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A bibliometric overview of *Mechanism and Machine Theory* journal: Publication trends from 1990 to 2020

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This work is dedicated to Professor Andrés Kecskeméthy, a true and inspiring mentor.

Abstract

This work reports a bibliometric overview of *Mechanism and Machine Theory* journal in the timespan 1990-2020. This desideratum is achieved by considering the most relevant features associated with the life of this scientific journal, namely in terms of publications, citations, regions of origin of publications, authors, institutions, etc. In the present study, the Scopus database was chosen as the platform to identify and extract information on those aspects. Thus, based on the data collected, a comprehensive bibliometric analysis of *Mechanism and Machine Theory* is performed, which permits to reveal the overall picture of the journal trends in evolution, as well as its impact and influence in the mechanism and machine science community. Overall, the outcomes presented in this study allow to observe that *Mechanism and Machine Theory* journal has been attracting more and more interest year after year.

Keywords: Mechanism and Machine Theory, Bibliometric analysis, timespan 1990-2020, publications, citations, influential papers, leading authors

1. Introduction

Mechanism and Machine Theory journal is one of the top dissemination forums in the research fields related to the science of mechanisms [1]. *Mechanism and Machine Theory*, former *Journal of Mechanisms*, was founded in 1964 [2], being the first issue published in the spring of 1966 [3]. Over the decades, hundreds of volumes have been published uninterruptedly with innumerable papers from thousands of authors of leading research groups in the vast domain of mechanism and machine science from many different regions of the world [4-6]. It has been recognized that *Mechanism and Machine Theory* has evolved to become one of the most prestigious international journals pertaining to different areas of science of mechanisms and machines [1].

With the objective to analyze the evolution of *Mechanism and Machine Theory*, the journal's publications and trends are studied in this work. The key research question of this investigation can be formulated in the following manner: what has been the evolution of *Mechanism and Machine Theory* journal from 1990 to 2020? In order to answer this question, some bibliometric dimensions associated with the performance of the journal in the timespan 1990-2020 were analyzed, including publications, citations, impact factor, CiteScore, influential papers, regions of origin of the publications, leading authors, and leading institutions. For this purpose, the Scopus database was considered to selected and extract bibliometric data.

The remainder of this report is structured as follows. Section 2 deals with the search strategy adopted to collect information about the journal. The publications and citations in *Mechanism and Machine Theory* in the years 1990-2020 are presented in Section 3. In Section 4, the regions of origin of publications are analyzed. Leading authors and institutions are discussed in Sections 5 and 6, respectively. A detailed analysis, decade by decade, is offered in Section 7. Finally, Section 8 addresses the main concluding remarks of this investigation.

2. Data collection

With the purpose to obtain a comprehensive set of information that allows for a complete bibliometric overview of *Mechanism and Machine Theory* journal, the Scopus database was selected as the data source for conducting the present study. Scopus database includes a vast number of scientific documents, such as research articles, review articles, conference papers, short communications, editorials, letters to editor, etc. The search methodology adopted to collect the *Mechanism and Machine Theory* publications is summarized as follows (see Fig. 1):

- **Database:** Scopus
- **Source title:** Mechanism and Machine Theory
- **Date range:** 1990-2020
- **Data retrieval date:** April 17, 2022

