MATLAB® News & Notes

MATLAB Tips & Tricks: Exploiting the comma-separated list

Vectorizing cell array and structure references

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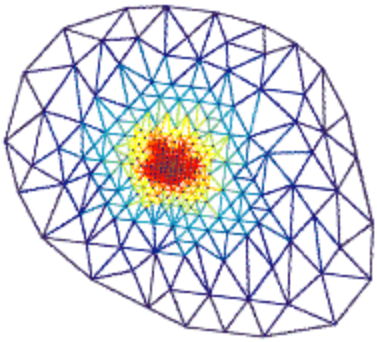

Have you ever found yourself wondering if it was possible to vectorize an expression that involved a structure or cell array? It is possible to vectorize some algorithms if you can take advantage of a comma-separated list. The comma-separated list syntax described below can be used to vectorize the following common operations:

- Concatenating conforming elements of a cell array into a single array (via `[ ]` or `cat`)
- Converting between cell arrays and structure arrays or assigning multiple elements of a structure array at once (via `deal` and `{ }`)
- Indexing into an N-D array with N subscripts without knowing N ahead of time (see `fftshift` for an example)
- Passing on variable arguments (in conjunction with `varargin` or `varargout`)

If your algorithm fits one of these categories, you can operate on the whole cell array or structure at once. Since the speed that an M-file takes is usually proportional to the number of lines of code executed, using the comma-separated list syntax can speed up your M-files.

The comma-separated list

The comma-separated list has been part of MATLAB from the beginning. In its simplest form, it is a list of statements separated by commas as in

```
x = 1:10, x, x(2)

x =

    1 2 3 4 5 6 7 8 9 10

ans =
```

```
    1 2 3 4 5 6 7 8 9 10

ans =

    2
```

Normally these statements would be placed on separate lines but you can put them all on one line by separating the statements with commas. Note that `ans` is displayed multiple times as each statement is evaluated.

A comma-separated list can be used in five situations:

- to combine multiple statements--`a,b,c,d`
- inside `[ ]` for horizontal concatenation--`[a,b,c,d]`
- inside `{ }` to create a cell array--`{a,b,c,d}`
- inside `( )`for indexing and function input arguments--`test(a,b)`
- inside `[ ]` for function output arguments--`[v,d] = eig(a)`

All of these situations work with the comma-separated list syntax for cell arrays and structures.

The comma-separated list syntax

The comma-separated list syntax is an extension of the syntax used to index into a cell array or structure and retrieve its contents. When you ask for more than one element, a comma-separated list is produced. For instance, suppose

```
strs = {'This' 'is' 'an' example'};
```

then

```
strs{4}

ans =

    example
```

and by indexing into more than one element at a time

```
strs{1:4}

ans =
    This

ans =
    is

ans =
    an

ans =
    example
```

you get a comma-separated list. It is as if you typed

```
>> strs{1},strs{2},strs{3},strs{4}
```

Note that MATLAB displays the value of `ans` multiple times, just like it did in the original comma-separated list expression. Any number of subscripts can be used. For example, `C{:,1}` is a comma-separated list if `C` has more than one row.

A comma-separated list is produced for a structure array when you access one field from multiple structure elements at a time. For instance if S is a 5-by-1 structure array then `S.name` is a five-element comma-separated list of the contents of the name field.

Where to learn more

In MATLAB, see the `help` for `lists`, `deal`, `varargin`, `vavargout`. Also see Chapter 13 of *Using MATLAB*.

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