2022 Spring CPSC 240
Practice Exercise 3: Property Tax Assessor

Preface

This programming exercise introduces arrays. Here we learn how to pass arrays from one function to another. By doing this exercise you will learn about the nature of arrays in memory.

Program specification

Make a hybrid program that satisfies the requirements on the following pages.

Notice that we are making hybrid programs using three programming languages. In a hybrid program we can use any mix of source code from any programming language provide there is a real compiler for that language.   A real compiler produces an object file which can be linked to form a larger executable file.

Languages like Java, C Sharp, and Python are interpreted languages. Their translators do not produce a linkable object file.

We use X86 because it is the main focus of this course.
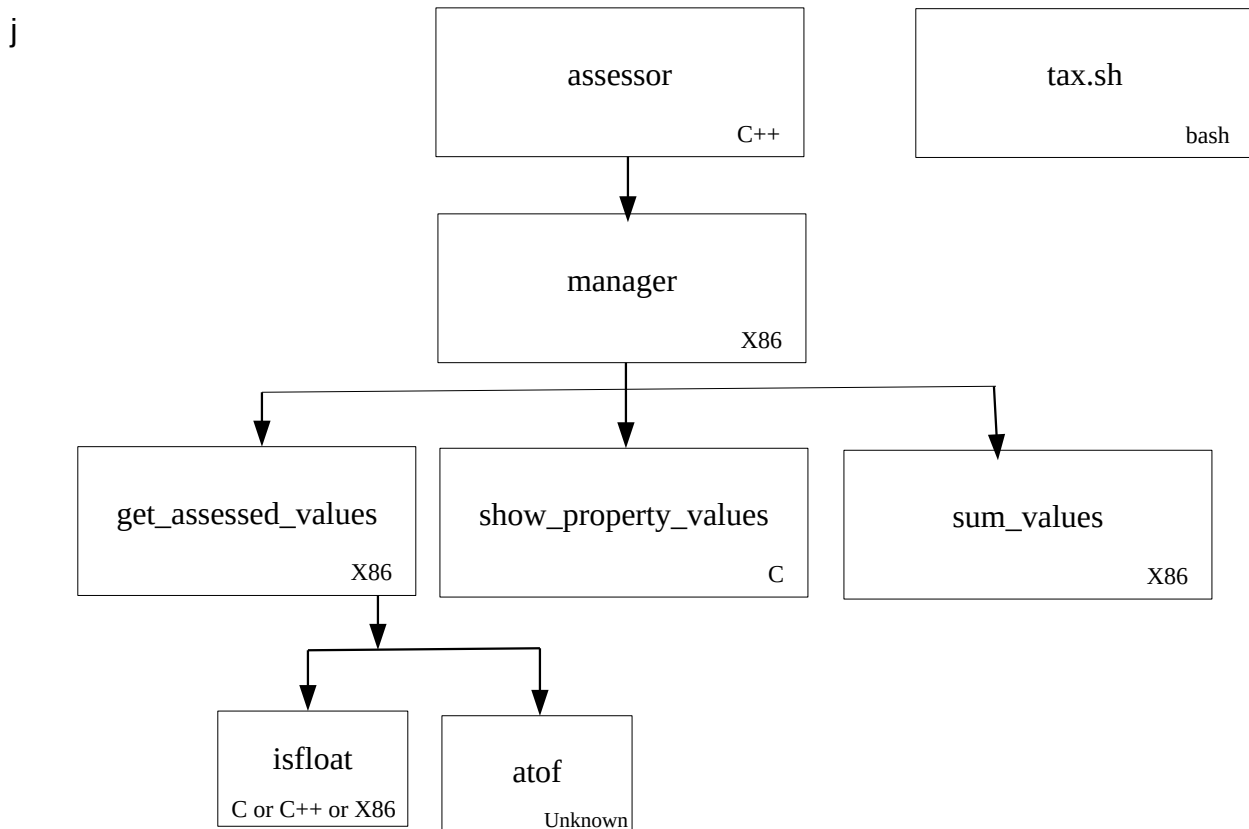We use C++ because you all experts in C++.
We use C because it is a very close cousin of C++ and does not require much learning time to make a basic program in that language.

Context

In this county the OC Tax Assessor performs the duty of assessing real estate and collecting taxes based on each property's assessed value. We will assume that the data are values of property in a specific tax district of OC. The assessor wants the total assessed value of all the property in a given district. Property type ranges from empty lots to tall office buildings. Let's go.

Functional relationships

This diagram shows which functions call which other functions.

j

```
┌─────────────────────────┐          ┌─────────────────────────┐
│        assessor         │          │         tax.sh          │
│                  C++    │          │                  bash   │
└─────────────────────────┘          └─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│        manager          │
│                  X86    │
└─────────────────────────┘
      │      │      │
      ▼      ▼      ▼
┌──────────────────┐ ┌──────────────────────┐ ┌──────────────────┐
│get_assessed_values│ │ show_property_values │ │    sum_values    │
│            X86   │ │                 C    │ │            X86   │
└──────────────────┘ └──────────────────────┘ └──────────────────┘
      │
      ▼
  ┌────────┐  ┌────────┐
  │ isfloat│  │  atof  │
  │C or C++│  │Unknown │
  │ or X86 │  │        │
  └────────┘  └────────┘
```

Assumptions

Everyone knows the 6 characters in the set called white space.

The root of the calling tree, sometimes called driver, does not participate in the solution of the problem. Well, perhaps the starting function does display some informative greeting, but that is the extent of its involvement.

Everyone knows how to display the current date from C++.

Sample dialog with the user of the program with valid inputs.

