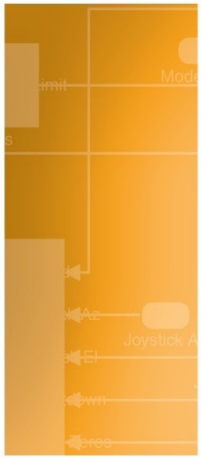
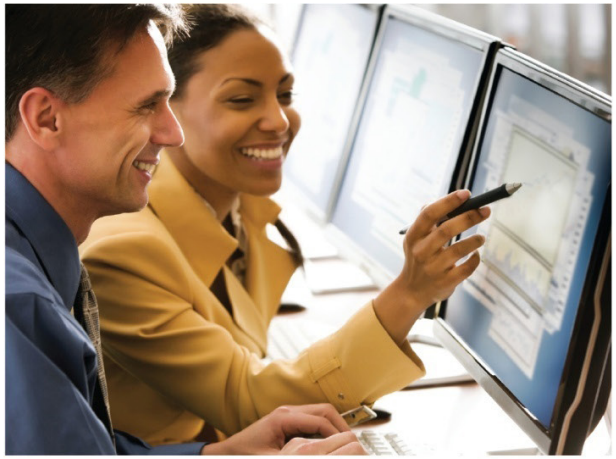
Increasing Automation with Programming Constructs

MATLAB® Fundamentals for Aerospace Applications





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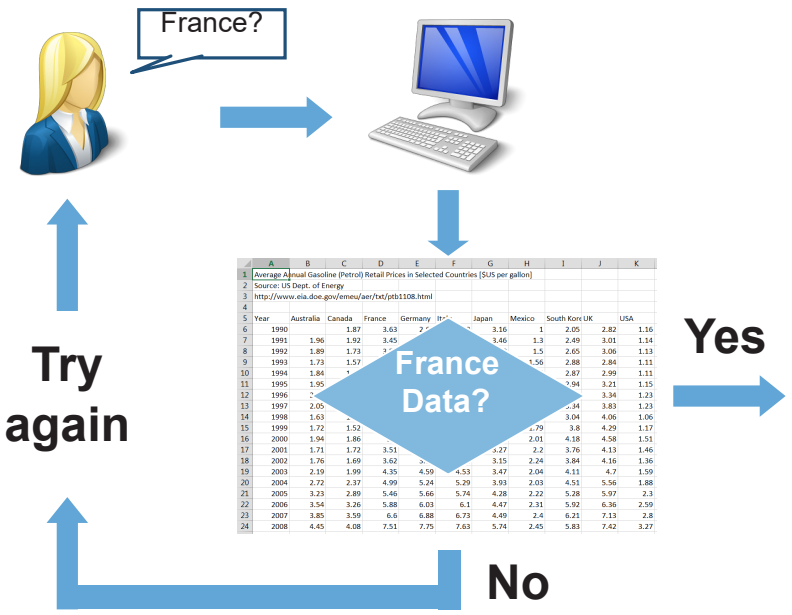
Outline

