Communication Systems

Lab # 03

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The while loop:

the format is

```
while expression
        statement1
        statement2
        statement3
 .
.
end
```

Programming Example:

```
>> x=input('plz enter a value');
plz enter a value10
```

```
>> n=0;
>> sum_x=0;
>> sum_x2=0;
>> while x>=0
n=n+1;
sum_x=sum_x+x;
sum_x2=sum_x2+x^2;
end
```

Calculating the day of the year

This program calculates the day of the year; this program contains a bug(added intentionally); remove it…..

```
disp('this program calculates the day of the month given by');
disp('current date');
month=input('enter current month(1-12)');
day=input('enter current day(1-31)');
year=input('enter current year(yyyy)');

if mod(year,400)==0
   leap_day=1;
else if mod(year,100)==0
```

```
    leap_day=0;
else if mod(year,4)==0
    leap_day=1;
else
    leap_day=0;
end


day_of_year=day;
for ii=1:month-1

    switch(ii)
        case{1,3,5,8,10,12},
            day_of_year=day_of_year+31;
        case{4,6,9,11},
            day_of_year=day_of_year+30;
        case 2,
            day_of_year=day_of_year+28+leap_day;
    end
end



fprintf('the month is',month);
fprintf('the day is',day);
fprintf('the year is',year);
fprintf('the day of the month is',day_of_year);
```

Introduction to tic/toc and JIT

JIT-> just in time compiler, is a built in compiler added to speed up the execution of current programs. It automatically speeds up the execution of the loop without any action by the programmer. But it has some limitations:

- It only accelerates the loop containing double, logical and char data types.
- If an array has more than two dimensions, then the array will not be accelerated.
- If a code calls external loops, then again it will not be accelerated.
- If a code changes the data type of a variable, then the loop will not be accelerated.

The Break and continue statement

They are used to control the operation of ‘while’ and ‘for’ loop. If break in a loop is executed, then the control is transferred to the statement immediately after that loop. If ‘continue’ statement is executed, then the control is transferred to the start of the same loop again.
For example

```
>> for i=1:5
if i==3
```

```
break;
end
fprintf('i=%d\n',i);
end
```

Output

i=1
i=2

```
>> for i=1:5
if i==3
continue
end
fprintf('i=%d\n',i);
end
```

Output

i=1
i=2
i=4
i=5

Nesting Loops

Task 1 is an example of nested loop. i.e. the table calculation of any number.

Logical arrays and vectorization

```
>> a=[1 2 3;4 5 6;7 8 9]
a =
    1    2    3
    4    5    6
    7    8    9
>> b=a>5
b =
    0    0    0
    0    0    1
    1    1    1
>> whos
  Name          Size                Bytes  Class

  a             3x3                    72  double array
  average1      1x1                     8  double array
  average3      1x1                     8  double array
```

```
  b          3x3                9  logical array
  i          1x1                8  double array
  j          1x1                8  double array
  maxcount      1x1                   8  double array
  sqaure        1x1000             8000  double array

Grand total is 1023 elements using 8121 bytes
```

Logical arrays have a very important special property, they serve as mask for arithmetic operations. A mask is an array that selects the elements of another array for use in an operation. The specified operation will be applied to the selected elements and not to the remaining elements.
For example this operation will take the square root of all elements for which the logical array is true and leave the other elements in the array unchanged.

```
>> a(b)=sqrt(a(b))
a =
   1.0000    2.0000    3.0000
   4.0000    5.0000    2.4495
   2.6458    2.8284    3.0000
```

Lab Task:

1. Take input from the user and calculate and display its table till 20 multiples
2. Calculate square of every integer from 1 to 1000.
3. Calculate and plot the distance and height of radio horizon as height of antenna is increased in case of LOS propagation using $\mathbf{d=2h^2}$ where h is the height of the antenna.\
4. Calculate and plot shannon's channel capacity for a twisted pair telephone line channel(whose bandwidth is 3700 hz)
5. Calculate power as function of time
Hints : power=current*voltage
Where current = Acos(wt+theta*pi/180)
And voltage=Acos(wt)
6. Calculate and plot SNR on a logarithmic scale.