Welcome to the Orange County Property Assessment Office on February 28, 2022
For assistance contact Miguel Torres at miguelgrande@premier.com

Please enter your name and press enter: Chris Sawyer
Please enter your title: Roller Coaster Expert
Thank you Chris Sawyer.

Next we will collect the property values in your assessment district. Between each value enter while space. When finished entering values press <enter> followed by control+D.

250800.75   99500.06
109500.55   1000000.99
9398.60
1250690.54
88888.90   <==<enter> was pressed here
                                <==Cntl+D was entered here

Thank you. Here are the assessed property values in this district.

        250800.75
         99500.06
        109500.55
       1000000.99
          9398.60
       1250690.54
         88888.90

The sum of assessed values is $2808780.39.
The mean assessed value is $401254.341428

The mean will now be returned to the caller function.
We enjoy serving everyone who is a Roller Coaster Expert.

The Assessor's Office received this number 401254.34 and will keep it.
Next an integer 0 will be sent to the operating system as a signal of successful completion.

Color codes
Yellow: start function
Green: X86
Blue: keyboard (stdin)

Replace Miguel's name with your own name.

Get the date from the operating system.

Sample dialog with the user of the program with an invalid input.

Welcome to the Orange County Property Assessment Office on February 28, 2022
For assistance contact Miguel Torres at miguelgrande@premier.com

Please enter your name and press enter: George Foreman
Please enter your title: Tax Auditor
Thank you George Foreman.

Next we will collect the property values in your assessment district. Between each value enter while space. When finished entering values press <enter> followed by control+D.

890550.00
296511.50
559330.95
199.657.88
Invalid input   <==<enter> was pressed here
                                 <==Cntl+D was entered here

Thank you. The data input set was corrupted. Please run this program again.

The sum of assessed values is $0.00
The mean assessed value is $0.0000

The mean will now be returned to the caller function.
We enjoy serving everyone who is a Tax Auditor.

The Assessor's Office received this number 0.00 and will keep it.
Next an integer 0 will be sent to the operating system as a signal of successful completion.

Comments

When the first invalid input is received then the action of further inputs is stopped. The program terminates gracefully.

Types of invalid inputs
34W8.65   <==Non-digit
543.67.80   <==Too many decimal points
9800   <==Lack of decimal point
56.9+458   <==Non-digit encountered.
++8000.00   <==Too many leading signs. One sign is acceptable, but not two.
19500+   <==No postfix signs allowed
(657)278-3700   <==No phone numbers

Optional alternate method of handling invalid inputs

This method does not ask the user to restart the program but simply discards the invalid inputs and continues processing the remaining data. Here is a sample dialog

Welcome to the Orange County Property Assessment Office on February 28, 2022
For assistance contact Miguel Torres at miguelgrande@premier.com

Please enter your name and press enter: Grace Hooper
Please enter your title: Rear Admiral
Thank you Grace Hooper.

Next we will collect the property values in your assessment district. Between each value enter while space. When finished entering values press <enter> followed by control+D.

200500.66
450.444.51
+230599.99
888W51.50
1000000.99   <==<enter> was pressed here
                               <==Cntl+D was entered here

Thank you. Here are the assessed property values in this district.

    200500.66
    230599.99
   1000000.99

The sum of assessed values is $1431101.64.
The mean assessed value is $477033.8800.

The mean will now be returned to the caller function.
We enjoy serving everyone who is a Read Admiral.

The Assessor's Office received this number 401254.34 and will keep it.
Next an integer 0 will be sent to the operating system as a signal of successful completion.

This shows an alternate method of handling invalid inputs. In this case the invalid numbers are simply discarded and the program continues.

For practice program #3 you choose how you wish to handle invalid inputs. Either technique is fine with the instructor.

Submission of completed program for feedback

You are invited to submit a copy of your program for evaluation by the instructor. Send the source files as attachments to an email message sent to holliday@fullerton.edu. We will discover if your program attains "Professional Certification". If the program reaches professional level then it qualifies to be saved in your portfolio.

Obtaining help to remove bugs from practice programs.

In this case you would like assistance in real time. Placing your request for debug help in the professor's work queue is too slow. For a response in reasonable time post a copy of the block causing the bug along with the output generated when the bug occurs in Discord. Ask if anyone knows how to fix it.

Try sending a copy of the source file and the generated error message to Johnson, or Daniel, or Sam. All three are assembly experts. The email addresses of two of them are posted in the class website. The email address of the third person is probably posted in Discord.

There are many opportunities to obtain assistance with reasonably quick turn around.

Timeline

March 8, 2022 @ 11:59pm

If you complete this practice program by the date given above then you are making normal progress in this class.

Calendar

Practice program #1:   Feb 8
Practice program #2   Feb 22
Practice program #3   Mar 8

Midterm on concepts: Mar 23 (Wed) or Mar 24 (Thur)

Class meetings   Apr 4 and 5:
Lecture on software construction: modularity, readability, cohesiveness, coupling, targeted audience, legal issues, proprietary vs open.

Midterm on programming Apr 6 (Wed) or Apr 7(Thur)

Practice program #4   Apr 15

View the colors

If you cannot see the colors or the diagram appears distorted then you need better software for viewing documents. Yes, google docs is a great place to view and edit documents, but on test day you may want quicker access to your docs. Consider Libre Office.

Software. This document was created by "Libre Office Writer" word processor and saved in the open source format known as "odt". You may obtain a free copy of Libre Office here: https://www.libreoffice.org/download/download/ . There are versions available for Macs, Windows, and Linux.

Libre Office will display colors and diagrams correctly.