

THE USE OF A SONIC DIGITISER AND MINI-COMPUTER IN PARTICLE SIZE AND SHAPE CHARACTERISATION

K. Ridgway, K.A. Ridgway and M. Pang, The School of Pharmacy, University of London, Brunswick Square, London WC1N 1AX.

Large and expensive image-analysing computers are available, but their cost is in the region of tens of thousands of pounds. The system displayed here can provide most of the measurement support that a particle technologist might expect of a larger system, but at a cost of £4,000 or less, because advantage is taken of recent advances in microelectronics. The computational capability is in fact greater than that of the larger conventional image-analysers.

A perspex plate, 60cm square, has a linear microphonic array along two of its adjoining edges. A hand-operated spark emitter can be positioned precisely at any point on the square, when the microphones will measure the time taken for the noise of the spark to travel to the two edges. These times are digitised into the x and y co-ordinates of the selected point by an interfacing circuit and fed to the expansion port of a Commodore PET 3032 mini-computer. If a large number of points along a traceable outline are to be digitised, the emitter can be set to repetitive operation at a convenient rate to avoid having to keep on pressing the button.

What the apparatus can do after digitisation is governed by the programming of the computer. The equipment demonstrated here allows an origin for co-ordinates and a scaling factor to be built in. The perimeter and the area of any digitised outlines can be calculated, and particles can be counted and grouped by any selected criteria, typically size and/or shape.

Closed outlines can be Fourier-analysed, either by the conventional method, the "rotating vector", in which the co-ordinates are converted to their polar form and r , the radius, is analysed as a function of θ , the angle made by the radius with the datum direction, or alternatively, where the particle outline is re-entrant so that this method fails, by the Zahn & Roskies (1972) method. In this latter, the profile is parametrised into the angle, ϕ , that is turned through by the tangent to the outline at a (curvilinearly) measured length along the outline from the origin to the point under consideration. This gives a transformation allowing multiply-re-entrant profiles to be tracked around. The number of harmonics for the Fourier analysis can be selected. The digitised outline can be displayed on the computer screen, and can readily be compared visually with the profile regenerated from the Fourier series to establish that an adequate fit has been achieved. In the PET on display, an additional high-density graphics integrated circuit board has been built in so that individual picture-points of the screen can be programmed: this gives improved resolution.

Possible uses for the equipment include the size and shape analysis of particles and granules, the measurement of tablet surface area and volume, and any area or length measurement from a diagram, photograph or projected image that the researcher may need to examine in such detail that manual methods require supplementation.

Zahn, C.T. & Roskies, R.Z. I.E.E.E. Trans on Computers (1972) 21: 269