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Mapping of IEEE Transaction on Power Electronics: A Scientometric Analysis

A. Senthamilselvi[1], S. Srinivasaragavan[2], M. Surulinathi[3] and G. Amudha[4]
[1]Bharathiyar University, Coimbatore - 641 046, Tamil Nadu, India
[2&3]Department of Library and Information Science, Bharathidasan University,
Tiruchirappalli - 620 024, Tamil Nadu, India
[4]VHNSN College, VirudhuNagar - 626 001, Tamil Nadu, India
E-mail: assenthamil@gmail.com.
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Abstract

Scientometrics is the science of measuring and analyzing science. In practice, scientometrics is often done using bibliometrics which is a measurement of the impact of scientific publications. This paper identifies the number of articles published in the Journal, "IEEE Transaction on Power Electronics" from the year 1999-2010. This paper analyses the Growth of literature, Document types, and Authorship pattern and Country-wise contribution of articles.

Keywords*: Power Electronics, Scientometrics*

1. INTRODUCTION

Scientometrics is a type of research method used in Library and Information Sciences (LIS) [1]. It is an emerging area of research in the LIS field. The quantitative analysis and statistics to describe patterns of publication within a given field or body of literature are utilized [2]. Researchers use scientometric methods of evaluation to determine the influence of a single author or to describe the relationship between two or more authors or works. Scientometric studies can be used to study regional patterns of research, the extent of cooperation between research groups and national research profiles [3]. The main derivatives of scientometrics are: Publication counts, Citation counts, Co-citation analysis, Co-word analysis, Scientific `mapping' and Citations in patents. Scientometrics is the advanced study of Bibliometrics [4]. Result of such studies are very useful in decision making in research administration and planning. In collection development and use in libraries. Bibliometric studies afford investigators to study the quality and quantity of work done by researchers and scientists in various fields.

2. OBJECTIVES OF THE STUDY

The objectives of the present study were:

a. To distribute the number of papers published (year-wise) and growth of literature;
b. Ranked list of authors;
c. Authorship patterns;
d. Country-wise distribution of authors;
e. Institution-wise distribution of authors.

3. SOURCE JOURNAL

IEEE Transaction on Power Electronics is a monthly journal and Frede Blaabjerg is the Chief Editor of this journal. This journal was published by The Institute of Electrical and Electronics Engineers Inc. New York. It covers fundamental technologies used in the control and conversion of electric power. Topics include dc-to-dc converter design, direct off-line and on-line switching power supplies, single- and three-phase inverters both at low and high power, controlled rectifiers, analog and digital control techniques, modeling, analysis, and simulation techniques, multilevel power conversion, the application of power circuit components (power semiconductors, magnetic, capacitors), and thermal performance of electronic power systems. All kind of applications focusing on power electronics are of interest like adjustable speed drives, all kind of transportation, power supplies, renewable energy, energy harvesting, lighting, displays, photovoltaic, wind turbines, fuel cell, and energy saving systems.

4. DATA COLLECTION

The issues of the "IEEE Transaction on Power Electronics" journal have been taken into consideration for this study. So the journal articles are downloaded from IEEE database from the year 1999 - 2010, that is

144 issues comprising 2369 articles. The sample collection for the study is 2369. A good number of research studies are being carried out in the field of bibliometrics.

5. DATA ANALYSIS AND INTERPRETATION

Table 1 Growth of Literature

Sl.No.	Year	Records	%	TLCS	TGCS
1	1999	127	5.4	313	2637
2	2000	140	5.9	358	3228
3	2001	99	4.2	348	2633
4	2002	124	5.2	342	3024
5	2003	158	6.7	493	3986
6	2004	188	7.9	595	4472
7	2005	168	7.1	481	2779
8	2006	211	8.9	697	2932
9	2007	276	11.7	907	3227
10	2008	326	13.8	836	2703
11	2009	303	12.8	253	969
12	2010	249	10.5	4	107
Total		2369	100.00	5627	32697

Table 1 indicates year-wise distribution of articles and growth of literature from the year 1999- 2010. There is a gradual increase in the publication of articles and citations in each year. Regarding published items, it shows a decline in the years 2001 and 2010. Regarding citations, there is a slight decline in the years 2005 and 2009.

