Putnam on Software Estimation

EM: Enhanced model
Existing software development estimation models are deficient in dealing with all the variables of estimation with assurance and precision. An enhanced estimation model is described, capable of providing more accurate analyses / predictions of manpower, machine time, money, and elapsed time in estimation designs. Prior work on simple regression fits to data do not provide a sufficient model; the situation can be improved by basing a model on Norden-Rayleigh manpower utilization functions. The model has been tested by comparing analyses / predictions with empirically measured values of the estimated parameters.

There is a case for “radical model”, but simpler regression models existed previously.

Builds on prior results

- Rayleigh
  - distribution suitable for manpower loading, among other things
  - $y' = 2Ke^{-at^2}$ manyears/year
  - $y = K(1 - e^{-at^2})$ manyears
  - $a = 1/2t_{d2}^2$, $t_d$ the time when $y'$ is max,
  - $K$ = integral under curve, total effort

- Norden
  - staffing in real software projects follows this distribution
  - staffing within phases does, too

- Putnam builds on these foundations, guided by other empirical observations and lots of data.
  - Finds ways to estimate parameters
  - Respects subtleties of real development problems

- Produces “software equation” to explain the data
Putnam software equation

- Relates product to state variables
  - \( PR \) = average productivity
  - \( SS \) = source statements
  - \( C_0 \) or \( C_n \), state of technology
  - \( K \) applied effort
  - \( t_d \) development time
  - \( t_i \) independent time variable
- \( SS = \int_0^\infty PR \ y'_1 \ dt = C_k \ K^{1/3} \ t_d^{4/3} \)

Revise project plan

- Drop minor project
- Devote a class session to creating thesis proposals
  - Discussion by Spitznagel, Raz, Shelton, Sutherland
- Devote most of the minor project energy to producing high quality major projects
- Devote the rest of the minor project energy to reading the rest of the assigned readings
  - Submit a list of very short statements of the main points of the assigned readings – 2-3 sentences per paper – as a single document, in the order of the course calendar. In your own words, not by quoting sentences from the paper. Due on Reading Day