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Calculation Of Drainage Basin Characteristics Using Visual Studio

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ABSTRACT-

The water is most essential requirement for human life and survival of plants and animals. Rainfall is the main and natural source of water. In this respect the hydrology provides a tool for assessment and development of water potential of a particular region. Drainage basin or watershed is described as the area containing set of streams which drains to a common point. The input for watershed is the rainfall and the output of watershed is the runoff i.e., stream flow to the outlet of watershed. The runoff developed is depend upon the watershed or drainage basin characteristics. Watershed or drainage basin characteristics are very important for calculation of runoff as well as soil erosion.

Thus, by using visual studio the calculations are completed in a very short span of time as the formula are predefined in the software. The complete design was done using visual studio 2022 of 64-bit application. It is was done in a very less time and with accuracy. All the formulas of all parameters are provided on main page. By entering the values of each value, the calculation of formulae for drainage basin characteristics. It was found that the results were accurate. Thus, this software program is very efficient for calculating formulae for drainage basin characteristics.

Keywords: Drainage Basin, Characteristics, program, visual studio, computerized.

I. INTRODUCTION

The entire area of a river basin whose surface runoff (due to a storm) drains into the river in the basin is taken into account as a hydrologic unit and is called drainage basin. The boundary line, along a topographic ridge, separating two adjacent drainage basins is called drainage divide (Mbajiorgu, Constantine,2020). The single point or location at which all surface drainage from a basin comes together or concentrates as an outflow from the basin in the stream channel is called concentration point or measuring point. Usually, the stream outflow is measured at pour point. The time required for the rain falling at the most distant part in a drainage area i.e., on the fringe of the catchment to reach the concentration point is called the concentration time.The storms having more duration than time of concentration will able to produce runoff from the entire catchment area &cause high intensity flood (Catchment Characteristics 123dok.com).watershed or drainage basin characteristics plays an important role in development of runoff from basin. The drainage basin characteristics such as stream density, drainage density, form factor, circulatory ratio, elongation ratio, length of overland flow and constant of channel maintenance are calculated by using visual studio.

Existing System

The Existing system is totally manual. This chapter deals with the Estimation of drainage basin characteristics. It includes different values and theoretical considerations those were used while developing software. It also encapsulates the configuration of the system and information about the used to develop software.

Limitations in Present System

There are certain limitations in system, that areas follow: -

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1) There are various steps or formulae involved in to determine Drainage Basin Characteristics Formulae so it is difficult to handle manually.
2) Manually calculations are difficult to estimating various parameters of drainage basin and also more time required.
3) For recording purpose, it should be note down in some paper, thus possibility of losing the data is more.
4) It is tough to search the previous record of knowledge.
5) Manually calculations include a lot of errors with less accuracy.
6) It requires the man power for calculation on the field and make it secures.

Proposed system

The proposed system is deals with the functionality of calculations of Drainage Basin Characteristics formulae.To remove the complexities, errors and difficulties the proposed system is developed (S.B. Pawar et al.,2022). These difficulties can take place at the time of managing the jobs at institution. Today the digitalization is directly come with computerization, so the students, researchers are coming under the one roof to learn about digitalization and computerization. Calculate the Drainage Basin Characteristics by paper-based method is complex method to find the accurate value of the specific parameter. Since these works does manually thus it takes more time and there are chances of errors such as wrong details, wrong value at wrong place etc.

So to reduce these faults "Calculation of Drainage basin characteristics using Visual Studio" has been developed, with objectives such as to get acquainted with software visual studio, to simplify the calculations of drainage basin characteristics formulae. The proposed system deals with all the activities which are done by the agriculturist for calculation accurate results.

Advantages of Proposed System: -

Performance improvements

Visual Studio 2022 is faster, more approachable, more lightweight, and is designed for both learners and those building industrial scale solutions.(answersdb.com)

Visual Studio 2022 is 64-bit

Visual Studio 2022 on Windows is now a 64-bit application. It easier to work with even bigger project and more complex workloads. (answersdb.com)

Build modern apps

Visual Studio 2022 makes it quick and easy to build modern, cloud-based applications with Azure(answerdb.com). As well, its new version also has full support for .NET 6 and its unified framework for web, client, and mobile apps for both Windows and Mac developers. And, Visual Studio 2022 includes robust support for the C++ workload with new productivity features, C++20 tooling, and IntelliSense. (answersdb.com)

Better dev tools for C++ and .NET, and Hot Reload

Visual Studio 2022 includes better cross-platform app development tools and the latest version of C++ build tools, to include C++20 support. (answersdb.com)

Innovation at your fingertips

Multi-repo support with Git in the IDE

If you've got worked with projectshosted on different Git repositories, you may have used external tools or multiple instances of Visual Studio to connect to them (answersdb.com). In Visual Studio 2022, you can work with a single solution that has projects in multiple repositories and contribute to them all from a single instance of Visual Studio. (answersdb.com)

Materials and Methods:

System Requirements

- Windows 11Home
- Installed memory (RAM): 8.00 GB (7.75 GB usable)
- System type: 64 – bit software

About the platform

- Visual Studio 2022
- Copyright (c) 1990, 1992 by Borland International, Inc.

