

Develop a Basic Calculator

Aryash Sengar, Harashleen Kaur

Department of Computer Science and Engineering Apex Institute of Technology, Chandigarh University, Mohali, Punjab, India

Abstract- The simple Calculator is a potent software tool that combines a simple calculator's functionality with more sophisticated statistical analysis capabilities. The calculator has an intuitive interface that enables users to carry out both simple mathematical operations and intricate statistical analyses with ease. Addition, subtraction, multiplication, and division operations are all part of the fundamental calculator function. Using the buttons on the interface, the user can enter numerical quantities, and the calculator will make the necessary calculations and display the results on the screen. The "=" button can be used to retrieve the outcome of the preceding calculation as the user continues to make other computations. The calculator offers statistical analysis, among other capabilities, in addition to simple arithmetic. Users can enter a collection of numerical data to compute central tendency metrics like the mean, median, and mode. Indicators of variability like variance and standard deviation can also be calculated using the calculator. The calculator's different statistical capabilities allow users to carry out unit conversions and more intricate statistical analyses. Deciles, Quartiles, Percentiles, and Kurtosis Calculation are also included in these functions. In general, the Basic and Statistical Calculator offers users a flexible tool for carrying out fundamental mathematical computations and sophisticated statistical analysis. Its user-friendly interface and extensive feature set make it a useful tool for professionals, researchers, and academics alike.

Keywords—Basic Calculator, Statistical Calculator, Arduino UNO, Tkinter, MATLAB, CATIA, Programming language, User Interface, UJ-MaGT.

I. INTRODUCTION

A calculator is a necessary tool for many professions and courses of study since it enables quick and accurate computations. While scientific calculators offer more complex functions like trigonometric functions, logarithms, and exponential functions, basic calculators only offer the four fundamental operations of addition, subtraction, multiplication, and division. Comparatively, statistical calculators are specialised

instruments that support the completion of intricate statistical computations and analyses.

The purpose of this research article is to examine the features and capacities of both statistical and fundamental calculators is the goal of this research work. It will provide a full analysis of the key differences between the two types of calculators, highlighting each one's unique benefits and drawbacks. The essay will also discuss how calculators have evolved through time, from simple mechanical devices to modern digital versions, and how advancements in technology have impacted their design and usability.

The article will also look into usage of calculators in other fields, including as science, engineering, finance, and education, will also be examined in this article. It will examine how calculators have transformed various fields by enabling quicker and more accurate calculations, increased efficiency, and improved decision-making processes.

Overall, the goal of this research paper is to present a thorough grasp of the numerous types of calculators, their uses in various sectors, and the calculator as a necessary tool.

II. LITERATURE SURVEY

1. Nandhini Velusamy et al. (2021) proposed how to identify a scientific calculator, what functions each key has, and how to obtain the precise value for any mathematical function. The correct application of the operations in the calculator's function, in the order that we specify. Comparing a scientific calculator to other simple calculators is very different. The order of operations is disregarded by the simple calculator. The primary function of a scientific calculator is to execute the calculations required to solve chemistry, physics, engineering, or trigonometry problems. When the function is worked with scientific notation, it plays a vital role.

2. Subham Thati (2021) explained how to build a simple

calculator using Arduino UNO, a 4x4 keypad, a 16x2 LCD display, a breadboard, and jumping wires. A real-time user enters data into this calculator using the 4x4 keypad, and a 16x2 LCD screen displays the results. Using the Arduino UNO, the calculation and control functions are carried out. Only some fundamental calculations, such as addition, subtraction, division, and multiplication, are performed in this calculator. For more complex calculations, a more cautious arithmetic program should be written. A more complex calculator should also be able to handle larger numbers and more floating points. In this project, we learn how to use an Arduino, a keypad, and an LCD. All computations are done with the aid of code.

3. José Ignacio Rojas Sola et al. (2023) proposed a geometric calculator designed as a CATIA V5 macro is discussed as an application in the field of engineering graphics. This macro's code is developed in the CATVBA programming language and makes use of the internal CATIA editor as well as the features provided by Visual Basic for Applications (VBA). This application's main goal is to enable the creation of the three primary geometric elements (point, line, and plane), to solve five different types of general geometric problems, and to compare the solutions to problems from analytical geometry.

