

Acknowledgement

The internship opportunity I had with BCAS campus was a great chance for learning and professional development. Therefore I consider myself as a very lucky individual as I was provided with an opportunity to be a part of it. I am also grateful for having chance to meet so many wonderful people and professionals who led me through this internship period.

I express my deepest thanks to the assessor Mr. Mohamed Nizzad, who works as an IT professional and take lectures on computer programming related subjects and others supportive subjects. He helped me taking part in useful decision & giving necessary advices and guidance and arrange all facilities for this assignment. I choose this moment to acknowledge his contribution gratefully. I acknowledge that this assignment was done with help of internet resources.

Sincerely,
S.SHALOMSHAN
Date:01.01.2021

Introduction

The primary purpose of this assignment is to give deep brief explanation about the programming concept. This assignment points out some most important essential fundamentals about computer programming. Its also focuses on computer programming paradigms and the other required tools for programming such as IDE and more.

This assignment includes two tasks. Each task has two sub tasks. All of the requirements of this assignment have been done in a perfect manner. The task one is mainly focused on the basic idea of computer programming such as algorithms, Pseudocodes, flowchart and basic of C# programming. It has to be done as a 15 minutes' presentation. And it also focuses on algorithms which can be used to test a prime number.

The one of the requirements of the task two is to explain the computer programming paradigms such as procedural, object oriented and event driven programming. It has to be also contained the brief explanation of them in a good manner. It's another requirement of this task is to produce a report that analyze the common features of IDE. And it has to be included information about the modern well-used IDE's and its features.

The more details about each task has been explained in their own introduction section. This main introduction is only giving the basement idea of the assignment.

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Task 1 (Presentation Speaker Notes)

Definition Of Algorithm

What is a algorithm?

To write a logical step-by-step method to solve the problem is called algorithm, in other words, an algorithm is a procedure for solving problems. In order to solve a mathematical or computer problem, this is the first step of the procedure. An algorithm includes calculations, reasoning and data processing. Algorithms can be presented by natural languages, pseudo code and flowcharts, etc.

Example :

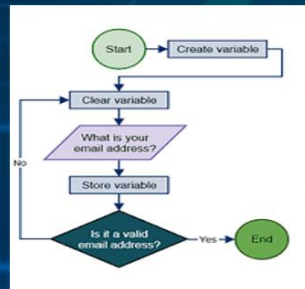


Figure 1 ALGORITHM

an algorithm is step by step method of solving a problem. it is commonly used for data processing, calculation and other related computer and mathematical operations. an algorithm is also used to manipulate data in various ways such as inserting a new data item searching for particular item or sorting an item.

like the above paragraph says it is a way of solving a problem. for example consider in the above box there are some apples in there. we need to get the total of them. the basic algorithm of its counting. if we count we can get the total apples. but can count one by one. that is an algorithm. or we can count two by two this another algorithm. it is faster then then old one. or we count horizontally. or we can count vertically. these two are much faster then the old two algorithms. or more even quick is count line apples then multiple with them. we can get the answer even quicker.

Definition Of Pseudocode

What is a pseudocode?

Pseudocode is a detailed yet readable description of what a computer program or algorithm must do expressed in formally-styled natural language rather than in a programming language

```

Example : If student's grade is greater then or equal to 60
            Print "Passed"
            Else
            Print "Failed"

```

Figure 2 PSEUDOCODE

pseudocode is a detailed yet readable description of what a computer program or algorithm must do expressed in a formally styled natural language rather than in a programming language. pseudocode is sometimes used as a detailed step in the process of developing a program. it allows designers or lead programmers to express the design in great detail and provides programmers a detailed template for the next step of writing code in a specific programming language.

I have written a pseudocode for on O level exam rank provider application it. if the student gets marks is greater then equal 35. the result would be "S". and other so on.

the explanation of the above pseudocode is very simple. I have two arrays. one is for sorting student marks. another is for sorting grade such A, B, C, S then we check all the condition such as marks greater then or equal 45. assign "C" and so on. after that we print the result to the screen.

Definition Of Flowchart

what is a flowchart?

A flowchart is the graphical or pictorial representation of an algorithm with the help of different symbols, shapes and arrows in order to demonstrate a process or a program. with algorithms, we can easily understand a program. the main purpose of a flowchart is to analyze different processes. several standard graphics are applied in a flowchart

Example :

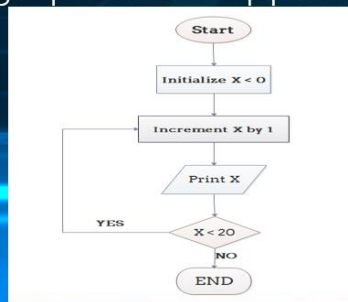


Figure 3FLOWCHART

A flowchart is a formalize graphic representation of logic sequence work or manufacturing process organization chart or similar formalized structure. the purpose of a flowchart is to provide people with a common language or reference point when dealing with a project or process.

We are going to look at three types of flowchart today. the first one is sequence the second one is selection and the last one is repetition.

We use the round shape fro starting and ending. then we use the arrow for flowing. we use the parallelogram for input and output. we use the rectangle for process. finally we use the demined shape for decision making.

Definition Of Basics Of C# Programming

What is a Basics Of C# Programming ?

C# is an object - oriented programming language.

Example : Every example program includes the description of the program, C# code as well as output of the program. All examples are compiled and tested on a Visual Studio. These examples can be simple C# programs or advanced C# programs. So, they are suitable for any user (dummies, beginners or advanced users).

Here is the listing of C# programming examples on Basics.

Figure 4 C# PROGRAMMING

C# is one of the popular programming language introduced by Microsoft. C# programs run on top of the common language runtime (CLR) which provides the run time support support to them. it is an object oriented programming language. it is mainly used for windows applications.

Task 1.2

Bubble sort

- ❖ Bubble sort is the simplest sorting algorithm that works by repeatedly swapping the adjacent elements if they are in wrong order.
- ❖ In this technique we sort the given elements in ascending or descending order by comparing two adjacent elements at a time and placing them in correct position.
- ❖ If we have n elements then it requires $(n - 1)$ pass to sort.

EXAMPLE:-

First Pass:

(5 1 4 2 8) → (1 5 4 2 8), Here algorithm compares the first two elements, and swaps since $5 > 1$.

(1 5 4 2 8) → (1 4 5 2 8), Swap since $5 > 4$

(1 4 5 2 8) → (1 4 2 5 8), Swap since $5 > 2$

(1 4 2 5 8) → (1 4 2 5 8), Now since these elements are already in order ($8 > 5$) algorithm does not swap them.

Second Pass:

(5 1 4 2 8) → (1 5 4 2 8)

(5 1 4 2 8) → (1 5 4 2 8), Swap since $4 > 2$

(5 1 4 2 8) → (1 5 4 2 8)

(5 1 4 2 8) → (1 5 4 2 8)

Now the array is already sorted but our algorithm does not know if it is completed.

The algorithm needs one **whole** pass without **any** swap to know it is sorted.

Third Pass:

(1 2 4 5 8) → (1 2 4 5 8)

(1 2 4 5 8) → (1 2 4 5 8)

(1 2 4 5 8) → (1 2 4 5 8)

(5 1 4 2 8) → (1 2 4 5 8)

About bubble sort

- ❖ Bubble sort requires $n - 1$ pass to sort an array of n elements.
- ❖ In each pass every adjacent elements $a[i]$
- ❖ $] and $a[i + 1]$ is compared and if they are not order then they are swapped.$
- ❖ In each pass we have $n - k$ comparisons, where n is the numbers of elements and k is the pass number.
- ❖ So 1st pass requires $n - 1$ comparisons, k^{th} pass requires $n - k$ comparisons and the last pass requires 1 comparisons.

Algorithm

/"a[0:n-1] is an array of n elements. temp is a variable to facilitate exchange.

BubbleSort(a, n)

Begin

for $k = 1$ to $n-1$ by 1 do

 //this is for pass

 for $j = 0$ to $n - k - 1$ by 1 do

 //this is for comparison

 if $a[j] > a[j+1]$ then

 Set $temp = a[j]$;

 Set $a[j] = a[j+1]$;

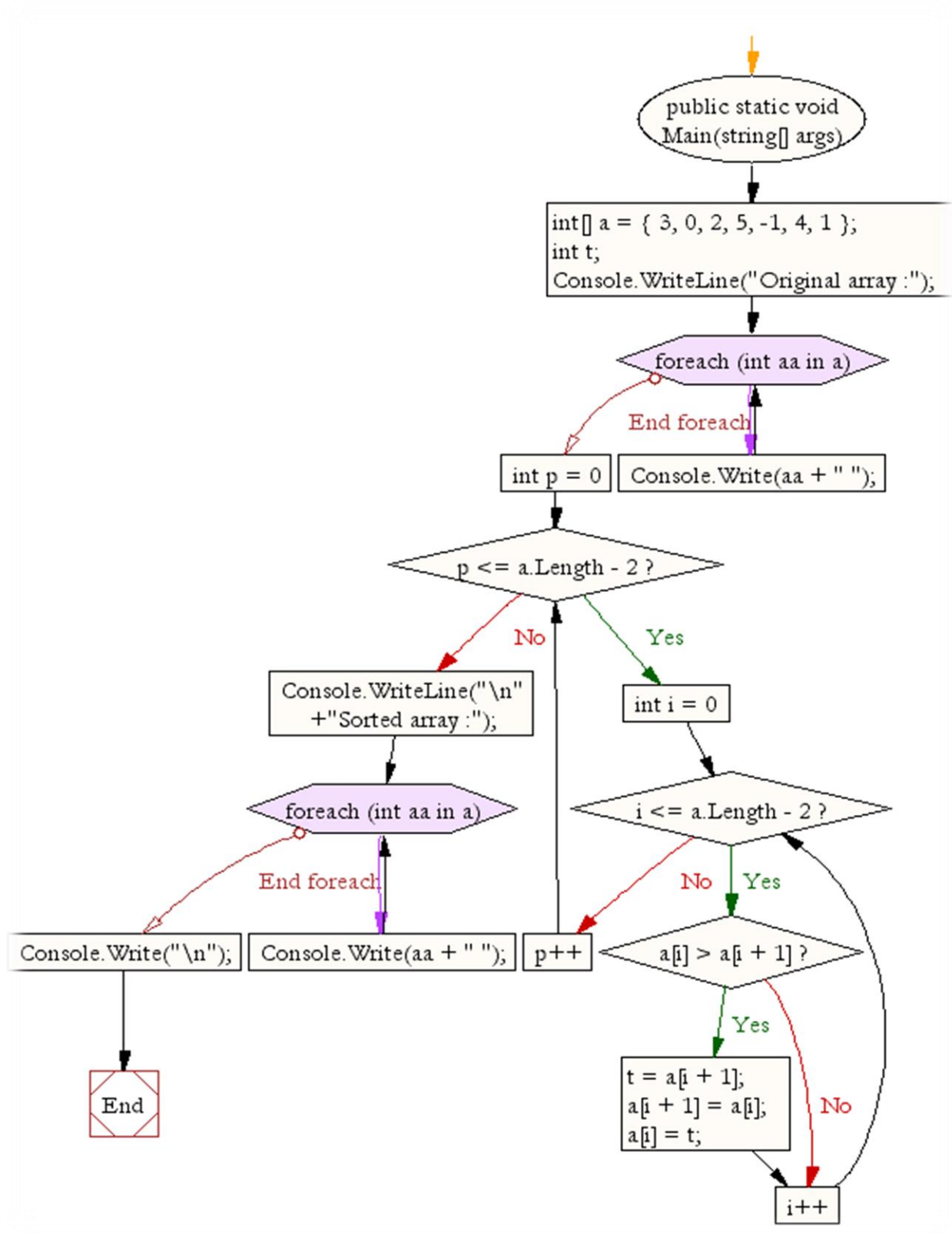
 Set $a[j+1] = temp$;

 endis

 endfor

 endfor

Flowchart



Write a program in C# to enter 7 elements and arrange them ascending order source code

The screenshot shows the Visual Studio IDE with a C# console application named 'ConsoleApplication3'. The code implements a bubble sort algorithm. The 'Main' method initializes an array with the values { 98, 34, 25, 50, 22, 12, 2 }, calls the 'bubbleSort' method, and then prints the sorted array. The output window at the bottom shows the sorted array: 2 12 22 25 34 50 98.

```

using System;

namespace ConsoleApplication3
{
    class Program
    {
        static void bubbleSort(int[] arr)
        {
            int n = arr.Length;
            for (int i = 0; i < n - 1; i++)
                for (int j = 0; j < n - i - 1; j++)
                    if (arr[j] > arr[j + 1])
                    {
                        // swap temp and arr[i]
                        int temp = arr[j];
                        arr[j] = arr[j + 1];
                        arr[j + 1] = temp;
                    }
        }

        /* Prints the array */
        static void printArray(int[] arr)
        {
            int n = arr.Length;
            for (int i = 0; i < n; ++i)
                Console.Write(arr[i] + " ");
            Console.ReadLine();
        }

        // Driver method
        public static void Main()
        {
            int[] arr = { 98, 34, 25, 50, 22, 12, 2 };
            bubbleSort(arr);
            Console.WriteLine("Sorted array");
            printArray(arr);
        }
    }
}

```

Sorted array
2 12 22 25 34 50 98

Source code explanations

I have written this algorithm in console application. we can also implement this in windows form application. Source is explained by commenting above. This is program is written C#. This program has static method. Since it is a static method we cannot create instance on of. Inside the public static void main method. We just used the method.

The source code is embedded as an images file to this document because the copy and paste the source code make mess-up documents. That's why the image is used. The source code and the program are also included to the softcopy DVD.

Selection sort

- ❖ The selection sort sorts an array by repeatedly finding the minimum element (considering ascending order) from unsorted part and putting it at the beginning. The algorithm maintains two subarrays in a given array.
 - 1) The subarray which is already sorted.
 - 2) Remaining subarray which is unsorted.
- ❖ In every iteration of selection sort, the minimum element (considering ascending order) from the unsorted subarray is picked and moved to the sorted subarray.
- ❖ In this technique we find the smallest element in each pass and place it in the appropriate position to get the elements in ascending order.
- ❖ If we have n elements then it requires $(n - 1)$ pass to sort.
- ❖ In pass 1, smallest element is searched between $a[1]$ to $a[n - 1]$ and swapped with $a[0]$.
- ❖ In pass 2, smallest element is searched between $a[1]$ to $a[n - 1]$ and swapped with $a[1]$.
- ❖ In a similar way the process is carried out $n - 1$ times.

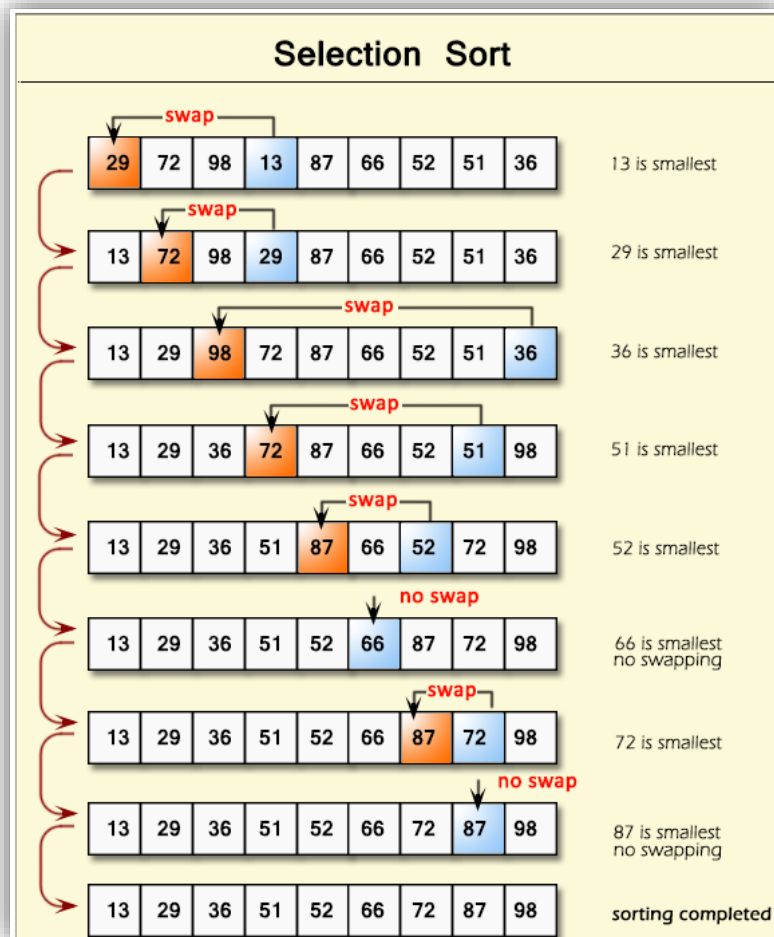
EXAMPLE:-

Consider an array arr having 5 elements

5 4 3 1 2

Arrange the elements in ascending order

We have 5 elements so we need max. 4 pass to sort the elements



About selection sort

- ❖ Selected sort requires $n - 1$ pass to sort an array of n elements.
- ❖ In each pass we search for the smallest element from the search range and swap it with appropriate place.
- ❖ In each pass we have $n - k$ comparisons, where n is the number of elements and k is the pass number.
- ❖ So, 1st pass requires $n - 1$ comparisons,
 K^{th} pass requires $n - k$ comparisons and
 The last pass requires 1 comparison.

