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Measuring fluid properties using high level programming language (CPP)

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Abstract
In developing countries ICT has played very important role in the development of education, health, rural development, agriculture development. In our country, largely within the town area unites varied on-line systems are getting used for varied functions i.e. everything is computerized to save lots of area unit time and efforts. Farmers are unaware and they do not have knowledge and skills regarding this technology. Hence in agriculture field it is important to research in it to make easy and very fast calculation of agricultural formulae. Fluid mechanics, especially fluid dynamics, is an active field of research with many unsolved or partly solved problems. Fluid mechanics can be mathematically complex. The paper deals with how we can make digitalize and make agricultural formulas easily with the help of high level programming language.

Keywords: Fluid, high level programming language, CPP

1. Introduction
Fluid mechanics is the science that deals with the action of forces on fluids at rest as well as in motion. If the fluids are at rest, the study of them is called fluid statics. If the fluids are in motion, where pressure forces are not considered, the study of them is called fluid kinematics. If the fluids are in motion and the pressure forces are considered, then the study of them is called fluid dynamics. The fluid term generally includes both the liquid and the gas phase. Fluid properties determine the behavior of fluid in fluid mechanics. Pressure, Density, specific volume, specific density, surface tension, specific gravity, viscosity are some properties used to determine behavior of fluid. Density, temperature, and pressure the example of intensive properties. Intensive property is a fluid property. Mass and volume are the examples of extensive properties, which are properties that depend on the amount of material.
Attempt has been made to simplify the calculation using C language with the paper entitled, Calculation of Fluid Properties Using High Level Programming Language with the focus on following objectives:

1. To study c ++ programming language.
2. To study how ICT build in agriculture.
3. To simplify the calculations to determine fluid properties by using different methods using CPP language.

2. Existing System
The Existing system is completely manual. The fluid properties calculation contains different formulas to determine behaviour of fluid. These formulas are very complex to calculate with the use of calculators. It is purely paper based to store the records of the onetime calculated values of those formulas. The calculations are done with calculator by entering the each value of formula manually in the calculator.

2.1 Limitations in Present System
2.1.1 There are certain limitations in system, which areas follow

1. There are various steps or formulae involved in fluid mechanics, so it is difficult to handle manually.
2. For recording purpose it should be note down in some paper, thus chances of losing the data is increases.
3. It is difficult to search the old record of data.
4. Manually calculations include more errors with less accuracy.

3. Proposed system

The proposed system is deals with the functionality of calculations of fluid properties.

To remove the complexities, errors and difficulties the proposed system is developed. Today the digitalization is directly comes with computerization, so the students, researchers are coming under the one roof to learn about digitalization and computerization. Calculate the formulas manually on the paper are very complex method to find the accurate value of the specific component. 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 high level programming language has been developed. The proposed system "high level programming language to measure fluid properties" deals with all the activities which are done by the agriculturist for measure the fluid properties. This paper is all about how can programming language reduce the manual work load and give the accurate results of the proper formulas. The data will store sequentially in the database and we can access it whenever we need it.

3.1 Advantages of Proposed System

1. Calculations are done very fast and it saves the time.
2. It stores the old data, so data recovery is possible easily.
3. No need to data note down on the paper because it stores digitally in computer.
4. Modified the data as per requirement.
5. System includes the various security features.
6. Accuracy can be maintained

3.1.1 Material

1. Windows 7 ultimate
2. Copyright @ 2009 Microsoft Corporation.
3. Processor: Intel (R) Core (TM) i3-3110M CPU @2.40 GHz.
4. Installed memory (RAM): 4.00 GB (3.39 GB usable)
5. System type: 32 – bit Operating System
6. Microsoft(R) Access

4. System Requirements

Table 1: Hardware Requirements

Content	Description
HDD	10 GB Min, 40 GB Recommended
RAM	4 GB Min, 3.39GB usable

Table 2: Software Requirements

Content	Description
OS	Windows XP or Higher Operating System
Database	MS-Access 2007
Technologies	C++ compliler
IDE	Ms-Visual Studio Net 2017

5. About the Platform

5.1 Development Platform

The system is developed in the high level computer language that is, C++ with the net framework. To develop and edit the software we have used the Microsoft visual studio 2017 version.

