

WELD COST CALCULATOR

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ABSTRACT

The main purpose was to demonstrate how we can efficiently use open source resources. The department has recently completed a major effort in restructuring and refining its departmental goals, objectives and operations in preparation for its next CES. This includes consistent communication and measurement of department outcomes by identified program constituents. In order to calculate the cost of welding by parameters like weld-type, weld position, Leg-height & width, angle, Root-Gap, Root-Face, Density of Weld, Size of weld, Length of weld (In mm), Area of weld, Deposition of weld in kg, Weld Length in mm, etc. This was developed and designed to calculate weld process data in less time and to improve output efficiency.

Python offers multiple options for developing GUI (Graphical User Interface). Out of all the GUI methods, tkinter is the most commonly used method. It is a standard Python interface to the Tk GUI toolkit shipped with Python. Python with tkinter is the fastest and easiest way to create the GUI applications. Creating a GUI using tkinter is an easy task.

Keywords- V groove, FILET, front end, back end

INTRODUCTION

BASIC IDEA: This is obviously the first step towards calculating the cost of actually making a welded joint but there are many other factors that need to be considered but which are beyond the scope of these articles. The most significant of these costs is the overhead; the cost of providing a welding workshop or site and the costs of managing and running the organization. These costs are dependent on the accounting practices of the organization. They comprise factors such as rent, rates, bank interest, cost of indirect workers, i.e. those not directly involved in fabricating, depreciation of plant etc. In addition, other accounting decisions (for example, where the costs of machining and assembly are absorbed) may affect the decisions on which is the most cost-effective joining method.

One of the most significant costs is that of labor and this inevitably varies with industry, time and country. The costs mentioned above cannot generally be influenced by the decisions made by a welding engineer. These articles will therefore concentrate on those aspects of welding activities that are not subject to accounting practices, overhead or labor costs. There are many costs, other than the cost of depositing weld metal that will affect the price of a welded fabrication.

OVERALL DESCRIPTION: The cost elements of a welded part are those related to materials, labor, and overhead. Only welding materials such as filler metals, gases, and welder manhour rates are considered in this article. If you wish to include overhead cost or any additional cost then it needs to add separately in the total welding cost calculated here. The reasons for costing welding are varied, but most often are to:

- Provide data needed for bidding on a job
- Compare the economics of welding with some other method of fabricating or manufacturing
- Establish information required in making a decision between alternate designs
- Evaluate proposed changes in procedures

- Compare the economic advantages of competing welding processes.

WHAT IS WELD COST CALCULATOR?

In order to calculate the cost of welding by parameters like weld-type, weld position, Leg-height & width, angle, Root-Gap, Root-Face, Density of Weld, Size of weld, Length of weld (In mm), Area of weld, Deposition of weld in kg, Weld Length in mm, etc. This was developed and designed to calculate weld process data in less time and to improve output efficiency.

There are many resources available that approach the issues associated with calculating welding costs from different perspectives, so it is important to note that there are a number of ways to get to an answer. The approach taken in this web page is a relatively fundamental approach that should be easily modified for use in most instances.

WHAT THE WELD COST CALCULATOR CAN DO FOR US:

- These welding calculators are completely free to use and can act as a handy guide for your personal projects.
- The welding machine calculators are predominantly designed to get your machine set up exactly for any job that you might need to throw at it!
- This can be also used for Standardization of weld process data and also Save time.
- Due to this the design stage cost avoidance can be achieved which lead to efficiency of output.
- Easy to use and demonstrate.

SOMETHING MORE ABOUT WELDING:

The history of joining metals goes back several millennia. The earliest examples of this come from the Bronze and Iron Ages in Europe and the Middle East. The ancient Greek historian Herodotus states in The Histories of the 5th century BC that Glaucus of Chios "was the man who single-handedly invented iron welding". Welding was used in the construction of the Iron pillar of Delhi, erected in Delhi, India about 310 AD and weighing 5.4 metric tons.

The Middle Ages brought advances in forge welding, in which blacksmiths pounded heated metal repeatedly until bonding occurred. In 1540, Vannoccio Biringuccio published De la pirotechnia, which includes descriptions of the forging operation. Renaissance craftsmen were skilled in the process, and the industry continued to grow during the following centuries.