Algorithm

/of0:n-1] is an array of n elements. temp is a variable to facilitate exchange,

SelectionSort(a,n)

Begin

for $k = 1$ to $n - 1$ by 1 do //this is for pass

 Set small = ofk-1]

 Set pos = k-1;

 for $j = k$ to $n - 1$ by 1 do //this is for searching small element

 if (a[j] < a[small]) then

 Set small = j;

 Set pos = j;

 endif

endfor

if (pos != k - 1) then //swap value

 Set temp = a[k-1];

 Set a[k-1] = a[pos];

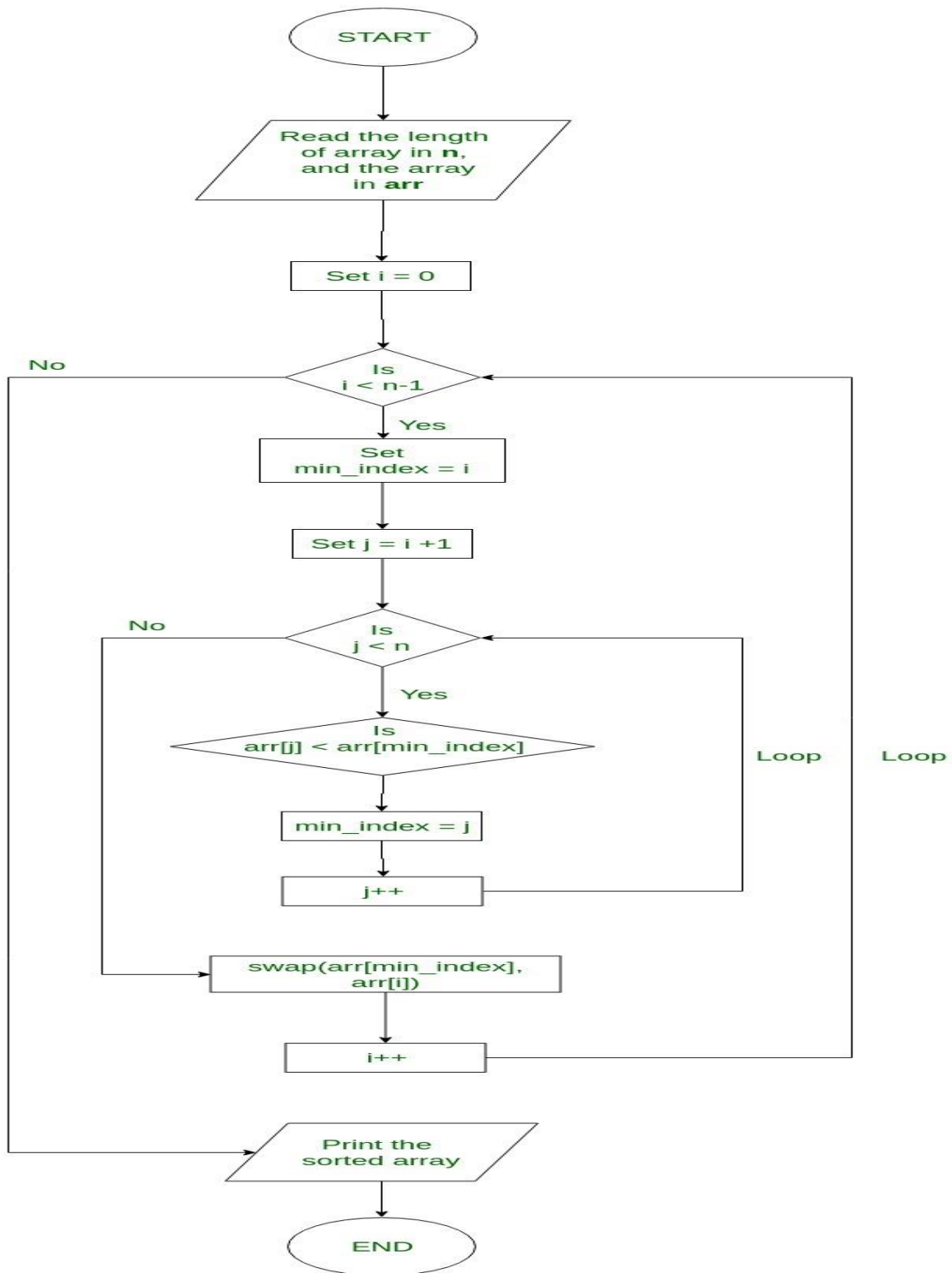
 Set a[pos] = temp;

Endif

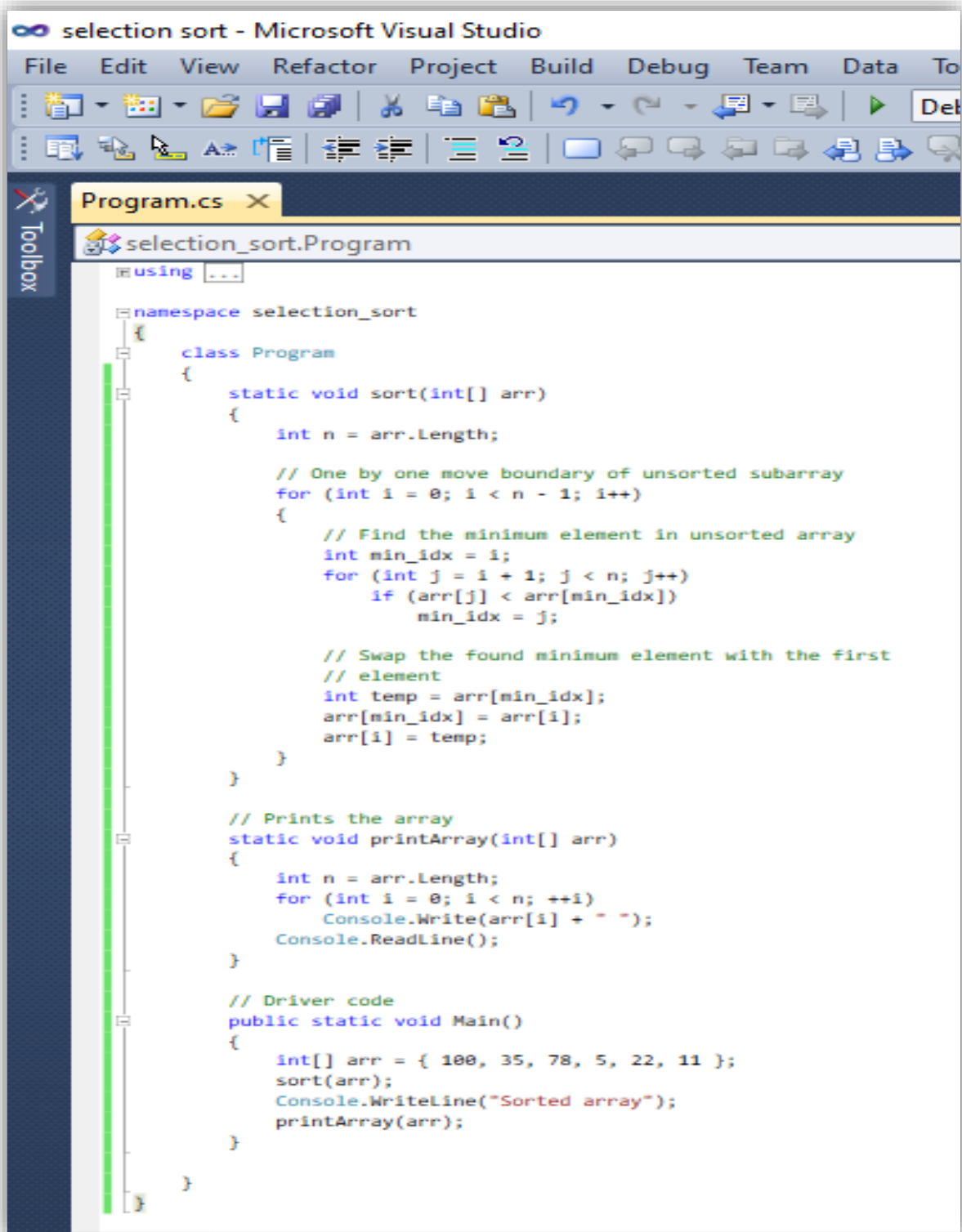
Endfor

End

Flowchart



write a program in C# to enter 5 elements and arrange them in ascending order using selection sort



The screenshot shows the Microsoft Visual Studio IDE with a project named 'selection_sort'. The file 'Program.cs' is open, displaying the following C# code:

```
using ...

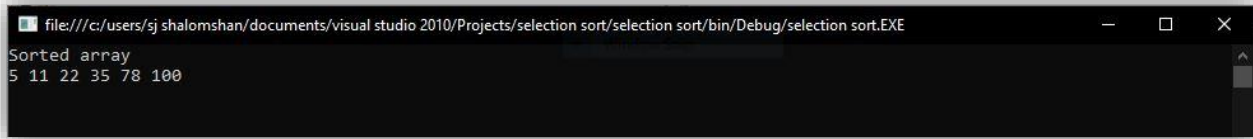
namespace selection_sort
{
    class Program
    {
        static void sort(int[] arr)
        {
            int n = arr.Length;

            // One by one move boundary of unsorted subarray
            for (int i = 0; i < n - 1; i++)
            {
                // Find the minimum element in unsorted array
                int min_idx = i;
                for (int j = i + 1; j < n; j++)
                    if (arr[j] < arr[min_idx])
                        min_idx = j;

                // Swap the found minimum element with the first
                // element
                int temp = arr[min_idx];
                arr[min_idx] = arr[i];
                arr[i] = temp;
            }

            // Prints the array
            static void printArray(int[] arr)
            {
                int n = arr.Length;
                for (int i = 0; i < n; ++i)
                    Console.Write(arr[i] + " ");
                Console.ReadLine();
            }

            // Driver code
            public static void Main()
            {
                int[] arr = { 100, 35, 78, 5, 22, 11 };
                sort(arr);
                Console.WriteLine("Sorted array");
                printArray(arr);
            }
        }
    }
}
```



The screenshot shows a console window titled "file:///c:/users/sj shalomshan/documents/visual studio 2010/Projects/selection sort/selection sort/bin/Debug/selection sort.EXE". The output text is "Sorted array" followed by the numbers "5 11 22 35 78 100" on the next line.

Source code explanations

I have written this algorithm in console application. we can also implement this in windows form application. Source is explained by commenting above. This is program is written C#. This program has static method. Since it is a static method we cannot create instance on of. Inside the public static void main method. We just used the method.

The source code is embedded as an images file to this document because the copy and paste the source code make mess-up documents. That's why the image is used. The source code and the program are also included to the softcopy DVD.

Bubble sort

- ❖ Bubble sort repeatedly compares and swap (if needed) adjacent elements in every pass. In i – th pass of bubble sort (ascending order), last $(i-1)$ elements are already sorted and i – th largest elements is placed at $(N - i)$ -th position

Advantage

- ✓ It is the simplest sorting approach.
- ✓ Best case complexity is if $O(N)$ [for optimized approach] while the array is sorted.
- ✓ Using optimized approach it can detect already sorted array in the first pass with time complexity of $O(1)$.
- ✓ Stable sort does not change the relative order of elements with equal keys.
- ✓ In place sort.

Disadvantage

- ✓ Bubble sort is comparatively slower algorithm.

Selection sort

- ❖ Selection sort selects i -th smallest element and place at i -th position. This algorithm divides the array into two parts sorted (left) and unsorted (right) subarray. It selects the smallest elements element from unsorted subarray and places in the first position of that subarray (ascending order).it repeatedly selects the next smallest element.

Advantage

- ✓ It can also be used on list structure that make add and remove efficient such as a linked list. Just remove the smallest element of unsorted part and end at the end of sorted part.
- ✓ The number of swaps reduced. $O(N)$ swaps in all cases.
- ✓ In place sort

Disadvantage

- ✓ Time complexity in all cases is $O(N^2)$ no best case scenario.

Task 2:-

Task 2.1:-

Introduction

The primary purpose of this task is to explain the programming paradigms in with a brief explanation. According to the requirements of this task, this document was prepared with a wide information about the programming paradigms.

This task clears out the basic idea to advanced concept of the programming paradigms. This also contains the advantages and the disadvantages of using different programming language approaches.

This task explores the most important aspects of programming paradigms. It includes a brief explanations of procedural, object orientated and event-driven programming paradigms. And also it points out the characteristics and the relationship between them in a manner which can be understood by programmers.

What is programming paradigms?

A programming paradigm is a model of programming based on distinct concepts that shapes the way programmers design, organize and write programs. A multi-paradigm programming language allows programmers to choose a specific single approach or mix parts of different programming paradigms. C++ as a multi-paradigm programming language supports single or mixed approaches using Procedural or Object-oriented programming and mixing in utilization of Generic and even Functional programming concepts.

Procedural programming

Procedural programming is the most natural way of telling a computer what to do as the computer processors own language and machine code is procedural. It can be considered as a structured or modular programming. The main idea of the procedural programming is performed by telling the computer what to do and how to do it through a list of step-by-step instructions. It basically involves procedures. Which means there are steps that need to be followed to complete a specific task.

For example, read a number, add 7 or display a specific message.

The main feature of procedural programming, it is easier for reading and writing the program's source codes. And we can easily maintain the program code as numerous procedures can be debugged separately. Furthermore, large programs are divided into smaller ones and that most of the data is shared and can therefore be reached from any other point within the program.

The main characteristics of the procedural programming being sequential logic, simplicity, easy implementation of compilers and interpreters, ability to make use of the same code in the program by calling it instead of copying.

Computer processors provide hardware support for procedural programming through a stack register and instructions for calling procedures and returning from them. Hardware support for other types of programming is possible, but no attempt was commercially successful.

Advantage of procedural programming

- ❖ Its relative simplicity, and ease of implementation of compilers and interpreters.
- ❖ The ability to re-use the same code at different places in the program without copying it.
- ❖ An easier way to keep track of program flow.
- ❖ The ability to be strongly modular or structured.
- ❖ Needs only less memory.

Disadvantage of procedural programming

- ❖ Data is exposed to whole program, so no security for data.
- ❖ Difficult to relate with real world objects.
- ❖ Difficult to create new data types reduces extensibility.
- ❖ Importance is given to the operation on data rather than the data.

Programming language that uses procedural programming concept

- ❖ Fortran
- ❖ ALGOL
- ❖ COBOL
- ❖ BASIC
- ❖ Pascal
- ❖ C

Example procedural programming source code in pascal

```
program Fibonacci;

function fib(n: Integer): Integer;
var a: Integer = 1;
    b: Integer = 1;
    f: Integer;
    i: Integer;
begin
    if (n = 1) or (n = 2) then
        fib := 1
    else
        begin
            for i := 3 to n do
                begin
                    f := a + b;
                    b := a;
                    a := f;
                end;
            fib := f;
        end;
    end;

begin
    WriteLn(fib(6));
end.
```

The example shows features of procedural language:

- ❖ There are some subroutines (function in this use)
- ❖ Variable are assigned value probably multiple times (:= operator)
- ❖ There are cycles (for operator in this case)
- ❖ Language is imperative, i.e. we are telling computer what to do in what order

Object oriented programming (oop)

Object Oriented Programming (OOP) is a paradigm which is a popular concept that is used by many modern programming languages. It is associated with a concept of class. Objects and various other concepts revolving around these two, like Inheritance, Polymorphism, Abstraction, Encapsulation and so on.

The most of the programming languages such as Java, Python, Ruby, C++, C# and etc. These are mainly focus on Object Oriented Programming (OOP) concept. This is the well-used programming paradigms that is used by many software engineers and developers.

Bellow I have explained the core concepts of Object Oriented Programming (OOP). Those are like Inheritance, Polymorphism, Abstraction, Encapsulation. And with that also I have written an explanation of class, object, overloading, overriding and other essential things about Object Oriented concept.

Understanding the oop concept

Let us try to understand a little about all these, through a simple example. Human Beings are living forms, broadly categorized into two types, Male and Female. Right? It's true. Every Human being (Male or Female) has two legs, two hands, two eyes, one nose, one heart etc. There are body parts that are common for Male and Female, but then there are some specific body parts, present in a Male which are not present in a Female, and some body parts present in Female but not in Males.

All Human Beings walk, eat, see, talk, hear etc. Now again, both Male and Female, performs some common functions, but there are some specifics to both, which is not valid for the other. For example: A Female can give birth, while a Male cannot, so this is only for the Female.

Class

Here we can take Human Being as a class. A class is a blueprint for any functional entity which defines its properties and its functions. Like Human Being, having body parts, and performing various actions.

Inheritance

Here we can take Human Being as a class. A class is a blueprint for any functional entity which defines its properties and its functions. Like Human Being, having body parts, and performing various actions.

Object

My name is Shalom, and I am an instance/object of class Male. When we say, Human Being, Male or Female, we just mean a kind, you, your friend, me we are the forms of these classes. We have a physical existence while a class is just a logical definition. We are the objects.

Abstraction

Abstraction means, showcasing only the required things to the outside world while hiding the details. Continuing our example, Human Beings can talk, walk, hear, eat, but the details are hidden from the outside world. We can take our skin as the Abstraction factor in our case, hiding the inside mechanism.

Encapsulation

This concept is a little tricky to explain with our example. Our Legs are binded to help us walk. Our hands, help us hold things. This binding of the properties to functions is called Encapsulation.

Polymorphism

Polymorphism is a concept, which allows us to redefine the way something works, by either changing how it is done or by changing the parts using which it is done. Both the ways have different terms for them.

If we walk using our hands, and not legs, here we will change the parts used to perform something. Hence this is called **Overloading**.

And if there is a defined way of walking, but I wish to walk differently, but using my legs, like everyone else. Then I can walk like I want, this will be called as **Overriding**.

Examples of an oop programming in java

Bellow I have written many good examples in Java that explains the OOP concept in perfect manner. This contains the explanations of class, Inheritance, Objects, Abstraction, Encapsulation, Polymorphism in Java programming. Each on them contains source and its explanations. The definition of OPP concept is thoroughly explained above with perfect explanations.