- Programming constructs
- User interaction
- Decision branching
- Loops

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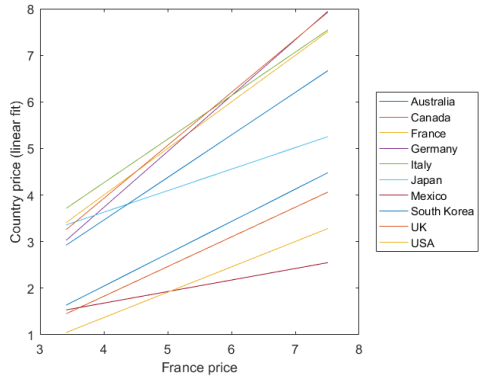
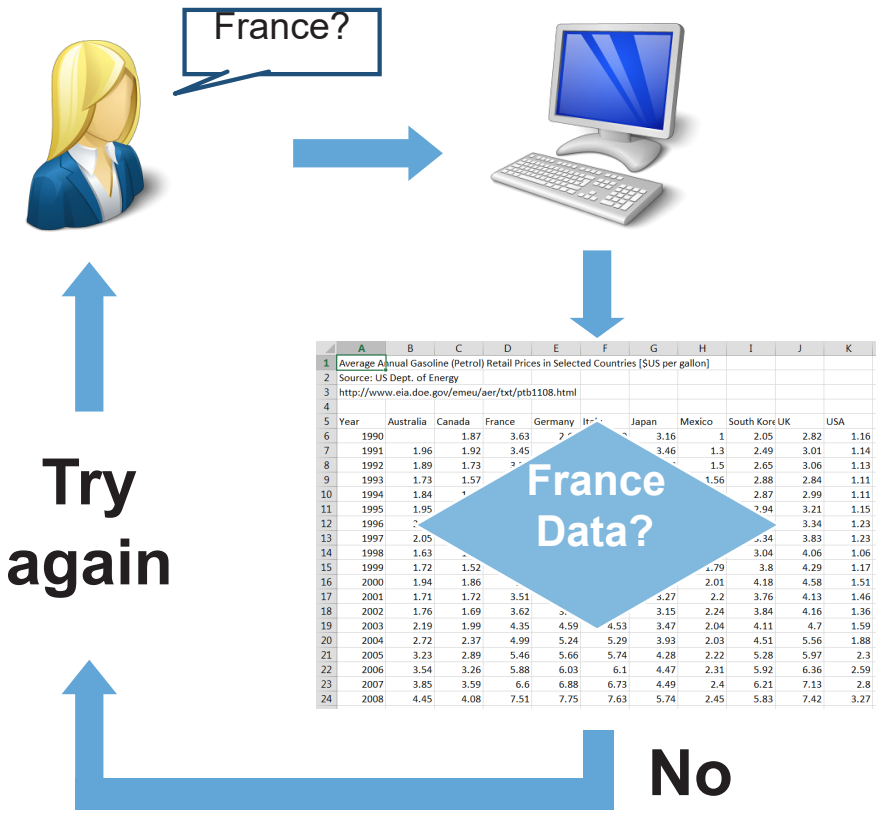


Course Example: Comparing Prices



Average Annual Gasoline (Petrol) Retail Prices in Selected Countries ($US per gallon)
Source: US Dept. of Energy
http://www.eia.doe.gov/emeu/aer/txt/ptb1108.html

Year	Australia	Canada	France	Germany	Japan	Mexico	South Kore	UK	USA
1990		1.87	3.63		3.16	1	2.05	2.82	1.16
1991	1.96	1.92	3.45		3.46	1.3	2.49	3.01	1.14
1992	1.89	1.73				1.5	2.65	3.06	1.13
1993	1.73	1.57				1.56	2.88	2.84	1.11
1994	1.84						2.87	2.99	1.11
1995	1.95						2.94	3.21	1.15
1996								3.34	1.23
1997	2.05						3.34	3.83	1.23
1998	1.63						3.04	4.06	1.06
1999	1.72	1.52				1.79	3.8	4.29	1.17
2000	1.94	1.86				2.01	4.18	4.58	1.51
2001	1.71	1.72	3.51		3.27	2.2	3.76	4.13	1.46
2002	1.76	1.69	3.62		3.15	2.24	3.84	4.16	1.36
2003	2.19	1.99	4.35	4.59	4.53	3.47	2.04	4.11	4.7	1.59
2004	2.72	2.37	4.99	5.24	5.29	3.93	2.03	4.51	5.56	1.88
2005	3.23	2.89	5.46	5.66	5.74	4.28	2.22	5.28	5.97	2.3
2006	3.54	3.26	5.88	6.03	6.1	4.47	2.31	5.92	6.36	2.59
2007	3.85	3.59	6.6	6.88	6.73	4.49	2.4	6.21	7.13	2.8
2008	4.45	4.08	7.51	7.75	7.63	5.74	2.45	5.83	7.42	3.27

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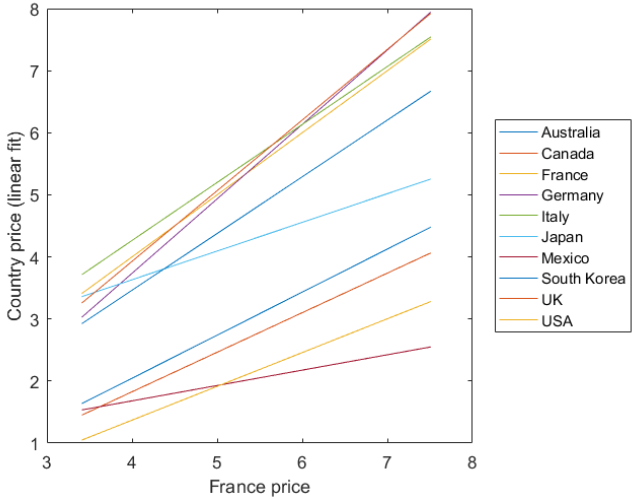

