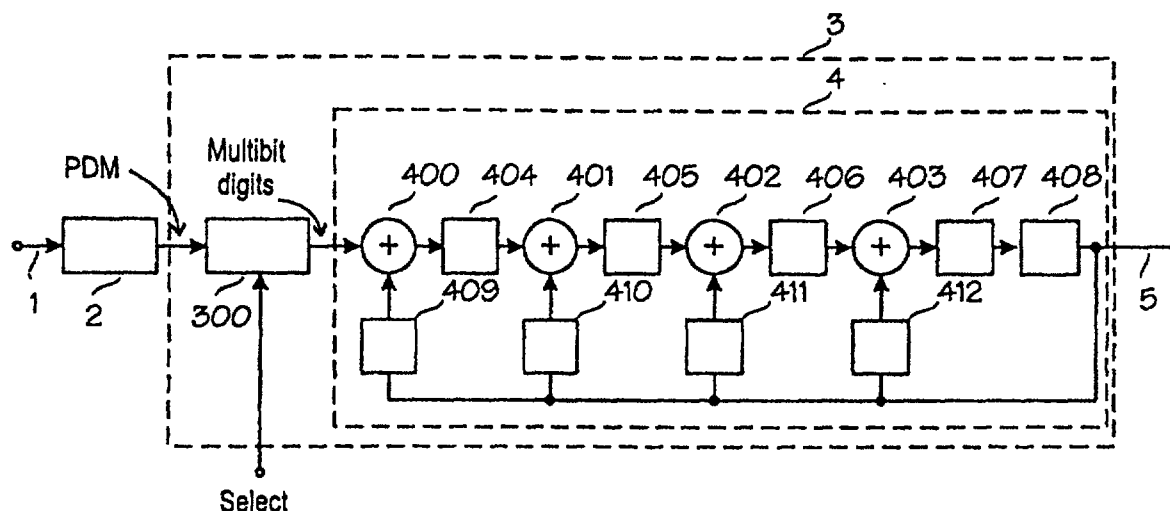




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H04B 14/06	A1	(11) International Publication Number: WO 99/20004 (43) International Publication Date: 22 April 1999 (22.04.99)
(21) International Application Number: PCT/US98/17743 (22) International Filing Date: 26 August 1998 (26.08.98) (30) Priority Data: 973919 9 October 1997 (09.10.97) FI (71) Applicant (for all designated States except US): ATMEL CORPORATION [US/US]; 2325 Orchard Parkway, San Jose, CA 95131 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): LIPASTI, Lauri [FI/FI]; ^① Limingantie 55 A 1, FIN-00560 Helsinki (FI). KOVANEN, Arhippa [FI/FI]; Kiillettie 5 F 53, FIN-00710 Helsinki (FI). ^② (74) Agent: SCHNECK, Thomas; Law Offices of Thomas Schneck, P.O. Box 2-E, San Jose, CA 95109-0005 (US).		(81) Designated States: CA, CN, JP, KR, NO, SG, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>

(54) Title: SIGNAL PROCESSING METHOD AND DEVICE



(57) Abstract

The invention relates to digital signal processing and specifically to level control of a pulse density modulated (PDM) signal generated by a sigma-delta modulator. A single-bit pulse density modulated PDM signal is generated by a first sigma-delta modulator (2) being an analog modulator, for instance. Level control is performed by multiplying the single-bit pulse density modulated PDM signal by a multibit multiplier (300) to obtain a multibit number stream, which is reconverted into a single-bit PDM signal by a second digital sigma-delta modulator (4). In accordance with the invention, the performance of the second sigma-delta modulator (4) is better than that of the first sigma-delta modulator (2), as to the signal-to-noise ratio. Thus, the most significant factor in the total signal-to-noise ratio (SNR) is the noise level of the first sigma-delta modulator (2), by which the PDM signal was originally generated. In the subsequent second sigma-delta modulator (4), the PDM signal can then be attenuated as much as is the difference between the SNR performances of the modulators without any decrease in the total signal-to-noise ratio. A relative amplification of the PDM signal is provided in this manner.