Class

```

1  public class Dog {
2
3      String breed;
4      int age;
5      String color;
6
7      void barking() {
8      }
9
10     void hungry() {
11     }
12
13     void sleeping() {
14     }
15 }

```

Figure 7 SOURCE CODE FOR CLASS IN JAVA

This is a simple class. This does not do anything. It is for explanation purpose. We have a Dog class that contains three methods such as barking, hungry and sleeping and it has three properties such as breed, age and color. Based on this class, we can create many instances that we can apply them for many different dogs with different properties such as color, age and so on. We can also create class for MySQL CURD function to manipulate the database. That will have methods like delete, update, insert and so on. But for the simple explanation we take the Dog class.

Inheritance

```

1  class Employee{
2      float salary=40000;
3  }
4
5  class Programmer extends Employee{
6
7      int bonus=10000;
8
9      public static void main(String args[]){
10         Programmer p=new Programmer();
11         System.out.println("Programmer salary is:"+p.salary);
12         System.out.println("Bonus of Programmer is:"+p.bonus);
13     }
14 }

```

Figure 9 SOURCE CODE FOR INHERITANCE IN JAVA

The theory is already explained above. Here we have two classes in Java. The first class is Employee and the second class is Programmer. We use the “extends” for inheriting purpose. The Programmer class inherits the properties and the methods from the Employee class. We have created an instance of a programmer class at the line number of 10. Now the instance which is created based on the Programmer class can use the property “salary” that is in the Employee class.

Abstraction

As per dictionary, abstraction is the quality of dealing with ideas rather than events. For example, when we consider the case of e-mail, complex details such as what happens as soon as we send an e-mail, the protocol our e-mail server uses are hidden from the user. Therefore, to send an email we just need to type the content, mention the address of the receiver, and click send.

Likewise, in Object-oriented programming, abstraction is a process of hiding the implementation details from the user, only the functionality will be provided to the user. In other words, the user will have the information on what the object does instead of how it does it.

```

1  abstract class Bike{
2
3      abstract void run();
4
5  }
6  class Honda4 extends Bike{
7
8      void run(){System.out.println("running safely..");}
9      public static void main(String args[]){
10
11         Bike obj = new Honda4();
12         obj.run();
13     }
14 }
15

```

FIGURE 11 SOURCE CODE FOR ABSTRACTION IN JAVA

But we cannot create instances of an abstract class. Because it does not have a complete implementation. The purpose of an abstract class is to function as a base for subclasses. It acts like a template, or an empty or partially empty structure, we should extend it and build on it before we can use it.

Encapsulation

Encapsulation is one of the four fundamental OOP concepts. It in Java is a mechanism of wrapping the data (variables) and code acting on the data (methods) together as a single unit. In encapsulation, the variables of a class will be hidden from other classes, and can be accessed only through the methods of their current class. Therefore, it is also known as data hiding.

```
/* File name : EncapTest.java */
public class EncapTest {
    private String name;
    private String idNum;
    private int age;

    public int getAge() {
        return age;
    }

    public String getName() {
        return name;
    }

    public String getIdNum() {
        return idNum;
    }

    public void setAge( int newAge) {
        age = newAge;
    }

    public void setName(String newName) {
        name = newName;
    }

    public void setIdNum( String newId) {
        idNum = newId;
    }
}
```

FIGURE 13 SOURCE CODE FOR ENCAPSULATION IN JAVA

```
public class RunEncap {
    public static void main(String args[]) {
        EncapTest encap = new EncapTest();
        encap.setName("James");
        encap.setAge(20);
        encap.setIdNum("12343ms");

        System.out.print("Name : " + encap.getName() + " Age : " + encap.getAge());
    }
}
```

Polymorphism

Polymorphism in java is a concept by which we can perform a single action by different ways. Polymorphism is derived from 2 greek words: poly and morphs. The word "poly" means many and "morphs" means forms. So polymorphism means many forms.

There are two types of polymorphism in java: compile time polymorphism and runtime polymorphism. We can perform polymorphism in java by method overloading and method overriding.

If you overload static method in java, it is the example of compile time polymorphism. Here, we will focus on runtime polymorphism in java.

Advantages of object oriented programming language

- ❖ The programs written with OOP are really easy to understand.
- ❖ Since everything is treated as objects, so we can model a real-world concept using OOP.
- ❖ OOP approach offers the reusability of classes. We can reuse the classes that are already created without writing them again and again.
- ❖ Since the parallel development of classes is possible in OOP concept, It results in the quick development of the complete programs.
- ❖ Programs written in OOP technique are marginally easier to test, manage as well as maintain.
- ❖ It is a secured development technique since data is hidden and can't be accessed by external functions.

Disadvantages of object oriented programming language

- ❖ Sometimes, the relation among the classes become artificial in nature.
- ❖ Designing a program in OOP concept is a little bit tricky.
- ❖ The programmer should have a proper planning before designing a program using OOP approach.
- ❖ Since everything is treated as objects in OOP, the programmers need proper skill such as design skills, programming skills, thinking in terms of objects etc.
- ❖ The size of programs developed with OOP is larger than the procedural approach.
- ❖ Since larger in size, that means more instruction to be executed, which results in the slower execution of programs.

Event driven programming

Event-driven programming is a computer programming paradigm in which control flow of the program is determined by the occurrence of events. These events are triggered by code called as an event listener that, if it detects the assigned event has occurred, it will run the event handler that is typically known as callback function or method.

The theory is, this programming paradigms approach is implemented in all programming languages. That means all programming languages support the event-driven style of programming paradigms.

It is most properly determined by events such as user actions (mouse clicks, key presses), sensor outputs, or messages from other programs or threads. It is mainly use on graphical user interface programming applications such as C#, JavaScript Web Applications. In an event-driven application, there is generally a main loop that listens for events, and then triggers a callback function when one of those events is detected. The task is easier in languages that provide high level abstractions, such as closures.

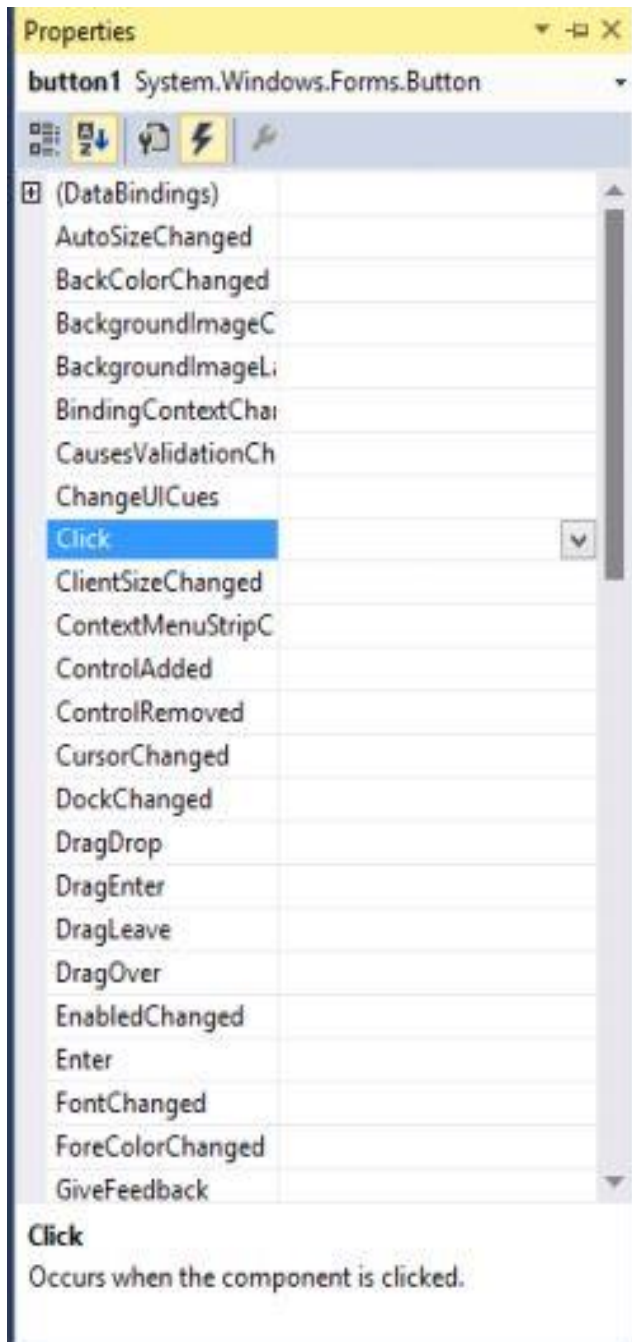
The application might be naturally centered on events. They involve some kind of sensor that detects and reports events and the purpose of the application is to analyze and react to these events.

Listener	Description
ActionListener	Responds to actions (e.g., button click, text field change)
ItemListener	Listens for individual item changes (e.g., a checkbox)
KeyListener	Listens for keyboard interaction
MouseListener	Listens for mouse events (double-click, right-click, etc.)
MouseMotionListener	Listens for mouse motion
WindowListener	Acts on events in the window
ContainerListener	Listens for container (JFrame, JPanel) events
ComponentListener	Listens for changes to components (e.g., a label being moved, hidden, shown, or resized in the program)
AdjustmentListener	Listens for adjustments (e.g., a scroll bar being engaged)

Figure 15 LISTENER TYPES

Example in c# programming

There are a lot of events in C# programming for buttons, checkboxes, radio buttons and so on. We can associate with any events that we want in C#.



Example 1 (click event)

```

20 private void button1_Click(object sender, EventArgs e)
21 {
22     int num1 = Convert.ToInt32(textBox1.Text);
23     int num2 = Convert.ToInt32(textBox2.Text);
24
25     MessageBox.Show((num1+num2).ToString());
26 }
27

```

This program will run when the user clicks the button 1. This is a simple explanation of event driven programming. When the user clicks the button, two integer type variables will be created for storing purpose. Then add together and display the result..

Example 2 (mousemove event)

```

int x = 0, y = 0;
protected override void OnMouseMove(MouseEventArgs e)
{
    base.OnMouseMove(e);
    // Create the graphics object
    Graphics g = CreateGraphics();
    // Create the pen that will draw the line
    Pen p = new Pen(Color.Navy);
    // Create the pen that will erase the line
    Pen erase = new Pen(Color.White);
    g.DrawLine(erase, 0, 0, x, y);
    // Save the mouse coordinates
    x = e.X; y = e.Y;
    g.DrawLine(p, 0, 0, x, y);
    label1.Location = new Point(x - label1.Width, y); // Place the label on the mouse left
    label2.Location = new Point(x, y - label2.Height); // Place the label on the mouse right
    label1.Text = x.ToString(); label2.Text = y.ToString();
}

```

This program will run when the user mouse moves over the form. And returns the coordinates of the form and draw a line according to the mouse pointer position.

Advantages of event driven programming

- ❖ It allows for more interactive programs. Almost all modern GUI programs use event driven programming.
- ❖ It can be implemented using hardware interrupts, which will reduce the power used by the computer.
- ❖ It allows sensors and other hardware to easily interact with software.

Disadvantages of event driven programming

- ❖ For simple programs, event driven programming is often more complex and cumbersome than batch programming.
- ❖ The flow of the program is usually less logical and obvious.

Relations and differences between programming paradigms

Above we have looked at all the important things about the programming paradigms including their characteristics and other essential things. With that also I have explained the three paradigms such as procedural, object oriented, and event driven programming in more details. But here the relationships and the differences between programming paradigms have been explained.

Object oriented vs procedural programming

	Procedure Oriented Programming	Object Oriented Programming
Divided Into	In POP, program is divided into small parts called functions .	In OOP, program is divided into parts called objects .
Importance	In POP, importance is not given to data but to functions as well as sequence of actions to be done.	In OOP, importance is given to the data rather than procedures or functions because it works as a real world .
Approach	POP follows Top Down approach .	OOP follows Bottom Up approach .
Access Specifiers	POP does not have any access specifier.	OOP has access specifiers named Public, Private, Protected, etc.
Data Moving	In POP, Data can move freely from function to function in the system.	In OOP, objects can move and communicate with each other through member functions.
Expansion	To add new data and function in POP is not so easy.	OOP provides an easy way to add new data and function.
Data Access	In POP, Most function uses Global data for sharing that can be accessed freely from function to function in the system.	In OOP, data can not move easily from function to function, it can be kept public or private so we can control the access of data.
Data Hiding	POP does not have any proper way for hiding data so it is less secure .	OOP provides Data Hiding so provides more security .
Overloading	In POP, Overloading is not possible.	In OOP, overloading is possible in the form of Function Overloading and Operator Overloading.
Examples	Example of POP are : C, VB, FORTRAN, Pascal.	Example of OOP are : C++, JAVA, VB.NET, C#.NET.

FIGURE 17 OOP VS PROCEDURAL

Event driven vs other programming paradigms

Event Driven Programming Paradigm	Procedural Programming Paradigm	Object Oriented Programming Paradigm
Provides graphical user interface to create the programs.	Provides character user interface to write the commands.	Provides command writing in modules.
Actions are defined on events. These events could be occurred by mouse clicking and moving or keyboard strokes.	Commands are written in linear fashion and executed also in linear fashion.	Objects and functions are prepared for interaction to perform specific tasks.
Focuses on selecting user interface.	Focuses on sequential execution of steps.	Focuses on objects or data and facilitate to secure it from unauthorized access.
Most common languages which follow this paradigm are Visual Basic and C#.	Most common languages which follow this paradigm are Basic, Fortran and COBOL.	Most common languages which follow this paradigm are Smalltalk, C++ and JAVA.

FIGURE 19 EVENT DRIVEN VS OTHER PARADIAMS

This event driven approach is used by many multi-paradigms programming languages. It is not a separate paradigm. It is used fixed with other programming paradigms such object oriented and procedural programming.

Task 2.2

Introduction

This task has more detailed information about the IDE (Integrated Development Environment). This explores the basic idea of IDE such as what is the purpose it, why the developers use it and what are the features that we can have by using it.

This task mainly focuses on the features of the IDE. And this task has more advanced information about the IDE in a general perspective. With that also, this task has explained many IDEs that have been using for different kinds of programming languages and their features.

With that also this task explained the different IDE that are used in C# programming, those are done with a comparison, comparing each IDE with another.

This task not only gives the information of the IDEs. But also this has another section that includes code that will critically evaluate the implementation of the programming paradigms, in terms of code structure and characteristics. This means it has programs that have the same functionality in different paradigms to show how each paradigm solves the problem and implements algorithm.

Basic idea about ide

It stands for integrated development environment (IDE). It is also known as integrated design environment or integrated debugging environment. It is a software application that provides comprehensive facilities for a computer programmer to develop software in an easy way. This has a bunch of features that will be discussed later.

This is also referred as a software development suite that has some most important tools which are used by developers for software writing and testing purpose. An IDE basically consists of the following components.

- ❖ A source code editor
- ❖ A compiler
- ❖ An interpreter
- ❖ Build automation tool
- ❖ A debugger

These are the basic level of components that an IDE has. If we take any other IDE in the market place. We could be able to see those features in them. These compiling and interpreting features can be easily accessible through a single graphical user interface (GUI). An IDE may be a standalone application, or it may be included as part of one or more existing and compatible applications.

Sometimes an IDE is a complicated piece of software by its nature. Because of a developer might be take a lengthy of learning process get higher productivity output. But most of the IDEs are same they have similar operations. This means if a developer knows how to work in Visual studio, he would be able to manage to work in Netbeans.

IDEs are intended to take full advantage of a programmer productivity by providing friendly components with similar user interfaces. This means the programmer needs to do less mode switching works instead of using discrete development programs.

Normally, an IDE is dedicated to a particular programming language. However, there are some multiple languages support IDEs are available in the market place such as Eclipse, ActiveState Komodo, NetBeans, Microsoft Visual Studio, WinDev, Xcode and etc.

Features of ide

The integrated development environment has many features. With help of those features developers can do their work effectively. The following things are the basic features of an IDE.

Basic features of an ide

- ❖ Explorer
- ❖ Source editor
- ❖ Compiler
- ❖ Data dictionary
- ❖ Form builder
- ❖ Tool bar
- ❖ Autocomplete
- ❖ Themes

Explorer

With the help of the explorer file systems the developer can view the directories in a hierarchical view that have been mounted for the IDE. Files that have been used by the program or one of their additional programs such as App-Builder are identified by unique icons. If we click one of these files with the left mouse button selects it, while clicking with the right mouse button opens a popup menu displaying the operations available for that file.

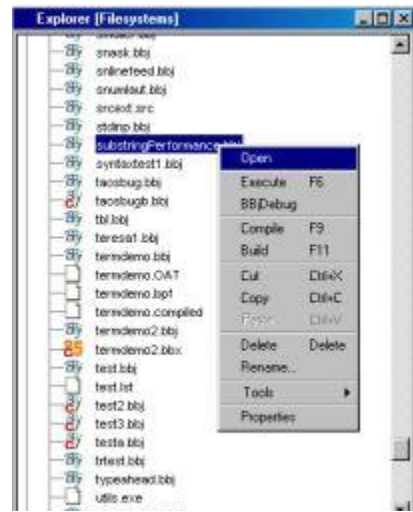


Figure 21 IDE FILE EXPLORER

Source editor

The IDE source editor is a text editor that is used for writing source code. Features of the source editor include the following.

- ❖ Color syntax highlighting
- ❖ Breakpoint placement
- ❖ Advance find and replace
- ❖ Keyboard macro recording and execution
- ❖ User defined abbreviations and abbreviation expansion
- ❖ Object syntax code completion
- ❖ Bookmarking for quick navigation

Debugger

The Debugger incorporates debugging and editing tools into the IDE environment. The Debugger is always connected to an interpreter and performs automatic syntax error checking as code is modified. Programs can be executed in the Debugger via command line dot-stepping. Breakpoints can be inserted to control the flow, and variables can be monitored in the Watch Tab. The Debugger is the tool of choice for testing application code and making minor editing corrections.