4. Sugiman et al. (2022) proposed developmental research employing the Plomp development model, which entails an initial phase of investigation, a stage of prototyping, and a final phase of evaluation. Lesson plans, student activity sheets with calculator support, and final exams with calculator support were included in the development of the enrichment learning resources. According to the survey's findings, the typical student claimed that using a calculator to assist in enrichment learning allowed them to learn new information and make them horrified after seeing that calculators can perform tasks beyond than simple arithmetic.

5. R A Sumarni et al. (2021) proposed Students' grasp of differential equations related to the concepts of business and energy is diminished by the physics notion. By replicating physics formulas, the MATLAB programme can be used to learn about fundamental physics related to effort and energy. Utilising MATLAB software and a multimedia development format that incorporates formulas, simulation, and theory, MATLAB-based physics calculators are produced. 29 students took the test for the product

reaction. The Likert scale, which ranges from 1 to 4, was used to score the response items. Descriptive statistics were used for the analysis. The evaluation for media expert validation is 3.43, while the evaluation for material expert validation is 3.64. Overall, the results of the student response analysis show that this physics calculator is suitable for educational application (3.21 out of 4). Students can better comprehend their schoolwork by simulating basic physics concepts with the aid of a MATLAB-based physics calculator.

6. Fatimah Salihah Radzuan et al. (2021) proposed in order to enhance teaching strategies for problem-solving, this study attempts to explore the effects of scientific calculators on mathematics achievement. 49 low-achieving 14-year-old math's students from a secondary school in Kajang, Selangor, Malaysia were chosen for this study. This action research study used a pre-test post-test quasi-experimental design with two groups. While the control group did not use any technological aid to learn topics like solid geometry and statistics, the experimental group did so with the help of a scientific calculator. The ANCOVA two-way test was used to analyse the post-test data while adjusting for the pre-test score. There was a reported significant change that was favorable to the experimental group. However, there were no discernible interactions between gender and group. The analysis's findings show that integrating teaching and learning of mathematics with the usage of a scientific calculator improved the students' math performance.

7. Mafuyai Mabur Yaks et al. (2021) proposed Almost all scientists, engineers, and other professionals who analyse data to understand events, relationships, etc. need to be proficient in graphing. In the majority of nations, learning to graph by hand is the preferred and standard practise at the secondary school level. The high "procedural load" of hand-drawn graphs, however, has been proven in studies to provide various challenges to scientific students. An algorithm dubbed UJ-MaGT was created and put to the test to lessen the procedural load. With the aid of UJ-MaGT, excellent results in time management, simplicity, and pedagogical modification in the graph plotting process were accomplished. The algorithm is currently present in a scientific calculator.

8. Lazim Abdullah et al. (2023) explored how pupils view the scientific calculator in today's society.

9. Dong Jiang et al. (2022) discussed the creation of a statistical calculator to determine the likelihood that a patient will contract a specific disease.

10. Antonio Miñarro et al. (2023) proposed the system in this post which is fairly adaptable and may be used with courses that have various features. Along with other specific parameters like the permitted IP address, teachers can also specify the permitted schedule for the various activities. Since we view data customization as a crucial component of enabling students to miss class, it stands out as the project's most noteworthy accomplishment. Additionally, it increases the potential for discussion because different students may arrive at different conclusions from various data sets using related assumptions. Depending on the data sets, even different queries might be posed. Three components make up the project's framework: JSP pages, databases on a web server, and Java applets and servlets. They created a statistical calculator in the Java programming language. The interface takes the shape of a button-activated statistics calculator. It presents itself as a separate window with all the statistical calculations needed for the practical sessions. The entire system was created in Java, allowing the calculator to communicate directly with the JSP pages. This enables the use of a load button to automatically load various data sets into the calculator. Time and errors made by students might be significantly decreased.

