EDUCATED GUESS

We conclude our two-part examination of TK!Solver — an equation processing program for the Apple II, IBM PC and compatibles, and the ACT Apricot — with a closer look at some of its unique abilities.

As we explained in the previous instalment of our spreadsheet series (see page 804), TK!Solver is a 'next generation' software package that takes the concept of the spreadsheet into the realm of higher mathematics and engineering. We have already shown that TK!Solver lets the user define variables with names and use these in complex mathematical equations. In this instalment, the last of our spreadsheet series, we look in detail at TK!'s unusual ability to *iterate*. This is a method where the program can solve for a variable by guessing at it. Ordinarily, when working with equations, one can determine the values of all the variables if enough information is given from the outset. The program simply reduces the problem to a series of calculations. For example:

$$A^2 + B^2 = 2COS\ Y$$

can easily be solved for any of the three variables if the other two values are known. Faced with this equation — and given values for A and B — TK!s Direct Solver would perform the required calculations and output a value for Y.

But there are occasions when the determination of a value is not straightforward. One such case is a redundant equation, which defines a variable in terms of itself. For example, consider:

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D=(A+B)/(2*D)
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within a model where A is the only known value. Other problems can occur as the result of an incomplete model, or a model with many interdependent variables and a limited amount of data. The concept of iteration is a difficult one, so let's look at a more practical example of iteration.

Let's reconsider the car journey model created in the last part and add a few details to make it more applicable. As you will recall, the previous model was built around five values: distance, time, speed, fuel and mileage. It could calculate mileage, given speed and fuel consumption; distance from speed and time; and several other simple variations. What if we now want to determine how fast we should travel in order to complete a trip within a given budget?

To begin with, we must add several factors to our model. For instance, the model must take into account the power output of the vehicle, the internal friction of the engine and wind resistance, all of which will have an effect on the vehicle's mileage and speed. (We will assume that internal friction is constant.) We must also have an upper boundary for our budget, and the cost of the fuel being consumed.

We'll begin building the actual model by entering these equations in the Rule sheet, one equation to a line. These equations are read automatically into the Variable sheet:

Building Equations

Because there are several variables, the screen is too small to hold all the information. To see all the variables displayed, we can show the Variable sheet in a window by itself. We do this by pressing the semi-colon key (;) to move the cursor into the variable window, and then type in W1. Now all the variables can be seen and we can begin entering values for them.

DIRECT SOLVING

The model can be solved directly, if enough information is given at the start. For instance, enter the following values in the INPUT column:

Input Values For Direct Solver

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