Following are the drainage basin characteristics

1. Stream density,

The stream density of a drainage basin is expressed as the number of streams per square kilometre.(Catchment Characteristics,id-123dok.com)

$Ds = Ns / A$

Where, Ns- Number of Streams

A-Area of the Drainage Basin

2. Drainage density,

Drainage density is expressed as the total length of all stream channels (perennial and intermittent) per unit area of the basin and serves as an index of the areal channel development of the basin (Catchment Characteristics, id-123dok.com).

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Drainage density varies inversely as the length of overland flow and indicate the drainage efficiency of the basin. A high value indicates a well-developed network and torrential runoff causing intense flood while a low value indicates moderate runoff and high permeability of terrain.

$$Dd = Ls/A$$

Ls= Total length of all stream channel in the basin.

A= Area of Drainage Basin

3. Form Factor,

The area of the drainage basin divided by the square of axial length of the basin; where value < 1

$$R_f = A/Lb2$$

Where, A = Area of Drainage Basin

Lb = Axial Length of Basin

4. Circulatory Ratio,

a. The ratio of basin area to the area of a circle having the same perimeter as the basin; where value £ 1.

$R_c = A/Ac$

Where, A = Area of Drainage Basin

Ac = Area of circle having equal perimeter as the perimeter of drainage basin

5. Elongation Ratio,

a. The ratio of the diameter of a circle of the same area as the basin to maximum basin length; where value £ .1

Re = Dc/L

Where, Dc = Diameter of circle having same area as basin

L = Maximum length of basin

6. Length of Overland Flow,

Lg = 1/2Dd

Where, Dd = Drainage Density

7. Constant of channel Maintenance

– It is inverse of drainage density.

$$C = 1/Dd$$

Where, Dd = Drainage Density

Following are the codes used for programming:

1.Source code for Homepage

```
namespace Drainge_Basin
{
publicpartialclassForm1 : Form
   {
publicForm1()
      {
InitializeComponent();
      }

privatevoid button5_Click(object sender, EventArgs e)
      {
         Form6 frm6 = new Form6();
         frm6.Show();
      }

privatevoid button2_Click(object sender, EventArgs e)
      {
         Form3 frm3 = new Form3();
         frm3.Show();
      }

privatevoid button1_Click(object sender, EventArgs e)
      {
         Form2 frm2 = new Form2();
         frm2.Show();
      }

privatevoid button3_Click(object sender, EventArgs e)
      {
         Form4 frm4 = new Form4();
         frm4.Show();
      }
privatevoid button4_Click(object sender, EventArgs e)
      {
         Form5 frm5 = new Form5();
         frm5.Show();
      }

privatevoid button6_Click(object sender, EventArgs e)
      {
         Form7 frm7 = new Form7();
         frm7.Show();
      }

privatevoid button7_Click(object sender, EventArgs e)
      {
         Form8 form8 = new Form8();
         form8.Show();
      }

privatevoid Form1_Load(object sender, EventArgs e)
      {

      }
   }
}
```

2.Source code for calculation of stream density using visual studio

```
using System;
```

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```
usingSystem.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
usingSystem.Threading.Tasks;
usingSystem.Windows.Forms;

namespace Drainge_Basin
{
publicpartialclassForm2 : Form
   {
publicForm2()
      {
InitializeComponent();
      }
privatevoid label2_Click(object sender, EventArgs
e)
      {
      }
privatevoid label1_Click(object sender, EventArgs
e)
      {
      }
privatevoid button1_Click(object sender,
EventArgs e)
      {
double Ns, A, Ds;
         Ns = Convert.ToDouble(textBoxNs.Text);
         A = Convert.ToDouble(textBoxA.Text);
         Ds = Ns / A;
         textBoxDs.Text = Ds.ToString();
      }
   }
}
```

3.Source code for calculation of Drainage density by using visual studio

```
namespace Drainge_Basin
{
publicpartialclassForm3 : Form
   {
publicForm3()
      {
InitializeComponent();
      }

privatevoid button1_Click(object sender,
EventArgs e)
      {
double Dd, Ls, A;
         Ls = Convert.ToDouble(textBoxLs.Text);
         A = Convert.ToDouble(textBoxA.Text);
         Dd = Ls / A;
textBoxDd.Text = Dd.ToString();
      }
   }
}
```

4.Source code for calculation of Form Factor

```
using System;
usingSystem.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
usingSystem.Threading.Tasks;
usingSystem.Windows.Forms;

namespace Drainge_Basin
{
publicpartialclassForm4 : Form
   {
publicForm4()
      {
InitializeComponent();
      }

privatevoid button1_Click(object sender,
EventArgs e)
      {
double A, Lb, Rf;
         A = Convert.ToDouble(textBoxA.Text);
         Lb = Convert.ToDouble(textBoxLb.Text);
double z = Math.Pow(Lb, 2);
         Rf = A / z;
textBoxRf.Text = Rf.ToString();

