Simple Computer Network Analysis

In 1987, GWBASIC was supplied free with DOS systems. this simple, interpreted language was bombproof, adequately fast, and much easier to code in than the DOS-based FORTRAN or C compilers of the time.

I wrote several simple codes to illustrate a variety of algorithms which students could use either in teaching laboratories or on their home computers. We used these in the stage III network theory course, before the advent of MATLAB. Later, we used QBASIC.

This paper described the methods I used. It shows how the numerical analysis of ladder, mutual inductively coupled and operational amplifier active filter circuits can be performed using two simple BASIC subroutines, implementing network theorems. Lossy elements are easy to include.

The philosophy was that the user had to *understand* how the theorems were *applied* to compose suitable analysis code, but did not have to undertake the labour of performing the complex algebra calculations they described.

These codes were supplemented and later included in an appendix to the text by myself and Brian Earnshaw, *Linear steady-state network theory* .

Here are the GWBASIC subroutines I used. See the appendix of the text for an explanation of how they were called.

```
3000 'Thevenin transformer
3010 RD=R1+R2:XD=X1+X2:DD=RD*RD+XD*XD
3020 RT=(R2*RD+X2*XD)/DD:XT=(X2*RD-R2*XD)/DD
3030 R1S=R1:US=U:R1=R1*RT-X1*XT:X1=R1S*XT+X1*RT
3040 U=U*RT-V*XT:V=US*XT+V*RT:RETURN
3099 '
3100 'Series to parallel impedance converter
3110 QS=XS*XS/RS/RS:RP=RS*(1+QS):XP=XS*(1+1/QS)
3120 RETURN
3199 '
3200 'Parallel to series converter
3210 QS=RP*RP/XP/XP:RS=RP/(1+QS):XS=XP/(1+1/QS)
3220 RETURN
3299 '
3300 'Parallel reactance combiner
3310 XP=X*XP/(X+XP)
3320 RETURN
3390 '
3400 'Millman transformer
3410 UQ=U1*R2-V1*X2+U2*R1-V2*X1
3420 VQ=V1*R2+U1*X2+U2*X1+V2*R1
3430 RQ=R1+R2:XQ=X1+X2:ZQ=1/(RQ^2+XQ^2)
3440 U=(UQ*RQ+VQ*XQ)*ZQ
3450 V=(VQ*RQ-UQ*XQ)*ZQ
3460 RETURN
```