Table 2 Ranking of Authors Based on Publication

S.No.	Author	Records	TLCS	TGCS
1	Lee FC	82	419	1897
2	Chung HSH	52	151	636
3	Blaabjerg F	48	208	1192
4	Akagi H	37	102	620
5	Jovanovic MM	37	115	526
6	Boroyevich D	29	93	680
7	Hui SY	28	74	303
8	Jain PK	28	60	343
9	Xu M	27	113	363
10	Barbi I	26	72	433
11	Maksimovic D	26	189	702
12	Hui SYR	23	52	308
13	Kolar JW	23	44	168
14	Loh PC	23	71	412
15	Tse CK	23	45	258
16	van Wyk JD	23	38	205
17	Batarseh I	21	81	275
18	Liu YF	21	99	295
19	Moon GW	21	30	134
20	Sun J	21	71	296
21	Perreault DJ	20	53	219
22	Holmes DG	18	90	704
23	Peng FZ	18	105	574
24	Wang S	18	56	226
25	Youn MJ	18	42	244
26	Qian ZM	17	61	225
27	Krein PT	16	67	332
28	Mattavelli P	16	65	196
29	Ruan XB	16	30	135
30	Alonso JM	15	24	112
31	Cobos JA	15	60	215
32	Joos G	15	30	227
33	Lai JS	15	36	184
34	Lehman B	15	31	135

35	Smedley KM	15	57	409
36	Wang F	15	22	55
37	De Doncker RW	14	25	187
38	Garcia O	14	62	259
39	Mazumder SK	14	40	290
40	Meynard TA	14	51	276
41	Sul SK	14	42	255
42	Zane R	14	52	144
43	Chen KH	13	18	39
44	Fujita H	13	24	316
45	Habetler TG	13	18	273
46	He XN	13	32	137
47	Huber L	13	42	159
48	Williams BW	13	18	109
49	Wu B	13	25	96
50	Chapman PL	12	45	211

Table 2 shows the ranking list of authors according to their publication count. The author Lee F.C contributed 82 articles and got the first place among the taken sample of 2369 articles. The second place got by Chung and he contributed 52 articles and the third place got by Ballbjerg contributed 48 articles in the ranked list of first 50 authors.

Table 3 Document-wise Distribution of Publications

S.No.	Document Type	Records	TLCS	TGCS
1	Article	2049	4701	27810
2	Proceedings Paper	274	888	4661
3	Correction	19	1	4
4	Editorial Material	14	3	24
5	Review	6	17	136
6	Letter	5	9	43
7	Biographical-Item	1	0	0
8	Reprint	1	8	19

Table 3 displays the type of document published in the journal IEEE Transaction on Power Electronics from the year 1999 to 2010. The articles formed the first place with 2049 and conference proceeding papers formed second place with 274 among the sample of 2369 contributions. The biographical item and reprints formed the eighth place with only one.

Table 4 Institution-wise Distribution of Publications

S.No.	Institution	Records	TLCS	TGCS
1	Virginia Polytech Inst & State University	119	565	2890
2	City University Hong Kong	49	158	679
3	Nanyang Technol University	33	85	645
4	University Aalborg	31	188	1185
5	University Illinois	31	117	711
6	Zhejiang University	29	98	427
7	Univ Wisconsin	28	122	996
8	DELTA Prod Corp	27	106	450
9	Queens University	23	79	313
10	Texas A&M Univ	23	42	537
11	Univ Fed Santa Catarina	23	76	462
12	Natl Univ Singapore	22	49	332
13	MIT	21	51	269
14	Univ Oviedo	21	29	144
15	Hong Kong Polytech University	20	46	302
16	Korea Adv Inst Sci & Technol y	19	50	299
17	Seoul Natl University	19	63	385
18	Tokyo Inst Technol ogy	19	73	465
19	Univ Padua	18	67	287
20	Georgia Inst Technol ogy	17	30	372

Table 4 indicates the ranked list of institutions which contributed more articles in the journal IEEE Transactions on Power Electronics. Virginia Polytech Inst & State University contributed nearly 119 articles and City University Hong Kong contributed 49 articles. Georgia Inst Technology formed 20th rank and contributed 17 articles among the sample of 2369 articles.