Compiler

Easy Compiling is another feature of an IDE. The developer can easily compile the source code in one click. For an instance, if we want to compile a java file manually, we need to use the "javac" command in CMD. Then we need to run the compiled java bytecode by using the "java" command. But if we use the IDE, we can do it in a single click. It assembles all selected source files for compiling, invokes the specified compiler as a process in a new execution thread, feeds it the appropriate command line parameters along with the selected files, and then displays the results when the process is finished.

Form-builder

The form builder plug-in module is a utility and is used to create graphical user interfaces for programs. Graphical controls are arranged on a "form" just as they will appear in the application program. Form-Builder saves the resulting interface to an ASCII resource file with the extension.arc, which IDE uses to create the actual GUI interface at runtime.

Toolbar

An IDE's toolbar looks much like a word processor's toolbar. The tools in the toolbar facilitate color-coding, source-code formatting, error diagnostics, and reporting and intelligent code completion. The interface allows the developer to compile and execute code incrementally and manage changes to source code in a uniform manner. IDEs are typically designed to integrate with third-party version control libraries, like GitHub or Apache Subversion.

Autocomplete

Autocomplete is a code completion tool that is built into modern IDEs. It is one of a number of similar tools that allow for intelligent code completion or intelligent text completion on different platforms.

Other features of an IDE

- ❖ It gives best support for coding by easy navigation through codes and code completion.
- ❖ Developer can test and debug the code easily. It is better than a text editor.
- ❖ Another important feature of the IDE is refactoring. It helps to differentiate the names of class, variables, packages, etc.
- ❖ Reformat coding.
- ❖ Check matching braces.
- ❖ Single step through a function.
- ❖ Traverse a package hierarchy searching for all the instances of a specific string.
- ❖ Helps in generating the UML diagram.

Different types of IDE's

There are different types of IDEs available in the market place. It is categorized depending on different types of platform that the programmers work on. Each IDE has its own set of unique behaviors. We can vary the IDEs into different categories depending on their usages.

- ❖ Cloud based IDE's
- ❖ Mobile application development IDE's
- ❖ IDE's for apple development
- ❖ IDE's for Microsoft development
- ❖ IDE's for web development
- ❖ Multi-language support IDE's
- ❖ Single-language IDE's

Cloud based IDE's

A cloud based IDE is a web-based integrated development environment platform. The advantage of cloud IDEs is the accessibility from anywhere in the world and from any compatible devices and platforms. No download and installation is needed. and ease of collaboration among geographically dispersed developers.

1. AWS Cloud9
2. Codeanywhere
3. Eclipse Che

There are many cloud IDE's available in the online market. But this document has only the most popular three of the cloud IDE's.

Aws cloud9

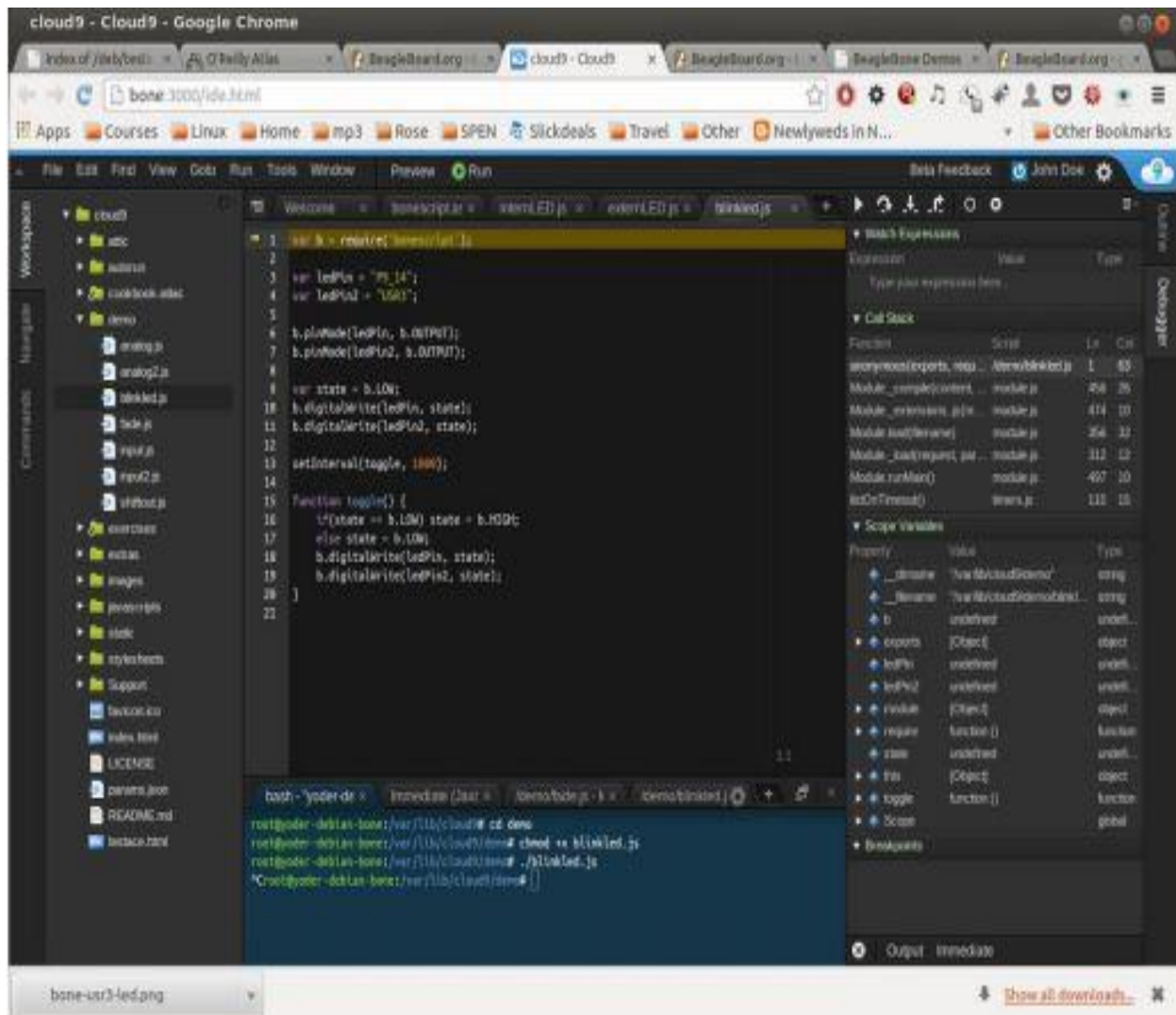


Figure 23 AWS Cloud9

AWS cloud9 is a cloud based integrated development environment that lets us write, run and debug the source code within a web browser. It contains code editor, debugger, and terminal. It comes with necessary tools for programming languages such as Python, JavaScript, PHP and more. Therefore, we do not want to install or configure any systems to startup a new project. Since it is cloud based service, we can work on our project from anywhere such as office, home and etc. It can be used with any operating systems. Cloud9 also provides a seamless experience for developing server less applications enabling you to easily define resources, debug, and switch between local and remote execution of server less applications. With cloud9 we can easily share the development environment with our team.

Codeanywhere

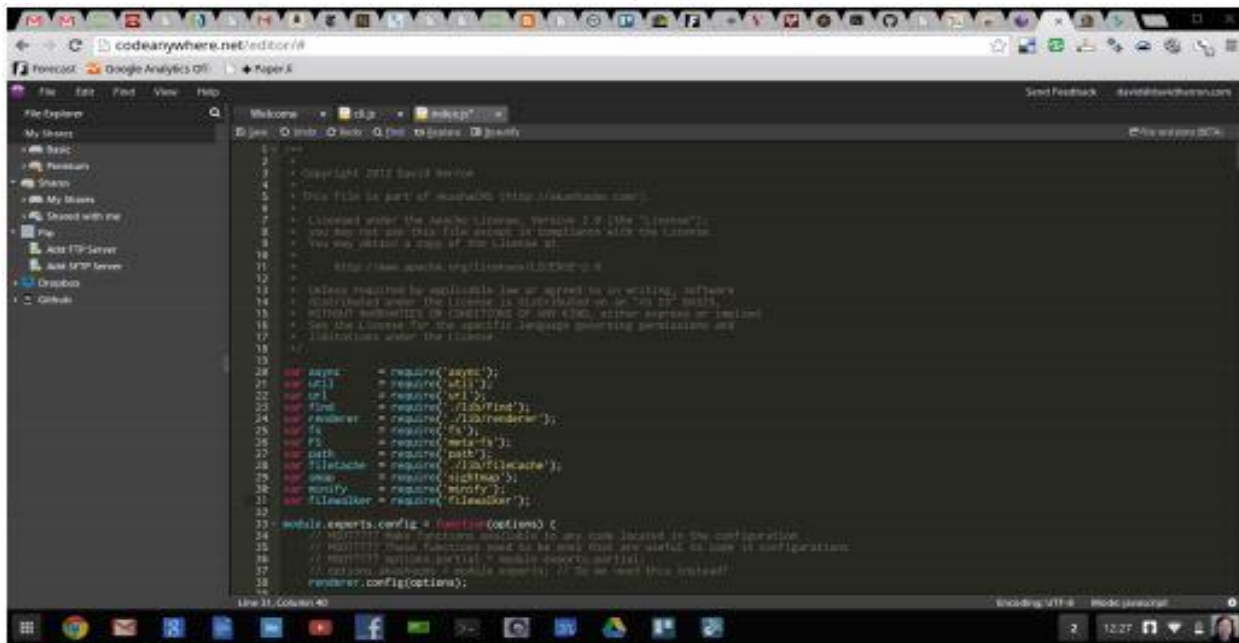


Figure 25 CODEANYWHERE

It is a cross-platform cloud IDE. It enables developers to directly write, edit, collaborate and run web development projects within a web browser and with any mobile devices. It is totally written in JavaScript. The editor is based on Code Mirror which is a JavaScript component that provides a code editor in browser that has a rich programming API. The Code anywhere uses the Open VZ as a container for its development environments which is an operating system-level virtualization technology. We can connect to their virtual machines via SSH or FTP protocol. It also supports the Dropbox and Google drive features. The Code anywhere supports more than 75 programming languages such as HTML, CSS, JavaScript, Node.js, IO.js, PHP, Ruby, Python, Go and other programming frameworks. In 2017 the company acquired Code bender, Arduino IDE in the cloud, and one of the biggest communities and code repositories of the Arduino ecosystem. Code anywhere features a sharing capability so you can get help from a colleague, open your code base to a group, or simply show your latest code to friends at a hackathon. And it has a live pair programming concept. It is a cross-platform cloud IDE. It enables developers to directly write, edit, collaborate and run web development projects within a web browser and with any mobile devices. It is totally written in JavaScript. The editor is based on Code Mirror which is a JavaScript component that provides a code editor in browser that has a rich programming API. The Code anywhere uses the Open VZ as a container for its development environments which is an operating system-level virtualization technology. We can connect to their virtual machines via SSH or FTP protocol. It also supports the Dropbox and Google drive features.

The Code anywhere supports more than 75 programming languages such as HTML, CSS, JavaScript, Node.js, IO.js, PHP, Ruby, Python, Go and other programming frameworks. In 2017 the company acquired Code bender, Arduino IDE in the cloud, and one of the biggest communities and code repositories of the Arduino ecosystem.

Code anywhere features a sharing capability so you can get help from a colleague, open your code base to a group, or simply show your latest code to friends at a hackathon. And it has a live pair programming concept.

Eclipse che

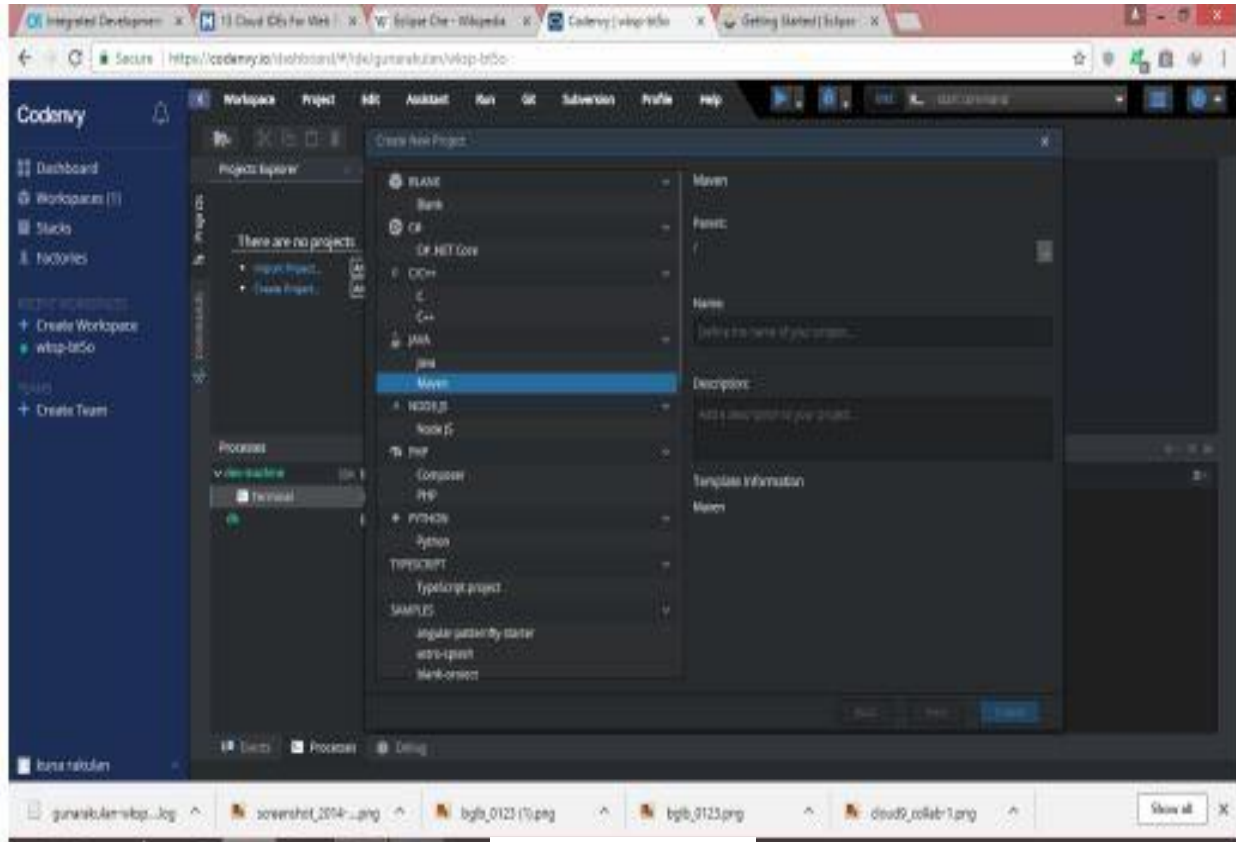


Figure 27ECLIPSE CHE

Eclipse Che is an open-source web based developer workspace server and cloud integrated development environment (IDE) which provides a remote development platform for multi-user purpose. It supports many computer programming languages such as C, C++, C#, Python, Java and more. This is the eclipse online version. With the help of this service programmers can work as a team in a workplace environment. It is good for student because they can create their own learning group and do their programming as team. It also contains a SDK which can be used to create plug-ins for languages, frameworks or tools. It is almost free.

Popular IDE's for developer

1. Visual studio
2. Xcode
3. Android studio
4. NetBeans
5. Eclipse
6. IntelliJ IDEA
7. Code Blocks

Visual studio

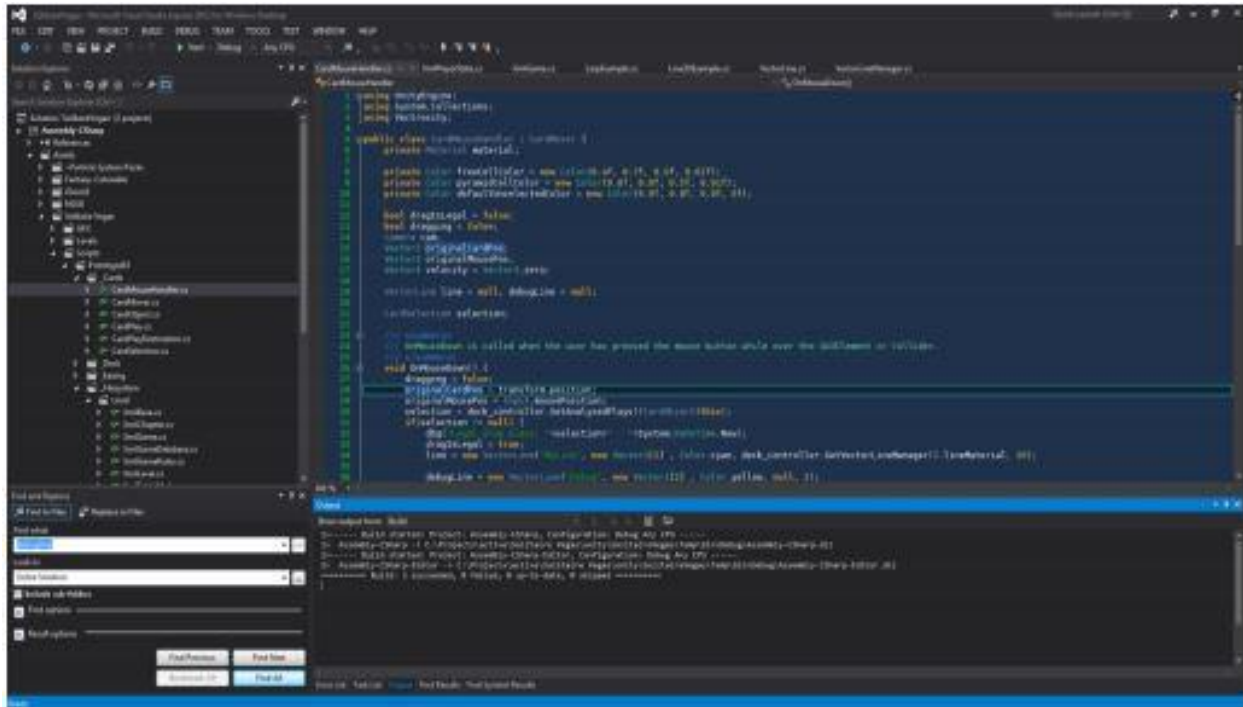


Figure 29 VISUAL STUDIO

Microsoft Visual Studio is an awesome integrated development environment (IDE) for developers. It was created by Microsoft. It is used to develop computer software programs, as well as web development such as web sites, web applications, web services and mobile application development. We can also use visual studio on macOS.