5.2 Platforms to run on

To run or use this software your system must have to fulfill the above software as well as hardware specifications respectively.

6. To determine fluid properties following formulae calculated

6.1 Pressure of fluid

Pressure of a fluid is the force per unit area of fluid. In other words, it is the ratio of force on a fluid to the area of the fluid held perpendicular to the direction of the force.

$$\text{Pressure (pa0} = \frac{\text{Normal Force}}{\text{Area}} \text{ (N/m}^2\text{)}$$

Differences or gradients in pressure drive a fluid flow, especially in ducts and pipe.

6.2 Mass Density of fluid

The density of a fluid is its mass per unit volume.

$$\text{Density } (\rho) = \frac{\text{Mass}}{\text{Volume}} \text{ (Kg/m}^3\text{)}$$

Densities of fluids decreases with temperature and nearly constant for constant temperature while densities of gases increases with pressure

6.3 Specific Weight of fluid

Specific Weight or weight density of a fluid is the ratio between weight of a fluid to its volume. Thus weight per unit volume of a fluid is called weight density and it is denoted by symbol Sw.

$$Sw = \frac{\text{Weight of fluid}}{\text{volume of fluid}}$$

$$= \frac{(\text{mass of fluid}) * \text{acceleration due to gravity}}{\text{Volume of fluid}}$$

$$= \frac{\text{Mass of fluid} * g}{\text{volume of fluid}}$$

$$= p*g$$

6.4 Specific Volume of fluid:

It is defined as the volume of fluid occupied by a unit mass or volume per unit mass of fluid is called specific volume.

$$v = \frac{\text{Volume of fluid (m}^3\text{)}}{\text{Mass of fluid (Kg)}}$$

$$= \frac{1}{p}$$

6.5 Viscosity of fluid

Viscosity is a measure of resistance to fluid as a result of intermolecular cohesion. In other words, viscosity can be seen as internal friction to fluid motion which can then lead to energy loss. Different fluids deform at different rates under the shear stress. The ease with which a fluid pours is an indication of its viscosity**.** It is also called as dynamic viscosity.

Kinematic viscosity is the ratio of the dynamic viscosity to the density of fluid**.** It is denoted by (γ).

$$\text{Kinematic Viscosity } (\gamma) = \frac{\mu}{\rho}$$

6.6 Specific Gravity of fluid

Specific gravity is defined as the ratio of the weight density (or density) of fluid to the weight density (or density) of a standard fluid. For liquids, the standard fluid is taken water and for gases, the standard fluid is taken air. Specific gravity is also called relative density. It is dimensionless quantity and is denoted by S.

$$\text{Specific gravity for liquid} = \frac{\text{weight density of liquid}}{\text{weight density of water}}$$

$$\text{Specific gravity for gases} = \frac{\text{weight density of gas}}{\text{weight density of air}}$$

Thus, weight density of liquid=S*weight density of water

$= S*1000*9.81\ N/m^3$

The density of liquid = S*density of water

$= S*1000\ Kg/m^3$

6.7 Surface Tension

Surface tension is defined as the tensile force acting on the surface of liquid in contact with a gas or on the surface between two immiscible liquid such that the contact surface behaves like a membrane under tension.

It is the fluid property that creates the capability of resisting tension at the interface between two different liquids or at the interface between liquid and gas. It is denoted by σ.

The magnitude of this force per unit length of the free surface will have same value as the surface energy per unit area. It is denoted by Greek letter σ.

