# AutoSplit: Split Expenses for You

Lijun Livia Yang

## Executive Summary

### Introduction

It is always a pain when you have to deal with splitting bills after you get back a great road trip. There may be so many transactions that you have to carefully go through your credit card report and write down them one by one. Sure it's easy when you split the cost between yourself and one or two friends, but what happens when you have more than five people in the group?

AutoSplit is a great money-sharing calculation tool that makes splitting money simple and easy. You are free to enter as many participants as you want. The whole process is fast and straightforward. Users can also choose from either user interface (user form or spreadsheet) they feel comfortable with to input information and perform calculation.

### System Overview

After entering the names of the money splitting participants, users can either choose to add transactions through a self-explanatory user form, or add directly on a pre-formatted spreadsheet. There are three built-in buttons under the ribbon 'Expense Calculation'. When users want to add new transaction, start over, or calculate the expense, they can simply click on the corresponding button, and the system will accomplish the functions automatically. The calculation output is a table that clearly demonstrates the money responsibility of each participant.

# Implementation Documentation

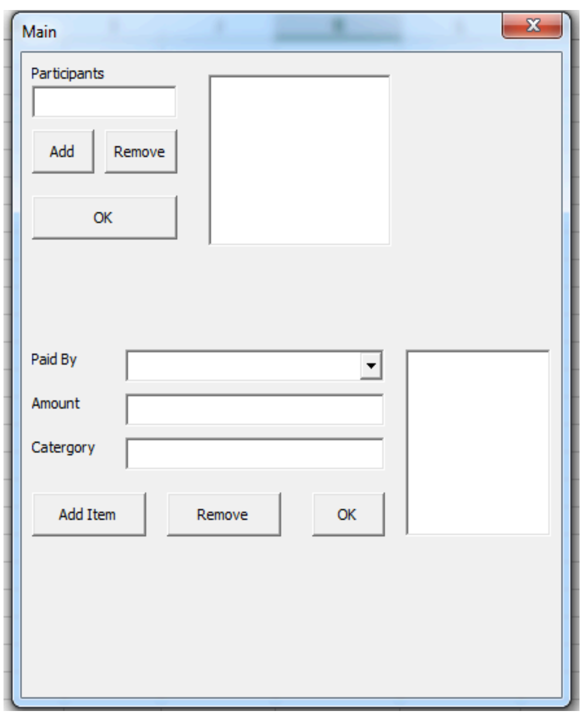
## User Interface

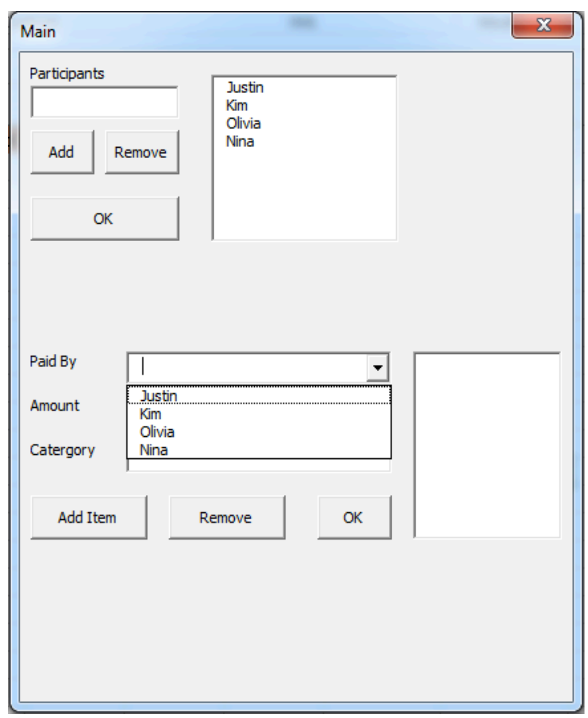
This system includes two user interfaces: user form and spreadsheet.

### User Form

The top section of the user form allows users to enter the participants who paid for the bills. Every time they enter a name and click ‘Add’, the name will be added to the name list on the right. They can also remove a name by select the name in the list box and click ‘Remove’. The name will then be removed from the name list. After users finish entering the names, they can confirm the participant’s list by clicking the OK button.