      }
   }
}
```

5.Source code for calculation of Circulatory ratio

```
using System;
usingSystem.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
usingSystem.Threading.Tasks;
usingSystem.Windows.Forms;

namespace Drainge_Basin
{
publicpartialclassForm5 : Form
   {
```

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```
publicForm5()
      {
InitializeComponent();
      }
privatevoid button1_Click(object sender,
EventArgs e)
      {
double A, Ac, Rc;
         A = Convert.ToDouble(textBoxA.Text);
         Ac = Convert.ToDouble(textBoxAc.Text);
Rc = A / Ac;
textBoxRc.Text = Rc.ToString();

      }
privatevoidtextBoxRc_TextChanged(object sender,
EventArgs e)
      {

      }
   }
}
```

II. RESULT AND DISCUSSION:

This chapter deals with the results obtained by calculation of drainage basin characteristics.

Fig1. Homepage

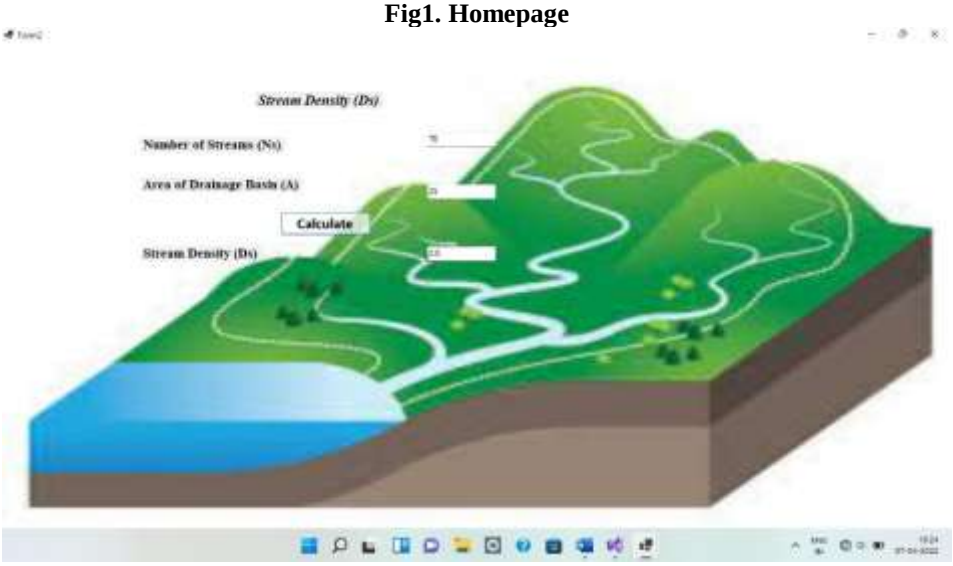

Fig 2. Stream Density

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Fig 3. Drainage Density

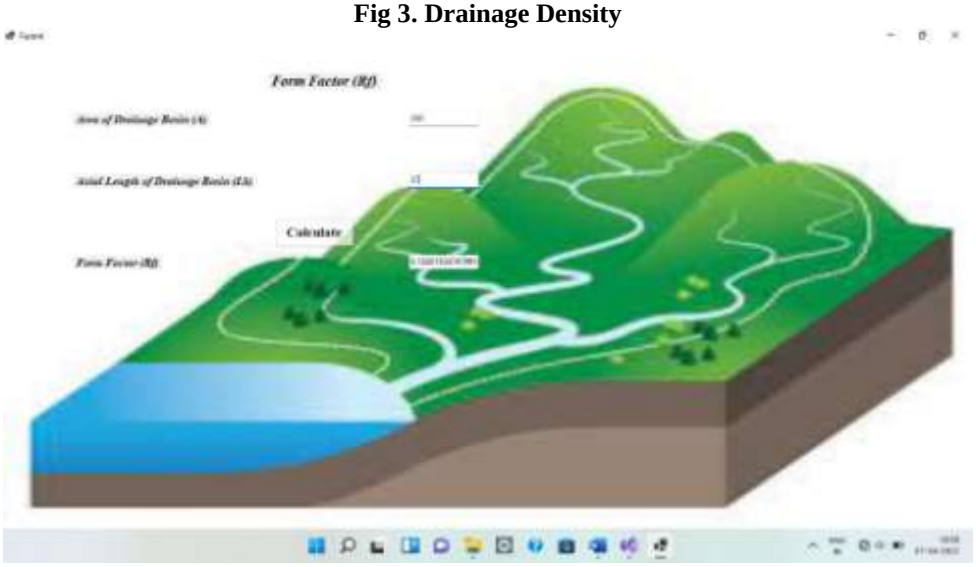

Fig 4. Form Factor

Fig 5. Circulatory Ratio

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III. CONCLUSION

This study tells us about calculation of drainage basin characteristics by using visual studio. The drainage basin characteristics such as stream density, drainage density, form factor, circulatory ratio, elongation ratio, length of overland flow and constant of channel maintenance are calculated accurately and easily by using visual studio.

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