EPILOGUE

What have we achieved ?

- comprehensive intro to the theory of signals and linear time-invariant systems.
- provided analysis tools
  - time domain models and convolution
  - frequency domain models and frequency reponse
  - Laplace transforms and transfer functions
  - z transforms and transfer functions
- provided a sample of some applications to control design
  - steady state response
  - transient response of 1st and 2nd order systems with no finite zeros
  - Root locus analysis

Challenges Remaining

- assumptions of linearity and time invariance simplify analysis and permit the development of structured general purpose designs

- These put us in the "ball park" of a good design. Must be modified, however, for practical application.

Deviations From LTI

- Time variance
  - slow : temperature variations, aging
  - fast : Doppler effects in cell phone systems, Speech and biomedical signal processing

- Non-linearity
  - e.g. actuator saturation, fundamental non-linearities in the plant

- Randomness
  - we have only dealt with deterministic models
  - you are learning about models for randomness in 3TQ4 and will apply them in 3TR4

Compensation for time variation

- If variation is slow enough we can modify standard LTI designs by making them "adaptive" so that they can track the variations

- If the variation is fast, we will need to look at linear (or non-linear) time varying systems

Compensation for non-linearities

- If non-linearity is small, we can simply modify our LTI designs by making them "robust" to small non-linearities

- If non-linearity is significant it must be tackled directly. Most methods exploit the structure of the particular non-linearity at hand. General theory is quite difficult to develop.