Visual studio is based on Microsoft software development platforms such as windows application programming interface (API), Windows Forms, Windows Presentation Foundation, Windows Store and Microsoft Silverlight. There are three types of visual studio products are available in the market place

- **Visual studio community edition:** It is free, fully-featured IDE for students, open-source and individual developers.
- **Visual studio professional edition:** it has professional developer tools, services, and subscription benefits for small teams.
- **Visual studio enterprise edition:** it is used for end-to-end solution to meet demanding quality and scale needs of teams of all sizes.

Visual studio has many useful features. It contains a source code editor which supports IntelliSense (Code autocomplete tool). As well as code refactoring. And it has a build in integrated debugger which works as both a source-level debugger and a machine-level debugger. It has more build in tools such as code profiler, forms designer for building GUI applications, web designer, class designer, and database schema designer. It is eligible to install third party plugins supports for source control systems (like Subversion and Git).

Visual studio supports more than 36 programming languages. It includes languages such as C, C++, C++/CLI, Visual Basic .NET, C#, F#, JavaScript, TypeScript, XML, XSLT, HTML and CSS. It gives support for other languages such as Python, Ruby, Node.js, and M among others is available via plug-ins Java.

Another feature of visual studio is it has .NET framework supports. It has a huge programming library that we can use to develop large applications. And also visual studio has unity game engine supports which means we can program for games in visual studio. Another part of the visual studio is web development projects. We can use it for web development. It gives us best support for web programming languages such as JavaScript, HTML, CSS, ASP.NET. with the help of visual studio, we can improve our web programming skills a lot. Because we can install third party snippet packs for easier developments. And like that visual studio has many features.

Xcode

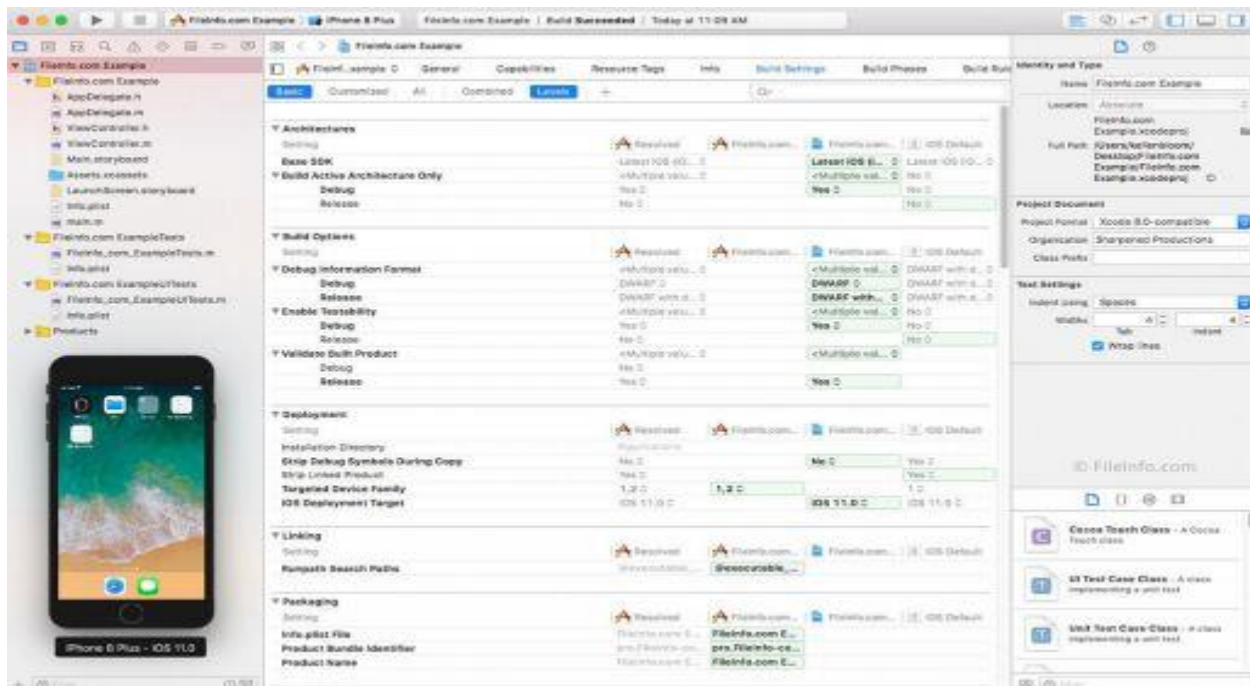


Figure 31 XCODE

Xcode is an integrated development environment for Apple development. It includes a collection of software development tools that was developed by Apple company for developing software for macOS, iOS, watchOS, and tvOS.

It supports programming languages such as C, C++, Objective-C, Objective-C++, Java, AppleScript, Python, Ruby, ResEdit (Rez), and Swift. It supports third party tools such as GNU Pascal, Free Pascal, Ada, C#, Perl, D and Fortran.

Xcode can build fat binary files containing code for multiple architectures with the Mach-O executable format which allows to run the applications on intel based processor includes 32 bit and 64 bit.

Android studio

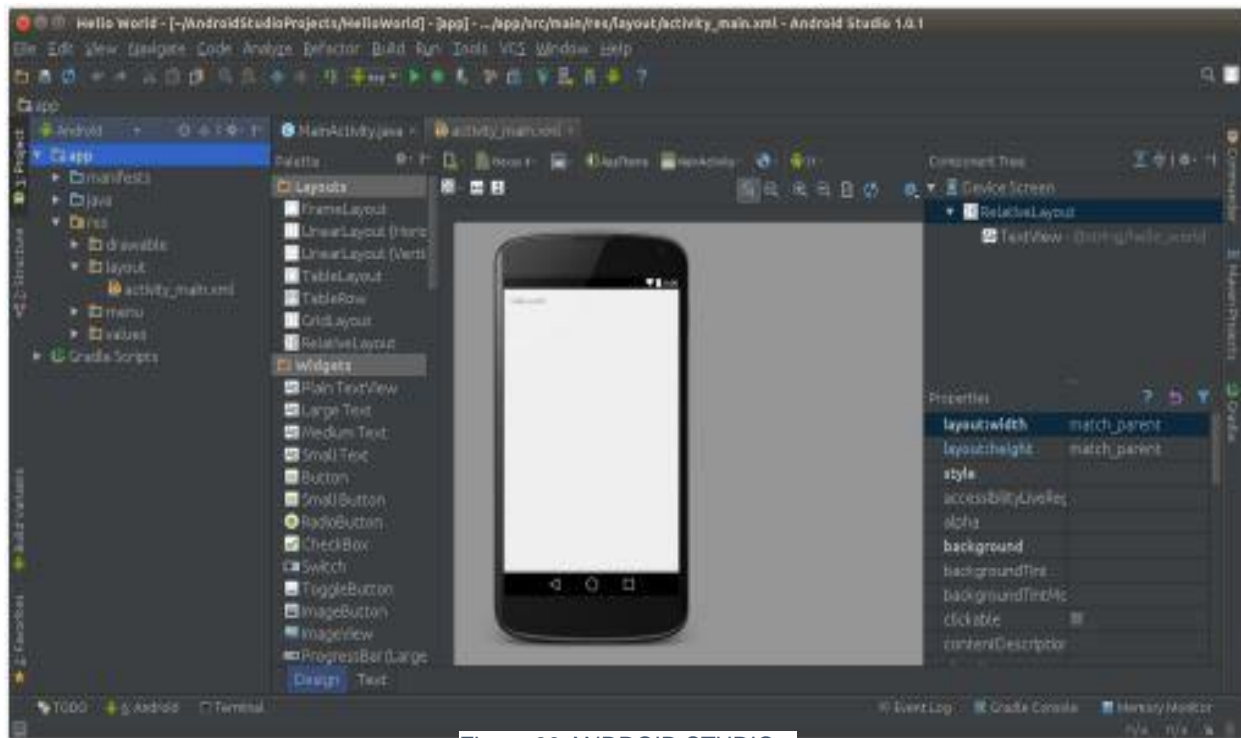


Figure 33 ANDROID STUDIO

Android studio is the official integrated development environment for developing android applications. It has robust editor tool that can be used to develop creative UI applications. The emulators can be used for different versions to test and simulate sensors without having actual Android devices. The foundation for Android Studio is based on IntelliJ IDEA.

It has a very good Gradle plugin which can be used create APK application files with different kinds of configurations. And also with the help this plugin we can export or upload the APK files to the Playstore with an easy single click.

This IDE mainly uses the Java programming language as its backbone. With that also it gets support with another statically typed programming language called Kotlin that runs on the Java virtual machine. It event supports C++ programming.

But it is very heavy application. It needs more CPU power to run on a computer. We can create virtual android device to test our application. When we create them we need to give RAM and CPU for that virtual device. But we can also test the application with a physical android device via plug it to the computer.

Netbeans

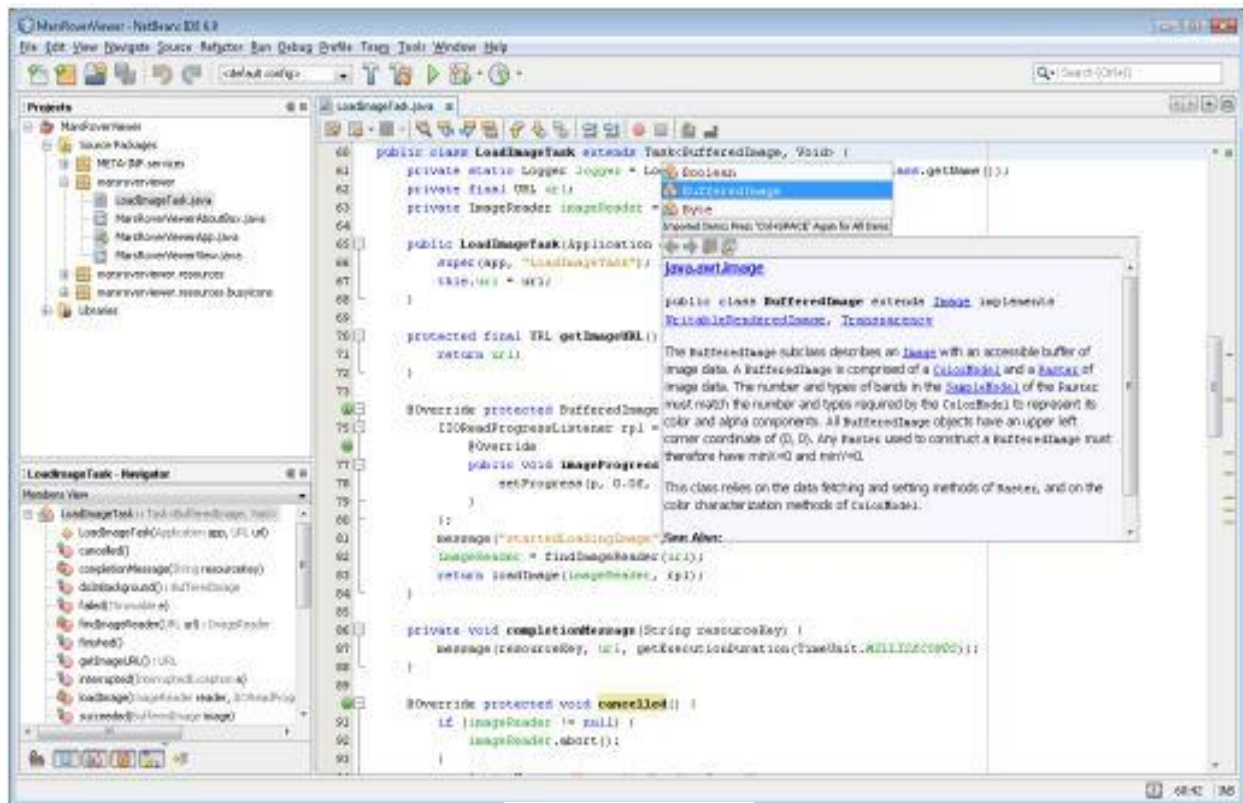


Figure 35 NETBEANS

NetBeans is a multi-languages support integrated development environment which allows applications to be developed from a set of modular software components called modules. NetBeans is almost like a cross-platform software application because it has different operating systems platforms such as Microsoft Windows, macOS, Linux and Solaris.

NetBeans IDE lets you quickly and easily develop Java desktop, mobile, and web applications, as well as HTML5 applications with HTML, JavaScript, and CSS. The IDE also provides a great set of tools for PHP and C/C++ developers. It is free and open source and has a large community of users and developers around the world.

It has feature called Rapid User Interface Development. We can design GUI for Java SE, Java EE, PHP, C/C++, and Java ME applications quickly and smoothly by using editors and drag- And drop tools in the IDE.

Eclipse

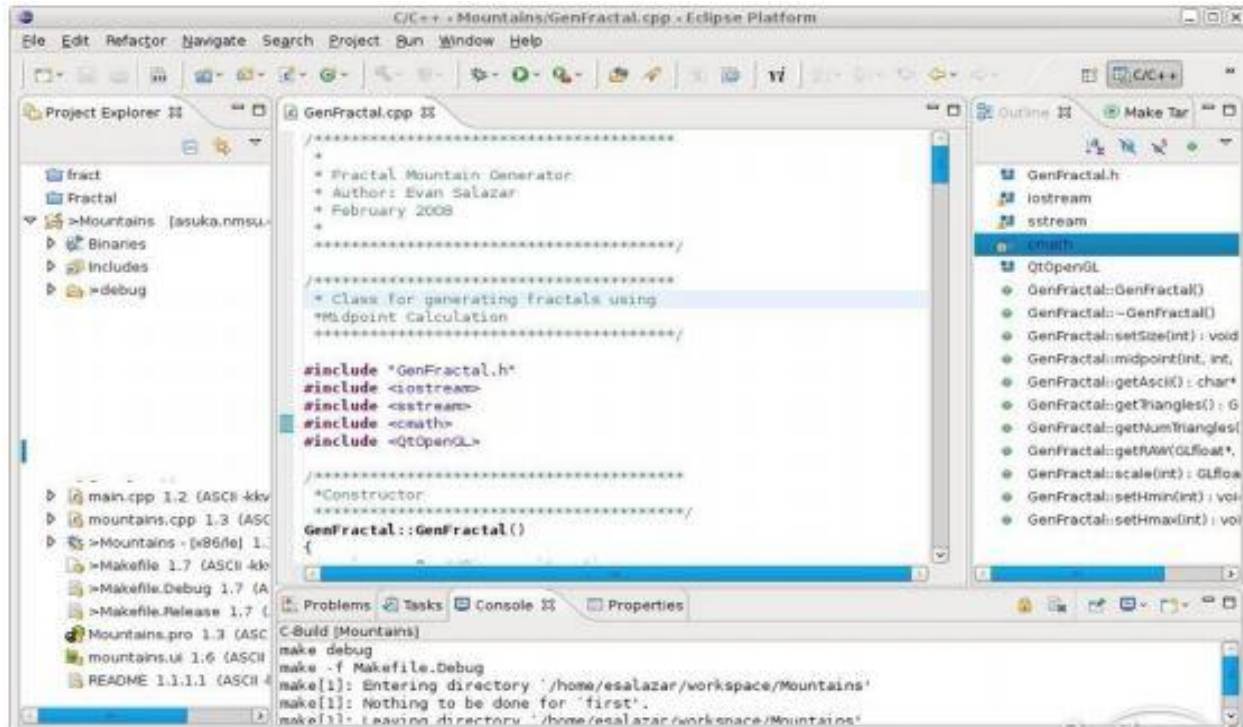


Figure 37 ECLIPSE

Eclipse is an Integrated development environment for software development process. It is most widely used for java application developments. It includes workplace and extensible plug-in system for customizing the application environment. Its primary usage is for java applications but it can be also supported many multi programming languages for desktop applications. It supports languages like Ada, ABAP, C, C++, C#, COBOL, D, Fortran, Haskell, JavaScript, Julia, Lasso, Lua, NATURAL, Perl, PHP, Prolog, Python, R, Ruby (including Ruby on Rails framework), Rust, Scala, Clojure, Groovy, Scheme, and Erlang.

There is a new version is available called eclipse oxygen. In eclipse we can install packages from the internet with the help of package explorer. This is also famous for android development. We can install the Android AVD and SDK manager plug-ins to the eclipse, then we have to locate the SDK folder. After that we can start developing android applications.

