Loan Calculator - User Manual & Technical Guide

Requirements

Develop a small application, i.e. a graphical user interface with the necessary associated processing which implements and demonstrates loan repayment schedules using the Equal Total Payments method. The application should, in general, work as follows:

- The user inputs in the screen their choice of loan amount, annual interest rate, loan period (in months or years).

- Upon submission of the previous items, the application performs the necessary calculations according to the input data and presents to the screen the loan amortization schedule

Overview

The application is designed to compute the amortization schedule for loans based on the above user requirements supplied.

It uses the Equal Total Payments calculation method which is commonly used for most loans from financial institutions such as, home mortgage loans, car loans and consumer installment loans. When this method is used, each payment includes the accrued interest on the unpaid balance, plus some of the principal. The amount applied toward the principal increases with each payment.

Declarations

A = Amount of Loan

N = Number of loan periods

Rn = Interest rate applicable for payment in period n

INT_n = interest due in period n

PP_n = principal portion due in period n

OB_n = outstanding balance due after period n

$Payment_n$ = amount of the loan to be paid in period n

Formulas

$Payment_n = (R_n \times A) / (1-(1+R_n)^{-N})$

Principal Amount Paid $(PP_n) = Payment_n \times (1+R_n)^{-(1+N-n)}$

Interest Amount Paid $(INT_n) = Payment_n - PP_n$

Loan Outstanding Balance $OB_n = (INT_n/R_n) - PP_n$

System Requirements (Hardware/Software)

The application is a Microsoft Windows desktop application which runs on any modern desktop or server computer running a recent version of the Windows operating system such as Windows 7/8/10 etc.

Any hardware configuration running on Intel or AMD processors can be used with 1GIG or more of memory. The application is very lightweight and does not require extensive system resources.

The Microsoft .Net Framework 4.6 or later distributable is required since the application is written in Visual Studio 2017, this framework is normally installed on most Microsoft Windows machines by default but it can be downloaded from the following Microsoft link if not present.

https://msdn.microsoft.com/en-us/library/5a4x27ek(v=vs.110).aspx

Application Code Design

The application is designed using C# which is part of the Microsoft Visual Studio 2017 Community Edition development suite. It does not require any additional software libraries or third party add-ons as it is built with standard Visual Studio components. This platform was chosen since I am familiar with using the C# language for application development on Windows.

The project type chosen from Visual Studio is a Visual C#, Windows Form application template which generates several files, most of which are set to the default settings. The design is based on a main Windows form which contains several input text fields, label fields for field descriptions, a listview control which shows the amortization schedule for the various periods, and two button controls which are used to trigger actions such as calculations or resetting fields. Here is the process listed below.

Steps

1. Get User Input (Loan Amount, Interest Rate, Period)
2. Validate that the above information was entered and that it is correct
3. Perform Calculations (Payment Amount, Principal Paid, Interest Paid, Loan Balance)
4. Output Loan Amortization Schedule and Payment Summary to Screen

Here is a list of key source code files and their purpose.

Filename	Description
App.config	Application configuration file
LoanCalculator.csproj	C# Project file – main project file which contains listing of files used
LoanCalculator.sln	Visual Studio Solution file, it contains text-based information about the project environment and project state
MainForm.cs	Main form C# code with methods
MainForm.Designer.cs	Main form designer layout for screen
Program.cs	Project C# code with methods - The main entry point for the application

