

Introduzione al sistema operativo Unix

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SCOPO DELL'ESERCITAZIONE

Conoscenza del Sistema Operativo Unix e sua applicazione in un laboratorio di ricerca. Conoscenza del linguaggio di programmazione C e suo utilizzo nell'analisi dei dati scientifici. Installazione in un elaboratore di un sistema operativo, e costruzione di un codice per l'analisi di dati.

Argomenti affrontati: *Sistema Operativo Unix, Linguaggio C, Reti di comunicazione, Analisi Dati. Come funziona un sistema operativo, una rete tcpip, nozioni elementari di programmazione e di analisi dei dati, calcolo della media, stima della varianza e della deviazione standard.*

tipo di lavoro e strumentazione usata: *Calcolo della media, stima della varianza e deviazione standard con un programma sviluppato su un elaboratore Risc6000 IBM in linguaggio C.*

Libri usati:

*Deitel & Deitel – Corso Completo di Programmazione in C – Apogeo Editore.
Maurice J Bach – Unix Architettura di Sistema – Gruppo Editoriale Jackson.*

tipo di lavoro svolto e/o abilità progettuali sviluppate: *Lo studente ha installato un sistema operativo Linux su un PC Compaq Pentium 4. Ha imparato le basi della programmazione nel linguaggio C insieme alle tecniche di base della programmazione. Alla fine e' stato in grado di scrivere un codice C necessario alla elaborazione richiesta, il tutto nelle tre settimane (15Giornilavorativi) disponibili.*

Relation of stage by Bonomo Luca

In these three weeks I learnt a lot of theories about informatics component, internet, programming language like The “C” language and now I am able to use these things in order to work on a computer.

The first day there was the presentation of all the structure of the national laboratories of Frascati and so I could see all the object of the structure and the tutors explained me and my other stage-friends why there were these structure in this national laboratory.

The first week my tutor explained me a lot of general information about computer and informatics program. He also explained me the characteristic of the Unix operative system.

I went to the conference By Vittori and Precourt. It was very useful because I could understood a lot of things about the orbital station .

The second week he explained me all the characteristic of the C language and I started to do some easy exercises about C language. He gave me a lot of books in order to give more information about what he explained me and in these books there were a lot of exercises. These exercises were very useful because in this way I could create some program about what my tutor explained me. He also explained me a lot of theories about the galaxy, the sun, the moon and a lot of thing that I asked him.

The third week I installed on a computer Linux9.0 and I wrote a complex program. This program and the installation of Linux are used as an exit test of the stage.

“Installing Linux”

The first operation to do in order to install Red Hat Linux 9.0 on a computer is to put the Linux compact disc in the cd-rom and reboot computer. When the computer is rebooting we must enter in the bios and selected cd-rom as primary unit boot and save this modification

Then computer start to read cd-rom and asked us if we want to install now Linux9.0 or if we want to check compact disc is not damaged.

After the check, the installation process starts. The program searches all the component of the computer such as keywords mouse and screen. Now I select English as language of Linux9.0. Then we have to select our key and mouse type. Now program asked us if we want to update Linux or if we want to install it. We decided new installation and the option custom in order to decided what install and what do not install.

Now we have to decide in which partition of hard disc we want to install Linux9.0.

We selected manual partition and we select a partition of the principal hard disc.

In computer there were two operative system and so we have to create a boot loader in order to decided if we want to start up Linux or Windows every time we reboot computer.

I have to create two loader one for windows and the other one for Linux. Then we selected the partition of hard disc in which we want to install the boot loader. The partition in which install the boot loader must be the first one that the computer reads.

I selected Italian as additional language and I selected the part of country in which I have installed Linux.

Now computer asked root password and I put it.

In this part of installation process we have to decide all the program to install in our computer. Then there is the installation of all the component on the hard disc. The installation program asked us to change cd of installation and put in the cd-rom the second compact disc and then the third compact disc.

Now I put a floppy disc in the computer in order to create a boot floppy.

This is the end of installation process. Now I reboot computer and selected Linux in order to start up Linux on computer.

“C” program

In this stage I studied the “C” language in order to create a final program.

The characteristics of this program are the following:

- 1) Take same information from a file
- 2) Elaborate these information
- 3) Print the result of the program into a file.

The file is characterized by ten columns of numbers; each column is composed by 50.000 numbers.

The program takes the numbers and makes same different operation such as:

- 1) Arithmetic mean
- 2) Variance
- 3) Standard deviation

To make these operation are used same different structural control such as:

- 1) While (this command is used in order to repeat a small part of program)
- 2) For (also this command is used to repeat a part of program)
- 3) Printf (this command is used to print on the screen same informations)
- 4) Fscanf (this command is used to take same informations from a file)
- 5) Fprintf (this command is used to print in a file same informations)