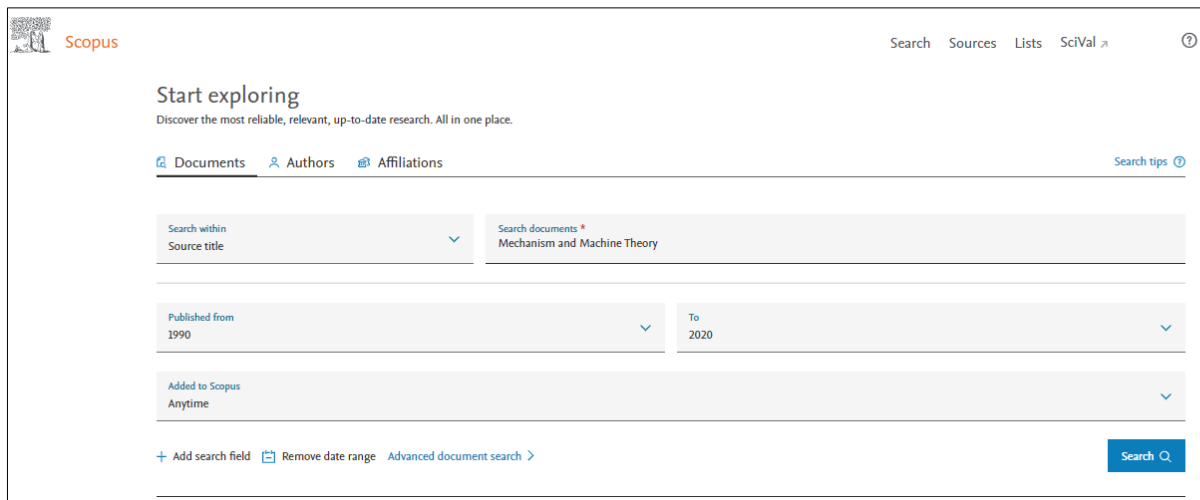


Fig. 1 Snapshot from Scopus database retrieval on April 17, 2022.

The main facets associated with the information obtained from Scopus database, analyzed in this report, include publications, citations, countries and territories of the publications, institutions and affiliations, authors, and keywords. A total of 4130 publications in the years 1990-2020 have been collected and extracted in plain text format (see Fig. 2).

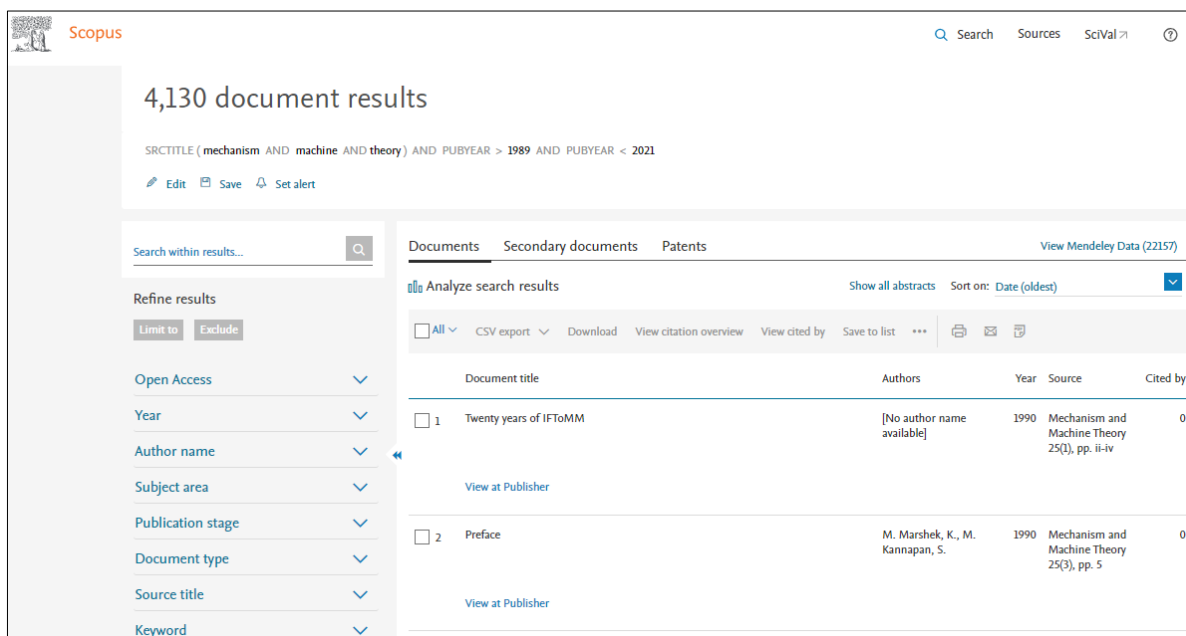


Fig. 2 Snapshot of the results obtained from the search methodology considered on Scopus database.

The total of 4130 documents that were obtained from the search methodology considered on Scopus database can be grouped into nine categories (see Tab. 1). The collected results, in terms of document type, are also presented in Fig. 3, where the proportion of each publication category is shown. It must be highlighted that articles are the absolute predominant type of publication, representing nearly 96% of the scientific documents of *Mechanism and Machine Theory* in the years 1990-2020. This category is followed by conference paper (1.33%), editorial (0.75%), review (0.75%), letter (0.68%) and erratum (0.51%) The last three categories, conference review, note and short review have a residual representation (less than 0.1%). Amongst the 4130 published documents, 386 (9.35%) have been published as open access option. In the timespan from 1990 to 2020, the total number of citations scored by the 4130 publications was equal to 119117, representing an average of 28.84 citations per publication.