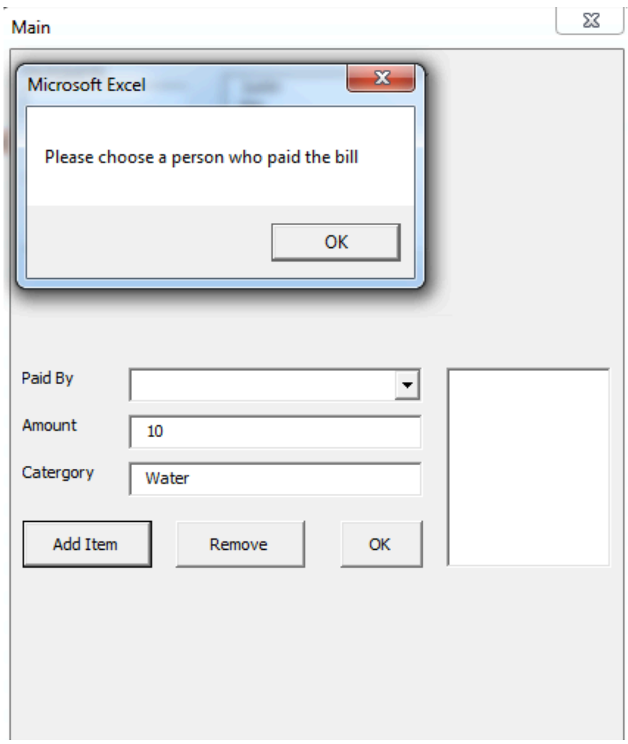
The bottom section of the user form allows users to enter the transactions by choosing the person who paid for the bill, amount of the transaction, and the transaction category. After users confirm the participants, the ‘Paid By’ drop-down box will be automatically filled up with the names of the participants.

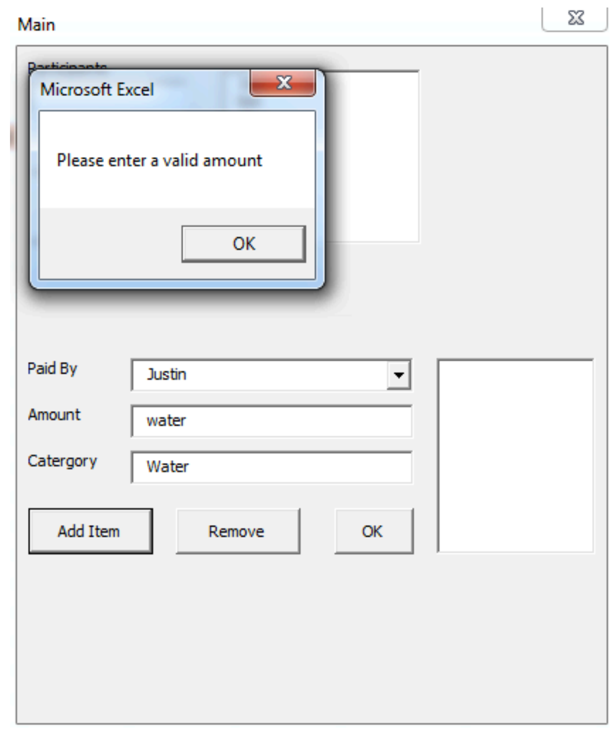


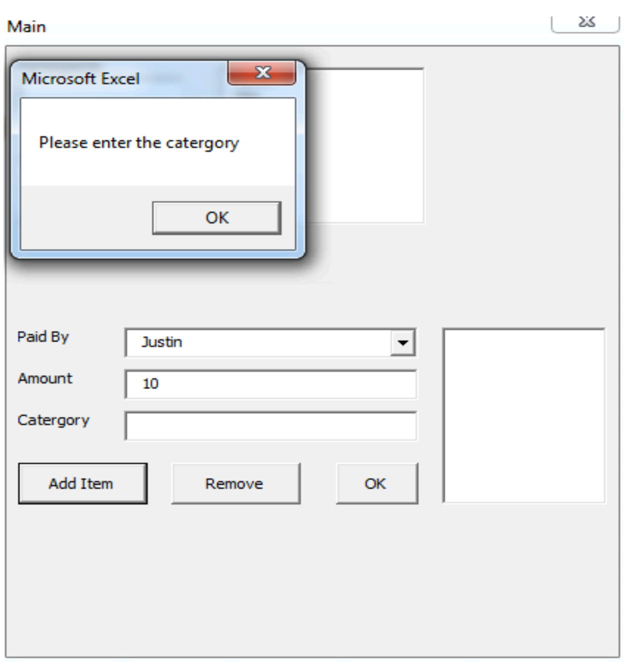



When the button ‘Add Item’ is clicked, the system will validate the name of the payer, amount, and category. An error message will pop up when the following situations occur:

