Math 292A (Fall 1997, Instructor: M. Holst)

Homework #3 (An Exercise in Implementing Finite Element Methods)

Handed out: 12 November 1997
Due in class: 1 December 1997

- **Problem.** Your assignment is to implement ONE of the following extensions to the Matlab finite element program FEMBIF. The idea is to learn enough about how a typical finite element implementation is structured (in this case, FEMBIF) to modify it when necessary.

  (If you are doing the assignments in this class in C or C++, I can propose an alternate homework that will keep you working in C or C++; it won't be easier, just different.)

  1. **Extension 1.** Add non-zero Dirichlet conditions to FEMBIF. (I.e., implement the single integral listed as [I5] in the class notes; make sure you look at all of the notes on this topic.)

  2. **Extension 2.** Add Robin conditions to FEMBIF. (I.e., implement the two surface integrals listed as [I2] and [I4] in the class notes. Attempt to keep the abstract forms interface that FEMBIF currently uses for volume forms.)

  3. **Extension 3.** Add the ability to handle elliptic systems to FEMBIF. (I.e., for problems which have more than one unknown per spatial point, such as the linear elasticity problem we looked at in class.)

  4. **Extension 4.** Add some other extension to FEMBIF, which is not listed above. (Examples would be an automatic mesh generator which interfaced with Matlab's Delaunay routine, or a better refinement routine. Note that you first must clear your proposed extension with me.)

  Turn in a printout of any routines you need to modify, and provide an example illustrating the use and correctness of your extensions.

  Note that each of these extension requires a bit of work; feel free to come to my office (possibly multiple times) for help and guidance. If you are having trouble using MATLAB in the SGI lab (such as this week when the machines are down), mention this to me and I'll get you an account on an alternate unix machine with Matlab access.