

CN208

Introductory Computer Programming

Week 7:- Function

By

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Function

- **Function Concept**
- Black Box View of a Function
- MATLAB Implementation

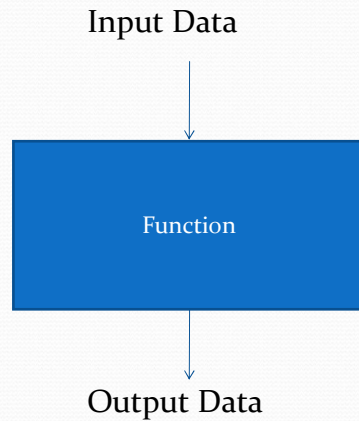
Function Concept

- **Function** is an implementation of procedural abstraction and encapsulation.
- **Procedural** abstraction is the concept that permits a code block that solves a particular sub problem to be packaged and applied to different data inputs.
- **Encapsulation** is the concept of putting a wrapper around a collection that you wish to protect from outside influence.

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Black Box View of a Function



Black Box View of a Function

- For using function you need to know:
 - What is input (type, format, structure, limit)?
 - What is output (type, format, structure, limit)?
- Why this is useful ?
 - Quickly implement.
 - Repeating usage.
 - Manage to program in the big project.
 - Easily debug.

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MATLAB Implementation

```
function <return info> <function name>  
(<parameters>)  
<documentation>  
    <code body>
```

* Note: file name must be <function name>.m

MATLAB Implementation

The existence of a file on disk called `stat.m` containing this code defines a new function called `stat` that calculates the mean and standard deviation of a vector:

```
function [mean,stdev] = stat(x)
n = length(x);
mean = sum(x)/n;
stdev = sqrt(sum((x-mean).^2/n));
```

MATLAB Implementation

`avg` is a subfunction within the file `stat.m`:

```
function [mean,stdev] = stat(x)
n = length(x);
mean = avg(x,n);
stdev = sqrt(sum((x-avg(x,n)).^2)/n);

function mean = avg(x,n)
mean = sum(x)/n;
```

MATLAB Implementation

Here is a trivial function, [addtwo.m](#)

```
function addtwo(x,y)
% addtwo(x,y) Adds two numbers, vectors, whatever, and
%           print the result = x + y
x+y
```

MATLAB Implementation

- `help < function name>`
 - Return all comments after the function header
- Calling function
 - Function result = `addone(input)`
% This is addone function to add one more value
% from the input.
 `result = input + 1;`
 - `help addone`
This is addone function to add one more value
from the input.
 - `addone(1)`
ans =
 2

MATLAB Implementation

Finally, here is another simple function, [cart2plr.m](#), with two input parameters and two output parameters.

```
function [r,theta] = cart2plr(x,y)
% cart2plr Convert Cartesian coordinates to polar coordinates
%
% [r,theta] = cart2plr(x,y) computes r and theta with
%
%     r = sqrt(x^2 + y^2);
%     theta = atan2(y,x);
%
r = sqrt(x^2 + y^2);
theta = atan2(y,x);
```

The comment statements have empty lines, but these will be printed if you type ``help cart2plr``.

MATLAB Implementation

- Be careful !!!!
 - Check the path that MATLAB know your .m files.

Reference

- <http://web.cecs.pdx.edu/~gerry/MATLAB/programming/basics.html> @ 04 NOV2008
- <http://www.mathworks.com/access/helpdesk/help/techdoc/index.html?/access/helpdesk/help/techdoc/ref/function.html&http://www.google.com/search?q=MATLAB+function&rls=com.microsoft:en-US&ie=UTF-8&oe=UTF-8&startIndex=&startPage=1> @ 4NOV2008

Q & A