Introduction to Computer for Engineers

## Lecture 12
Interpolation

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Interpolation & Curve fitting

- A common task

- 2 important facts of DATA
  o Discrete value
  o Noisy

- Empirical Modeling
  o Use curve fitting to obtain local model (algebraic equations) then use it to obtain the internal or external value

- Mathematical Modeling
  o Physical laws → ODE
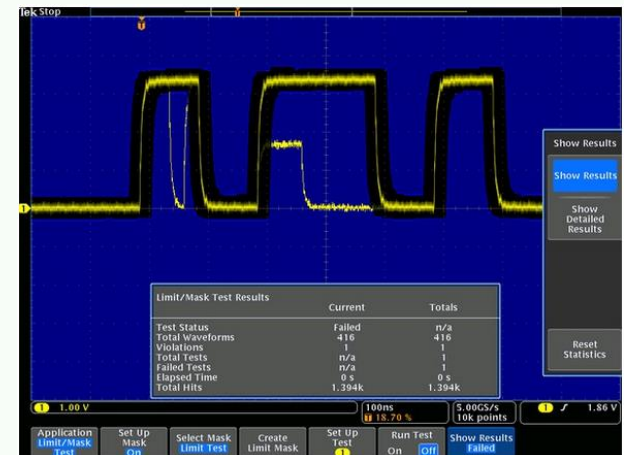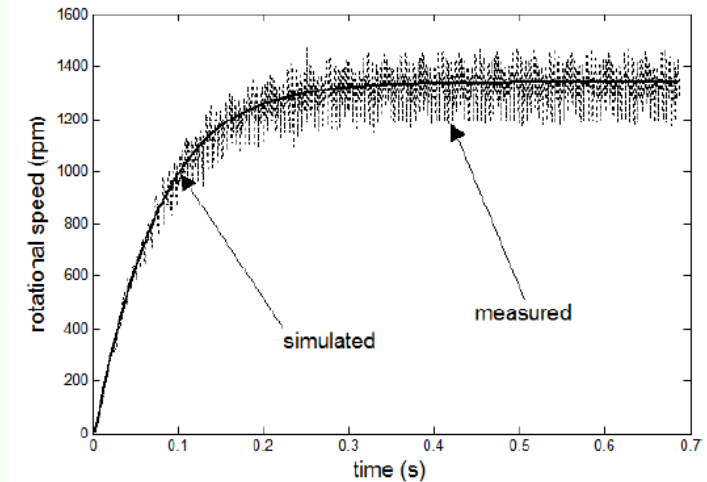
Interpolation vs. Estimation

Set of data time vs. rotation speed collected during experiment :