In MKS units, it is expressed as kgf/m while in SI units as N/m.

$$\sigma = \frac{\text{Force}}{\text{Length}}\ (\text{N/m})$$

7. Source code

```
#include<iostream>
#include<conio.h>
#include<math.h>using namespace std;int main()
{float
P,F,A,p,M,V,sw,g,v,dynamicviscosity,kinematicviscosity,pf,p
w,Surfacetension,l; int kk, choice=0;
//while statement start while (choice!=8)
{ut<<"\n\t\t*Department of Irrigation and Drainage
Engineering*\n\n\t\t";
cout<<"\t Fluid properties \n\n";
cout<<"1. Pressure of fluid\n";
cout<<"2. Density of fluid\n";
cout<<"3. Specific Weight\n";
cout<<"4. Specific Volume\n";
cout<<"5. Kinematic Viscosity\n";
cout<<"6. Specific Gravity\n";
cout<<"7. Surface Tension \n";
cout<<"8.Exist\n";
cout<<"\n\t Enter Your Choice <1-8>";
cin>>choice;
switch (choice)
{case 1: /*** Pressure of fluid ***/
{cout<<"*** Department of Irrigation and Drainage
Engineering *** ";
cout<<"*** 1.Pressure of fluid";
cout<<" Enter the value of force F";
cin>>F;
cout<<" Enter the value of Area A";
cin>>A;
P= F/A;
cout<<" Pressure of the fluid P="<<P;
break;}
case 2: /*** Density of fluid ***/
{cout<<"\n\t\t*** Department of Irrigation and Drainage
Engineering***\n\n\t\t";
cout<<"\n\n\t*** 2.Density of fluid\n";
cout<<"\n\t Mass of fluid M=";
cin>>M;
cout<<"\t Volume of fluid=";
cin>>V;
p=M/V;
cout<<"\n\tDensity of fluid="<<p;
break;}
case 3: /***3. Specific Weight ***/
{cout<<"\n\t\t*** Department of Irrigation and Drainage
Engineering ***\n\n\t\t";
cout<<"\n\n\t*** Specific Weight";
cout<<"\n\t Enter the value of density p=";
cin>>p;
cout<<"\t Enter value of Specific Gravity g=";
cin>>g;
sw=p*g;
cout<<"\n\t Specific Weight="<<sw;
break;}
case 4: /*** 4.Specific Volume ***/
{cout<<"\n\t\t*** Department of Irrigation and Drainage
Engineering***\n\n\t\t";
cout<<"\n\n\t\t*** 4.Specific Volume===";
cout<<"\n\n\t\t enter the value for volume of fluid==";
cin>>V;
cout<<"n\n\t\t enter the value for mass of fluid==";
cin>>M;
v=V/M;
cout<<"\n\n\t\t Specific Volume v="<<v;
break;}
case 5: /*** Kinematic Viscosity of fluid***/
{cout<<"\n\t\t*** Department of Irrigation and Drainage
Engineering***\n\n\t\t";
cout<<"\n\n\t\t***5.Kinematic Viscosity\n";
cout<<"\n\n\t\t enter the value for dynamic viscosity ==";
cin>>dynamicviscosity;
cout<<"\n\n\t\t enter the value for density p==";
cin>>p;
kinematicviscosity=(dynamicviscosity/p);
cout<<"\n\n\t\t kinematic viscosity ="<<kinematicviscosity;
break;}
case 6: /*** Specific Gravity of fluid ***/
{cout<<"\n\t\t*** Department of Irrigation and Drainage
Engineering***\n\n\t\t";
cout<<"\n\n\t\t ***6. Specific gravity of fluid===";
cout<<"\n\n\t\Enter the value for density of fluid pf==";
cin>>pf;
cout<<"\n\n\t\tenter the value for density of water pw==";
cin>>pw;
g=(pf/pw);
cout<<"\n\n\t\t Specific gravity of fluid g="<<g;
break;}
case 7: /*** Surface Tension of fluid ***/
{cout<<"\n\t\t*** Department of Irrigation and Drainage
Engineering***\n\n\t\t";
```

```
cout<<"\n\n\t\t ***7. Surface Tension of fluid===";
cout<<"\n\n\t\tEnter the value for force F==";
cin>>F;
cout<<"\n\n\t\t enter the value for Length l==";
cin>>l;
Surfacetension=(F/l);
cout<<"\n\n\t\t Surface tension of fluid="<<Surfacetension;
break;}
//end of case 8
} // end of all cases
} // main switch statement end
} // end of 1 start and end brace bracket
```