IntelliJ idea

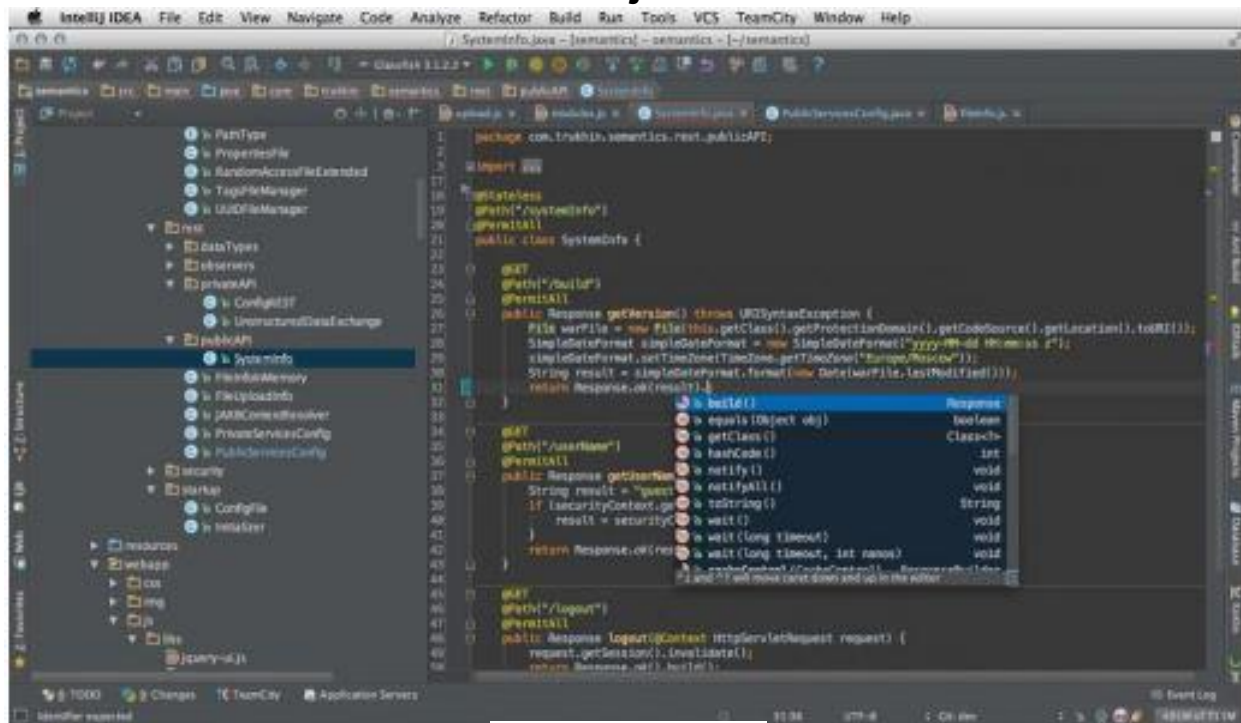


Figure 39 INTELLIJ IDEA

IntelliJ IDEA is a Java integrated development environment (IDE) for developing computer software. It is developed by JetBrains, and is available as an Apache 2 Licensed community edition, and in a proprietary commercial edition. Both can be used for commercial development.

It is not free. It is a paid version of integrated development environment. It has many features such as It is a very deep intelligence IDE which means. After it indexed the source code, it will serve a fast and intelligent experience by providing related suggestions in every context instant and clever code completion. It has a good refactoring tool.

Since it is an IDE for java, it can also understand and provides intelligent assistance for other programming languages such as SQL, JPQL, HTML, JavaScript and etc. It is better IDE for java. It is mainly focus java programming language. There are many IDEs out there for java development but it seems to be the best IDE for java development.

Code blocks

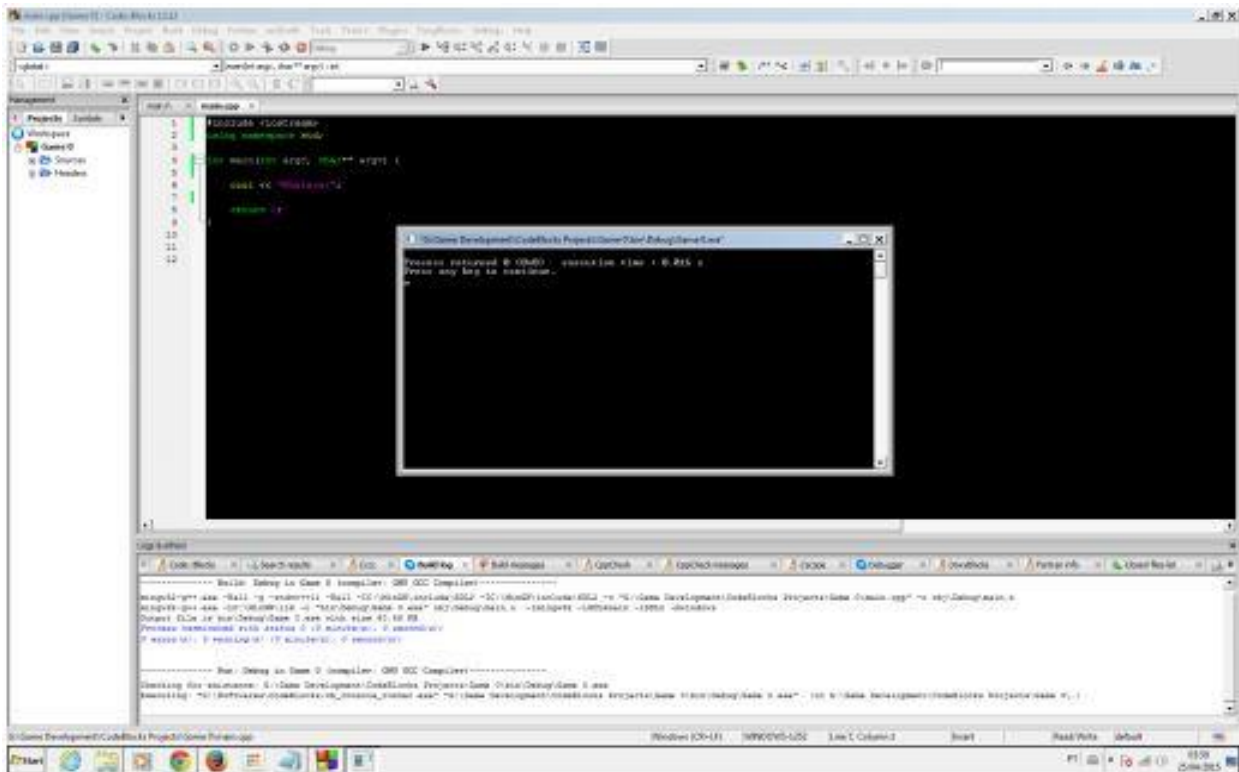


Figure 41 CODE BLOCKS

It is open source and free integrated development environment (IDE) that is mainly used for programming languages such as C, C++, Fortran. It was also developed for windows, macOS Linux, FreeBSD, OpenBSD and Solaris.

Code Blocks supports multiple compilers, including GCC, MinGW, Digital Mars, Microsoft Visual C++, Borland C++, LLVM Clang, Watcom, LCC and the Intel C++ compiler. Although the IDE was designed for the C++ language, there is some support for other languages, including Fortran and D. A plug-in system is included to support other programming languages.

The IDE features syntax highlighting and code folding. C++ code completion, class browser, a hex editor and many other utilities. Opened files are organized into tabs. The code editor supports font and font size selection and personalized syntax highlighting colors.

Different IDE's for c# programming

C# is a widely used programming language in the world. It is primarily used for desktop development. This is heavily Microsoft depended language. Most properly developers use Microsoft visual studio IDE for C#. However, there are some other IDEs that can be used develop C# programming.

1. Visual Studio
2. monoDesktop
3. SharpDevelop
4. Visual Studio Code
5. Rider
6. Xamarin Studio

Visual studio

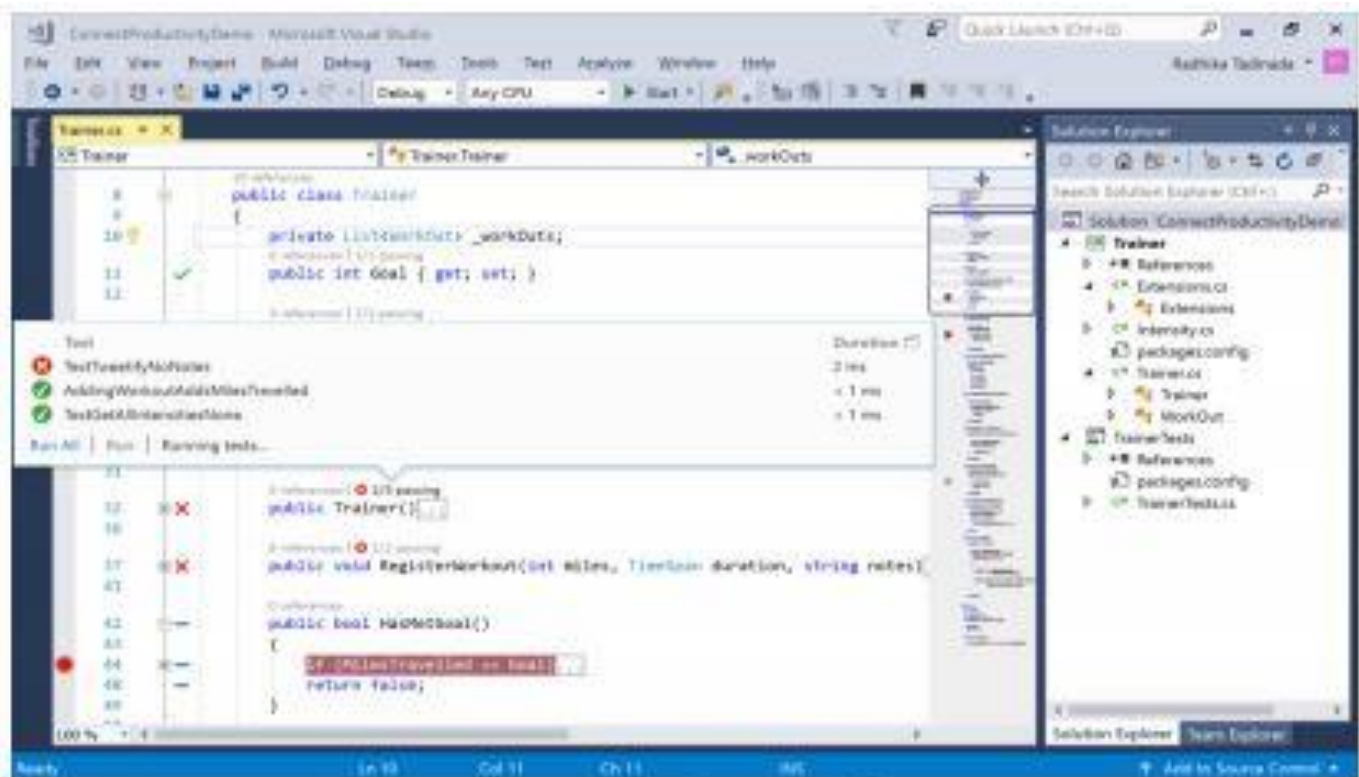


Figure 43 VISUAL STUDIO

This is a well-known IDE which is use for C# most properly. This features have been already explained in the previous topic. Depending on the research and with my own opinion I have found that this is the best IDE for C# programming. Because it has many easy features. And also visual studio has many extensions and code snippets packs if we compare with other IDEs

Monodesktop

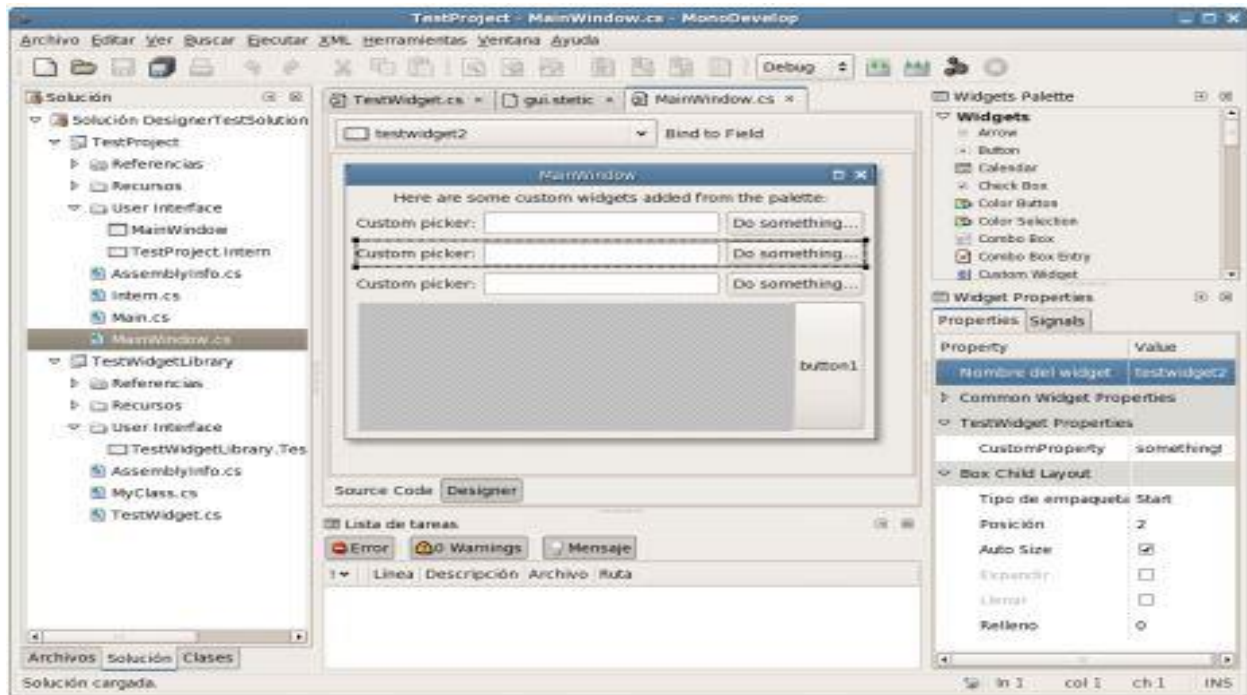


Figure 45 MONODESKTOP

It is an integrated development environment (IDE) which was developed by Xamarin. It has many similar features like Visual Studio. It is a cross platform software application for Linux, macOS and Windows. It is primarily focuses on Mono and .Net Frameworks.

Key Features:

- ❖ Standard features like code completion and debugging
- ❖ Also ships with Unity, a game engine, which enables advanced C# programming for apps like video games
- ❖ Code completion support for C#
- ❖ Code templates and code folding
- ❖ GUI support

Sharpdevelop

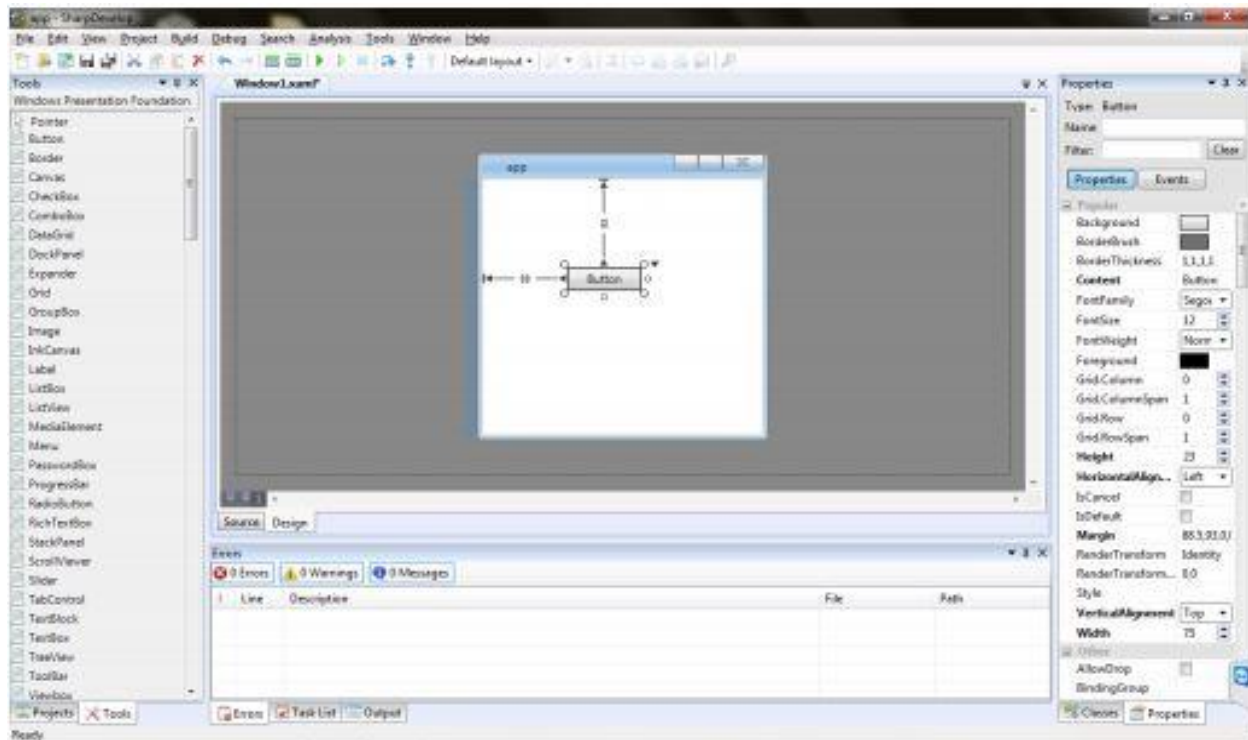


Figure 47SHARPDEVELOP

SharpDevelop is an open source integrated development environment (IDE) for the .NET Frameworks. It supports C#, Visual basic and other .Net framework programming languages. It was designed as a free and lightweight alternative to Microsoft Visual Studio.

