Assignment No. 12

Title:- obtain mean, variance, standard deviation

problem statement -

write 80387 ALP to obtain i) mean ii) variance iii) standard deviation, also plot the the histogram for data set. The data elements are available in otext file.

Objective:-

- To be able to solve mathematical problems in ALP
- To be able to handle file & data set from file in ALP.
- To able to include mathematical histogram using ALP.

Outcome -

Students will able efficient in handling & Solving mathematical problems through file using ALP.

s/w & h/w :- core i3/ i5 / i7
os Linux 32-64 bit
NASM
gedit
GDB debuggee

Thoery :-

Mean :- The mean is the average of data set It is found by adding all numbers in data set & dividing number of values in set.

If $a_1, a_2, a_3 \ldots a_n$ is data set then

$$\text{mean} = \frac{a_1 + a_2 + a_3 + \ldots + a_n}{n}$$

Variance :-

Variance is expectation of squared deviation of random variable from mean. It measures how for a set of random numbers are spread out from their average value.

To calculate variance, take each different & square & take average.

$$\text{Variance} = \sigma^2 = \frac{(d_1)^2 + (d_2)^2 + \ldots + (d_n)^2}{n}$$

Standard deviation :-

It is measure of mount of variation or dispersion of set of values. A low S.D indicates that value & do be close to mean of set while, high SD indicates that values and to be close to mean of set, while a high SD indicates that value are spread out over wide range

SD = σ = $\sqrt{\text{variance}}$

It is calculated by taking square root of variance.

Example -

mean - $600 + 470 + 170 + 430 + 300 \div 1970 = 394$

$$= \frac{206 + 76 + (-224)^2 + 36^2 + (-94)^2}{5}$$

$$= \frac{108520}{5}$$

$\sigma^2 = 21704$

S.D. = $\sqrt{21704}$

= 142.32

= 147 (nearest)

Algorithm -

i) Create a one folder which contain 1 program text file
ii) Write all input text to text file
iii) Define all paramuter required to execute above procedure 1st program file.
iv) Define all procedure.
v) Initialize coprocessor.

vi) load zero to top of stack

1) Calculate mean -
   a) push all values from array in floating point stack & add
   b) divide top of stack by number of elements.
   c) move it in variable mean.

2) calculate variance -
   a) load array value to top of stack
   b) substract it from mean.
   c) square the value.
   d) add ST0 & ST1
   e) set heap to ST (automatically)
   f). decrement count increment rsi to get next array element.
   g) Repeat steps till all elements get added.
   h) Divide by no. of elements & move to variable variance.

3) Calculate SD -
   i) load variance to ST0
   ii) Take square root of this
   iii) move it into variance deviation.

Instructions :-

i) FMUL :-

multiply top of stack with given operand & store it into STO.

ii) FDIV :-

divide top of stack within provided operand & stack result in STO.

iii) FSQRT -

It does not accept any parameters. It calculate square root of STO top of the stack.

iv) FLDZ -

loads zero at the STO & sets the top of stack to STO.

Conclusion :-

Hence we implemented ALP (8087 ALP) to calculate mean, variance & SD & floating point operations.