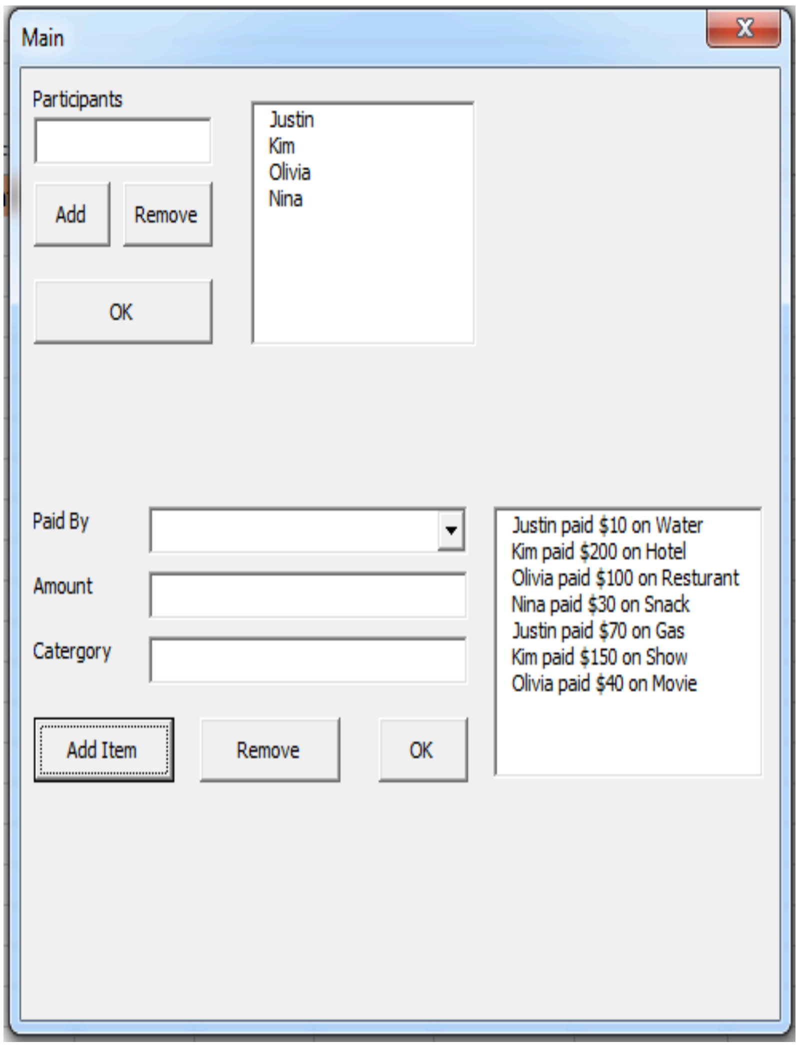
- No payer is selected from the drop-down list
- The amount box is left blank
- A non-numeric value is entered into the amount box
- The category box is left blank



If the data is validated, the transaction will be added to the transaction list to the right. Multiple transactions could be added to the list. To remove an item from the list, users could simply select the item from the list and click the 'Remove' button. When users are done inputting transactions, they can confirm by click the OK button on the bottom right.