Table 5 Country-wise Distribution of Publications

S.No.	Country	Records	TLCS	TGCS
1	USA	762	2318	13213
2	Peoples R China	245	501	2470
3	Taiwan	178	282	1545
4	Canada	166	443	2088
5	Spain	136	366	1810
6	South Korea	124	258	1785
7	Japan	114	260	1622
8	Italy	107	243	1698
9	UK	105	167	1062
10	France	101	178	1386
11	Brazil	96	201	1322
12	Singapore	81	174	1064
13	Australia	69	240	1574
14	India	69	147	796
15	Germany	60	86	597
16	Denmark	57	230	1324
17	Switzerland	54	101	493
18	Iran	29	34	231
19	Netherlands	29	70	323
20	Israel	20	47	220
21	Chile	18	50	253
22	Finland	16	41	197
23	South Africa	16	29	145
24	Belgium	15	34	206
25	Ireland	15	25	167
26	Sweden	13	24	229
27	Unknown	13	6	49
28	Greece	12	28	294
29	Portugal	12	27	205
30	Turkey	12	20	164
31	Mexico	11	14	110
32	New Zealand	9	10	48
33	Romania	9	43	267
34	Thailand	9	7	28
35	Austria	8	17	102
36	Hong Kong	8	31	102
37	Poland	8	10	39
38	Tunisia	8	7	52
39	Malaysia	7	26	89
40	Venezuela	7	21	161
41	Argentina	5	8	50
42	Yugoslavia	5	10	90
43	Kuwait	4	4	28
44	Slovenia	4	7	60
45	U Arab Emirates	4	4	35
46	Egypt	3	12	33
47	Norway	3	3	46
48	Serbia	3	13	33
49	Tanzania	3	1	15
50	Uruguay	3	10	17
51	Algeria	2	4	14
52	Syria	2	2	14
53	Ukraine	2	1	18
54	Bangladesh	1	0	5
55	Bulgaria	1	2	4
56	Croatia	1	2	29
57	Hungary	1	1	16
58	Iraq	1	2	5
59	Lebanon	1	2	3
60	Macedonia	1	0	4
61	Moldova	1	6	31
62	Qatar	1	1	2
63	Russia	1	0	1
64	Saudi Arabia	1	0	0
65	Slovakia	1	4	17

Table 5 indicates the Country-wise distribution of publications and listed 65 countries. Usually Unites States of America ranked first with 762 contributions among the sample of 2369 contributions whereas the developing country China ranked second with 245 contributions. Japan formed the seventh place with 114 contributions and India formed 14th place with 49 contributions. Nearly 12 countries contributed each one article in the list of 65 countries.

Table 6 Top 10 Highly Cited papers

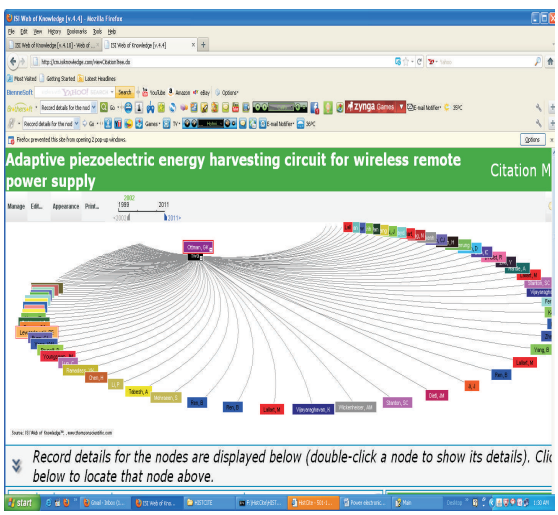
S.No.	LCR	CR	Date / Author / Journal	LCS	GCS
1	1	12	442 Ottman GK, Hofmann HF, Bhatt AC, Lesieutre GA Adaptive piezoelectric energy harvesting circuit for wireless remote power supply IEEE TRANSACTIONS ON POWER ELECTRONICS. 2002 SEP; 17 (5): 669-676	6	224
2	3	49	781 Blaabjerg F, Chen Z, Kjaer SB Power electronics as efficient interface in dispersed power generation systems IEEE TRANSACTIONS ON POWER ELECTRONICS. 2004 SEP; 19 (5): 1184-1194	29	203
3	0	13	273 Koutroulis E, Kalaitzakis K, Voulgaris NC Development of a microcontroller-based, photovoltaic maximum power point tracking control system IEEE TRANSACTIONS ON POWER ELECTRONICS. 2001 JAN; 16 (1): 46-54	11	188
4	0	18	155 Celanovic N, Boroyevich D A comprehensive study of neutral-point voltage balancing problem in three-level neutral-point-clamped voltage source PWM inverters IEEE TRANSACTIONS ON POWER ELECTRONICS. 2000 MAR; 15 (2): 242-249	19	187
5	0	10	579 Zmood DN, Holmes DG Stationary frame current regulation of PWM inverters with zero steady-state error IEEE TRANSACTIONS ON POWER ELECTRONICS. 2003 MAY; 18 (3): 814-822	16	179
6	1	14	524 Peterchev AV , Sanders SR Quantization resolution and limit cycling in digitally controlled PWM converters IEEE TRANSACTIONS ON POWER ELECTRONICS. 2003 JAN; 18 (1): 301-308	29	176
7	1	22	539 Patella BJ, Prodic A, Zirger A, Maksimovic D High-frequency digital PWM controller IC for DC-DC converters IEEE TRANSACTIONS ON POWER ELECTRONICS. 2003 JAN; 18 (1): 438-446	27	162
8	2	15	945 Femia N, Petrone G, Spagnuolo G, Vitelli M Optimization of perturb and observe maximum power point tracking method IEEE TRANSACTIONS ON POWER ELECTRONICS. 2005 JUL; 20 (4): 963-973	7	160
9	2	10	566 Ottman GK, Hofmann HF, Lesieutre GA Optimized piezoelectric energy harvesting circuit using step-down converter in discontinuous conduction mode IEEE TRANSACTIONS ON POWER ELECTRONICS. 2003 MAR; 18 (2): 696-703	3	148
10	0	28	6 Hava AM, Kerkman RJ, Lipo TA Simple analytical and graphical methods for carrier-based PWM-VSI drives IEEE TRANSACTIONS ON POWER ELECTRONICS. 1999 JAN; 14 (1): 49-61	22	132