Program C Listing:

```
#include <stdio.h>
#include <math.h>

main(argc,argv)
int argc;
char *argv[];
{
float varianza[10];
float fnum[10];

int rc,k;
int counter=0;
float media[10];
float somma[10];
float a[10];
float vett[10];
float b[10];
FILE *fp;
FILE *fp2;

/* reset del valore dei vettori */

for(k=0;k<10;k++)
{
somma[k]=0.0;
media[k]=0.0;
fnum[k]=0.0;
}

/* Controllo del numero di parametri inseriti al prompt */

if(argc<3)
{
printf("errore non e\' stato inserito il file da cui leggere i
dati\n");
printf("oppure non e\' stato inserito il file su cui stampare il
risultato\n");
exit(-1); /* Uscita se parametri errati */
}

/*apertura file */
fp=fopen(argv[1],"r");
fp2=fopen(argv[2],"w");
if(fp==NULL || fp2==NULL)/*controllo esistenza parametri
inseriti*/
{

printf("il file e\' inesistente o non apribile\n");
rc=fclose(fp);
rc=fclose(fp2);
exit(-1);/*uscita se parametri inesistenti*/
}
for(k=0;k<10;k++)rc=fscanf(fp," %f",&fnum[k]);
```

```

        if(rc<0)/*contollo contenuto del file*/
        {
            printf("il file e\' vuoto\n");
            exit(-1);/*uscita se file vuoto*/
        }

while(rc>0)/*esegue il ciclo finche' sono presenti valori nel file*/
{
for(k=0;k<10;k++)
    {
        somma[k]=somma[k]+fnum[k];/*somme di tutti gli elementi */
    }
    counter=counter+1;

    for(k=0;k<10;k++)
        {
            rc=fscanf(fp,"%f",&fnum[k]);
        }
    }
for(k=0;k<10;k++)
    {
        media[k]=(somma[k]/(float)counter);/* calcolo della media */
    }

rc=fclose(fp);/*chiusara file input */

counter=0;

fp=fopen(argv[1],"r");/*apertura file*/

for(k=0;k<10;k++)
    {
        rc=fscanf(fp,"%f",&fnum[k]);
    }
while(rc>0)/*esegue il ciclo finche' sono presenti valori nel file*/
{
    for(k=0;k<10;k++)
        {
            varianza[k]=varianza[k]+(media[k]-fnum[k])*(media[k]-
fnum[k]);/*somme della differenza
al quadrato tra valor medio e il valore in input*/
        }
        counter=counter+1;

for(k=0;k<10;k++)
    {
        rc=fscanf(fp,"%f",&fnum[k]);
    }
    }
for(k=0;k<10;k++)
    varianza[k]=varianza[k]/((counter-1)*1.0);/*calcolo della stima
della varianza */

rc=fclose(fp);/*chiusura file input*/

```

```

for(k=0;k<10;k++)
{

vett[k]=sqrtf(varianza[k]); /* Deviazione Standard */
}

for(k=0;k<10;k++)
a[k]=3*vett[k];/*deviazione standard per tre */

/*inizio stampa su file*/
fprintf(fp2,"media su %d entry; stima della varianza standard su %d
entry;\n\n\n",counter,counter);
for(k=0;k<10;k++)
{
fprintf(fp2,"col %d = media %d= %19.15f   varianza %d =
%19.15f   stima dev. stand.%d =
%19.15f\n",k+1,k+1,media[k],k+1,varianza[k],k+1,vett[k]);
}

fprintf(fp2,"\n\n\n\n\n");

fprintf(fp2,"valori da inserire nel grafico\n");
for(k=0;k<10;k++)
{
fprintf(fp2,"x (%d) = %19.15f   +-
%19.15f\n",k+1,media[k],a[k]);
}
/*fine stampa su file*/
rc=fclose(fp2);/*chiusura file output*/
printf("\n\n");
exit(0);
}

```

Code Output

media su 50000 entry; stima della varianza su 50000 entry;

```

col 1 = media 1= 12.787573814392090   varianza 1 =
0.000005517081263   stima dev. stand.1 = 0.002348846755922
col 2 = media 2= 34.845302581787109   varianza 2 =
0.000091527203040   stima dev. stand.2 = 0.009566985070705
col 3 = media 3= 809.632507324218750   varianza 3 =
0.025296593084931   stima dev. stand.3 = 0.159049034118652
col 4 = media 4= 98.043373107910156   varianza 4 =
0.002215739339590   stima dev. stand.4 = 0.047071639448404
col 5 = media 5= 76.064796447753906   varianza 5 =
0.001200152444653   stima dev. stand.5 = 0.034643217921257
col 6 = media 6= 23.989250183105469   varianza 6 =
0.000077651813626   stima dev. stand.6 = 0.008812027052045
col 7 = media 7= 87.941223144531250   varianza 7 =
0.002838776912540   stima dev. stand.7 = 0.053280174732208
col 8 = media 8= 191.891067504882812   varianza 8 =
0.015906836837530   stima dev. stand.8 = 0.126122310757637

```

col 9 = media 9= 67.171958923339844 varianza 9 =
0.001955272629857 stima dev. stand.9 = 0.044218465685844
col 10 = media 10= 88.944572448730469 varianza 10 =
0.001775300595909 stima dev. stand.10 = 0.042134314775467

In sintesi:

x (1) =	12.787573814392090	+-	0.007046540267766
x (2) =	34.845302581787109	+-	0.028700955212116
x (3) =	809.632507324218750	+-	0.477147102355957
x (4) =	98.043373107910156	+-	0.141214922070503
x (5) =	76.064796447753906	+-	0.103929653763771
x (6) =	23.989250183105469	+-	0.026436081156135
x (7) =	87.941223144531250	+-	0.159840524196625
x (8) =	191.891067504882812	+-	0.378366947174072
x (9) =	67.171958923339844	+-	0.132655397057533
x (10) =	88.944572448730469	+-	0.126402944326401