Intelligent Ledger Balance using Theory of Matrices

Syed Arif Kamal*

Department of Mathematics, University of Karachi; profdrakamal@gmail.com

This lecture introduced intelligent ledger balance using theory of matrices. The methods presented here could, also, be used in computation of attendance and similar applications. The ledger entries might be visualized as the elements of ledger matrix $\pounds$, represented as $\pounds_{ij}$, where i is the number of rows and j the number of columns. Let $\boldsymbol{x}$ be a $1 \times i$ row vector, and $\boldsymbol{y}$ be a $j \times 1$ column vector, each entry of these vectors consists of unity. The product of row vector and ledger matrix, represented in Einstein convention as $x_i \pounds_{ij}$, generates a $1 \times j$ row vector, each entry of which was the sum of entries of respective ledger column. Similarly, the product of column vector and ledger matrix, represented in Einstein convention as $\pounds_{ij} y_j$, generates a $i \times 1$ column vector, each entry of which was the sum of entries of respective ledger row. The triple product $x_i \pounds_{ij} y_j$, therefore, represented the grand sum of ledger, which could be obtained in 2 ways: (*a*) summation of the entries of the $i \times 1$ column vector, $\pounds_{ij} y_j$, or (*b*) summation of the entries of the $1 \times j$ row vector, $x_i \pounds_{ij}$. The two methods generated identical results. A difference in the sums obtained using method (*a*) and method (*b*) was the first indicator that errors had crept in the summation process. Often, it was tedious and time-consuming job to detect the fault. In the attendance register, with rows representing attendance of a particular student during the entire course and columns representing attendance of students in a particular lecture, the same procedure generated a row sum (indicating if a particular student has attended the required minimum of classes and qualified to sit in the final examination) and a column sum (indicating the class attendance in a particular lecture). A method was proposed to isolate the area, which contained the errors. To do so, the ledger matrix was partitioned into 4 or more matrices, and each matrix was considered a sub-ledger. In this way, one was quickly able to identify the sub-ledger containing the error and rectify it. The grand row-sum was easily obtained by adding the respective row-sums of sub-ledgers. Similarly, grand column-sum was readily available from the total of respective column-sums of sub-ledgers. Practical examples were worked out during the lecture. This lecture was dedicated to the loving memory of Islamuddin, who served as Chairman, Department of Mathematics, University of Karachi during 1997-2000. The speaker had a chance to work on many projects/ activities during his chairmanship, in particular preparing proposal for the Institute of Mathematical Science (1998), launching of the NGDS Pilot Project (1998; run successfully since its inception to date with the speaker as Project Director — anthromathematics talk focused, mainly, on this project), approval of Program of Industrial and Business Mathematics from Board of Faculty of Science, the Last-Total-Solar-Eclipse Expedition of the Second Millennium (August 11, 1999 — violation of Kepler's second law of planetary motion confirmed during this scientific activity), display of stall of Department of Mathematics at the University of Karachi Alumni Reunion (February 28 & March 1, 1998). There was a vibrant academic atmosphere during the tenure of Islamuddin: the speaker was awarded Dean's Research Grant to model planetary orbits, gave 4 seminars at different institutions including the parent university, the Aga Khan University and Hamdard University, wrote 5 general-interest articles, presented 3 conference papers, published 5 journal papers and prepared one manual. The Former Chairman was, also, conscious of the need of recognition and reward for faculty members. Senior posts were announced during his tenure, although he, himself, did not apply for one (this showed his integrity and honesty — he retired in 2001 as Associate Professor). The speaker, however, got a chance to apply for the post of Professor. Born in 1941, Islamuddin did his MSc in 1962 from the department he was supposed to lead in 1997. The same year he was appointed Lecturer in his alma meter. In the early seventies, he was promoted as Assistant Professor and in 1995 as Associate Professor. He, also, got a chance to earn postgraduate diploma from England. His interests included numerical analysis and statistics. In the first week of August 2010, he bid farewell to this world for his heavenly abode. Mathematicians all over the country are going to remember Islamuddin for his dedication, sincerity, truthfulness and selfless service for a long time. May Allah rest his soul in eternal peace!

*Web address of this pa*ge**:** http://www.ngds-ku.org/Presentations/Islamuddin.pdf
*HTML version***:** http://www.ngds-ku.org/pub/confabstA.htm#C84:

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*PhD (Mathematical Neuroscience); MA, Johns Hopkins, Baltimore, MD, United States; MS, Indiana, Bloomington, IN, United States • *paper mail***:** Professor, Department of Mathematics, University of Karachi, PO Box 8423, Karachi 75270, Pakistan • *telephone***:** +92 21 9926 1300-15 ext. 2293 • *homepage***:** http://www.ngds-ku.org/kamal