8. Results

```
*Department of Irrigation and Drainage Engineering*

Fluid Properties

1. Pressure of fluid
2. Density of fluid
3. Specific Weight
4. Specific Volume
5. Kinematic Viscosity
6.  Specific Gravity
7.Surface Tension
8.Exist

Enter Your Choice <1-8>
```

Fig 1: Output of main page

```
Enter Your Choice <1-8>1

*** Department of Irrigation and Drainage Engineering ***


*** 1.Pressure of fluid

Enter the value of force F=50
Enter the value of Area A =10

Pressure of the fluid P=5.000000
```

Fig 2: Output of pressure of fluid

```
*** Department of Irrigation and Drainage Engineering***


*** 2.Density of fluid

 Mass of fluid M=825
 Volume of fluid=0.917

Density of fluid=899.672852
```

Fig 3: Output of density of fluid

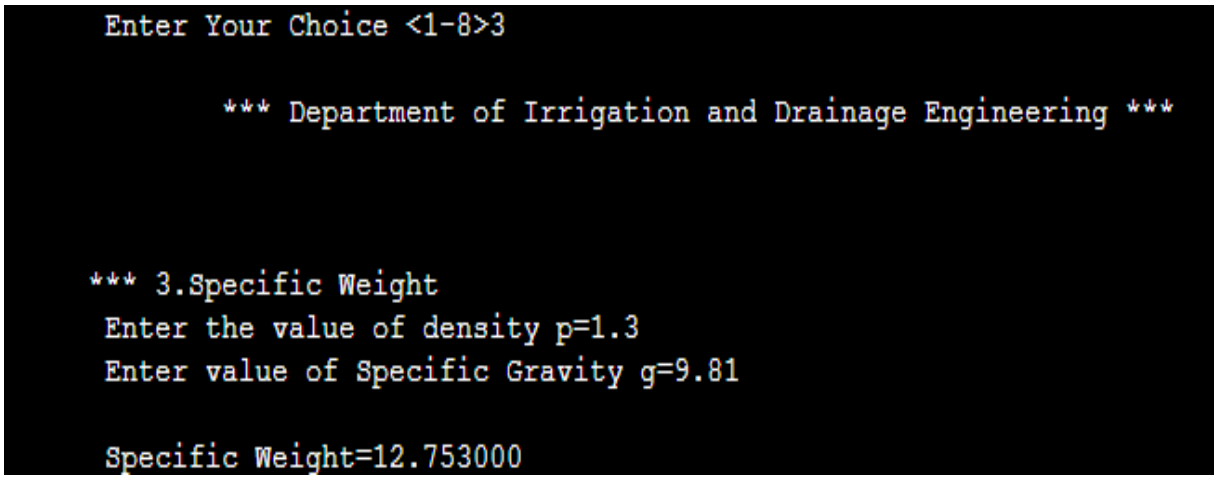

Fig 4: Output of specific weight of fluid

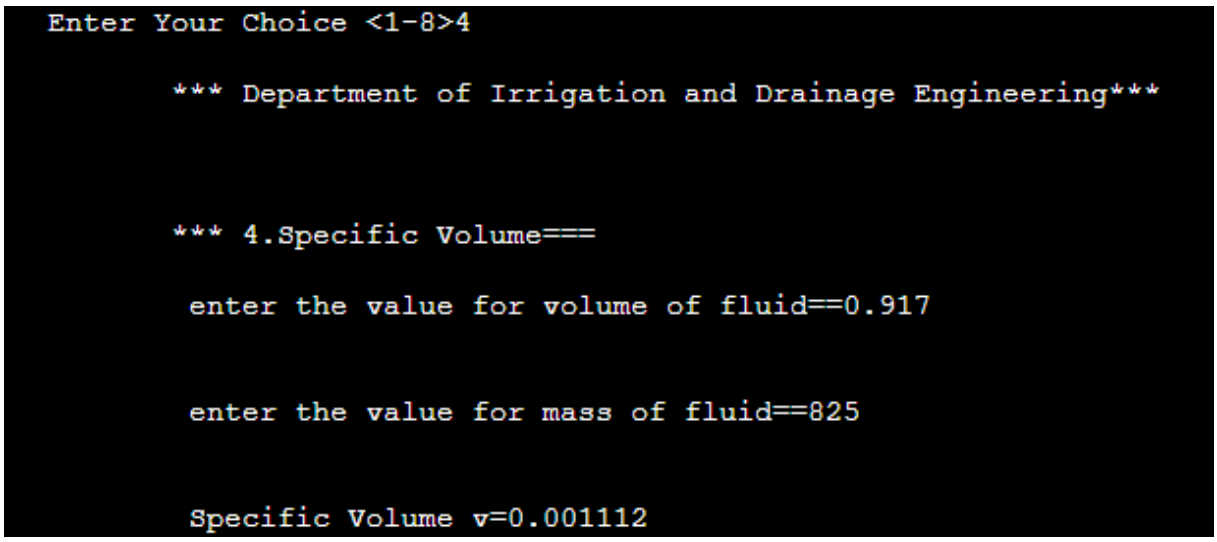

