for example - error prop

Monday, August 27, 2012
10:57 PM

Most Igor basics are demonstrated in Getting Started.

Remember the Igor Quick Reference page that summarizes a lot of the commands from Getting Started and has some snippets of code. (http://cires.colorado.edu/jimenez-group/wiki/index.php/Igor_Quick_Reference)

Igor has a lot of built-in functions; sometimes you just have to find the name of the function you need.

If you know a related command, use the Help and look for related functions under *See Also*.

How far have you gotten on HW1?

A) Haven't started yet

B) Some is done

C) Most is done

D) Virtually done, not turned in yet

E) Done and turned in

Office Hrs
~1 hr after class

Chem 1011
Chem 132
MW 11-12:30

How was Taylor Ch. 3 (propagation of error)?

A) Totally new to me

B) Reminder of something I was taught but never really used

C) Review of something I haven't done recently

D) Review of something I do all the time

Today's code example: Propagation of Error (simple case)

Our setup: Example from Taylor Sect. 3.6, pg. 61.

Efficiency of a motor, $e = \frac{\text{work out}}{\text{energy in}} = \frac{mgh}{VIt}$

Given: fractional uncertainty in *m*, *h*, *V*, *I*, *t*

Want: fractional uncertainty of *e*

Work in pairs to outline a function that will calculate the fractional uncertainty in *e*.

- Write the equation needed for the calculation
- Decide what information you want the function to receive
- Decide what information you want the function to send back.
- Write "psuedocode" for what you want the function to do

Efficiency of a motor, $e = \frac{\text{work out}}{\text{energy in}} = \frac{mgh}{VIt}$

Given: fractional uncertainty in *m*, *h*, *V*, *I*, *t*

$\frac{\delta}{} = \; / \; / \; / \; / \; 5$

eqn for $\frac{\delta e}{e} = \sqrt{\left(\frac{\delta m}{m}\right)^2 + \left(\frac{\delta h}{h}\right)^2 + \left(\frac{\delta V}{V}\right)^2 + \left(\frac{\delta I}{I}\right)^2 + \left(\frac{\delta t}{t}\right)^2}$

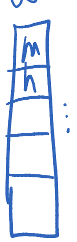
Could have $\frac{\delta g}{g}$ is a constant

or negligible

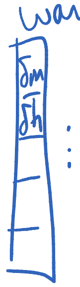
Share some pseudocode:

Sam + Raea

wave with values



wave with uncertainties



function ________ (ValueWave, UncWave)

calc $e = \frac{mgh}{VI}$

calc $\frac{\delta e}{e} = \sqrt{\text{eqn above}}$

print e, $\frac{\delta e}{e}$

end

Another approach?

CONSTANT G_M_S2 = 9.8 etc.

function ______($\underline{m}$, $\underline{\delta m}$, $\underline{h}$, $\underline{\delta h}$, ___)

all variables

$e = \frac{mgh}{VIt}$

$\delta e = \sqrt{\text{eqn}}$

back = ???

end

Let's code one.

What limitations does our function have?

* function didn't actually do what we were told to write
  - ⇒ but it uses data we're more likely to have
* not necessarily easy to enter the data
* only handle # or / of 5 items

How can we generalize our function so that it's more flexible?

⇒ waves

Igor counts from ∅

index	measWv	uncWv
0	m	δm
1	h	dh
2	V	dV
3	I	dI
4	t	dt

uncWv[2] ← dV

Wave for avg, wave for unc

Or

One wave, paired elements:

0 = avg, 1 = unc

2 = avg, 3= unc

m
δm
h
δh
⋮

$$\text{eqn} = \sqrt{\left(\frac{dm}{m}\right)^2 + \left(\frac{dh}{h}\right)^2 + \ldots}$$

$$= \text{sqrt}\Big(\big(\text{uncWv}[0] / \text{measWv}[0]\big)^2$$

New pseudocode:

unc wv / meas wv

Taylor problem 3.22: Student measures

$I = 2.10 \pm 0.02$ amps $V = 1.02 \pm 0.01$ volts

a) What is power with uncertainty? $P = IV$

b) What is the resistance with? $R = V/I$

Which answer (power, resistance) has greater uncertainty?

A) Power

B) Resistance

C) Both are the same