Tab. 1 Type of document published in *Mechanism and Machine Theory* journal from 1990 to 2020.

Document type	Quantity	Percentage
Article	3960	95.88 %
Conference Paper	55	1.33 %
Editorial	31	0.75 %
Review	31	0.75 %
Letter	28	0.68 %
Erratum	21	0.51 %
Conference Review	2	0.05 %
Note	1	0.02 %
Short Survey	1	0.02 %

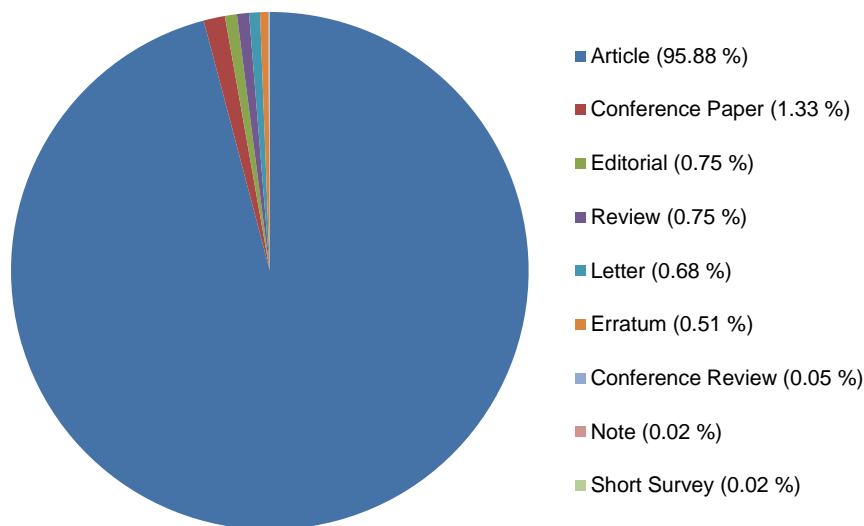


Fig. 3 Type of document published in *Mechanism and Machine Theory* journal in the years 1990-2020.

3. Publications and citations

This section presents a synopsis of the publications of *Mechanism and Machine Theory* journal in the years 1990-2020. The number of publications and citations can be utilized to quantitatively measure the scientific activity and impact of the journal's community. Table 2 lists the annual publications and citations of the journal from 1990 to 2020 based on Scopus. In addition, Tab. 2 depicts the evolution of the number of publications, cumulative number of publications, number of citations, citations per publication, and publications not cited per year of *Mechanism and Machine Theory* journal in the timespan 1990-2020. Overall, the number of publications has been continuously growing year after year, which is a sign of the increased attention from the scientific community to the topics covered by the journal. The journal has issued a total of 59 publications in 1990, and 135 in 2011. The average number of publications per year in the years 1990-2011 is around 94, which represents a growing of 4.0% each year in this period. After 2011, the average number of publications per year is around 240, reflecting an increasing of 10.2% per year. The number of publications has increased rapidly since 2011, reaching 335 publications in 2019, surpassing 300 for the first time.

Tab. 2 Annual publications and citations of *Mechanism and Machine Theory* in the years 1990-2020.