REQUIREMENTS ANALYSIS

SOFTWARE REQUIREMENTS SPECIFICATION:

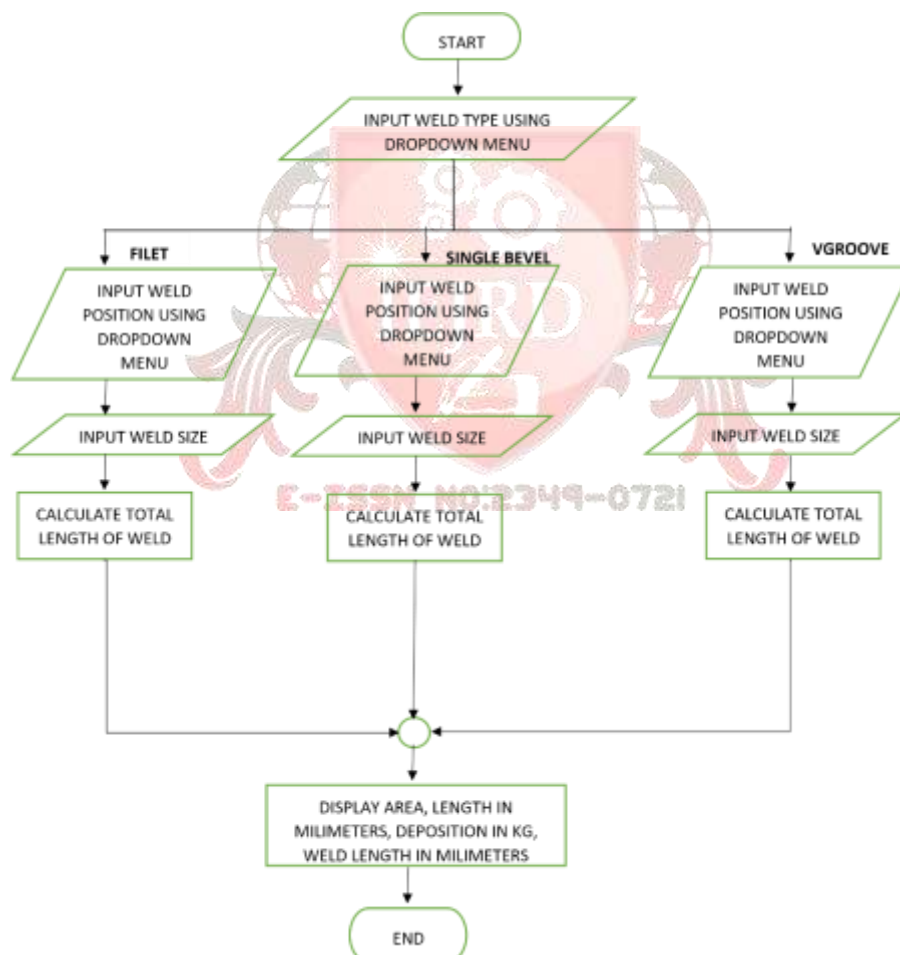
1. **Problem Statement** -To develop a software which will help to calculate the welding time & cost.
2. **Objectives** -This software is used in a company or organization to calculate the time & cost and to calculate the give data by the user. However it helps to reduce the time of calculation which was first done manually and which was very time consuming.

SOFTWARE REQUIREMENTS

1. **Operating Systems Support** -There must be used are windows-Xp or greater versionsoperating system (for application) which will support our functions that we are going to built in our project.

2. **Programming Language** -As this project is based on scientific calculation that is why we have used Python programming language which is Developer friendly for scientific calculations. We have also used Microsoft Visual Studio (VB.net) to develop our front-end of the application.
3. **Performance Analysis** When the user utilizes this application where user gets the calculated time and cost of a specific weld type in specific region. The clear functions of this application clears a specific entry which user wishes to delete & clear all function clears all the entries by the users
4. **Technical Analysis** For developing the software, we have used Python as programming language as back-end of this application because the functionalities for developing the modules of requirement as it can be done easily using it. VB.Net is used for developing the front-end of this application as developing UI using VB.net is done easily & code can be easily understood by other person without being familiar with other language.

DESIGN



IMPLEMENTATION

PROPOSED ARCHITECTURE:

Language: As this project is based on scientific calculation that is why we have used Python programming language which is Developer friendly for scientific calculations. We have also used Microsoft Visual Studio (VB.net) to develop our front-end of the application.

Tools used:

- Python 3.10
- VB .Net(Framework)

Software requirements

- Microsoft Visual Studio - .Net framework
- Microsoft Visual Code

OVERALL DESCRIPTION

FRONT-END: We have used VB.net programming language to design our front-end as VB.Net is a simple, modern, object-oriented computer programming language developed by Microsoft to combine the power of .NET Framework and the common language runtime with the productivity benefits that are the hallmark of Visual Basic. VB.Net programming is very much based on BASIC and Visual Basic programming languages.

