COEN 45

The `find` command in MATLAB

We can find the elements of a vector that satisfy various conditions by writing the condition as a logical expression and using it as input to `find`. "Find" means reporting the positions (index numbers) of all the entries that satisfy the given condition. We will use `find` instead of logical arrays.

The following examples will illustrate this using a vector

```
a = [1 3 5 8 9 15 9 22 31];
```

- The third thru ninth elements of `a` are all greater than 3, and we can get those index numbers by

```
>> find(a>3)
ans =
     3     4     5     6     7     8     9
```

- The fifth and seventh elements are 9's

```
>> find(a==9)
ans =
     5     7
```

- The fourth and eighth elements are even numbers, so

```
>> find(mod(a,2)==0)
ans =
     4     8
```

- To get rid of all elements with values between 10 and 19 inclusive,

```
>> a(find(a>=10 & a<=19)) = []
a =
     1     3     5     8     9     9    22    31
```

If `find` is given a numeric array instead of a logical expression (something we won't normally do) , it finds all non-zero elements of the array

```
find(-3:3)
a =
     1     2     3     5     6     7
```

because the fourth element of [-3 -2 -1 0 1 2 3] is zero.

More examples:

- To discard entries from a dataset that are more than 3 standard deviations away from the mean ("outlier"),

```
%% x is an existing vector
xbar = mean(x);  %% mean
sig = std(x);    %% std. dev.
outliers = find(abs(x-xbar) > 3*sig);
x(outliers) = [];
fprintf('Discarded %d outliers\n',length(outliers));
```

  If there were no outliers, `outliers` would be null, and the code would work fine. Nothing would be eliminated.

- Reporting duplicates in a list:

```
a = [3 4 1 3 0 8 1 39 3 2 5 0 2 1];
ua = unique(a);
for i = 1:length(ua)
    fprintf('%3d appears %d times\n',ua(i),length(find(a==ua(i))));
end
  0 appears 2 times
  1 appears 3 times
  2 appears 2 times
  3 appears 3 times
  4 appears 1 times
  5 appears 1 times
  8 appears 1 times
 39 appears 1 times
```

`find` is meant for numbers. To find sub-strings within strings, use `findstr`.