring an efficient budget.
- Users can set monthly limits on their expenses which will be tracked daily and help user spend their future expenses wisely.
- An Alert will be generated in case the user crosses their monthly limit helping them decide to reduce or stop further expenses as necessary.

User can also monitor his/her expenses and analyze categorically using graphs and tables provided by the application.

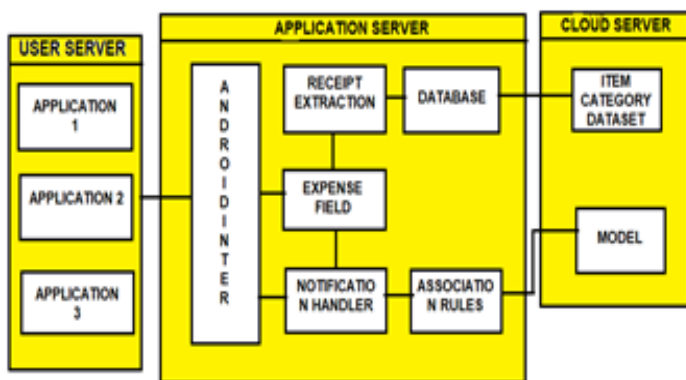


Fig -1. Flow Chart of System Architecture

The architecture as shown above has three blocks program, application server and cloud server. The interface displays the appliance with which the user can interact while the cloud server consists of various datasets and AI model. the appliance server further consists of the subsequent modules android interface, receipt extraction, expense field, notification handler, association rules and database which is required for appropriate action.

The usual process of the architecture is as follows: -

- The user sends appropriate command or request to the server through the net, using the interface of the applying.
- The application server is accountable for forwarding the command to the requested server.
- The server finds the results of requested commands (either the info processing or the database querying).
- The software or application delivers the processed information to the server.
- The server provides the user with the requested data.

### 4. Methodology

#### A. Receipt Recognition

In the proposed system we are using Image Processing libraries provided by python to process the receipts provided by the user. Image processing basically includes the following three steps:

- Importing the image via image processing tools;
- Analyzing, manipulating the image;
- Providing an output which can be an altered image or conclusion based on image analysis [3].

So, for this project will process all our receipts to provide us with necessary output such as

- Store Name
- Date of Transaction
- Item Name
- Cost of Items
- Total Cost

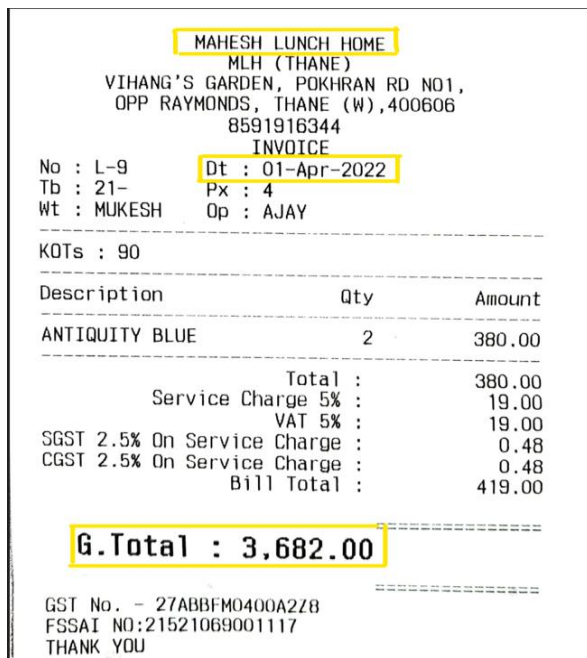


Fig -2. Text Recognition

B. Sorting Items into Different Categories

Using Machine Learning algorithms in python like tesseract and pytorch the application will use keywords such as Product and its Price from the receipts and categorize them into various categories. These categories will be general classes such as Groceries, Clothing, Stationery, etc. These Products will be matched against a big database of such categories which will help determine which product belongs to which category. Once all the Products are sorted, the User will be able to view the expenses according to categories helping them analyze their expenses better. If there is any Product which doesn't find any category, with the help of AI we will later sort it into one of the categories or classify it as Miscellaneous.