## Spreadsheet

The original spreadsheet has a really simple and clear layout. The left part lists out all the transactions, and the right part is designed to summarize the amount paid by each person and his or her amount due.

| Paid By | Amount | Category | | Person | Amount Paid | Should Pay |
|---|---|---|---|---|---|---|
| | | | | | | |

After users confirmed their input of participants and transactions at the user form, the form on the left side of the spreadsheet will be populated with the provided information. The form on the right will show a summary of the amount paid by each participant.

| Paid By | Amount | Category | | Person | Amount Paid | Should Pay |
|---|---|---|---|---|---|---|
| Justin | 10 | Water | | Justin | 270 | |
| Kim | 200 | Hotel | | Kim | 350 | |
| Olivia | 100 | Resturant | | Olivia | 140 | |
| Nina | 30 | Snack | | Nina | 30 | |
| Justin | 70 | Gas | | | | |
| Kim | 150 | Show | | | | |
| Olivia | 40 | Movie | | | | |
| Justin | 190 | Gift | | | | |

## Calculation

There are three built-in buttons under the ribbon ‘Expense Calculation’. They are ‘Calculate Expense’, ‘Clear Contents’, and ‘Add Participants and Expenses’.


## Calculate Expense

For the purpose of simplicity, we assume that all participants are splitting the expense. When the button ‘Calculate Expense’ is clicked, the system will automatically calculate the amount due by subtracting the average share of the total expense from the amount paid. In this case, the total expense is $270+350+140+30=$790, thus everyone should contribute $790/4=$197.5.  Since Olivia already paid $140, now she only owed $197.5-$140=$57.5 dollars. When the ‘Should Pay’ is negative, it means that the persons should pay a certain amount of money to others.  They are the payers. When it is positive, it means that the persons should receive money from others. They are the receivers.

In order to simplify the calculation process, the receivers are listed on the columns and the payers are listed on the rows.  I went through a while to distribute the amount of money that payer owe to the receivers. For example, Olivia should pay $57.5 and Justin should receive $72.5, which is more than everything Olivia owed. As a result, Olivia should pay $57.5 to Justin and let Nina pay the rest to Justin, which is $72.5-$57.5=$15. Now that Justin is paid off, Nina needs to move on to pay Kim $167.5-$15=$152.5. By looping through processes like this, the system will be able to calculate the expense distribution of a large group of participants. Technically, there is no number limit, meaning that users can split expenses among as many participants as they need.

| Person | Amount Paid | Should Pay |
|---|---|---|
| Justin | 270 | 72.5 |
| Kim | 350 | 152.5 |
| Olivia | 140 | -57.5 |
| Nina | 30 | -167.5 |

| | Justin | Kim |
|---|---|---|
| Olivia | 57.5 | |
| Nina | 15 | 152.5 |

### Clear Contents

Start over is as easy as just clicking on the 'Clear Contents'. Everything except for the column names and the default format will be wiped out and ready for restart.

### Add Participants and Expenses

There are two ways to add participants and expenses. One is to click on the 'Add Participants and Expenses' button. It will bring up the main user form. Users can enter information about the new participant and add new transaction by following the steps explained above.

Users who feel more comfortable directly working on spreadsheets don't need to access to the user form every time they want to add new participants or transaction. They can simply type in the information under the pre-designed form. The expense calculation would work either way.

## Learning and Conceptual Difficulties

I had some experience programming with Java before I took this VBA class. I was one of those programmers who sometimes feel reluctant to seek for help from others. Internet could be really helpful with most syntax questions, but not with logic problems.

I was stuck at the logic of the expense calculation part when I was working on this project. I was going to use two dynamic array, one for payers and one for receivers. However, looping through each dynamic array and comparing the values of each item are not only complicated, but also confusing. After spending two nights trying all kinds of possible solutions, I still could not get the code to work. Since the expected working hour for this project is 40 hours, I didn't want to waste more time on the same problem. And I couldn't move forward without the key part of my codes working. So I decided to ask some of the classmate from the VBA class and Dr. Allen for help. Their suggestions totally opened up my mind.

From this experience, I learned that even though many people define programmers as those people who always work alone, communication does improve the effectiveness and efficiency in the computer science area. We all have different talents, and unique perspectives of how things work. Coloration enables people to share skills and knowledge, which then strengthens a group.

### Optional Function for Future Development

The current user form is functional, but far from being perfect. I was going to add some extra features so that users can remove multiple participants and transaction at one time. One bug of my system is that users need to make sure the spreadsheet is cleared before they start adding items on the user form, otherwise, the newly entered items will just be populated under the existing ones. These are small bugs that could be modified in the future.

## Assistance

I received no assistance in writing the code of this project. I encountered one logic problem and consulted with some classmates from the VBA class and Dr.Allen. Dr.Allen went through the logic with me, but I wrote up the code all by myself.