Year	Publications	Percentage of total publications	Cumulative publications	Percentage of cumulative publications	Citations	Citations per publication	Publications not cited
1990	59	1.43 %	59	1.43 %	1604	27.2	7
1991	52	1.26 %	111	2.69 %	1085	20.9	5
1992	67	1.62 %	178	4.31 %	1568	23.4	3
1993	73	1.77 %	251	6.08 %	1134	15.5	8
1994	102	2.47 %	353	8.55 %	2431	23.8	7
1995	105	2.54 %	458	11.09 %	2129	20.3	12
1996	92	2.23 %	550	13.32 %	2667	29.0	4
1997	74	1.79 %	624	15.11 %	1494	20.2	2
1998	94	2.28 %	718	17.38 %	3683	39.2	3
1999	77	1.86 %	795	19.25 %	2986	38.8	2
2000	98	2.37 %	893	21.62 %	3887	39.7	1
2001	85	2.06 %	978	23.68 %	3788	44.6	1
2002	89	2.15 %	1067	25.84 %	5333	59.9	1
2003	64	1.55 %	1131	27.38 %	2504	39.1	2
2004	88	2.13 %	1219	29.52 %	3536	40.2	2
2005	88	2.13 %	1307	31.65 %	3921	44.6	5
2006	93	2.25 %	1400	33.90 %	5065	54.5	3
2007	109	2.64 %	1509	36.54 %	5315	48.8	0
2008	108	2.62 %	1617	39.15 %	4601	42.6	0
2009	167	4.04 %	1784	43.20 %	7764	46.5	2
2010	140	3.39 %	1924	46.59 %	5425	38.8	2
2011	135	3.27 %	2059	49.85 %	4384	32.5	3
2012	158	3.83 %	2217	53.68 %	5426	34.3	7
2013	150	3.63 %	2367	57.31 %	4651	31.0	0
2014	181	4.38 %	2548	61.69 %	5387	29.8	2
2015	186	4.50 %	2734	66.20 %	5132	27.6	3
2016	228	5.52 %	2962	71.72 %	5647	24.8	3
2017	215	5.21 %	3177	76.92 %	4298	20.0	2
2018	294	7.12 %	3471	84.04 %	5108	17.4	9
2019	335	8.11 %	3806	92.15 %	4502	13.4	5
2020	324	7.85 %	4130	100.00 %	2662	8.2	11

From the analysis of the outcomes registered in Tab. 2, it can be observed that the cumulative percentage of publications greater than 50% in the *Mechanism and Machine Theory* was reached in 2012. In other words, the timespan 2012-2020 has contributed with more than half of all the journal publications in the years 1990-2020. This idea can be realized in the plot of Fig. 4, where the evolution of the number of publications in each year of *Mechanism and Machine Theory* from 1990 to 2020 in Scopus database is shown.

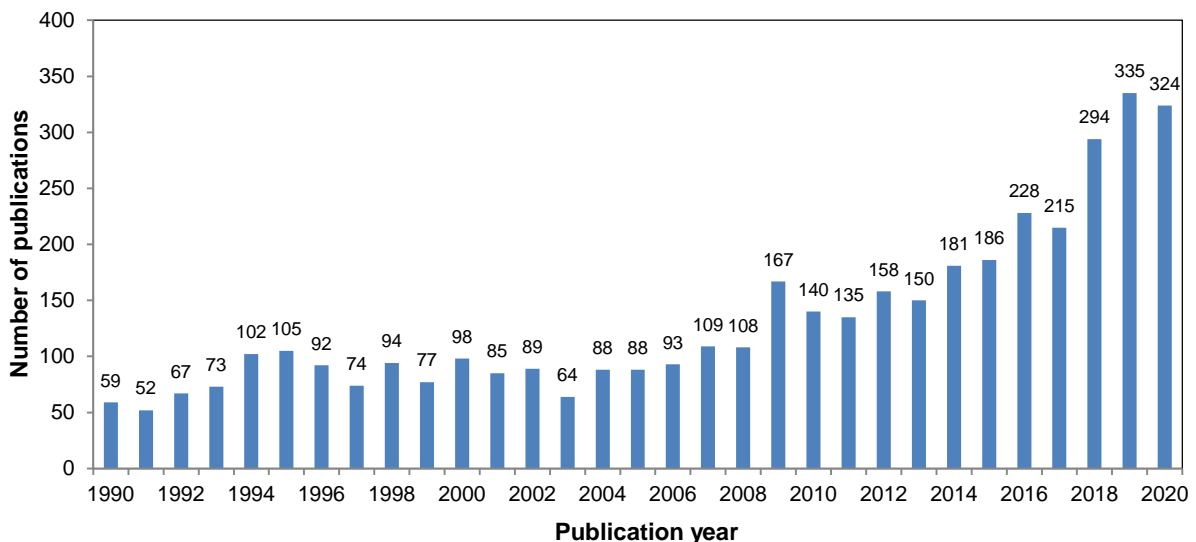
**Fig. 4** Evolution of the number of publications in each year of *Mechanism and Machine Theory* from 1990 to 2020.

Table 2 also presents the total number of citation per year, which again shows a tendency of growing year after year. This is true except for the triennium 2018-2020, in which the number of citations is less than in the preceding years. This circumstance can be explained in light of the age of publications. It is expected that the most recent publications demand time to be read, understood and, eventually, cited. A similar analysis can be performed in terms of the number of citations per publication, and number of publications not cited (see Tab. 2).