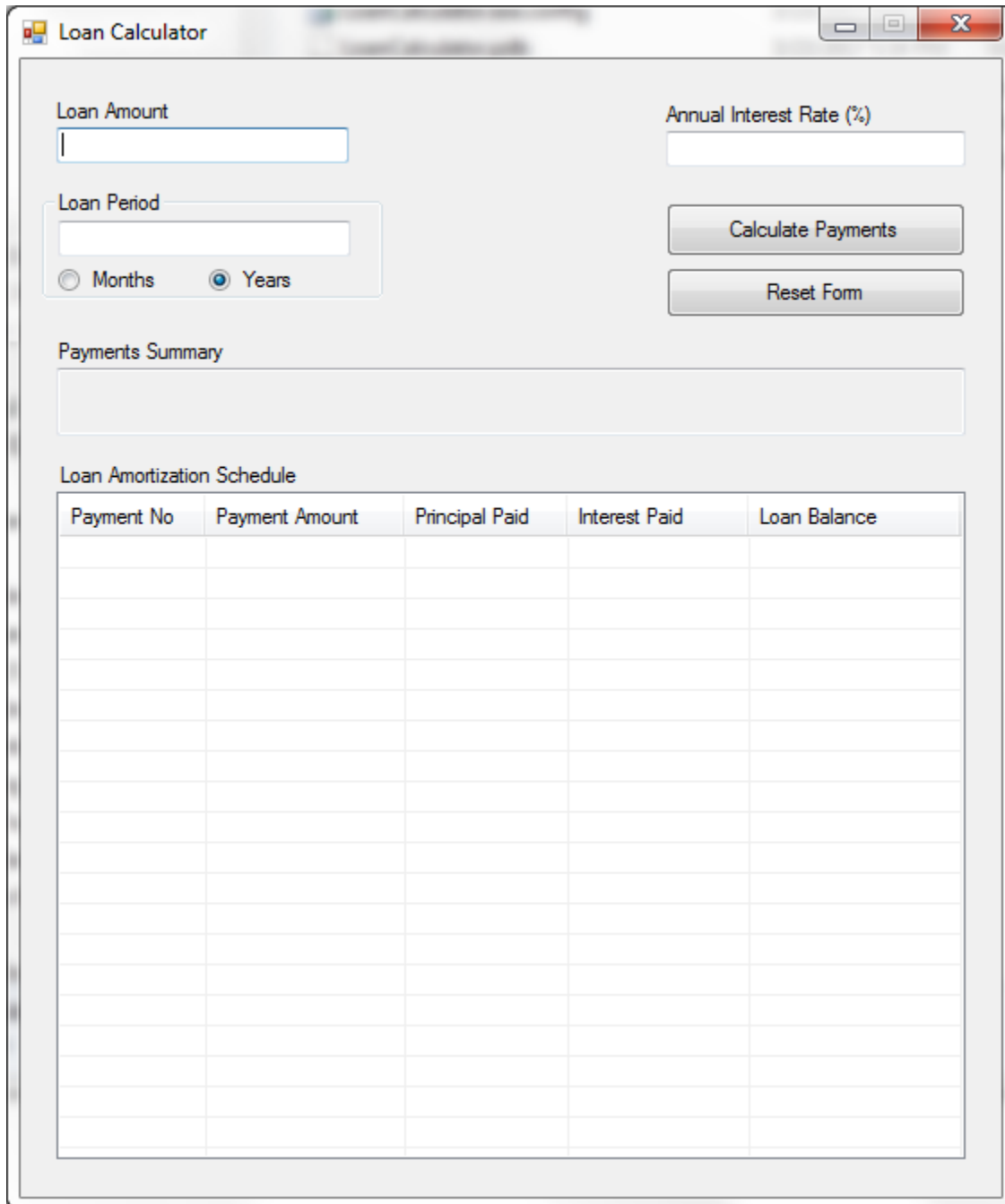Here is a list of key methods used by the application.

Method Name	Description	Source Code File
CalculateLoanSchedule	Calculates the Loan Amortization Schedule using the formulas provided in the Equal Total Payments section and output results to screen	MainForm.cs
ResetForm	Clear all information entered on screen so that a new loan can be entered	MainForm.cs

N.B. There is also documentation embedded within the C# source code files (.cs)

Using the Application

Here is the initial blank screen which appears on startup.

Figure 1

To use the application, you simply enter data into the following required fields:

1. Loan Amount
2. Annual Interest Rate
3. Loan Period (Month or Years)

See example screen below.

Figure 2

There are two buttons on the screen which are used to perform the following tasks when clicked on:

Calculate Payments - This option computes the loan amortization schedule and updates the screen as shown below.

Figure 3

Loan Calculator

Loan Amount
125000

Annual Interest Rate (%)
8

Loan Period
25

○ Months   ● Years

Calculate Payments

Reset Form

Payments Summary
The monthly payments will be 964.77 for loan amount 125,000.00 at 8% for 25 years. The total number of periods are 300 and the total amount repaid will be 289,431.00.

Loan Amortization Schedule

Payment No	Payment Amount	Principal Paid	Interest Paid	Loan Balance
1	964.77	131.44	833.33	124,868.53
2	964.77	132.31	832.46	124,736.21
3	964.77	133.20	831.57	124,603.02
4	964.77	134.08	830.69	124,468.94
5	964.77	134.98	829.79	124,333.96
6	964.77	135.88	828.89	124,198.08
7	964.77	136.78	827.99	124,061.30
8	964.77	137.69	827.08	123,923.60
9	964.77	138.61	826.16	123,784.99
10	964.77	139.54	825.23	123,645.46
11	964.77	140.47	824.30	123,504.99
12	964.77	141.40	823.37	123,363.58
13	964.77	142.35	822.42	123,221.24
14	964.77	143.30	821.47	123,077.94
15	964.77	144.25	820.52	122,933.69
16	964.77	145.21	819.56	122,788.48
17	964.77	146.18	818.59	122,642.30
18	964.77	147.15	817.62	122,495.15
19	964.77	148.14	816.63	122,347.01

Reset Form – This option is used to enter new information after a previous calculation was performed and it clears all onscreen information ie. all input fields on the screen. This results in a blank form similar to what is shown in Figure 1 earlier.