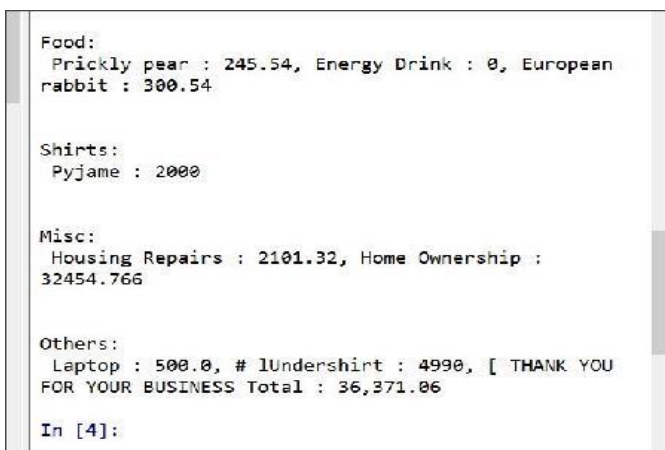


Fig -3. Items Sorted into Different Categories

C. Machine Learning

Machine learning may be a method of knowledge analysis that automates analytical model building [7]. it's a branch of computer science supported the thought that systems can learn from data, identify patterns and make decisions with minimal human intervention. In our project, we'll be creating Machine Learning Models to -

- Train the model to acknowledge receipt formats employing a data-set of just about 1000 receipts of various formats to extend the efficiency of the system against new or differing types of receipts.
- Use various Machine Learning algorithms like CTPN, LSTM and AED to induce better and accurate results on applying receipt recognition.

D. MPAndroidChart

In this project, MPAndroidChart library is used to create beautiful, customized and animated charts. Pie charts, line graphs, bar graphs are used in this project to give the users visual representation of their expenses. The users can view these graphical reports either by transaction date or by category. Adding graphs and charts will make information clearer and therefore improve the user experience. This will give the user a better understanding of their expenditure.

5. RESULTS

In this project we implemented image processing libraries- OpenCV and PIL to recognize the text in scanned receipts and bills. The input receipts were successfully processed to give necessary outputs such as date of transaction, item name and cost of the item. This extracted data was satisfactorily sorted into different categories and was displayed to the user in the form of bar graph as shown below.

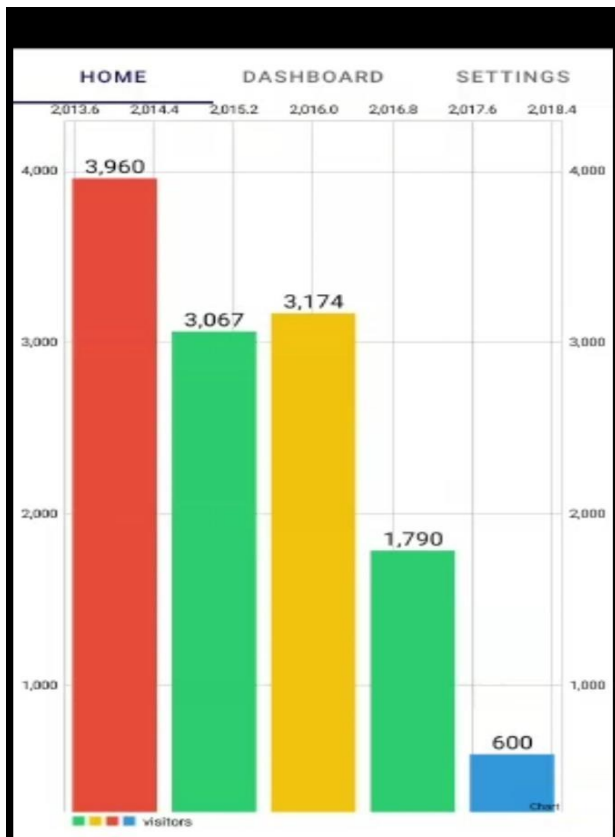


Fig -4 Sorted Items

The above bar graph shows the monthly expenses of a user sorted into their respective categories i.e., 'Food & Dining', 'Transportation', 'Housing', 'Entertainment' and 'Medical' respectively.

The application also displayed the daily expenses of the user and successfully showed the user if the expenses crossed the set limit. The data was displayed in text as well as graphical format as shown below.