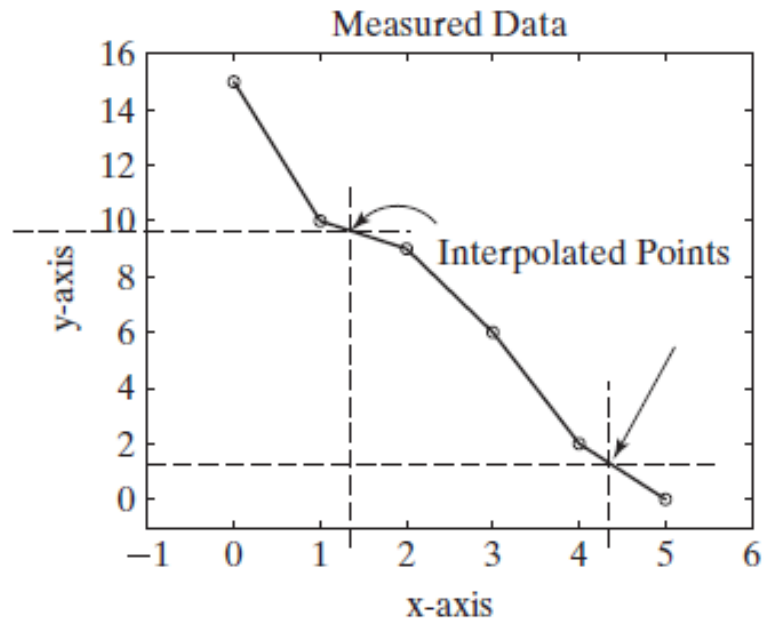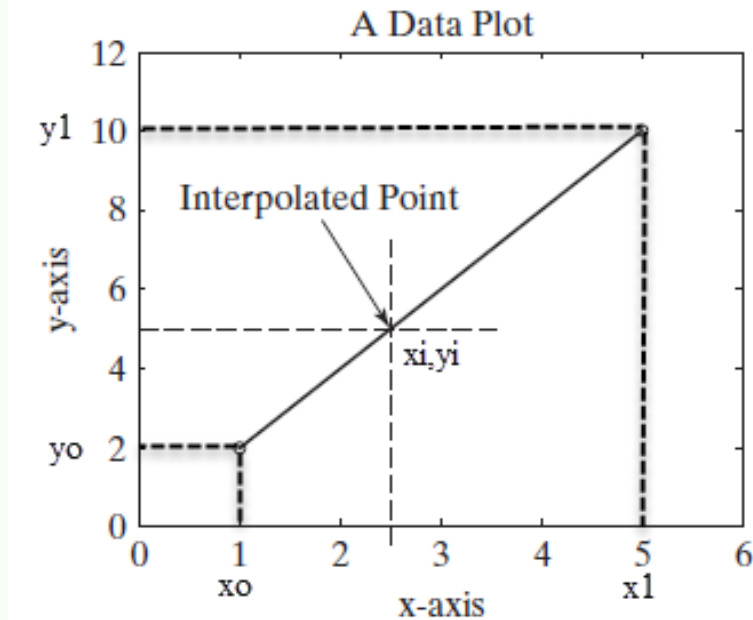**Rotation speed take discrete values (measure rpm each 0.0005 second)**
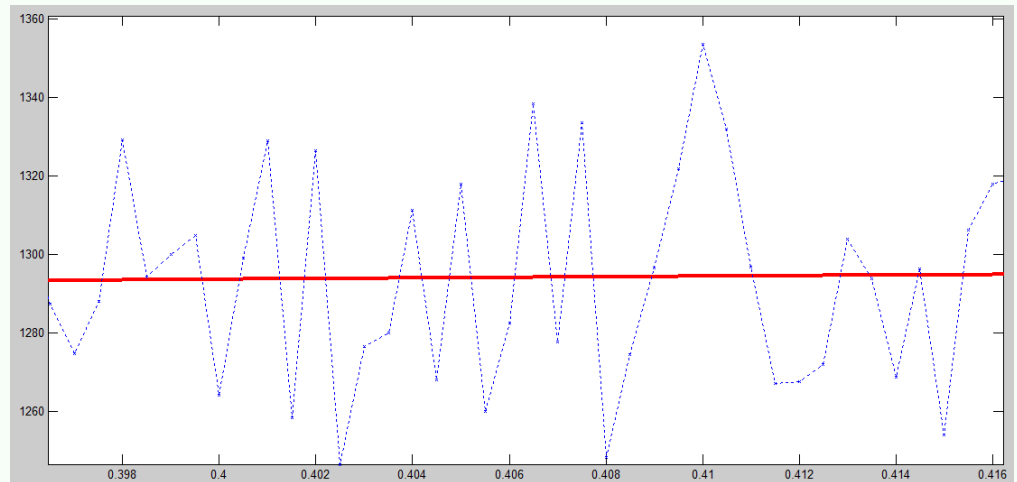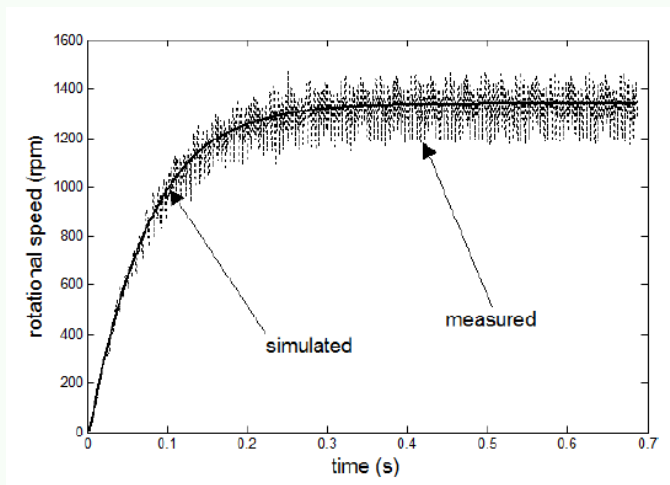
What is the value of rmp at t = 0.3982 ? → Interpolation

What is the value of rmp at t = 0.7005 ? → Predict

The predict value is consistent ?

Linear Interpolation

A Data Plot / Measured Data

Suppose that from x=1 to x=5, y is "LINEAR"

The interpolation value is given as

Matlab function interp1(x,y,x_value,'linear')

Non-linear interpolation

Table 13.1 Interpolation Options in the `Interp1` Function

`'linear'`	linear interpolation, which is the default	`interp1(x,y,3.5,'linear')`
		`ans =`
		   `4`

`'nearest'`	nearest-neighbor interpolation	`interp1(x,y,3.5,'nearest')`
		`ans =`
		   `2`

`'spline'`	piecewise cubic spline interpolation	`interp1(x,y,3.5,'spline')`
		`ans =`
		   `3.9417`

`'pchip'`	shape-preserving piecewise cubic interpolation	`interp1(x,y,3.5,'pchip')`
		`ans =`
		   `3.9048`

`'cubic'`	same as `'pchip'`	`interp1(x,y,3.5,'cubic')`
		`ans =`
		   `3.9048`

`'v5cubic'`	the cubic interpolation from MATLAB® 5, which does not extrapolate and uses `'spline'` if x is not equally spaced	`interp1(x,y,3.5,'v5cubic')`
		`ans =`
		   `3.9375`

interp1(x,y,x_value,'linear')

End of Interpolation