**General Project Report**

Hello! My name is Charlie Comeau (龚成荫), and I am a second-year Computer Science major from Georgia Tech in Atlanta, Georgia, United States who is currently exchanging at Tsinghua University in Beijing for one year. For my Fall 2019 C++ Programming class final, I have decided to create a budget.

**Problem Introduction:**

The world is a magnificently large, diverse, and complicated place. As an exchange student from America at Tsinghua University, this semester I have had the pleasure (and the burden) of experiencing what exactly that really means. However, I have also had the pleasure of discovering that there are more things that unite us than divide us. While food comes at a close second – in my opinion, money and what it can buy commands the most care and attention of everyone I have met both here and at home.

On a macro level, money is an unspoken yet easily understood idea that transcends all languages, political borders, ethnicities, and backgrounds. It is one of the most powerful motivations known to man, and its importance to our society is like that of water to agriculture. Just like how plants need water to live, humans need money to purchase and fulfill their own needs. In short, the importance of money simply cannot be overstated in today’s world.

However, many people still struggle with money. For a country that proudly defines itself as the richest nation in the world, a surprising 49% of Americans currently live paycheck-to-paycheck with no money left over after spending for savings. In other words, about half of America is just one unlucky emergency away from serious debt. Among the young adult population, those figures are even worse and hover around 70%. Additionally, on a personal level, many of my friends are unfortunately the human representation of these money-tight statistics.

On the other hand, China has had a remarkable and an unprecedented economic growth within only a few generations, managing to increase their GDP by about 44,500% in the past 60 years. Clearly, money is and has been on both country’s minds. While the causes of both these figures are quite fascinating and heavily debatable, I believe they reinforce that the importance of managing money also cannot be overstated and there exists a massive and statistically significant need for this skill. Therefore, I would like to design an online budget through C++ for my final project.

As aforementioned, young adults (such as college students) are part of the statistically worst group about money. As a result, there exists a wealth of resources online designed to help students budget their money. Even though my program will most likely pale in comparison to theirs, it is my hope that I can help someone (such as myself) be smarter about how they choose to spend their money.

**Reason of Project Creation:**

On a personal level, this will be a more advanced version of what I have done for myself in Excel Spreadsheets this past summer while traveling in Europe. After a few very costly mistakes in the very beginning, I learned the hard way that Europe is much more expensive than America, and thus enormously more expensive than China. Out of self-anger and frustration, I chose to implement a basic budget for myself in order to keep a better track of my finances and be smarter with my money. However as a student, I did not have an after-tax income, therefore the goal of my Excel spreadsheets were not to budget using an externally fixed amount of funds, but to help me set reasonable expectations for various spending categories and to maximize my money in an expensive environment.

Another note I would like to address is the cost of tuition in America. Whereas the cost of college in China (and throughout much of the rest of the world) is largely subsidized by the gov’t, American college tuition is exorbitantly high. For many students (me included), the college we choose to go to is more determined by tuition price rather than our own capability and where we got admitted. For example, I had one classmate in high school who got into the prestigious and private University of Chicago, but in the end settled for a local community college because she couldn’t pay U-Chicago’s steep tuition. Additionally, even after entering college, many students also must also face the financial burden of their tuition. My high school history teacher often told us his college story of being a double history major while also working 3 jobs to pay for his tuition (He says at age 60 he is still catching up on lost sleep from college). My stepfather graduated college with over $100,000 in student loan debt, and it took him over 15 years of extremely frugal living off an ~$80,000 salary (Top ~20-30% of America) to pay it off completely. And where I am lucky to qualify for an in-state scholarship at Georgia Tech, many of my friends who came from out-of-state are not. The top of the desk of one of my hardest working classmates has a piece of paper with only the number $49,513 written largely across it, to remind himself how much it costs for one year for him to study at college and help him focus on his work. I cannot speak for the general, average financial details of being a college student in China, but I know that in America, the finances of college often defeat students faster than the actual academic work.

**Big Picture Blueprint**

To begin with, my budget uses the following simplifying assumptions.

1) Spending Events/Type can be broken down into 3 categories: FIXED, VARIABLE, and SAVINGS.