Key Feature:

- ❖ The usual features offered by Visual Studio including code editing, compiling and debugging
- ❖ A few advanced features include context action and background syntax check
- ❖ Features for project management
- ❖ SharpDevelop works natively with Visual Studio project and code files

Visual studio code

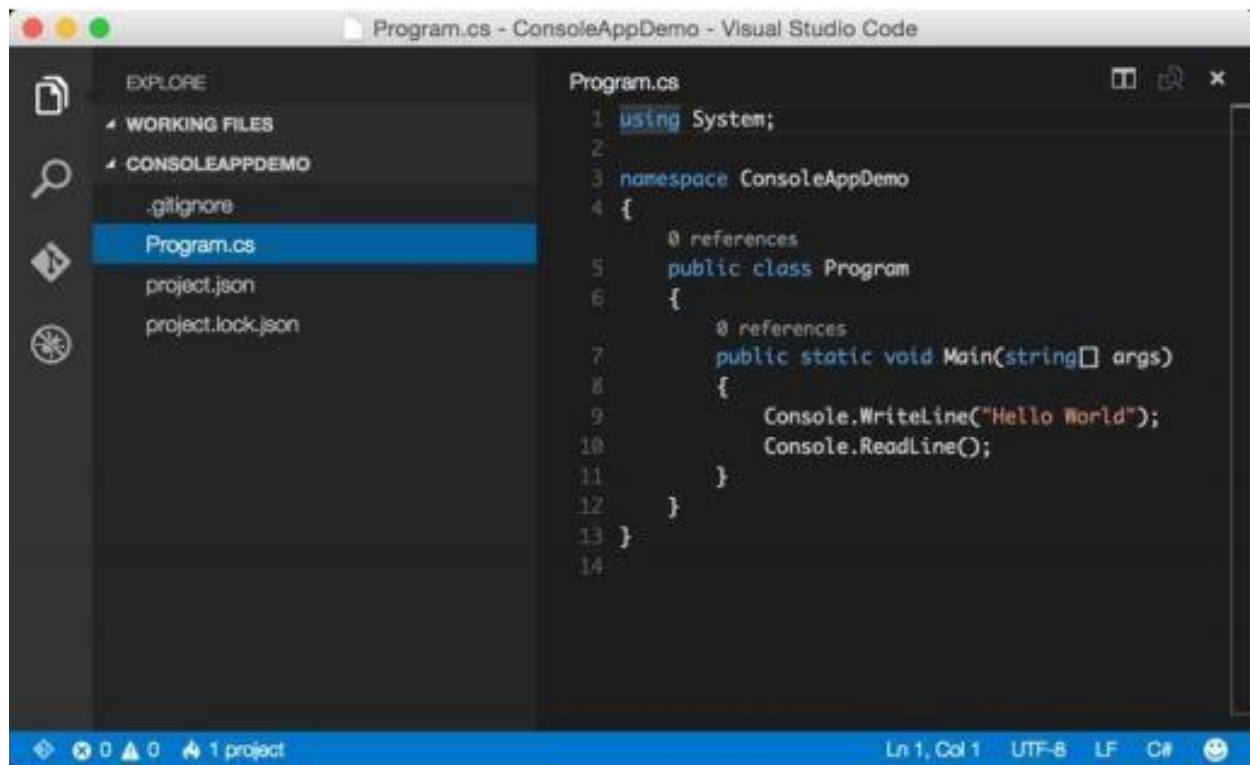


Figure 49 VISUAL STUDIO

Visual Studio Code is the most popular code editor for C# development. Even though it is not a full featured IDE. We can use it with the C# extension for powerful editing, plus full support for C# IntelliSense and debugging. We can consider it as lightweight C# IDE.

Key Features:

- ❖ Excellent auto-complete with context-aware suggestions
- ❖ Built-in Git integration for better version control
- ❖ Huge list of extensions to further enhance the platform

Rider

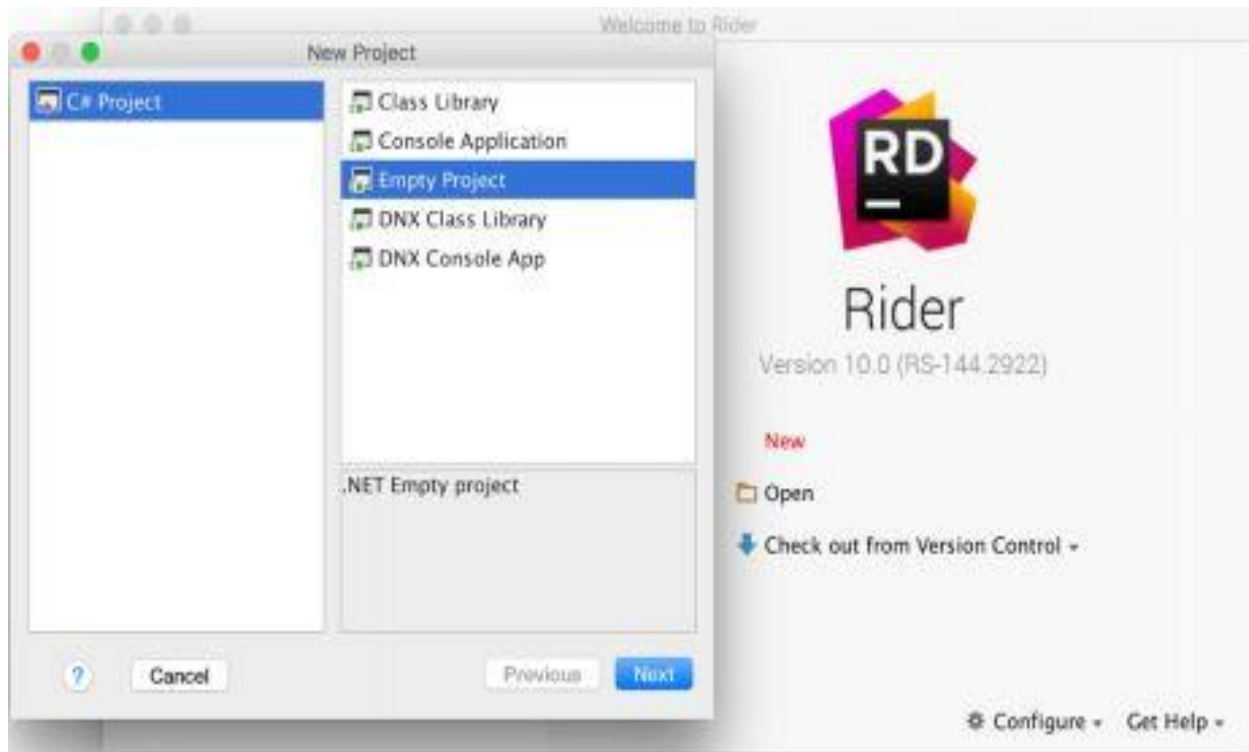


Figure 51 RIDER

It is a JetBrains Rider is a new cross-platform .NET IDE based on the IntelliJ platform and ReSharper. Rider supports .NET Framework, the new cross-platform .NET Core, and Mono based projects. This lets us develop a wide array of applications including .NET desktop applications, services and libraries, Unity games, Xamarin apps, ASP.NET and ASP.NET Core web applications.

Key Features:

- ❖ Integrates seamlessly with other JetBrains products
- ❖ 2000+ code checks
- ❖ Context actions
- ❖ Support for the Unity game engine
- ❖ Support both .NET Framework and .NET Core

Xamarin studio

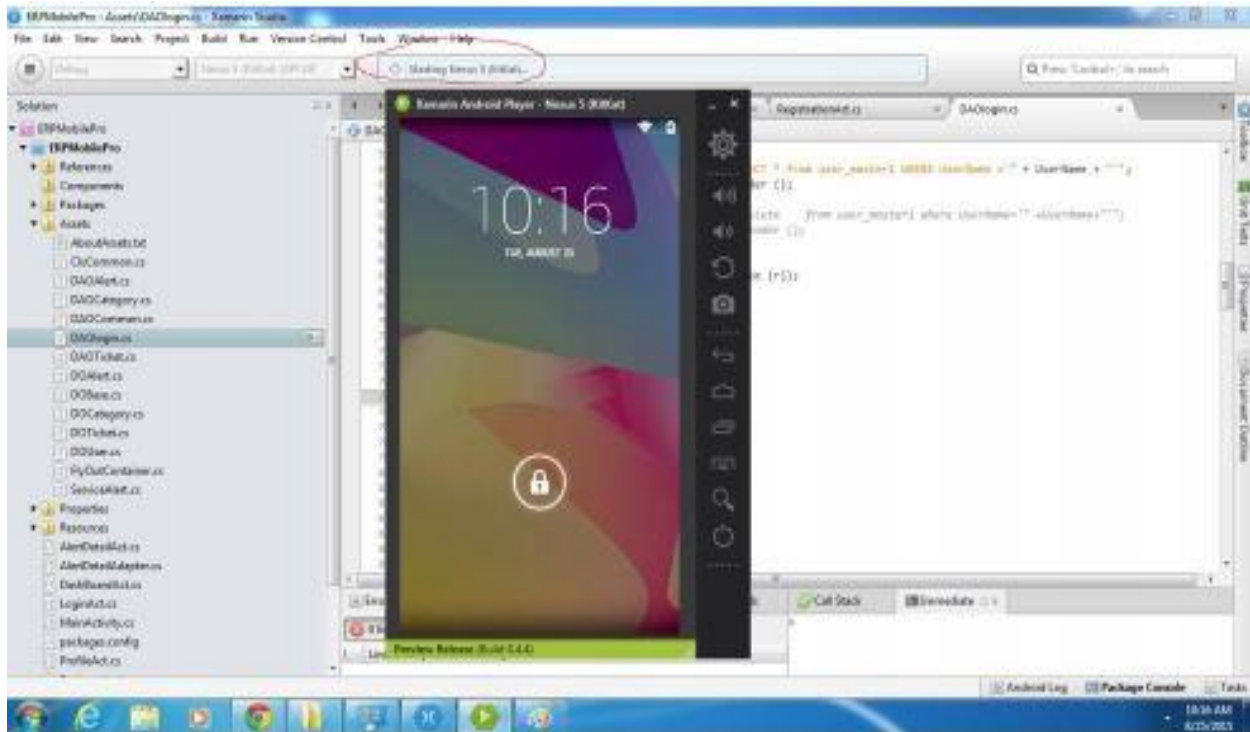


Figure 53XAMARIN STUDIO

Xamarin Studio is a mobile based Integrated development environment (IDE) which was developed by Xamarin is a Microsoft-owned San Francisco, California-based software company. This is a cross-platform IDE which uses the .NET framework library. With a C#-shared codebase, developers can use Xamarin tools to write native Android, iOS, and Windows apps with native user interfaces and share code across multiple platforms, including Windows and macOS.

Key Features:

- ❖ Native UI, native API access, and native performance
- ❖ Ship cutting-edge apps with same-day support for new OS releases
- ❖ Automate UI test on thousands of real-world devices and hundreds of configurations in the cloud
- ❖ Distribute your app to beta tester and user on Android, iOS, Windows, and macOS with every commit or on demand

Comparisons between C# IDE's

I have listed 6 IDEs that we can use for C# programming. Each of them has its own features and powers. All of them seems to be similar but not actually. It looks like all other IDEs are deriving the features from the Visual Studio.

The Xamarin Studio is totally looks different but it also has some same features like others. We can use the Xamarin Studio to develop android and iOS mobile applications with the help C# programming language. This is the unique feature that it has from others.

We can develop windows phone applications in Visual Studio since it has a windows emulator installed on it. These types of developments are difficult in other IDEs except the Xamarin Studio. But I highly recommend the Visual Studio because it has a bunch of features than other five IDEs. Even if we want to develop iOS or android applications in Visual Studio, we can install the Xamarin Studio as a part of it and use its feature inside the Visual Studio. Therefore, Visual Studio seems to be better than others.

But in sharpdevelop and monodevelop we cannot have mobile development features like that but sometimes we can install SDK manager via using the package installer. But they are not officially created for mobile development.

Visual Studio Code is not a full featured IDE. We can consider it as a code editor. We have to install an extension to develop programs in C#. But we can develop C# programs with IntelliSense and debugging performance but it not powerful like Visual studio and other IDEs.

Rider and Visual studio has unity supports. But theoretically we can even use the notepad for unity development. But visual studio and rider will give a better performance for unity development. In visual studio if we want to connect with the unity engine. we need to install a piece of software called "visual studio tools for unity".

We cannot manually connect the visual with unity engine like notepad, that will not give better performance. But the rider IDE comes with preinstalled plugin that connects to unity engine.

There are no plugins for sharpdevelop to connect with unity engine. But we can connect with it manually. The performance would be very poor if we do not use plugins or a piece of software. The auto live execution and some other important features will not work. It would be just like notepad. What am I trying to explain is we can achieve anything in any IDE by using some tricks or plugins. But we have to look at for what purpose that the IDE officially created for.

My recommended IDE

We have listed some most well used IDEs in the market nowadays. Each of them has different kinds of features. But all of the features are not in one IDE. For an example, if one IDE has one particular feature that may not be available in another IDE.

Therefore, in this section, I am going to list my recommended features that an IDE should have in order to work in a perfect manner. I feel these features are very essential for an Integrated development environment. That's why I have listed them bellow. But these features are gathered from different kinds of IDEs. But all of them are not available in one IDE.

- ❖ Supported Usage Scenarios
- ❖ Live Dependency Validation
- ❖ Architectural Layer Diagrams
- ❖ Architecture Validation
- ❖ Code Clone
- ❖ CodeLens
- ❖ Peek Definition
- ❖ Refactoring
- ❖ One-Click Web Deployment
- ❖ Model Resource Viewer
- ❖ Visualize solutions with Dependency Graphs and Code Maps
- ❖ Multi-Targeting
- ❖ Advanced Debugging and Diagnostics
- ❖ IntelliTrace
- ❖ Code Map Debugger Integration
- ❖ .NET Memory Dump Analysis
- ❖ Code Metrics
- ❖ Graphics Debugging
- ❖ Static Code Analysis
- ❖ Performance and Diagnostics Hub
- ❖ Testing Tools
- ❖ Live Unit Testing
- ❖ Test Case Management
- ❖ Web Load & Performance Testing
- ❖ IntelliTest
- ❖ Microsoft Fakes (Unit Test Isolation)
- ❖ Code Coverage
- ❖ Lab Management
- ❖ Coded UI Testing
- ❖ Manual Testing with Microsoft Test Manager
- ❖ Exploratory Testing with Microsoft Test Manager
- ❖ Fast-forward for Manual Testing with Microsoft Test Manager
- ❖ Unit Testing
- ❖ Embedded Assemblies
- ❖ Xamarin Inspector
- ❖ Xamarin Profiler
- ❖ Remoted iOS Simulator for Windows
- ❖ Share code between Android and iOS with Xamarin
- ❖ Native iOS and Android UI Designers
- ❖ Xamarin.Forms
- ❖ Xamarin Instant Player

- ❖ Cross-platform Development
- ❖ Collaboration Tools and Features
- ❖ PowerPoint Storyboarding
- ❖ Code Review
- ❖ Task Suspend/Resume
- ❖ Team Explorer

These are recommended features from my side. These features are collected from different types of IDEs. My thought is, these are the very essential features that an IDE must have in order for the developers to work perfectly.

If an IDE exists with these kinds of features in it. It would be very good for us. Because these features are gathered from different kinds of IDEs and combined as one. But I feel if an IDE has all the mentioned features in it. That IDE would be very useful for the developers.

Visual studio is a highly featured integrated development environment. But Visual studio does not contain any supportive tools for PHP by default, since php is not a product of Microsoft. But the php-designer IDE has more good features for PHP programming language. depending on my recommendation, I suggest the visual studio to have the same features for PHP. like php designer. We can install PHP supportive tools in Visual Studio as a paid extension. But they do not give efficient support for PHP development. And it is not officially given by the Microsoft.

Visual studio also does not does have any supportive tools for Java programming language. If the visual studio had the Java support, it would be much useable product. Therefore, my recommendation is to have Java support to visual studio officially,

Task 3:-

The primary of the task 3 implement the basic algorithm of the SMS system. According the scenario the SMS system was develop in C# programming language in concise manner.

Development part has been already done. Now SMS system is up and running. According to the requirements of the task. We have to describe the application in a report with extracts of important code snippets that has been coded.

This task is going to give detailed information about the SMS system. It is well explained all the important snippets code and other important concept of programming. this task will give a great understandable overview of the SMS system.

Introduction

This document is going to bring the most important detailed information about the SMS system. Normally if we wonder what is SMS? short message service. This is the definition of SMS system.

In Sri Lanka, SMS service increasingly becomes the preferred option for most people, especially among students in campuses, universities and families. But most ISP organizations are using manual method to store information about customer. And all of the work is been done in paper.

Purpose of this SMS system has been developed to such fraudulent transection An agency delivers goods to the shops and collects the cash on later dates. A cash collector is appointed to collect the cash from the shops where the good were delivered. The agency observes that there is a malpractice by the cash collector that the actual collection amount is higher then the claim made by the cash collector that the actual collection amount is higher then the claim made by the cash collector.