III. PROPOSED SYSTEM

There are many different types of calculators, but none of them come in a single package that enables pupils to perform the calculations they need to with the help of an easy-to-use program. Our goal is to combine all of the aforementioned calculators into a single form that will allow students to answer their problems quickly and save valuable time that would otherwise be spent looking for different software to perform various calculations. To minimise misunderstanding between the available operations, an appropriate GUI would be developed to transition between distinct frames that include various types of calculators. The software would be offered as a web application, an Android application, and a Windows application.

Based on the user's inputs, the calculator would produce accurate computations based on the user's inputs. The results would be displayed on the screen in an easy-to-read style. The accuracy of the scientific calculator would be higher since it could perform more intricate calculations, whilst the simple calculator's capabilities would be more limited but would still

produce accurate results for the basic operations. In general, calculators are reliable tools for performing computations quickly and accurately.

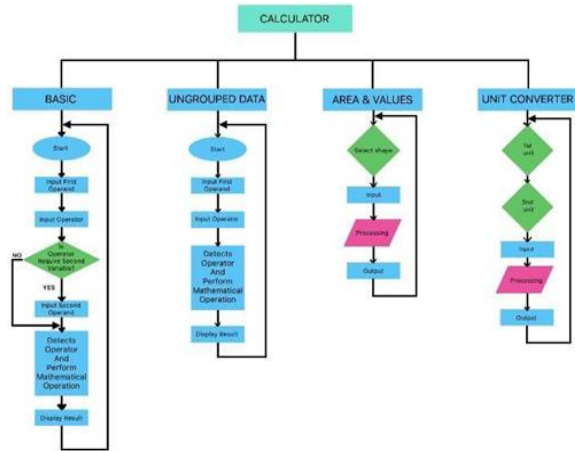


Figure 1: Flowchart for working of calculator

Here are some of the objectives which are to be followed:

- Implement basic arithmetic operations.

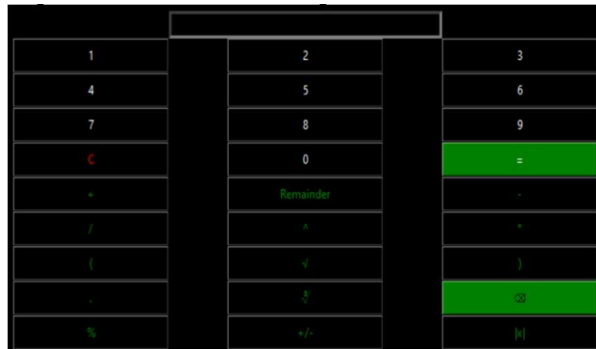


Figure 2: Basic Frame of Calculator

- Allow users to clear the calculator and start a new calculation.
- Implement statistical functions.

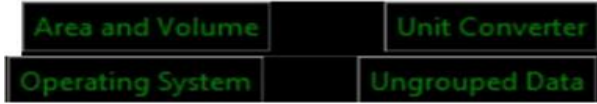


Figure 3: Statistical Frame of Calculator

- Implement memory functions.
- Allow users to input data sets and calculate statistical measures.
- Provide options to calculate measures for a

population or a sample.

- Allow users to convert one unit to another unit.
- Allow users to calculate area and volume.
- Allow users to switch between different calculator modes.



These goals should serve as a solid starting point for creating both a fundamental and a statistical calculator. However, you might want to modify or build upon these goals depending on your particular needs and use case.

Here's the methodology to be followed:

- Define requirements: Clearly state the functions and needs for both the statistical calculator and the basic calculator. This will ensure that the final product satisfies the user's needs and assist direct the development process.
- Choose a programming language: Choose a coding language that is appropriate for creating the calculator. For developing calculators, common choices include Python, Java, and JavaScript.
- Plan the user interface: Identify the calculator's user interface. This include selecting the calculator's structure, appearance, and features. Using a wireframe tool or a piece of paper, sketch out the user interface.

