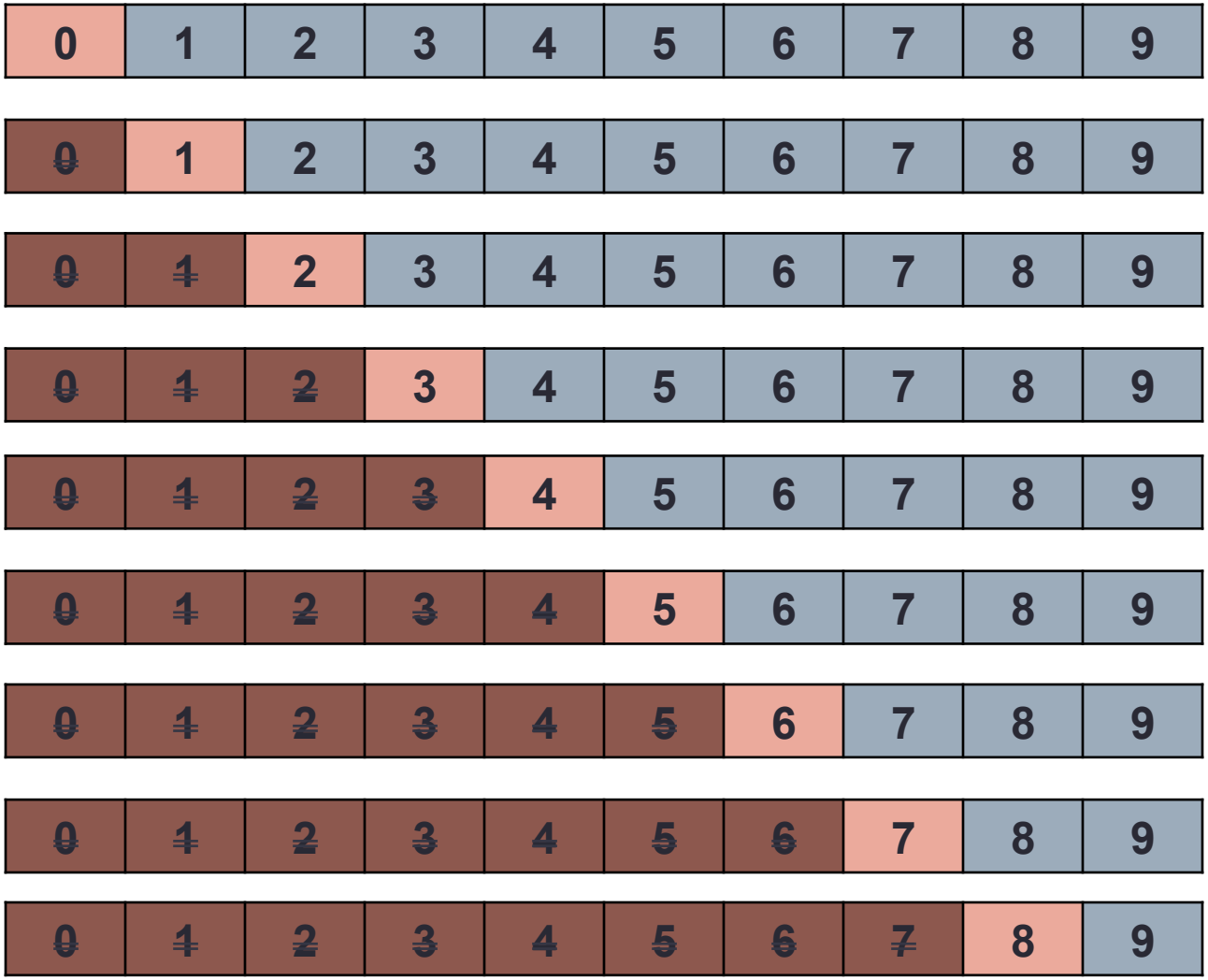
CS101: Intro to Computing
Fall 2015

Lecture 26

Administrivia

- Homework 14 released
  - Counts as ***two*** assignments
  - Three parts
  - Due on Wednesday
- Final exam
  - Practice exam released today
  - December 15th 1:30pm-4:30pm (here)
  - Get approval for the conflict (email me)

Homework/Exam Hint



REVIEW

```
a=3
b=5

x=(a<5) & ((b<=5) & (a~=b))
```

What is the value of x?

a) True

b) False

c) None of the above

```
A=0:2:10;
sum=0;
for x=1:3
    sum=sum+A(x);
end
disp(sum);
```

What value is displayed?

