SPECIAL TECHNIQUES OF COMPUTATION IN VISUAL BASIC

Gr. Ţâra, D. Damian
"George Baritiu" University, Brasov

1. INTRODUCTION

Some especial calculations are not allowed on a classic calculator and this is the reason that makes the necessity of a special calculator appear. An interested user can program this kind of calculator, from case to case.

2. A SPECIAL CALCULATOR

A program that simulates a pocket calculator will be presented next. After starting the program, the button OFF will be switched ON; then you must type the number, press the RADICAL button followed by ORD number which represents the root's grade and then, ending the action and showing the result by pressing the „=" button.

Notice the way the result is presented, in a long enough TEXT box. Be aware of the way the Text Box object is activated, the properties are defined, the methods tackles it by giving values to its name txt ECRAN. These two functions, VAL (string-expression) and STR (numerical-expression) are meant (if necessary) to turn an alphanumerical expression into a numerical expression and vice versa.

Figure 1 presents a demonstrative example concerning the possibilities this program offers.

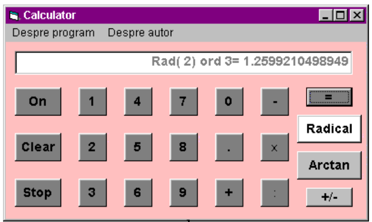

Figure 1 The 3rd Grade Root.

The three messages that can be found in the MENU EDITOR window, initiated by the icon found on the *Tool Bar* are shown in Fig. 2.

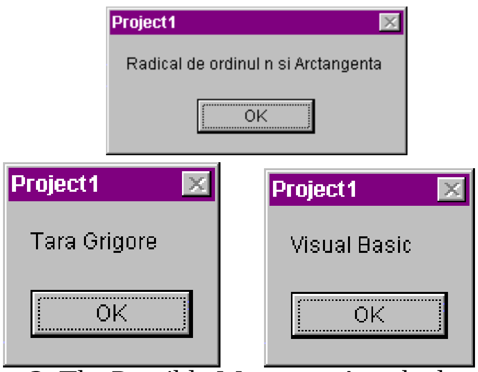

Figure 2. The Possible Messages Attached to the Program.

This program, with all its peculiar subroutines that can be followed clearly, is presented in List 1.

```
Private Sub  btnEgal_Click (Index As Integer)
        If pornit Then
            Select Case oper
                Case "+"
                    v = v + s
                Case "-"
                    v = v - s
                Case "*"
                    v = v * Val(s)
                Case "/"
                    If Val(s) <> 0 Then
                        v = v / Val(s)
                    Else
                MsgBox "Împărţire la zero!"
                        s = ""
                    End If
                Case "rad"
                    v0 = v:  vv = 1 / Val(s)
                    vvv = v ^ vv
ss = "Rad(" + Str(v0) + ") ord" + Str(Val(s)) +"="+
        Str(Format(vvv,"#0.00000000000000"))
        Case "atan"
                    v0 = v:  v = Atn(v)
                    v = 180 * v / 3.1415 9265358979
                    vv = v - Int(v)
          vvv = vv * 60 - (Int(vv * 60))
        v = Int(v): vv= Int(vv *60)
         vvv=Int(vvv * 60)
                    If v < 0 Then
          If vvv > 0 Then vvv = 60 - vvv
        If vv>=0Andvvv>0 Then vv=
        59-vv:v =179+ v
         If vv > 0And vvv=0 Then vv=
        60-vv:v=179+ v
        If vv = 0 And vvv= 0 Then v=180 +v
                    End If
        ss = "atan(" + Str(v0) + ")=
        "+Str(v)+" ° " + Str(vv) + " ' " + Str(vvv) + " " "
            End Select
             If oper = " " Then  v = Val(s)
                    s = Str(v)
                If oper = "atan" Then s = ss
                If oper = "rad" Then s = ss
                txtEcran = s
                oper = " "
                        Else    Beep
           End If
        End Sub
        Private Sub arctangenta_Click()
            oper = "atan"
            v = Val(s)
            s = ""
        End Sub
        Sub btnRadical_Click()
            oper = "rad"
            v = Val(s)
             s = ""
        End Sub
```

List 1. File *Calculator*.frm

3. THE GEOMETRICAL NTERPRETATION OF THE PARTIAL DERIVATES

As an application, the geometrical interpretation of the partial derivates for the function $f(x,y)=x^2+y^2$, in the point $(1,1,2)$ is very interesting. Because the equation of the tangent plan to one surface

$$z=f(x,y)$$

in a point (x_0, y_0, z_0) is

$$z - z_0 = f'_x(x_0, y_0)(x - x_0) + f'_y(x_0, y_0)(y - x_0),$$

where $f'_x(x_0, y_0)$ is the angular coefficient of the curve from the section $y = y_0$, and $f'_y(x_0, y_0)$ is the angular coefficient of the curve from the section $x = x_0$, we have

$$f'_x(1{,}1) = 2x\big|_{x=1} = 2\,,$$

respectively

$$f'_y(1{,}1) = 2y\big|_{x=1} = 2\,,$$

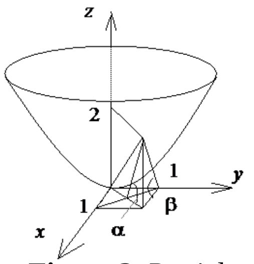

Figure 3. Partial Derivates.