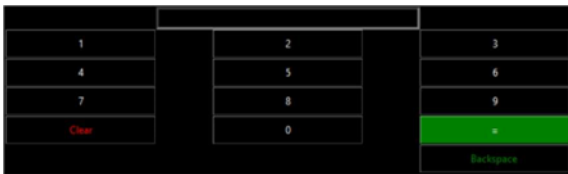


Figure 4: Basic Interface of the Calculator

- Implement the basic calculator: Implement the addition, subtraction, multiplication and division operations on a calculator first. Include features like memory functions and error handling.



Figure 5: Implementation of Basic Calculator

Implement other calculators: Implement the other calculator functions, such as mean, area, volume, standard deviation, variance, and correlation, after ensuring that the fundamental functions are functioning properly.

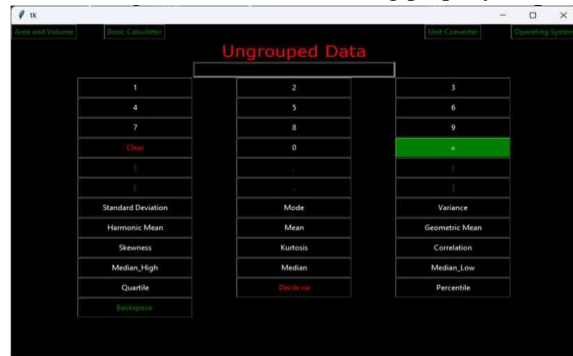
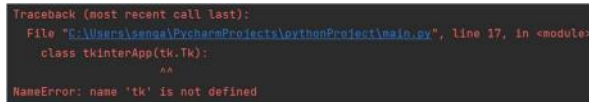


Figure 6: Implementation of Statistical Calculator

- Test and debug: Make sure the calculator is operating properly by giving it a thorough test. Test for boundary conditions, error handling scenarios, and edge situations. Fix any problems that were discovered during testing.



- Refine and improve: Upon completion of testing and bug fixing, make adjustments to the calculator's user interface and functionality in response to user feedback or new requirements.
- Document and deploy: The calculator's design, coding, and functionality should be documented. Install the calculator on the targeted platform or gadget.

Here's the experimental setup:

- Development Environment: Create a development environment for the calculator on your computer using the tools and programming language of your choice. This contains a text editor, any required libraries, and an integrated programming environment (IDE).

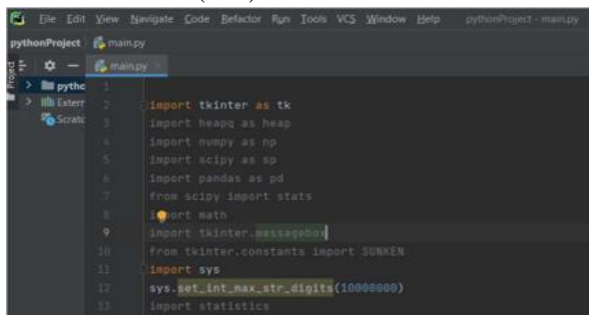


Figure 7: Development environment

- User Requirements: Determine the calculator's user needs. Decide what features are required and how the user interface should appear. User surveys, interviews, or focus groups can be used for this.
- Architecture and Design: Create a calculator architecture and design that takes into account all of the individual parts, how they work together, and the computation methods. Either on paper or with a wireframe tool, sketch out the design.
- Implementation: Start by implementing the calculator's fundamental operations, such as addition, subtraction, multiplication, and division. Continue using other calculator features like mean, median, mode, standard deviation, variance, and correlation after that.



Figure 8, 9: Implementation

- Testing: To be sure the calculator is operating properly, test it. This involves functional testing to ensure the calculator accurately carries out all desired operations and performance testing to ensure the calculator carries out operations in a reasonable amount of time. Test for boundary conditions, error handling scenarios, and edge situations.

```
Traceback (most recent call last):
  File "E:\Users\sanga\PycharmProjects\pythonProject\main.py", line 17, in <module>
    class tkinterApp(tk.Tk):
      ^^
NameError: name 'tk' is not defined
```

- Debugging: Debug any problems that you encounter during testing. This entails determining the issue's root cause and implementing the necessary code modifications.

```
Process finished with exit code 0
```

