A NEW ANGLE ON THE t-TEST

Dave Saville, Biometrics Unit, Ag Research, New Zealand
Graham Wood, Central Queensland University, Australia

The most elementary statistical test is the paired samples t-test with just two pairs. Here the data set to be analysed consists of two numbers (the two paired differences), and the statistical test examines whether the population mean is zero. This test can be derived in a surprisingly fast and intuitive manner by plotting one number against the other on a piece of graph paper, then joining this point to the origin as a vector. The angle between this vector and the 1:1 line is then calculated, and divided by 90 degrees; the answer is the p value for the paired samples t-test for a sample size of two! The simple idea behind this derivation is explained in this paper.

The extension of the idea to larger sample sizes and to other tests (such as the independent samples t-test, analysis of variance and simple regression) is also outlined.

This work follows on naturally from the authors' work on teaching applied statistics to second year university students using ideas from n-dimensional geometry. Further details are to be found in Appendix D of Saville and Wood (1996).

REFERENCE

Saville, D. J. and Wood, G. R. (1996). Statistical Methods: A Geometric Primer. New York: Springer.