so that the plan's equation is $z - 2x - 2y + 2 = 0$ (*Fig.* 3). So, we have:

$$\beta = arctg(2) = 63^0 26' 5''.$$

Knowing that the angle between two plans

$$Ax + By + Cz + D = 0,$$
$$A'x + B'y + C'z + D' = 0,$$

is given by the formula:

$$\cos\alpha = \frac{AA' + BB' + CC'}{\sqrt{A^2 + B^2 + C^2}\sqrt{A'^2 + B'^2 + C'^2}}$$

and the plan *x0y* has the equation *z* = 0, we get $\cos\alpha = 1/3$, so that $\sin\alpha = 2\sqrt{2}/3$, respectively $tg\alpha = 2\sqrt{2}$.

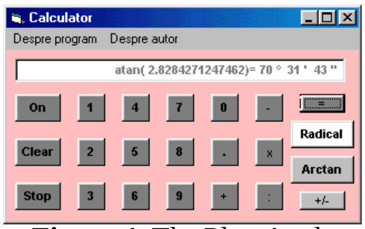

Figure 4. The Plan Angle Calculation.

Next, we calculate: *Rad* (8) *ord* 2 = 2.8284271247462, and then obtain (Fig. 4)

$$\alpha = arctg(2\sqrt{2}) = 70^0 31' 43''.$$

4. THE TABLE OF THE LAPLACE INTEGRAL FUNCTION

For those calculations that are tabled (tables which can replace the mathematical and technical books), adequate programs can be created.

Thus, the Combo Box will be used, with dropdown list and scroll bar that allow to overview the entire list of the previous calculated data, having the option of selecting a preferred position (*Fig.* 5).

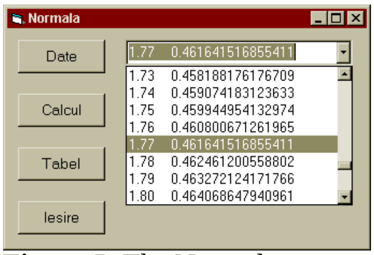

Figure 5. The Normal Repartition Table.

Notice that the **CboNorm.*AddItem_l*** instruction, is the one that builds the table, line by line, those lines being taken from a file "c:\date\norm.dat", built especially for temporary storing.

Next, we propose the construction of a table that must replace (on demand) the results offered by the Laplace Integral Function. The repartition function (The Laplace Integral): ***N* (0, 1)** has the form:

$$\Phi(z) = \frac{1}{\sqrt{2\pi}} \int_0^z e^{-\frac{x^2}{2}} dx = P(Z < z)$$

In fact, this shows the area defined by the well known "The Gauss Bell" which is defined by the density of normalized probability function, meaning the function from the integral that makes also the object of several tables.

Considering that this integral has no primitive, for solving the problem we must use the series that defines it:

$$\Phi(z) = \frac{1}{\sqrt{2\pi}}\left(z - \frac{z^3}{1!\cdot 2\cdot 3} + \frac{z^5}{2!\cdot 2^2\cdot 5} - \frac{z^7}{3!\cdot 2^3\cdot 7} + \frac{z^9}{4!\cdot 2^4\cdot 9} - \frac{z^{11}}{5!\cdot 2^5\cdot 11} + \ldots \right)$$

convergent for $\forall x \in R$, extinction that results from $f(x) = e^x$,series, by replacing $x \leftarrow -x^2/2$, followed by term-by-term integration on $[0, z]$ (*List* 2).

```
CboNorm.AddItem l
Private Sub CmdCalcul_Click()
Print "Valoarea repartitiei normale pentru z =", z
Print i, vv(z)
ComboNorm.Text = vv(z)
End Sub
Function vv(z As Double)
As Double
Dim t, u As Double
i = 1  t = 1  u = z
v(0) = z
u = (-1) * u * (z ^ 2) / 2
v(i) = v(0) + t * u / (2 * i + 1)
While (Abs(v(i) - v(i - 1)) > eps)
  i = i + 1
  t = t / i
  u = (-1) * u * (z ^ 2) / 2
v(i) = v(i - 1) + t * u / (2 * i + 1)
Wend vv = v(i) * 1 / ((2 * pi) ^ (1 / 2))
End Function
```

Lista 2. File: *Normala*.frm

5. CONCLUSIONS

A fact can be noticed: in different situations, every user can build an adequate calculator with a specific purpose. The utility of this calculator becomes extremely important as shown in the application above.

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