Fig 5: Output of specific volume of fluid

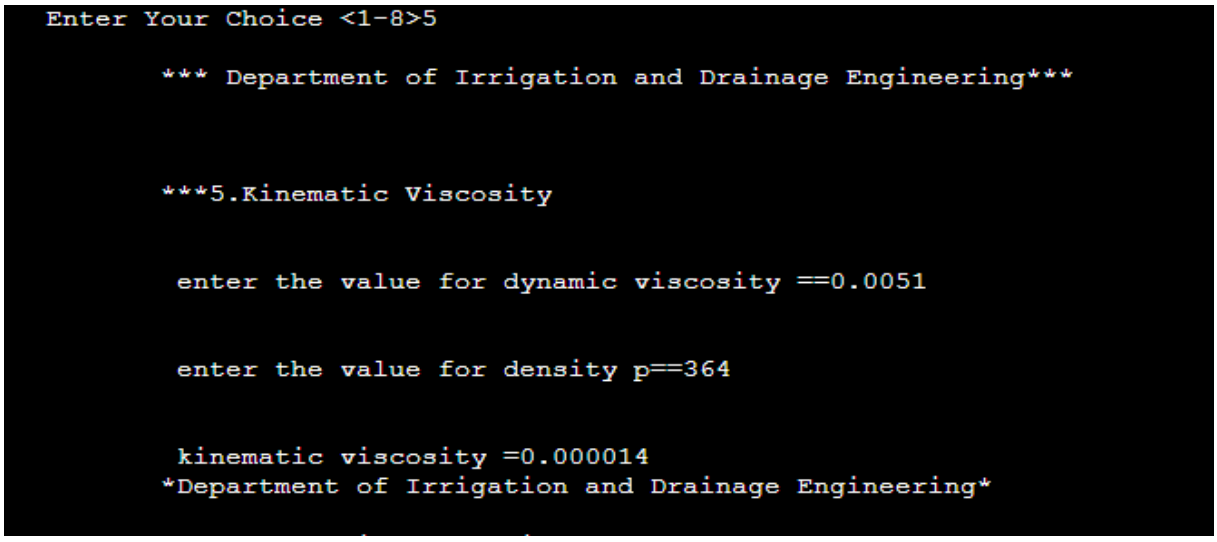

Fig 6: Output of kinematic viscosity of fluid

9. Conclusion

Today the digitalization is directly comes with computerization, so the students, researchers are coming under the one roof to learn about digitalization and computerization. Calculate the formulas manually on the paper are very complex method to find the accurate value of the specific component. By using C languages, the calculations are completed in a very short span of time as the formulae are pre-defined in the software. The complete design was done using C++ language in a very less time and with accuracy. Turbo C++, version 3.0 was used for this purpose. It contains the main page where, the parameters are given. By entering the values of each parameter, the values are determined within few minutes.

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