Developing Robust MATLAB Code

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MATLAB for Software Development

Develop

Test

Integrate

Share
Input Validation

narginchk
nargoutchk
validateattributes
validatestring

Property Validation

classdef MyClass
properties

Prop(dim1, dim2, ...) ClassName {fcn1, fcn2, ...} = defaultValue

end
end

Code Suggestions and Completions
Clean Code

- All handles are cleaned up after execution
- Code executes from a clean MATLAB install
- Code does not require changing working directory
- Code does not manipulate MATLAB path
- Uses error and warning identifiers
- No shadowing of MATLAB functions
- Variable names do not conflict with functions
- Naming conventions are followed

```
package.Class
classMethodOrFunction
object.Property
```

```
value1 = 0:1:6*pi;
Press Shift+Enter to rename 3 instances of 'val1' to 'value1'
```
Documentation – Live Functions

Add two values together

C = ADDME(A) adds A to itself.
C = ADDME(A,B) adds A and B together using the equation c = a + b.

Examples
Add a value to itself:
\[
c = \text{addme}(10);
\]
Add two values:
\[
c = \text{addme}(10, 90);
\]

See also SUM, PLUS.

>> help addme
addme    Add two values together
         c = addme(a,b)

Syntax
\[
c = \text{addme}(a,b)
\]

Description
C = ADDME(A) adds A to itself.
C = ADDME(A,B) adds A and B together using the equation c = a + b.

Examples
Add a value to itself:
\[
c = \text{addme}(10);
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Add two values:
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See also sum, plus.

Open documentation in Help browser
Unit Testing

Do I need a unittest?

Do you care if it actually works?

Yes / No

You need a unittest / You don't need a unittest

---

classdef SolverTest < matlab.unittest.TestCase
% SolverTest tests solutions to the quadratic equation
% a*x^2 + b*x + c = 0

methods (Test)

function testRealSolution(testCase)
    actSolution = quadraticSolver(1,-3,2);
    expSolution = [2,1];
    testCase.verifyEqual(actSolution,expSolution);
end

function testImaginarySolution(testCase)
    actSolution = quadraticSolver(1,2,10);
    expSolution = [-1+3i, -1-3i];
    testCase.verifyEqual(actSolution,expSolution);
end

end
Mocking

Mock
Implements the abstract methods and properties of the specified interface
Backed by an actual MATLAB class generated at runtime
Carries out actions

Behavior
Defines the same methods as the mock
Controls the mock behavior
Used to verify interactions with the mock
classdef testConfigurePlotAppExample < matlab.ui.test.TestCase

methods (Test)
    function test_SampleSize(testCase)
        app = ConfigurePlotAppExample;
        testCase.addTeardown(@delete, app);
        testCase.type(app.SampleSizeEditField, 12);
        testCase.press(app.UpdatePlotButton);

        ax = app.UIAxes;
        surfaceObj = ax.Children;
        testCase.verifySize(surfaceObj.ZData, [12 12]);
    end
end
end
Continuous Integration Pipeline

Beyond source control integration and testing

Code analysis and metrics
Code coverage
# MATLAB Interfaces with other languages

<table>
<thead>
<tr>
<th>Language</th>
<th>MATLAB Engine</th>
<th>MATLAB Compiler / Compiler SDK</th>
<th>MATLAB Production Server</th>
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**MATLAB Functions**

- `matlab.engine.shareEngine`: Convert running MATLAB session to shared session
- `matlab.engine.engineName`: Return name of shared MATLAB session
- `matlab.engine.isEngineShared`: Determine if MATLAB session is shared
Packaging

MATLAB Toolbox Packaging:
- Manages the MATLAB search path
- Picks up file dependencies
- Specifies MathWorks product dependencies
- Provides registration points for examples and documentation

See Developer Zone posts
http://blogs.mathworks.com/developer/
Distribution

Store front-end

- Ratings
- Comments
- Metrics

Repository
- Shared folder
- SharePoint
- Maven

displays

supplies