Applications built using the VB.NET language are very reliable and scalable, relying on the .NET Framework to access all libraries that help to execute a VB.NET program. With this language, you can develop a fully object-oriented application that is similar to an application created through another language such as C++, Java, or C#. In addition, applications or programs of VB.NET are not only running on the window operating system but can also run-on Linux or Mac OS.

As we need many inputs from the user and as python console window is not much attractive and easy to handle for every user we have decided to use VB.net to design front-end of our project. In this we have used drop-downs, labels, textboxes to get input from the user and also we have used DataGridView view to display the inputs taken by the user and to display the calculated outputs in it and also we have used the concept of visibility mode to control the flow of our project.

We have created windows application of our project using setup project which is present in visual studio by including all required resources due to which our project runs efficiently and created a setup file of our project which was later submitted to the sponsored company of our project.

BACK-END We have used Python programming language to design our back-end . Python is a high-level, general-purpose and a very popular programming language. Python programming language (latest Python 3) is being used in web development, Machine Learning applications, along with all cutting-edge technology in Software Industry. Python Programming Language is very well suited for Beginners, also for experienced programmers with other programming languages like C++ and Java.

Python is currently the most widely used multi-purpose, high-level programming language. Python allows programming in Object-Oriented and Procedural paradigms. Python programs generally are smaller than other programming languages like Java. Programmers have to type relatively less and indentation requirement of the language, makes them readable all the time.

Python language is being used by almost all tech-giant companies like – Google, Amazon, Facebook, Instagram, Dropbox, Uber... etc.

The biggest strength of Python is huge collection of standard libraries which can be used for the following:

- Machine Learning
- GUI Applications (like Kivy, Tkinter, PyQt etc.)
- Web frameworks like Django (used by YouTube, Instagram, Dropbox)
- Image processing (like OpenCV, Pillow)
- Web scraping (like Scrapy, BeautifulSoup, Selenium)
- Test frameworks

- Multimedia
- Scientific computing
- Text processing and many more.

Implementation of Back-End: We have created many functions for the purpose of simplicity which includes As given below:

- Input (): Using this function we get input from the front-end of our project.
- Send_data (): Using this function we can send calculated output to the front-end of our project.
- Split (): Using these functions we are able to differentiate between types of welds selected by the user at front-end side.
- Type (): This function is used to distribute the data given by the user in the correct type of weld
- Fillet (): This function is used to calculate all parameter's related to weld type fillet.
- Single-Bevel (): This function is used to calculate all parameter's related to weld type Single-Bevel.
- V-Groove (): This function is used to calculate all parameter's related to weld type V-Groove.

Some other functions used for calculations:

- Area (): This function is used to calculate the area of the selected type of weld.
- Time (): This function is used to calculate the time required for welding of the selected type of weld.
- Deposition of weld (): This function is used to calculate the total deposition of weld of the selected type of weld.
- Tack_weld (): This function is used to calculate the tack_weld in seconds of the selected type of weld.

Back-end in short: As the functions define above we have used these functions to calculate the different parameters of the project due to which the line of coding was reduced up to 40% that is why as mentioned above we have selected python programming language to design back-end of our project.

TESTING REPORTS

1.Unit Testing: Unit testing focuses each module individually, ensuring that if function properly as unit. In this testing we have tested of our software to ensure maximum error detection. It helps to remove bugs from sub modules & prevent arrival of huge bugs after words.

Functional Partitioning:

1. We have tested fillet functions.
2. We have tested Single-Bevel functions.
3. We have tested V-Groove functions.
4. To transfer the data from front-end to back-end & vice-versa.

Functional Description:

1)Name: Fillet functions.

Input: Manufacturing region, leg width, leg height, weld size, angle, weld length, pick and place.

Output: Calculated measurements displayed in table 2.

Specification: This module helps to calculate all parameters as per Type: Fillet.

2) Name: Single-Bevel functions.

Input: Manufacturing region, leg width, leg height, weld size, angle, weld length, pick and place.

Output: Calculated measurements displayed in table 2.

Specification: This module helps to calculate all parameters as per Type: Single-Bevel.

3) Name: V-Groove functions.

Input: Manufacturing region, leg width, leg height, weld size, angle, weld length, pick and place

Output: Calculated measurements displayed in table 2.

Specification: This module helps to calculate all parameters as per Type: V-Groove.

