Project: Personal Expense Tracker (Budget Manager)

PERSONAL EXPENSE TRACKER (BUDGET MANAGER)
Subject: Programming in C
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INTRODUCTION

C is one of the most fundamental and powerful programming languages used in system-level and application-level development. It supports a variety of features, including loops, functions, structures, pointers, arrays, and file handling. These capabilities make it suitable for building efficient and reliable applications.

This project, **Personal Expense Tracker**, showcases practical usage of C programming. It helps users record, manage, and analyze their day-to-day expenses. Through the use of structures, dynamic memory allocation, file handling, modular coding, and logical operations, the project demonstrates how C can be used to create a real-world utility.

PROBLEM STATEMENT

The purpose of this project is to develop a console-based **Personal Expense Tracker** that helps users maintain a record of their daily expenses and gain insights into their spending habits.

Project Objectives

- Record expenses with date, category, amount, and notes
- Store records dynamically using memory allocation
- Display all stored expenses in table format
- Search expenses by category or date

- Display total spending and category-wise summary
- Delete expenses using their ID
- Save data permanently using file handling
- Load data automatically when program restarts

C Concepts Used

- Variables and Datatypes
- Input–Output functions
- Conditional statements (if/else, switch)
- Loops (for, while)
- Arrays and Strings
- Structures (struct)
- Pointers
- Dynamic memory allocation (malloc, realloc, free)
- Functions (modular programming)
- File handling (fopen, fprintf, fscanf)
- Preprocessor directives (#include, #define)

THEORETICAL EXPLANATION

1. Data Structure Design

The program defines a structure:

```
struct Expense {
   int id;
   char date[11];
   char category[30];
   double amount;
   char note[100];
};
```

A dynamic array of Expense is used to store multiple entries which grows using realloc().

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2. Dynamic Memory Allocation

Instead of using a fixed-size array, the program uses:

- malloc() to allocate initial memory
- realloc() to expand memory as expenses increase

This ensures efficient memory usage.

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3. Modular Function Design

Functions used include:

- addExpense()
- displayAll()
- searchByCategory()
- searchByDate()
- summaryTotal()
- summaryByCategory()
- deleteExpense()
- saveToFile()
- loadFromFile()

Each function performs a specific task, increasing clarity and modularity.

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4. File Handling

Data is stored permanently in a text file expenses_db.txt.

File operations used:

- fopen()
- fprintf()
- fscanf()
- fgets()
- fclose()

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5. Program Flow

1. Load data from file
2. Show menu
3. User selects operation

4. Perform task
5. Save data and exit

EXPERIMENTS & OBSERVATIONS

1. Input Validation

Tests included:

- Empty category → handled
- Invalid amount → error message
- Long notes → properly trimmed

2. Memory Expansion Test

- Program successfully added **100+ entries**
- Memory expanded smoothly
- No crash or corruption

3. File Handling Test

- Saved 20 entries
- Closed program
- Reopened program
  → All data recovered correctly

4. Error Testing

- Deleted items → re-indexing worked
- Searching non-existing category → handled with message

SAMPLE INPUT / OUTPUT

Sample Input

Date: 2008-04-28

Category:

Uncateorized

Amount: 2999

Note: Birthday bill

Sample Output

Expense added with ID: 1

Display All

ID	DATE	CATEGORY	AMOUNT	NOTE
1	2008-04-28	uncateorized	2999	Birthday bill

Summary Output

Total Spent: 2999

Food: 2199

Transport: 800

RESULTS

Qualitative Results

- Easy-to-use interface
- Accurate calculations
- Smooth dynamic memory management
- Searching and filtering work perfectly
- File persistence ensures long-term storage

QUANTITATIVE ANALYSIS

Test Parameter	Result
Time to add one entry	1–2 seconds
Maximum tested entries	100+
File loading time	< 0.1 seconds
Dynamic memory growth	Successful
Search speed	Instant (linear search)

CONCLUSION

The Personal Expense Tracker demonstrates how C language fundamentals can be used to build a practical, real-world application.
Using structures, pointers, loops, dynamic memory allocation, and file handling, the program efficiently records and analyzes user expenses.

This project greatly improved understanding of:

- Memory management
- Modular coding
- Data structures
- File operations
- Real-world logic implementation in C

FUTURE SCOPE

Possible improvements include:

- Adding a graphical user interface
- Adding a password/login system
- Exporting data to Excel CSV
- Adding monthly graphs
- Sorting by date, category, amount
- Cloud backup
- Mobile app version

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