a) 6

b) 12

c) 24

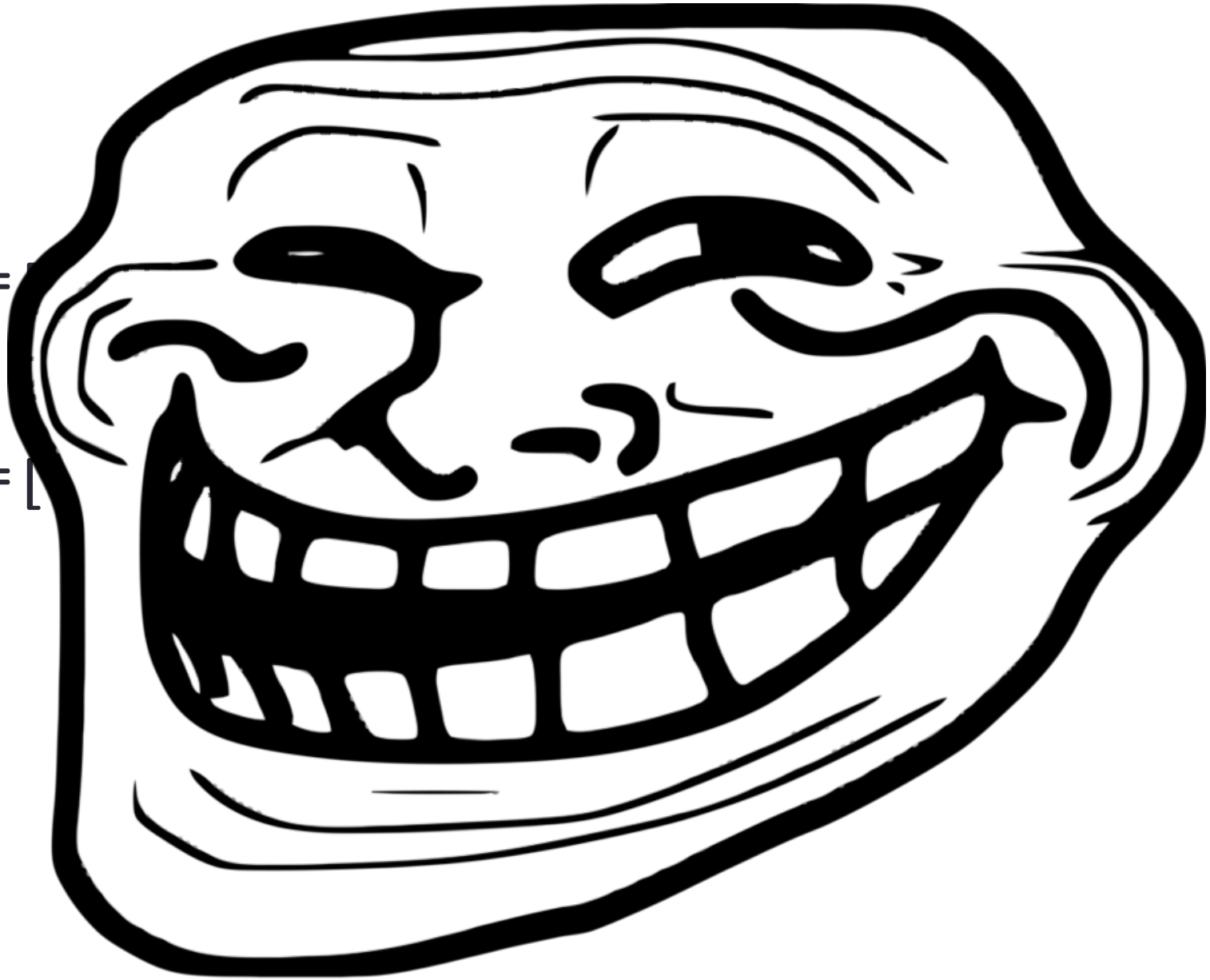
d) 7

OVERVIEW

Course Summary (so far…)

1. Matlab fundamentals ✓
2. Data visualization ✓
3. Data wrangling
4. Simulation
5. Random processes
6. Optimization

```
A=[
A(
C=[
```



What happened?

- The dimensions of arrays must always match!
- The type has to be the same, too.
- What do we do?

STRUCTURING DATA

Cell Arrays

- Arrays that can contain data of multiple types and sizes
- Matlab's (not very good) answer to lists/ dictionaries
- Created with curly brackets

```
C={pi,[3,4,5;1,2,3],'Eight'}
```

Indexing Cell Arrays

- Works the same as regular arrays:

```
C={pi,[3,4,5;1,2,3],'Eight'}
C(2)
```

- ***DANGER***: This returns another cell array!!
- Indexing with curly brackets returns the value:

```
C{2}(2,3)
```

Structures

- In Matlab types with attributes (“fields” are called “structures”
- Access fields with dot operator .

```
car=struct('year',2014,
'make','Ford',
'model','Mustang');
x=car.year;
car.year=2001;
```