The impact factor and the CiteScore have been serving as indicators to measure the influence and attractiveness of the field of mechanism and machine science. Figure 5 shows the evolution of the impact factor and CiteScore of *Mechanism and Machine Theory* journal in the years 1990-2020. From the analysis of these two plots, it can be drawn that both parameters have been sustainably consolidated and going up over the years.

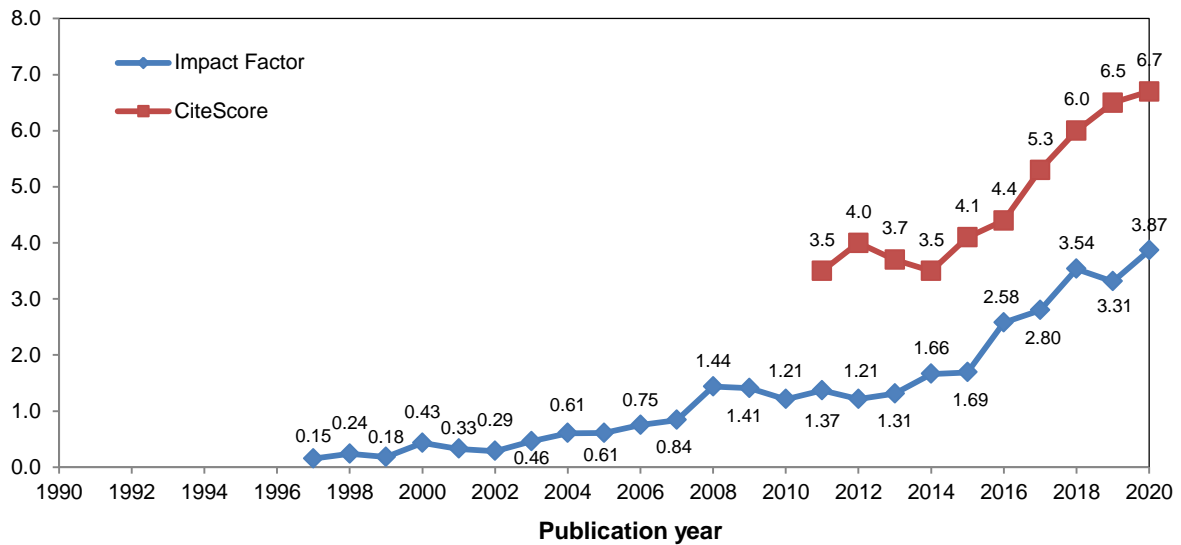


Fig. 5 Impact factor and CiteScore of *Mechanism and Machine Theory* journal from 1990 to 2020.

The number of citations scored by the publications is a quantitative parameter utilized to measure the impact and influence of *Mechanism and Machine Theory* journal. Figure 6 shows the distribution of citations of the journal in the timespan 1990-2020. As it was expected, the increasing number of citations corresponds to a decrease in terms of number of publications. From the analysis of the chart in Fig. 6, it can be observed that 2389 of the publications collected 20 or less citations, which is the highest number of occurrences amongst the intervals considered. Moreover, 117 of the 2389 publications did not score any citation. A total of 36 papers have collected more than 200 citations, which can be considered to be the most influential works published in *Mechanism and Machine Theory* from 1990 to 2020. It must be noticed that review papers occupied the top positions in this ranking, due to the nature and importance of this type of publication. Table 3 lists the top 36 most cited papers published in *Mechanism and Machine Theory* in the years 1990-2020. The minimum number of citations equal to 200 was the threshold established to define the top cited publications.

