TOPIC-SCEINTIFIC CALCULATOR

PROJECT REPORT

1)INTRODUCTION

Calculator is used in situations where quick access to different mathematical functions is required. It serves as a great tool for doing rigorous calculations in short time. It consists of many functions like algebraic, trigonometric, exponential etc.

It finds many applications in field of statistics, engineering. We have introduced features used in statistics like mean, median, mode, standard deviations.

2.FUNCTIONS

TRIGONOMETRIC FUNCTIONS:

It contains basic functions like sine, cosine and tan. We used Taylor's theorem for evaluating sine,cosine functions between (0,pi/2). Interval (0,2pi) was further broken into four equal intervals. Taylor's theorem was used in interval (-2pi,2pi) and reduced other values so that it fits in given interval.. Sine and cosine functions were evaluated by above method. Tan was evaluated using formulae Tan =sine/cosine. Other trigonometric functions are just the reciprocal of the above three functions, hence

LOGARITHMIC & EXPONENTIAL FUNCTIONS:

Evaluated using taylor's theorem for small interval around zero.For other values we continuously divided the value by 'e' till it was reduced to a number between (0,1) then subtracted the value (number of times it was divided in case of natural log) to obtain the actual value. It contains logarithmic having base 'e' and '10'.

Exponential function also used the above algorithm.The integer part is separated from fractional part, and taylor's theoem is applied on the fractional part which is then multiplied by e^ (integer part) to obtain the final result. It contains base 'e' .

ALGEBRIAC FUNCTIONS:

It consists of functions for basic algebraic operations like addition, subtraction, multiplication and division. These Operations are performed when user enters a numerical value , then presses the

required operator and enters second value .result is displayed on the screen once the user presses the '=' button.

POWER FUNCTIONS:

Used for calculating square, cube and in general any (integral) power of a number. We also included square root and cube root. Basically, we used two power functions. One took exponent as integer input and other one was more general and took all values as input .

First power function was quite easy and we were able to compute it using simple for loop with appropriate initialisations and conditions.

Second one was more tricky. We mathematically manipulated power .We used our already built functions exponential and logarithm. We first took logarithm of input value and then used exponent under appropriate conditions with correct manipulation.

FUNCTIONS FOR STATISTICS:

For finding mean, median, mode and standard deviation of discrete values entered by user which are used by statistician.

 Evaluation of mean was done by summing all values using for loop and then dividing it by number of values. Standard deviation was calculated using for loop and then using square root function. We used two more functions built by us, one which gives sum of all elements and other one which gave sum of square of all elements. For calculating median and mode the given set of values was sorted in ascending order. If number of values were odd then the middle value is the median, if the number of values were even average of two middle terms was taken a median. For evaluating mode, each element of the given data was scanned and if same element was found again, it's count (array for counting the number of times a number is present) was incremented and finally the number with maximum count was declared mode.

INVERSE TRIGONOMETRIC FUNCTIONS:

We included three basic and most commonly used inverse trigonometric functions sine inverse, cosine inverse and tangent inverse. As series of inverse functions is more specific, that is it applies to more general cases and also mathematical manipulations are tough, we used cmath library for these functions.

HYPERBOLIC FUNCTIONS:

Basically, we included two commonly used hyperbolic functions sine h and cosine h. These were relatively easy to evaluate. Formula for both functions required knowledge of only exponential function which was already made by us. We used already built exponential function to evaluate both hyperbolic functions.

FACTORIALS AND FUNCTIONS INCLUDING FACTORIALS:

We included three commonly used functions in this part. These are factorial, permutation and combination. We used looping construct(for loop) for making factorial function.

Knowing the formula for permutation and combination, factorial was the only needed functionand using factorial function which we built, we were able to evaluate both combination. Using both combination and factorial function, we evaluated permutation function.

QUADRATIC FUNCTION:

Used for calculating several aspects of quadratic function like evaluating its value at particular value of variable , evaluating its integral and differential at particular value of variable. This function also provides user option of evaluating maximum or minimum value of quadratic equation

3. GRAPHICS:

Used simplecpp for building main dialog box of the calculator. User inputs number,function by clicking on the respective buttons. Buttons containing

1.numbers (0-9),

2. algebraic operators(+,-,*,/),

3. trigonometric functions(sin, cos, tan) ,

4. logarithmic function[log(base 10), ln(base e)],

5. factorial(!)

6.permutations & combination(nPr, nCr) ,

7. "stats" button which will lead to a terminal window containing functions used in statistics.

8. "MEM" button which is used to store previous results calculated which may be useful in checking all the inputs.

9. hyperbolic function(hyp).

10.Inverse Trigonometric function(Trigo Inv)

11.Exponential (e^)

12.Decimal point (.)

13.Power functions(pow)

14.Equal sign(=)

15.conversion of Degrees to radians and vice-versa(conv.)

16.Value of universal constants (cons.)

Using simplecpp package defined co-ordinates(x,y) of each button ,also decided the width and length of buttons.

REFERENCES:

1.Introduction to programming through c++ by ABHIRAM RANADE

2.Internet