User Interaction

Text	`input`	`disp` `fprintf`	`warning` `error`

Graphical	`inputdlg`
	`listdlg`
	`uigetfile`
	
	`ginput`
		`msgbox`
		`waitbar`
			`warndlg`
			`errordlg`

Decision Branching

Yes

No

```
myctry = inputdlg('Enter a country:');
idx = strcmpi(myctry,country);

if any(idx)
    myPrices = Prices(:,idx);
    if ~strcmp(myctry,country{idx})
        warning('Modified country name')
        myctry = country{idx};
    end
    plot(Year,myPrices,'o-')
    xlabel('Year')
    ylabel([myctry,' prices'])
else
    error(['No data for ',myctry])
end
```

Mutually exclusive options

For-Loops

```
for k = 1:length(country)
    c = polyfit(myPrices,Prices(:,k),1);
    disp([country{k},'/',myctry,': ',num2str(c(1))])
end
```

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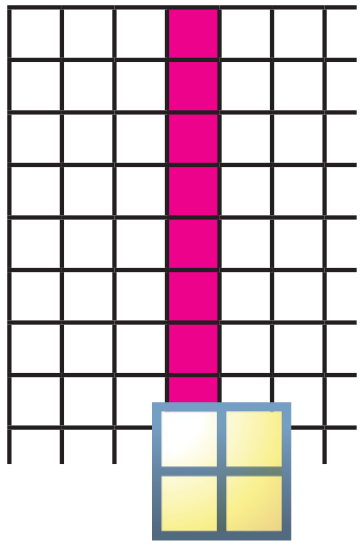