Structure Arrays

- Like integers or floats, we can have an array of structs

```
cars=[car,car,car];
cars(2).year=1995;
cars(3).year=2011;
cars.year
```

READING DATA

Reading CSV

- Function ‘csvread’ reads a csv file
- Cannot handle headers or malformed data
- Manually edit errors in the file
- Probably best to clean file using Python or some other scripting language

```
M=csvread(‘data.csv’)
```

Importing data

- Matlab has another function for reading data, importdata
- Much more flexible: can process images and delimited text files
- Returns a cell array

Importing Images

- Images in Matlab are 3D arrays
  - 3 2D arrays of red, green, and blue

```
I=importdata('cat.jpg')
I=I(1000:2000,2000:3000,1)'+10
imshow(I);
```

Importing CSV Files

- Reads in data as a struct
- Usually two fields:
  - data - array of numeric data in the file
  - textdata - cell array of text data in the file
- Sometimes, also header attirbutes

```
C=importdata('Batting.csv');
disp(C.textdata(1,:));
x=C.data(:,12);
y=C.data(:,13);
plot(x,y,'.');
```

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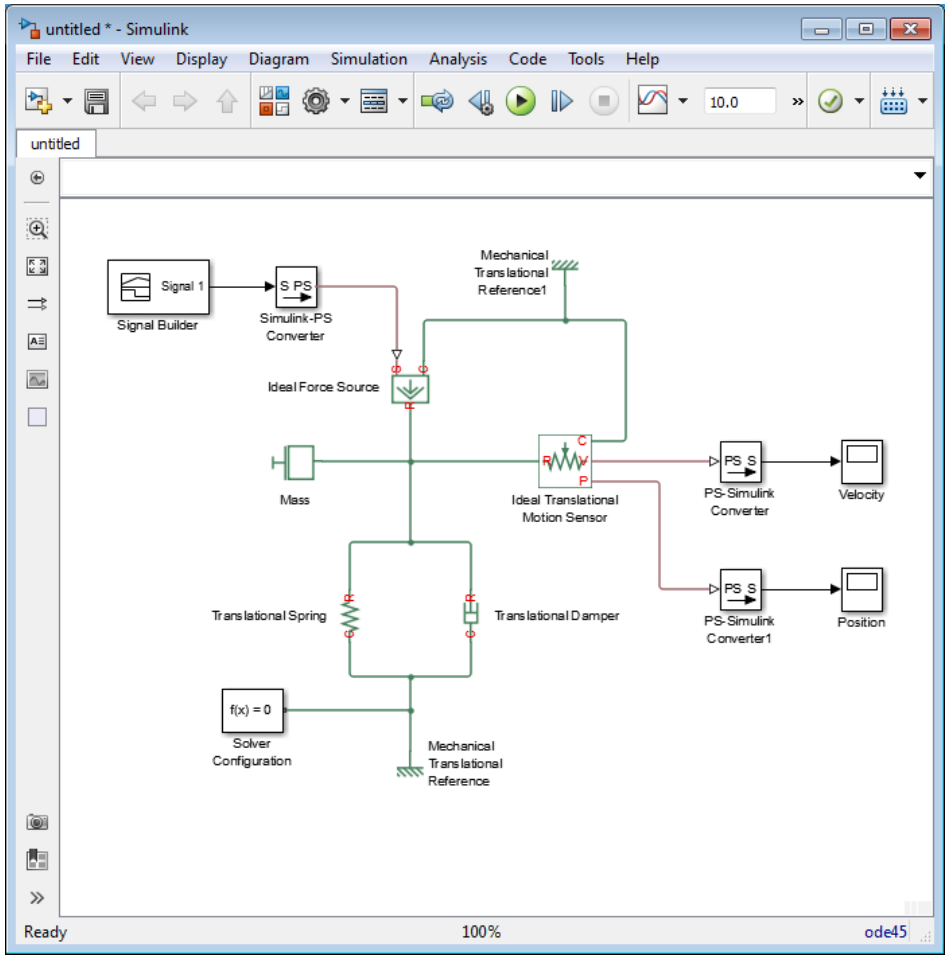
Simulation

- Simulations in Matlab are no different in principle from Python
- There are many nice features (e.g. animation) in Matlab
- Simulink is a graphical tool for creating simulations
  - Too much to learn in CS101

Simulink


untitled * - Simulink
File Edit View Display Diagram Simulation Analysis Code Tools Help
10.0
untitled
Signal 1
Signal Builder
S PS
Simulink-PS Converter
Mechanical Translational Reference1
Ideal Force Source
Mass
C
R
P
Ideal Translational Motion Sensor
PS S
PS-Simulink Converter
Velocity
PS S
PS-Simulink Converter1
Position
Translational Spring
Translational Damper
f(x) = 0
Solver Configuration
Mechanical Translational Reference
Ready
100%
ode45

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