

REPEATABLE RUNOUT (RRO) COMPENSATION METHODS AND APPARATUS FOR DATA STORAGE DEVICES

ABSTRACT OF THE DISCLOSURE

5 In one illustrative example, a method for use in reducing Repeatable Run Out (RRO) error in a data storage device involves obtaining an RRO measurement for each track of a limited number of N disk tracks; characterizing the RRO measurement for each track with real and imaginary values by performing a discrete Fourier transform (DFT) calculation on each RRO measurement; performing a least-squares fit on all of the real
10 values to identify a first set of (n+1) coefficients of an nth-order polynomial function which is a function of disk track r and representable in the form $A_i(r) = a_n r^n + a_{(n-1)} r^{(n-1)} + \dots + a_1 r + a_0$; and performing a least-squares fit on all of the imaginary values to identify a second set of (n+1) coefficients of an nth-order polynomial function which is a function of disk track r and representable in the form $B_i(r) = b_n r^n + b_{(n-1)} r^{(n-1)} + \dots + b_1 r + b_0$. RRO
15 compensation is performed based on the relation $D_{RRO}(r, s) = \sum_i \text{for all } H \{A_i(r) \cos(i(s2\pi/\text{total_sectors})) + B_i(r) \sin(i(s2\pi/\text{total_sectors}))\}$ where D_{RRO} is the estimated RRO error; r is a track number; s is a sector number at track number r; i is an RRO harmonic number; H is a set of harmonics to be compensated; and total_sectors is a total number of sectors along track number r. Advantageously, RRO variations across
20 the disk can be accurately compensated for with use of a small amount of memory.

Figure 5