Source: www.isiknowledge.com

Table 6 shows the top 10 cited articles among the sample of 2369 articles. Ottman, Hoffman and Bhatt's**,** **"**Adaptive piezoelectric energy harvesting circuit for wireless remote power supply" article formed the first rank in the top ten list with 224 citations whereas Blaabjerg, Chen and Kjaer's article formed the second rank with 203 citations.

Citation Map of Ottman GK et al. (Highly Cited Paper)

Title: Adaptive piezoelectric energy harvesting circuit for wireless remote power supply .
Author(s): Ottman GK, Hofmann HF, Bhatt AC, *et al.*
Source: IEEE TRANSACTIONS ON POWER ELECTRONICS
Volume: 17 Issue: 5 Pages: 669-676
Published: SEP 2002
Times Cited: 224



H-index of IEEE Transaction on Power Electronics

The H-index is based on a list of publications ranked in descending order by the times cited. The value of h is equal to the number of papers (N) in the list that have N or more citations. This metric is useful because it discounts the disproportionate weight between highly cited papers and papers that have not yet been cited. The IEEE Transaction on Power Electronics Journal H Index is 65 and it means that there are 65 papers which received more than 65 and above citations.

Results found	: 2,369
Sum of the times cited	: 32,697
Average citations per item	: 13.80
h-index	: 65

Table 7 Funding Agencies (Top 20)

Funding Agency	Record Count	% of 2369
National Natural Science Foundation of China	16	0.68
National Science Council Taiwan	13	0.55
National Science Foundation	12	0.51
National Science Council of Taiwan	6	0.25
Research Grants Council of the Hong Kong Special Administrative Region China	6	0.25
National Science Foundation NSF	5	0.21
Spanish Ministry of Education and Science	5	0.21
Delta Environmental and Educational Foundation	4	0.17
Office of Naval Research	4	0.17
Safran Group	4	0.17
Ministry of Knowledge and Economy	3	0.13
National High Technology Research and Development of China	3	0.13
National Science Council	3	0.13
National Science Council of Taiwan R O C	3	0.13
National Science Foundation Engineering Research Center	3	0.13
Spanish Ministry of Science and Technology	3	0.13
Australian Research Council	2	0.08
Boeing Company	2	0.08
Centre for Power Electronics City University of Hong Kong	2	0.08

Table 7 shows the top list of funding agencies which sponsored for the contribution. Among the above list of 19 funding agencies, National Natural Science Foundation of China sponsored for nearly 16 contributions and National Science Council, Taiwan ranked second in the sponsor with 13 contributions. The National Science Foundation took three places with the sponsor of 12 contributions.

6. CONCLUSION

The maximum numbers of articles are published in the year 2009 during the last ten years. The numbers of articles are increased from the year 2001 to 2009. It shows the gradual increase in the growth of articles in the field of Power Electronics. The author with 82 contributions formed the first place in the top 50 authors. The proceeding papers forms place next to articles in the document type. Virginia Polytechnic Inst & State University contributed more articles in the Power Electronics journal. It is interesting to note that China took second place in the contribution of articles. National Natural Science Foundation of China sponsored for the more articles. IEEE Transaction on Power Electronics is the very popular journal in the IEEE Database. The popularity of the journal IEEE Transaction on Power Electronics shows an upward trend as more and more authors round the globe are contributing to this journal.

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