Determining Size

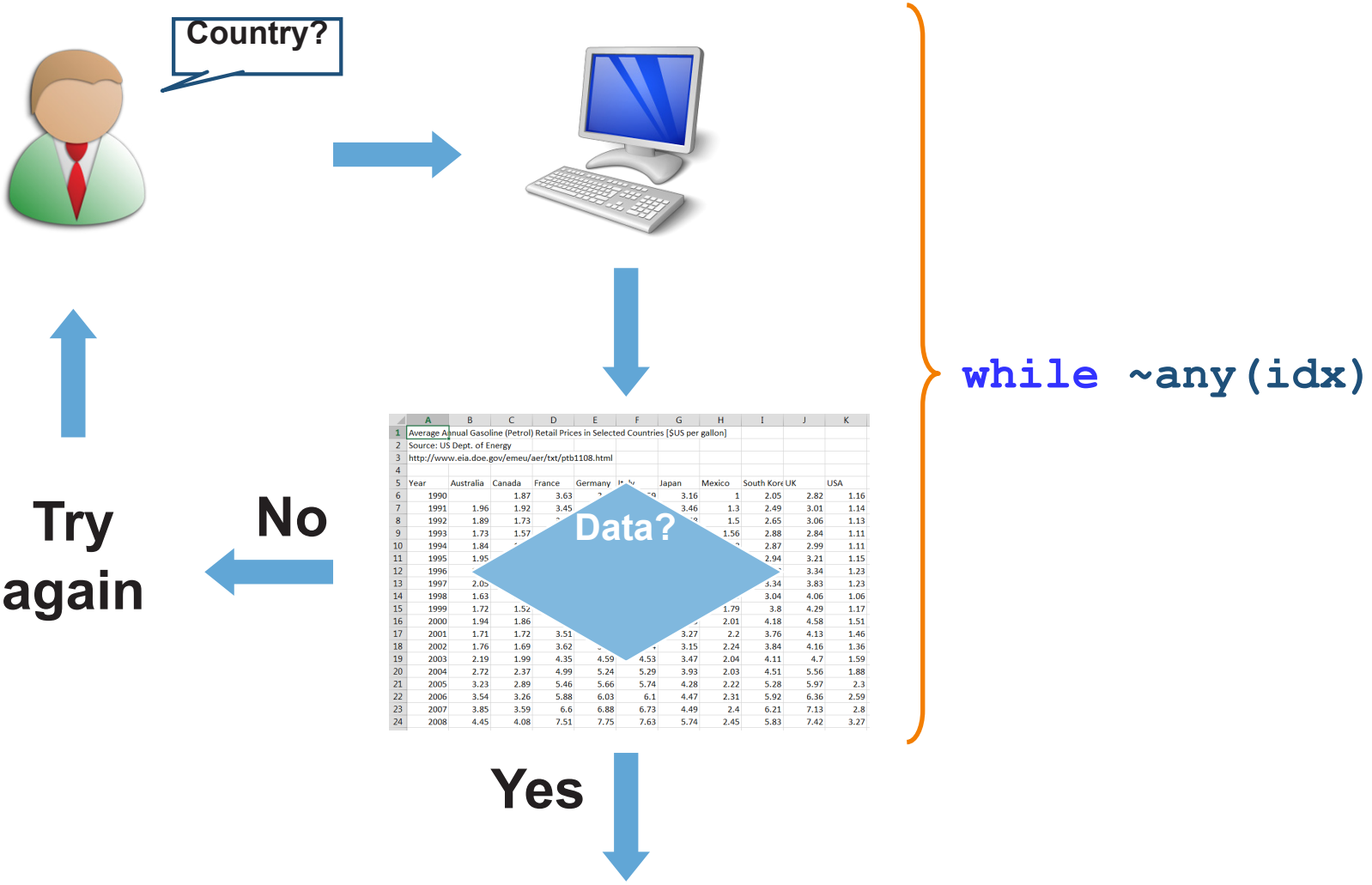
m-by-*n*

n-by-1

1-by-*n*

`size(x)`	[*m n*]	[*n* 1]	[1 *n*]
`size(x,1)`	*m*	*n*	1
`size(x,2)`	*n*	1	*n*
`length(x)`	*max(m,n)*	*n*	*n*
`numel(x)`	*m*n*	*n*	*n*

While-Loops



	A	B	C	D	E	F	G	H	I	J	K
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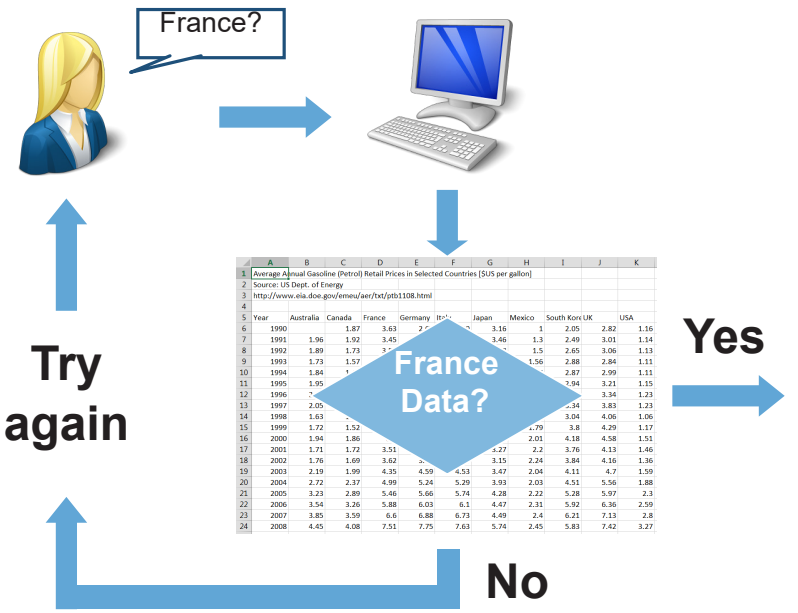


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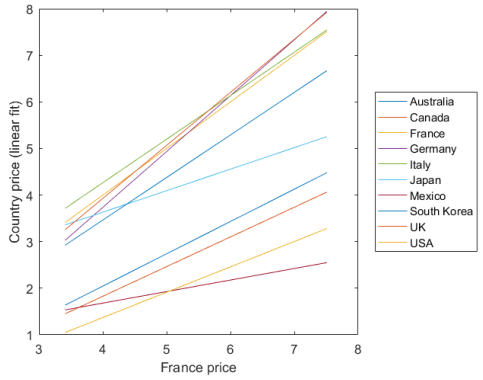

Test Your Knowledge

1. If `x = -4` what will be the result of running the following code?

```
if (x < 0) || (sqrt(x) > pi)
    y = 7;
else
    y = 2;
end
```

   A. `y = 7;`
   B. `y = 2;`
   C. `y` will be left undefined
   D. An error message due to taking the square root of a negative number
   E. An error message due to comparing an imaginary number to a real number

Test Your Knowledge

2. What construction should you use to loop over a block of code an indefinite number of times?

   A. `if`

   B. `for`

   C. `switch`

   D. `while`

   E. Logical indexing