

Introduction

Forty years after my first experiences with computers, programming and numerical calculations I find myself attracted again to the years in which I used Facit hand calculators, Marchand electrical calculating machines, the early vacuum-tube and ferrite-ring computers. This period was followed by the digital machines whose speeds and memory capabilities increased year after year. Having worked since my retirement in 1992 with an early Apple computer, an Olivetti PC running under DOS, the IBM Aptiva with Windows 3.1 and my latest acquisition (a Pentium based machine with Windows 98) offered an invitation that was hard to resist. The many mathematical and engineering problems that I tackled in the sixties resulted in thousands of lines of numerical values. These had to be used either as input for a next calculating process or had to be evaluated on its correctness and shaped in forms that were readable and understandable. Evaluating the correctness involved more than often hand calculations; cumbersome reasoning; and shaping the results in a readable form transforming the numerical results into tables or plotting them manually (and later with the aid of drawing facilities). Later in my career I became completely detached from these challenging and always exciting experiences of finding solutions to problems, studying the numerical results, and better understanding the behaviour of the many tools that numerical analysis techniques provided. However, the fascination about numbers, mathematical problems and solutions never left me. One of the aspects that hampered my early work on solving numerical problems had to do with the speed of computers and the limited means to visualize the convergence and divergence of numerical methods. In the eighties I became familiar with the work of Benoit Mandelbrot on fractals. However, means, resources and time prohibited me to study the generation of fractals and the underlying methods in more detail. When the obligations of doing things in the context of my profession eased, I took a renewed interest in this subject. That was mainly dedicated to finding out what mathematical formulae were applied in creating these pictures. The fact that a well-known numerical method was used to determine whether or not a formula or equation would converge to a solution, added to my curiosity. I embarked on a further investigation on how and why fractals could be generated, hoping that it would lead me to ways where I would better understand other numerical problems as well.

The work on fractals, degenerated or compromised fractals and methods for finding roots of complex polynomial functions and the visualization of that work (resulting in mosaics) is described in detail in five documents: Part 1 through Part 5. Appendices contain a list of the used programs, the consulted literature, and the source of the used programs. Please note that all parts contain a lot of repetitive descriptions.