2.Integration Testing: Integration testing is a systematic technique for constructing the program structure while at the same time conducting tests to uncover errors associated with interfacing. The objective is to take unit tested components and build a program structure that has been dictated by the design. We prefer the Top-down integration testing as a testing approach for our project. The Top-down integration testing is an incremental approach to construction of program structure. Modules are integrated by moving downward through the control hierarchy, beginning with the main control module. Modules subordinate to the main module are incorporated into the structure in depth-first order. Depth-first integration would integrate all components on a major control path of a structure. Selection of a major path is somewhat arbitrary and depends on application-specific characteristics

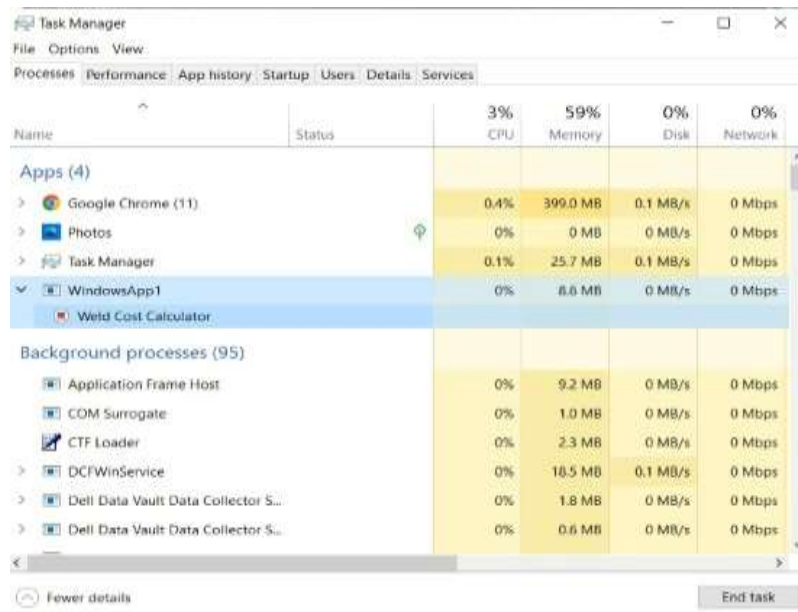
3.Validation testing: The purpose of validation testing is to ensure that all expectations of the customer have been satisfied. The testing is done by the project group members by inspecting the requirements and validating each requirement. We prefer the alpha testing technique for the validation purpose. The group members will present at the place and observing the working and collecting the bugs occurring at the site. The changes are made according to the requirements and testing is done again to gather more errors if present.

4.System Testing: In the system testing system undergoes various exercises to fulfill the system requirements. These tests include: a. Security Tests: these are designed to ensure no user can access the other documents which are none of his business, b. Performance Tests: The tests are conducted to check the performance of the system.

5.Black Box Testing: Black Box Testing mainly focuses on input and output of software applications and it is entirely based on software requirements and specifications. It is also known as Behavioral Testing.

RESULT

PERFORMANCE ANALYSIS: Figure below shows the details of performance analysis of weld cost calculator.



