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Analysis of A,B,C,D constants in a Transmission line

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1.0 Abstract:
The Complexity of electric power system to meet industrial requirements and their products are increasing day by day. The reliability and quality of the distribution and so transmission system is also gaining importance[1]. In order to understand the Transmission lines reliability, an analysis is carried out for A,B,C,D constants, sending voltage, sending current and voltage regulation as a function of transmission distance, Keeping the receiving voltage and power constant.

1.1Keywords: Component reliability,
Eigen value voltage, current, power system

2.0 Introduction: *Although* power flow at *any* point in a transmission line can be found if the voltage, current and power factor are known or can be calculated, power can be derived in terms of A,B,C,D constants. Here line impedance=,1603 + j0.8277Ω Receiving v=215K, and power is 125 Mw is kept constant.

Line length is varied from 50 – 500 K.M. in instalment of 50. Two tables are generated for analysis.

3.0Analysis: Table A1 with Distance, A, B, C, and D is generated using the load flow analysis [3]using the data given. The data is normalized. Using PCA covariance matrix,[2] coefficient matrix is given in table A2, correlation analysis matrix A3 is generated.[4] This matrix gives inter correlation between the components. The Eigen values and proportion of variances explained by components is shown in table A4.

Similarly Table B1 is generated using the distance, sending voltage, sending current and voltage regulation. Coefficient matrix is given in B2. Correlation matrix is B3, Eigen value and variance is given in B4.

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Table A1				
Distance	A	B	C	D
50	0.9947	42.1	0.0003	0.9947
100	0.9789	83.72	0.0005	0.9789
150	0.9528	124.47	0.0008	0.9528
200	0.9167	163.9	0.001	0.9167
250	0.871	201.6	0.0012	0.871
300	0.8163	237.2	0.0014	0.8163
350	0.7532	270.3	0.0016	0.7532
400	0.6824	300.55	0.0018	0.6824
450	0.605	327.6	0.002	0.605
500	0.522	351.2	0.0021	0.522

Table A2	Coefficient				
Distance	0.4502	-0.1779	0.3669	-0.7944	0
A	-0.4457	-0.5352	0.0324	-0.1178	0.7071
B	0.4468	-0.4711	0.4874	0.5838	0
C	0.4476	-0.4167	-0.791	-0.0184	0
D	-0.4457	-0.5352	0.0324	-0.1178	-0.7071

Table A3	correlation				
Distance	1	-0.9799	0.9965	0.9972	-0.9799
A	-0.9799	1	-0.9602	-0.9642	1
B	0.9965	-0.9602	1	0.9992	-0.9602
C	0.9972	-0.9642	0.9992	1	-0.9642
D	-0.9799	1	-0.9602	-0.9642	1

Table A4	Eigen	Latent	Explained
Distance	4.9207	98.4144	98.4144
A	0.0784	1.5677	99.9821
B	0.0008	0.0163	99.9984
C	0.0001	0.0017	100.0001
D	0	0	100.0001

Table B1			
Distance	Vs Kv	Is	Vreg
50	219.9	335.46	2.798
100	225.3	334.88	6.896
150	231	334	12.4
200	236.8	333.6	19.53
250	242.6	333.7	28.59
300	248.4	333.1	40.07
350	253.85	333.7	54.71
400	259.04	335	73.7
450	263.8	337.2	98.865
500	268;2	340.4	133.4

Table B2		Coefficient		
dist	-0.5237	-0.3385	-0.3663	-0.6906
Vs	-0.5179	-0.3849	-0.2589	0.7187
Is	-0.4043	0.8568	-0.3154	0.0539
Vreg	-0.5423	0.0557	0.8362	-0.0597

Table B3		Correlation		
	dist	Vs	Is	Vreg
dist	1	0.9992	0.5425	0.9517
Vs	0.9992	1	0.5104	0.9396
Is	0.5425	0.5104	1	0.7725
Vreg	0.9517	0.9396	0.7725	1

Table B4	Eigen	latent	Explained
dist	3.3926	84.8146	84.8146
Vs	0.6066	15.1646	99.9792
Is	0.0008	0.0197	99.9989
Vreg	0	0.0011	100

4.0 Conclusion:

Contribution [5] of each component factors in each analysis is discussed. PCA is done using a covariance matrix. Sum of the Eigen values represents the number of variables entered into the PCA. Last component Eigen values are very small in both the case. The analysis of variables is to identify the dimension that are latent.

5.0 References:

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