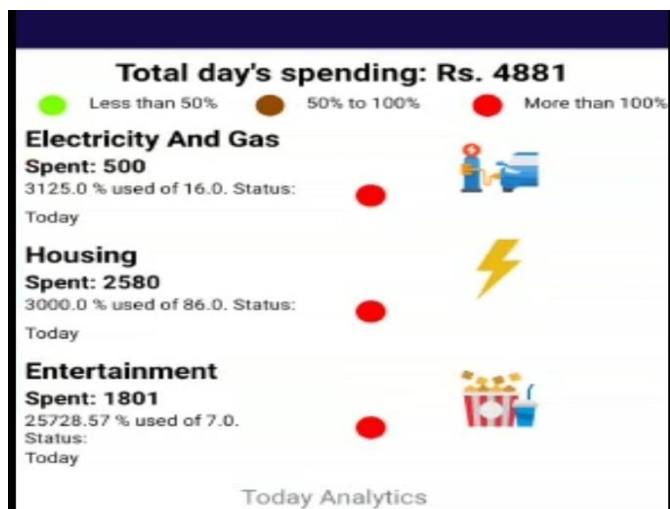


Fig -5 Daily Expenses

The above image shows that the total expense of the user or that particular day was Rs. 4881 which comprised of Rs.500 for electricity and gas, Rs. 2580 for Housing and Rs. 1801 for Entertainment. Here the user has crossed the set limit for the above mentioned three categories which is depicted by small red circle. If the expenses would have been less than 50% of the set limit then it would have been depicted by a green circle on the other hand if the expenses would have been between 50% to 100% of the set limit it would have been depicted as a brown circle. This promisingly helped the user understand his expense pattern and in which category he is spending more which will be used to reduce the expenses in the future.

Graphical representation of the expense data is as shown below: -

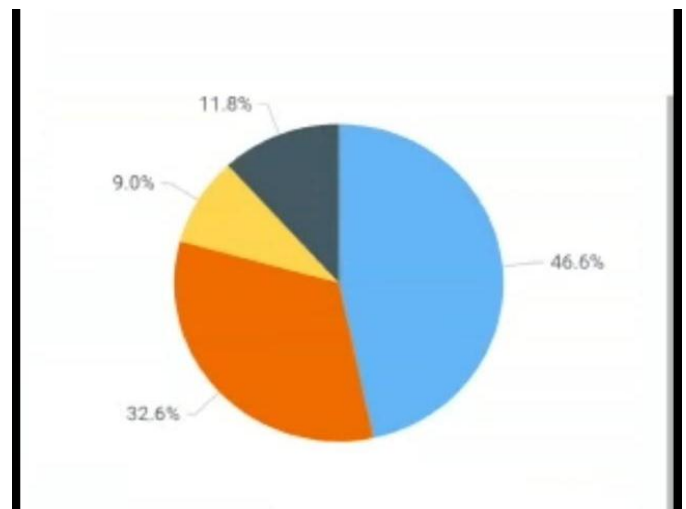
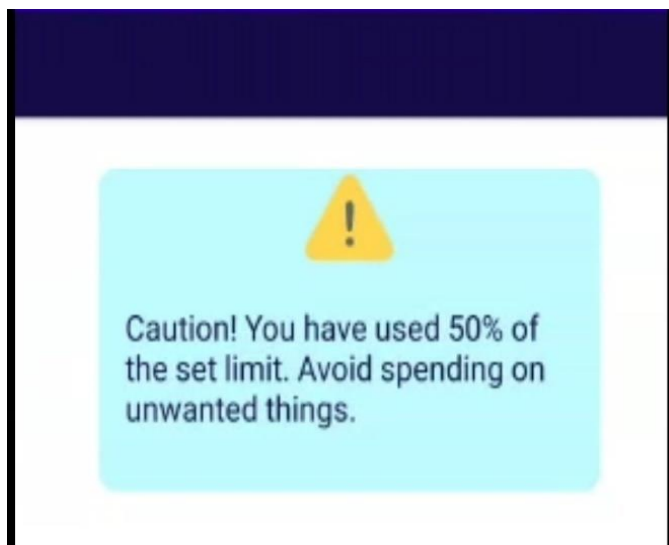


Fig -6 Expenses in each Category by Percentage

The above pie chart displays expenses done by the user in each category converted to percentage. The conclusion that can be derived from the above chart is that maximum expense lies in housing category while minimum lies in medical category i.e., 46.6% and 9% respectively.

The third important feature of the application of giving timely suggestions to the user was also successfully implemented. After analyzing and understanding the expenses and expense pattern of the user for a particular month the application came up with a suggestion for the user. The suggestion was displayed in the suggestions tab as shown below.



**Fig -7** Suggested Message

## 6. CONCLUSION AND FUTURE WORK

We have presented a working prototype of intelligent expense tracker. The development of this application has been conducted in a stepwise manner using the well-defined methodology, customized according to the requirements of the system. This application will successfully help all those people who want to track their expenses to get a better sense of their expenditure thereby promoting savings. The development of this application has been conducted in a stepwise manner using the well-defined methodology, customized according to the requirements of the system. Most of the goals set at the beginning of the development phase have been met. Future work can be like we can integrate this app with any of our credit / debit / cash card & keep track directly from our saving account. Once when we start doing that this will help us to update details automatically rather than updating in manually.

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