Task Manager

File Options View

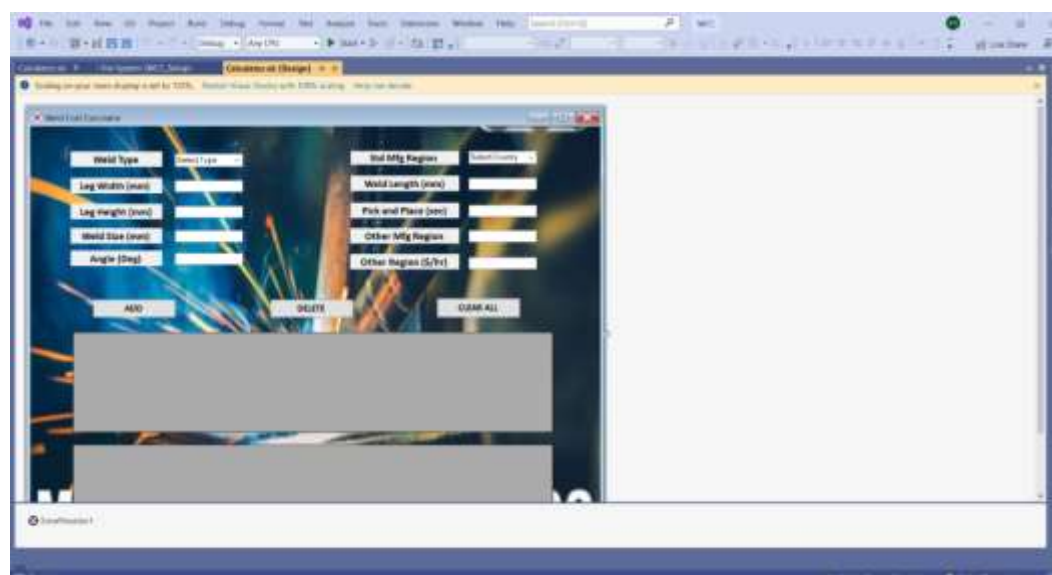
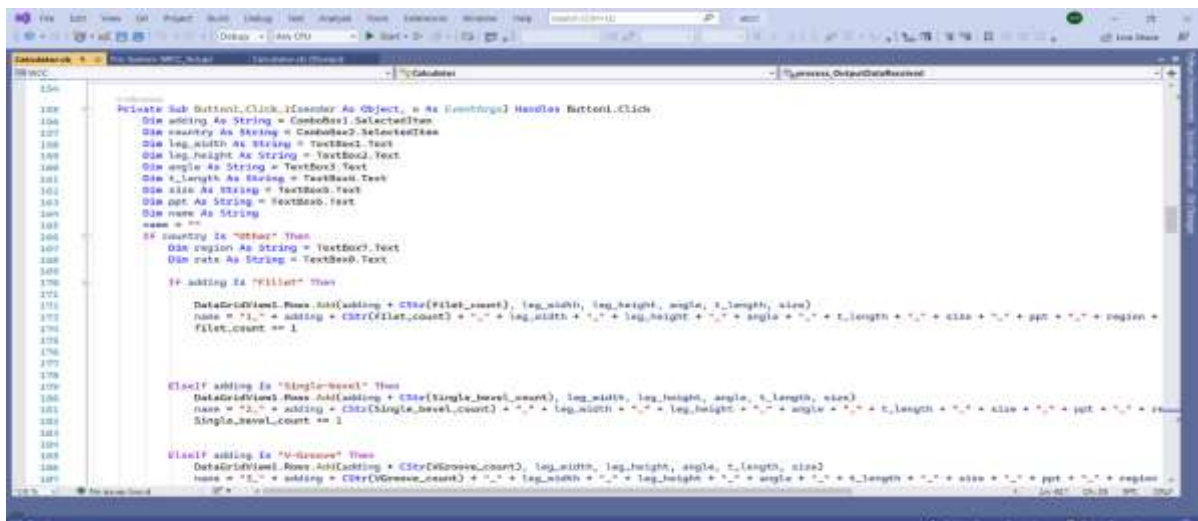
Processes Performance App history Startup Users Details Services

Name	Status	CPU	Memory	Disk	Network
Apps (4)					
Google Chrome (11)		0.4%	399.0 MB	0.1 MB/s	0 Mbps
Photos		0%	0 MB	0 MB/s	0 Mbps
Task Manager		0.1%	25.7 MB	0.1 MB/s	0 Mbps
WindowsApp1		0%	8.6 MB	0 MB/s	0 Mbps
Weld Cost Calculator					
Background processes (95)					
Application Frame Host		0%	9.2 MB	0 MB/s	0 Mbps
COM Surrogate		0%	1.0 MB	0 MB/s	0 Mbps
CTF Loader		0%	2.3 MB	0 MB/s	0 Mbps
DCFWinService		0%	10.5 MB	0.1 MB/s	0 Mbps
Dell Data Vault Data Collector S...		0%	1.8 MB	0 MB/s	0 Mbps
Dell Data Vault Data Collector S...		0%	0.6 MB	0 MB/s	0 Mbps

Fewer details End task

FUNCTIONAL PARTITIONING:

Front-End



Back-End

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360         return time
361
362     def single_bowl(total,bowlH):
363         area=(1/2*leg_height*leg_height*(path.tan(math.radians(angle))))
364         depth=(total_length*area*count
365         time_result=time_cal_bowl(total,bowlH)
366         time_result=time_result*count
367         get_val(data[7])
368         get_val(preparation_time,length)
369         w=up
370         task=task_add(t,length)
371         subbody_movement(t,length)
372         t=time_result+preparation_time+task_time*...
373         couting=cout(t)
374         name_data[8]=" "+data[1]+","+"str(round(area,2))+","+"str(round(depth,2))+","+"str(round(time_result,2))+","+"str(round(preparation_time,2))+","+"str(round(w,2))+","+"str(round(t,2))"
375         print(name)
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APPLICATIONS

This project can be modified and used in following areas:

- ✓ Design Engineering: -1)To estimate the weld cost.2) To select the optimum weld design
- ✓ Cost Engineering :-1)To estimate the should cost of assembly. 2)To select the best manufacturing location.
- ✓ Manufacture Engineering: -1)To estimate the optimum process cycle time.
- ✓ Requirements Engineering: -1)To compare the quotes with the entries.

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