SMS system source code

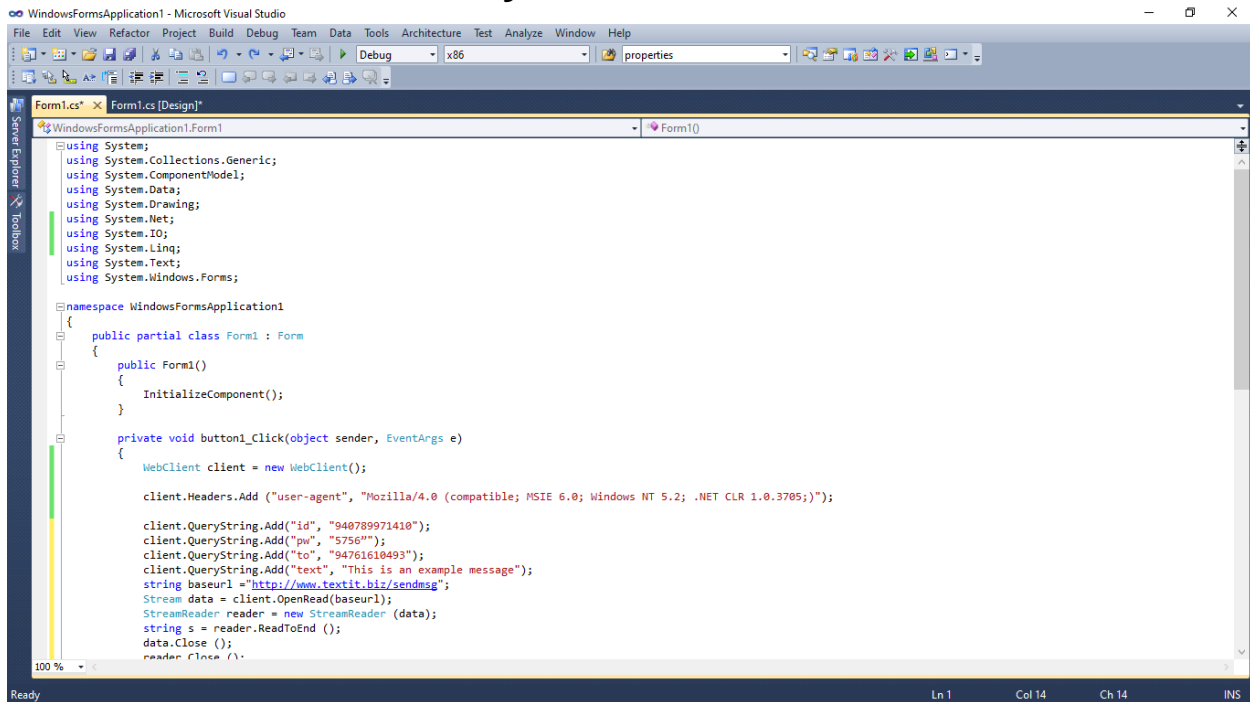


Figure 54 SMS SYSTEM

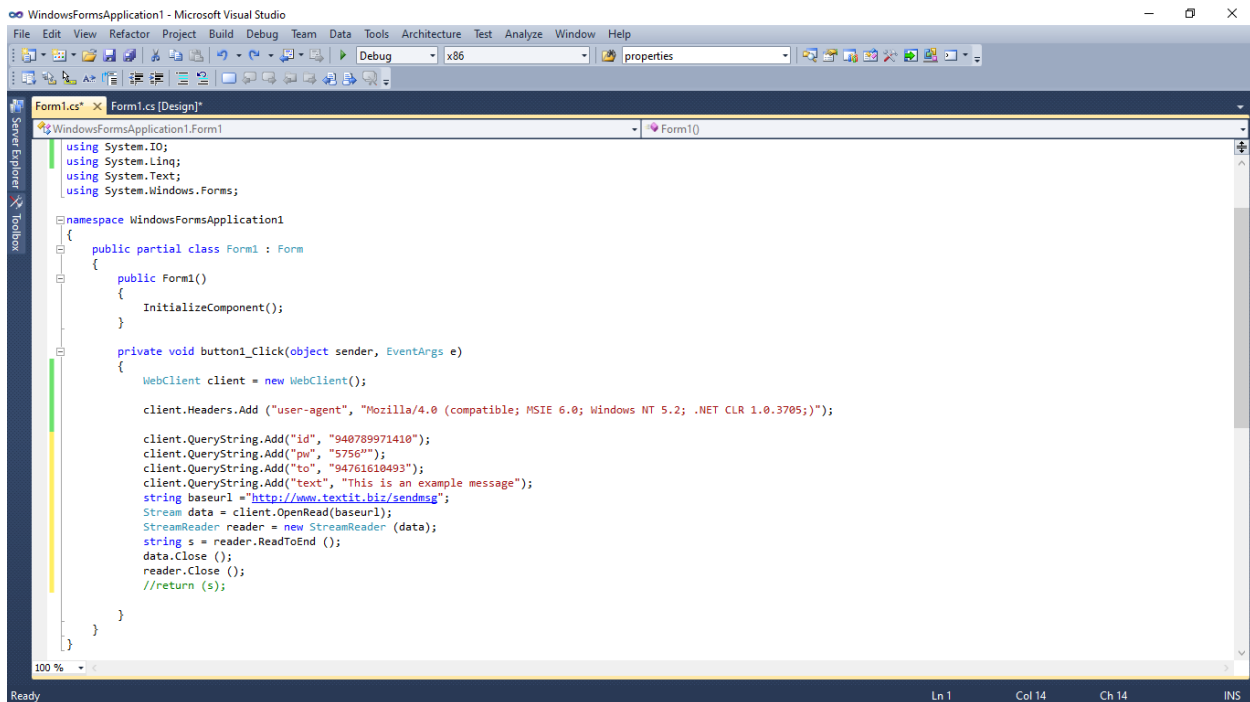


Figure 55 SMS SYSTEM

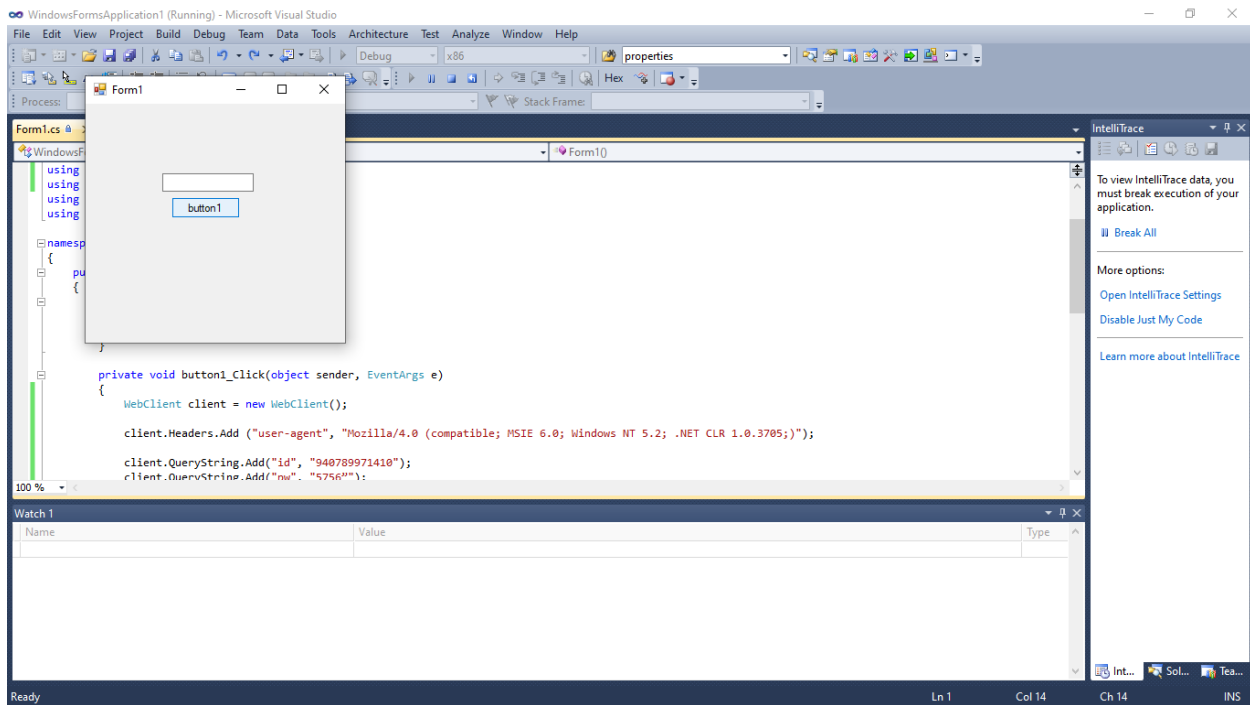


Figure 56 SMS SYSTEM

Source code explanation

I have create this SMS system using C# windows form application. For this I have used the textit.biz SMS gate way and its softcopy is attached to the DVD

Task 4:-

Introduction

This task is very different from the tasks which have been completed already. Because it has much different types of objectives to accomplish. The main scope of this task is to select a coding standard by doing research about the relevant coding standards currently used in the industry in relation to the programming languages which were used to develop the System.

This task is also involving an explanation of the debugging process and explain the its facilities available in the IDE. With that also, this task outlines the coding standard that has been used in the System program.

One of the other responsibilities of the task is to explain the evaluation of the debugging process how they can be used to help developing more secure, robust applications. Finally, This task outcomes a critically evaluate why a coding standard is necessary in a team as well as for the individuals.

Coding standard

What is coding standard

It is a well-known fact that in any industry standardization positively impacts the business. Similarly, in the software industry, establishing coding standards is essential for successful implementation of a program. The smooth functioning of software programs is vital for the success of most organizations.

The definition of the coding standard can be explained in many different ways. But the right way to explain that could be easily understood as a series of procedure for a specific programming language that determines the programming style, procedures, methods and so on. It is also for various aspects of the program written in that language. The coding standards are a very critical attribute of software development.

A coding standard ensures that all developers writing the code in a particular language write according to the guidelines specified. This makes the code easy to understand and provides consistency in the code.

In more details. It means if one developer writes a program by using a particular coding standard, that can be much easier for the other developers to continue to source code without any unclear statement's problems.

One of the most essential factors in a software development system is the consistency of the coding standard. This is because it positively impacts the quality of the system. While using a software system, you need to ensure that the guidelines do not contradict each other. The source code that uses the standard should also be in harmony with the standard. The completed source code should indicate as if the code has been written by a single developer in a single session.

Sometimes a coding standard is an accepted practice for a particular language. For instance, programmers generally accept that when writing C# source code, they will write parameters and private and protected fields using Camel casing. They will write all other identifiers using Pascal casing. What this means for the C# programmer is that they can look at a piece of C# source code written by another and quickly identify segments. This increases readability substantially.

Common aspect of a coding standard

- ❖ Naming conventions
- ❖ File naming and organization
- ❖ Formatting and indentation
- ❖ Comments and documentation
- ❖ Classes functions and interfaces
- ❖ Pointer and reference usage
- ❖ Testing

Basic proper coding standard

- ❖ You need to ensure that the code is readable and properly spaced out.
- ❖ You will need to define different sections by dividing blocks of code into paragraphs.
- ❖ You will need to use indentation to depict where the control structures begin and end and clearly indicate where the code within them is.
- ❖ Your variable naming conventions should be consistent throughout the code. They should describe the data they contain.
- ❖ You will be required to name the functions according to what they perform.
- ❖ Your coding should be such that when you return to it after a time gap you should be able to understand it without having to look at every line.
- ❖ You need to follow the appropriate method for commenting on the work.
- ❖ Avoid using complex language functions or constructs that are difficult to comprehend.

Why is a coding standard necessary?

Without the proper coding standard, some developer uses their own style of coding standard which would cause more unexpected problems. There are lots of negative impacts of using poor coding standard while developing process.

Security Issues: The main reasons for commonly exploited software vulnerabilities are inconsistencies, bugs, and errors in the logic. Most of these problems arise due to programming errors that result from poor coding practices.

Site Performance Issues: Bad coding affects the overall performance of the site. Various performance issues include:

- ❖ User interaction
- ❖ Server response
- ❖ Code reusability
- ❖ Flow issues

Benefits of coding standard in a team

In the software industry, all of the coding works are done as a teamwork. For an example, today one developer is writing codes for one application. The same application will be continued by another developer tomorrow. Therefore, it is very vital to follow the coding standard.

If they do not follow the coding standard very effectively, the other developer will find it difficult to work with it. If all the developers follow the coding standard very closely, there will be no problem because they can be worked in a synced environment.

The success of the software product is depended on each and everyone in a team. If one member makes a mistake, the entire team will be broken and the outcome of the software product also will be failed. Therefore, it is very mandatory to follow the coding standard precisely.

The another most important factor is that in a team, new member will be included for software development process. But that newly joined employee has to follow the coding standard in order to work in with them perfectly. Therefore, the newly joined employee has to have the skills to write computer codes in standard way.

Benefits of coding standards

Increases Efficiency: It has been observed that software developers spend a significant amount of time in resolving issues that could have been prevented. Establishing coding standards enables the team to detect problems early or prevent them entirely. This enhances the efficiency throughout the software process.

Minimize the Risk of Project Failure: Many a time IT projects fail due to software development problems. Coding standards reduce the risk of failures.

Reduces Complexity: Higher the complexity of a code the more vulnerable it is to errors. Coding standards help develop software programs with reduced complexity thereby minimizing errors.

Maintenance becomes easy: If a source code is consistent it can be easily maintained. This is because anyone can step in at any stage maintain it or incorporate any modifications.

Correction of bugs: A consistent source code makes it easy to locate and correct bugs in the software.

A comprehensive view: A consistent source code facilitates a clearer view of how the code fits within the larger application or the company as a whole.

Cost saving: A consistent code leads to a clear view which in turn results in the potential for more code reuse. This drastically reduces the cost and development effort.

Best practices for writing super readable codes

- ❖ Code Commenting & Documentation
- ❖ Consistent Indentation
- ❖ Avoid Obvious Comments
- ❖ Code Grouping
- ❖ Consistent naming scheme
- ❖ Avoid Deep Nesting
- ❖ Limit Line Length
- ❖ File and Folder Organization
- ❖ Object-oriented vs. Procedural
- ❖ Read open source code
- ❖ Code Refactoring
- ❖ Inline Commenting
- ❖ Descriptive Blocks
- ❖ Group/Class Comments
- ❖ Front-end Code Commenting

Task 4.1:-

In this section, there are lots of things about debugging and testing. The main scope of this section is to test the application in various manner. The application has to be tested by one of the classmates.

Another objective of the task is to explain the debugging process and explain the debugging facilities available in the IDE which was used to develop. It also evaluates how the debugging process can be used to help develop more secure, robust application.

Explanation of the debugging process

This section is going to give a clear explanation of the debugging process in the software development filed. Debugging is a vital task to cover. There are lot of things that we have to explain about the debugging in here.

What is debugging

Debugging, in computer programming and engineering, is a multistep process that involves identifying a problem, isolating the source of the problem, and then either correcting the problem or determining a way to work around it. The final step of debugging is to test the correction or workaround and make sure it works.

In software development, debugging involves locating and correcting code errors in a computer program. Debugging is part of the software testing process and is an integral part of the entire software development lifecycle. The debugging process starts as soon as code is written and continues in successive stages as code is combined with other units of programming to form a software product. In a large program that has thousands and thousands of lines of code, the debugging process can be made easier by using strategies such as unit tests, code reviews and pair programming.

Debugging facilities in IDE

There are lots of debugging features are available in all kinds of IDEs. But here we have taken the visual studio IDE to explain the debugging process. Because we have written the in Visual Studio by using C# programming language. Some of the most essential debugging tools and methods are show bellow.

- ❖ Set a breakpoint
- ❖ Navigate code in the debugger using step commends
- ❖ Steps into a property
- ❖ Run to a point in your code quickly using the mouse
- ❖ Advance the debugger out of the current function
- ❖ Run to cursor
- ❖ Restart your app quickly
- ❖ Inspect variables with data tips
- ❖ Inspect variables with the autos and locals windows
- ❖ Set a watch
- ❖ Examine the call stack
- ❖ Examine an exception
- ❖ View snapshots with IntelliTrace step-back (visual studio enterprise)

These are the debugging facilities available in the Visual Studio integrated development Environment. In most of the IDEs the same features are available. Here, we will give a simple explanation of each features.

How debugging helps to develop more secure robust applications

By using the debugging methods, we can produce more secure software application because, debugging gives a clear understanding of the software workflow. Via doing a proper debugging, as software developers, we are able to dig the low-level staff of the software system.

If the software developers get to know the low-level staff of the software program, they would able to find any security leaks inside the system. Debugging also provides clear understating of the memory management of the running system.

The another most important advantage of the debugging process is, there is a option called break points, it gives an idea of how the software system is working in more details. From the we are able to secure the system much better.

This process is also helping us to remove existing and potential errors in a software code that can cause it to behave unexpectedly or crash. It helps us to prevent incorrect operation of a software system, it is also used to find and resolve bugs or defects inside the software system. Therefore, the outcome would be more robust and secure.

Debugging is distinguished from testing and defined not only for removing bugs from programs dynamic debugging but also from documents describing the programs static debugging.

The key problem of debugging is understanding the software. Debugging may be supported by static analysis tools and by interactive debugging systems which help both to understand the software better and to estimate the impacts of an intended change. Graphical representations are also very useful for better understanding system structures and for recognizing faults and clashes faster. Tools may furthermore be used to report errors and corrections, and to maintain these reports.

In the context of the tools supporting debugging are connected. Tools can be based on a uniform internal representation, allowing a uniform user interface. Tasks and corresponding tools can be tailored to each other, avoiding duplication of work. One task knows what the others have already done. One knows if certain types of errors have been prevented or removed, for an example if static analysis tools prevent data flow errors during runtime.

Conclusion

In conclusion this assignment has more detailed information about the computer programming concept. As a student I have I have gained a lot of knowledge about computer programming and other essentials things about programming concept.

In this assignment I have done lot things which are very to improve my knowledge. Specially I have a done a 15 minutes Microsoft PowerPoint presentation that focuses on the basic programming essentials such as algorithm, pseudocodes, flowchart and C# programming.

This assignment was very helpful for me to create and understand algorithms which is used for primality test. I was able to create algorithm which does the same thing in different perspective. But some are fast and quick.

I have improved a lot knowledge about computer programming paradigm such as procedural object oriented and event driven programming paradigms. Its was very useful for me.

I have learned a bunch of things about the IDE's via this assignment. I have done many resourceful researches about them and found many extra ordinary details about the IDE's. I have pointed out different IDE's that are used to C# programming development and I have listed many good modern IDE's that are the markets. It was very helpful to learn about the cloud based IDE's. For that researching purpose I needed to create an account in the Eclipse Che for screenshots and other useful things.

I have gained a bunch of knowledge about C# programming. I have created SMS system. then I learn about software coding standard.

I have learned so many things about the debugging process and other essential things. I have improved a lot of skills in testing. this assignment taught me a lot of things.

Finally I express my deepest thanks to the assessor. Mr. Mohamed Nizzad. who gave this awesome opportunity to my computer programming knowledge.

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