RESULT AND OUTPUT

Basic Arithmetic Operations



Figure 10, 11: Basic Arithmetic Operation

Mean

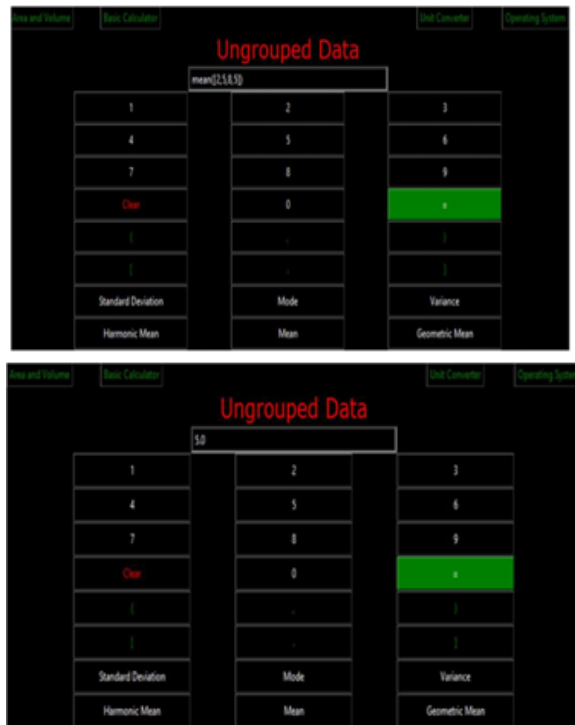


Figure 12, 13: Mean

Square Root

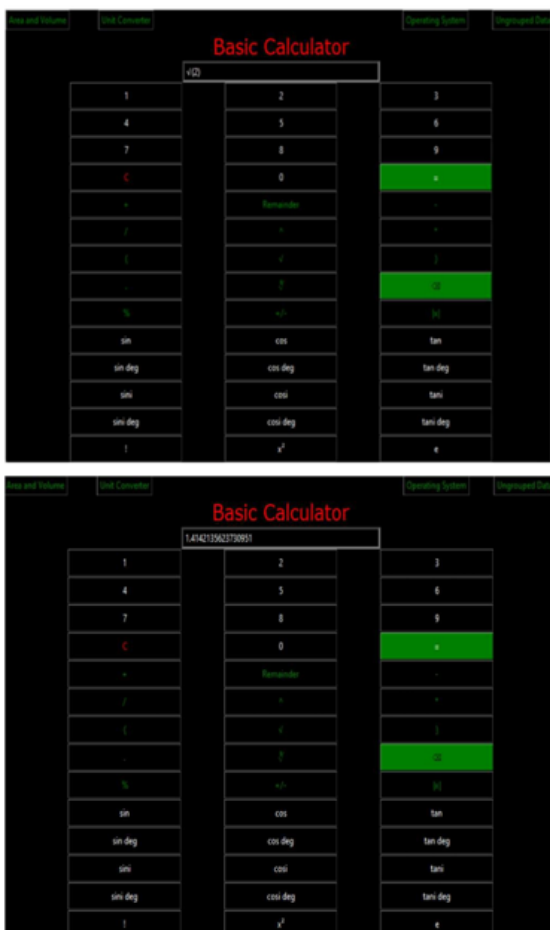


Figure 14, 15: Square Root

CONCLUSION

The creation of a calculator takes meticulous planning, design, and execution. You may develop a calculator that satisfies the user's demands and yields precise results by identifying the user requirements, selecting the appropriate programming language, and adhering to a systematic methodology. Prioritise implementing the basic calculator functions like addition, subtraction, multiplication, and division before moving on to the more advanced calculator features like mean, median, mode, standard deviation, variance, and area volume. Before improving the user interface and releasing the calculator, it should be thoroughly tested for functionality and performance, with any problems needing to be debugged. Overall, creating a calculator necessitates close attention to detail and a commitment to test and

iterate until the calculator is user-friendly. You may design a calculator that is precise, user-friendly, and useful with careful planning and implementation. Currently, it is only a Windows application, but it may eventually be transformed into a variety of forms, each tailored to a different operating system. It may also become a web application.

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