-Fixed Spendings stem from buying necessities and rent to cost about the same each month, such as rent, mortgage, car payments, taxes, college tuition, loans, food, and insurance.

-Variable spendings stem from purchases that are either infrequent, for non-necessities, or of unpredictable costs such as eating out, going out, car repairs, house repairs, gifts, traveling, and “fun money.”

-Savings stem from money left over after accounting for Fixed and Variable spendings. When major emergencies, unexpected events, or large spending events happen, such as a medical accident, family emergency, car accident, paying for college, vacations, etc., we pull out the extra money needed to pay from our savings. Savings is the most important part of a budget, but also the hardest part to do.

2) For our budget, savings is not just money left over after fixed and variable savings. We believe savings is and should be a deliberate act, thus we allow you to "set aside" money for savings and cannot be further used for other purposes. Because savings is the hardest part of following a budget, we believe that making it a deliberate act will help our user achieve their monetary goals.

3) The default settings of our budget follow the 50/30/20 rule - the most popular proportion for each aforementioned spending category. That is to devote 50% to fixed costs, 30% to variable costs, and 20% for savings

4) For percentages and monetary amounts, we automatically round all input and output to the nearest hundredth. However, for calculations that require more precision such as foreign exchange, we do not round until after the initial calculation. As a result, conditional spending amounts and multiple foreign exchange changes may be off by a hundredth of a percent or one monetary cent.

5) This budget is a budget for one calendar month; thus, all spending events should happen within that month.

6) This budget accounts for money left over AFTER TAX, or after-tax income.

7) This budget assumes that all events within the budget are of the same currency.

The budget is made up of multiple spending events, for which the user has control over both of them.

For the budget itself, the user determines the overall currency, the month, the total after-tax income, and the three percentages for each spending category that collectively sum to 100, and whose default is 50/30/20.

From there, for the events themselves the user then determines the date, the spending type, the amount spent, a name, and if needed a note. The user can input as many events in as they desire.

After the user finishes their initial event input, they now reach the modification stage, where they can still modify both event and budget data, and additionally add new events or delete existing ones. Specifically, they can add an additional event, delete an existing one, change an existing event’s monetary amount, spending type, name, and note, change the budget’s 3 conditional percentages, total after-tax income, and change the currency used (foreign exchange – for-ex conversion). They can continue in this modification stage for as long as they would like.

Some nice, automatic features about this program are its calculations. From the user-inputted after-tax income and 3 conditional percentages, the program can then calculate how much of the total after-tax income should be allocated to each spending category. For example, if my after-tax income is $3,000 and my percentages are the default 50/30/20, then the program will calculate that 3000 \* .50 = $1500 are allocated for fixed spendings, 3000 \* .30 = $900 are allocated for variable spendings, and 3000 \* .20 = $600 are allocated for savings.

After every new input or data change, the program automatically calculates for each category, how much many has been spent and how much money is still left, and its corresponding conditional percentage. From the previous example, if I choose to spend $100 on a fixed spending, then my total current fixed cost spending is $100, and I have $1400 left to spend for fixed costs. I have spent 100 / 1500 = 6.66666% => 6.67% (round to nearest hundredth) of my total money allocated for fixed spendings, and I have 1400 / 1500 = 93.33% of my fixed spending money still left to spend.

Additionally, the program calculates the total amount and percentages for how much money has been spent and how much money is still left in total. Building again from the previous example, if I spend $50 on a variable spending, then I have spent 100 + 50 = $150 in total and have 3000 – 150 = $2850 left to spend. I have spent 150 / 3000 = 5% of my total after-tax income and have 2850 / 3000 = 95% of my total after-tax income to spend.

My favorite function of the program is the for-ex operation, where using a few exchange rates found online, one can convert their budget freely between US Dollars, Chinese Renminbi, Euros, and British Pounds. None of the conditional percentages are modified as the relative amounts do not change, but all the monetary amounts themselves are modified based on the corresponding exchange rate.

During the modification phase, when an event amount, type, or the budget after-tax income, currency, or 3 conditional percentages are modified, all the conditional and total calculations are updated accordingly.