

IS NUMERICAL ANALYSIS BORING?

By Francis Sullivan



IN PRINCIPLE, THIS COULD BE A FOUR-WORD ESSAY BECAUSE THE SHORT ANSWER IS, “NO, OF COURSE NOT!” INDEED, MY ASKING THE QUESTION ENTAILS A SLIGHT PERSONAL RISK: I CERTAINLY DON’T WANT TO ALIENATE MY FRIENDS WHO ARE NUMERICAL ANALYSTS. I’VE WORKED HAPPILY, IF NOT EXACTLY IN,

then certainly someplace near, the field of numerical analysis for many years. I’ve even taught it (not a guarantee against being boring, I know) and coauthored a book on one of the field’s many active subareas.

Instead of annoying the numerical analysis community, I want to comment on the fact that a few numerical analysts have themselves recently asked whether their subject is boring. It all began with a posting to *NA Digest* (vol. 6, no. 16; www.netlib.org/na-digest-html/06/v06n16.html) by one of the field’s most distinguished researchers. He complained that the *Digest* was becoming dull and suggested that some controversial posts might liven things up. Well, his initial post certainly did so all by itself. The first response claimed that not only is *NA Digest* dull, but some very important topics in numerical analysis have also become dull—nothing new or exciting is happening, at least in that poster’s opinion. Later posts claimed that cliques tend to dominate some meetings of numerical analysts and discuss problems of merely academic interest while neglecting real-world applications.

Perhaps workers in other scientific fields suffer from similar episodes of anguish and self-doubt about the subject’s status and I’m just not aware of it. However, having for many years heard complaints against numerical analysis by numerical analysts citing “dullness” and “irrelevance for solving the real problems,” I doubt that the suffering in other fields is quite the same as it is here (always excepting, of course, certain profound but arcane specialties in certain not-to-be-named parts of mathematics).

I can offer plausible reasons for the special case of numerical analysis, but first we must agree on what numerical analysis actually is. For now, let’s say that it’s primarily the science of getting the correct answer to numerical computations. Secondarily, it deals with getting the correct answer

efficiently and explaining why the answer is correct as well as how correct it is as a function of the amount of effort expended on performing the computation.

Perhaps a long history of struggle trying to get people to do computations correctly leaves numerical analysts extra concerned about how others perceive the field. I’m certain that the history of numerical analysis explains why its practitioners are so touchy about the idea of initiating a computation in a spirit of wild abandon, using untested and unanalyzed folk methods, paying no attention at all to rigor or correctness.

But many people have a natural desire to fool around with computations. We like to explore and experiment. If we’re alert, we might even notice interesting limitations of standard numerical methods. Occasionally, naïve experimentation helps us discover new things or rediscover old things in new settings. Some might even say that too much rigor too early chokes off interesting ideas and stifles creativity.

On the other hand, I don’t really think we should encourage those who want to “roll their own” numerical software rather than use professional code based on well-analyzed methods. After all, who wants to fly on a plane designed with home-crafted numerical methods? Fortunately, tools such as Mathematica and Matlab offer explorers the possibility of doing lots of experiments while using very good methods. Naturally, users might still combine methods in strange ways, but when strange things happen, they probably won’t be due to the underlying components.

Those who want to know about the interesting things under the hood of packages like Mathematica and Matlab really ought to take a course in numerical analysis—while you’re at it, leave an apple on the teacher’s desk. Better yet, when the teacher enters the room, jump up and down and scream and dance in the aisles, like you’re in the audience at a Rolling Stones concert.

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