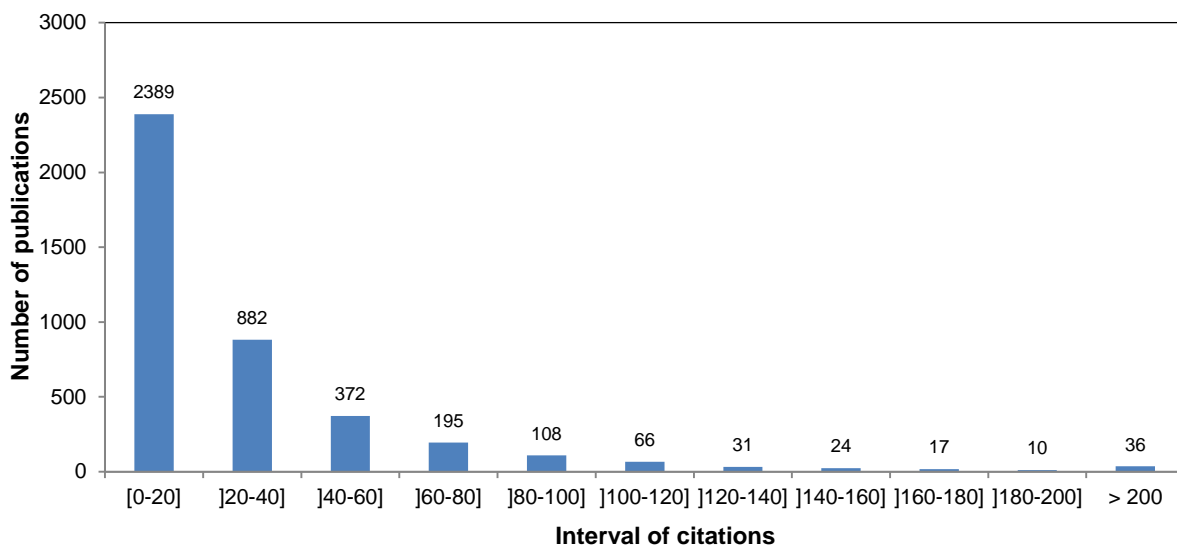


Fig. 6 Distribution of citations of *Mechanism and Machine Theory* journal from 1990 to 2020.

Tab. 3 Top 36 most cited papers published in *Mechanism and Machine Theory* in the years 1990-2020.

Rank	Title	Year	Type	Country	Citations	Citations per year
1	Dynamic analysis of flexible manipulators, a literature review [7]	2006	Review	India, Germany	738	46.13
2	Literature survey of contact dynamics modelling [8]	2002	Review	Canada	601	30.05
3	The Stewart platform manipulator: A review [9]	2000	Review	India	586	26.64
4	An atlas of physical human-robot interaction [10]	2008	Review	Italy	513	36.64
5	Compliant contact force models in multibody dynamics: Evolution of the Hertz contact theory [11]	2012	Review	Portugal, USA	430	43.00
6	A Newton-Euler formulation for the inverse dynamics of the Stewart platform manipulator [12]	1998	Review	India	417	17.38
7	Lie group of rigid body displacements, a fundamental tool for mechanism design [13]	1999	Research	France	400	17.39
8	New kinematic structures for 2-, 3-, 4-, and 5-DOF parallel manipulator designs [14]	2002	Research	China	354	17.70
9	An algorithm for solving the direct kinematics of general Stewart-Gough platforms [15]	1996	Research	Canada, Austria	338	13.00
10	Load sharing characteristics of planetary transmissions [16]	1994	Research	USA	334	11.93
11	A new method for smooth trajectory planning of robot manipulators [17]	2007	Research	Italy	321	21.40
12	Shift dynamics and control of dual-clutch transmissions [18]	2007	Research	USA	314	20.93
13	Literature review of automotive vehicle engine mounting systems [19]	2001	Review	USA	301	14.33
14	Mesh stiffness calculation of a spur gear pair with tooth profile modification and tooth root crack [20]	2013	Research	China	298	33.11
15	Multiple finger, passive adaptive grasp prosthetic hand [21]	2001	Research	Canada	285	13.57
16	Mobility of mechanisms: A critical review [22]	2005	Review	France	282	16.59
17	A study on dynamics of mechanical systems including joints with clearance and lubrication [23]	2006	Research	Portugal, USA	275	17.19
18	Dynamics and control of a planar 3-DOF parallel manipulator with actuation redundancy [24]	2009	Research	China	264	20.31
19	Optimal synthesis of mechanisms with genetic algorithms [25]	2002	Research	Spain	262	13.10
20	Modeling and simulation of wear in revolute clearance joints in multibody systems [26]	2009	Research	Portugal	261	20.08
21	Simulation and design of underactuated mechanical hands [27]	1998	Research	Canada	254	10.58
22	Optimum design of 3-DOF spherical parallel manipulators with respect to the conditioning and stiffness indices [28]	2000	Research	China	241	10.95
23	Closed-form dynamic equations of the general Stewart platform through the Newton-Euler approach [29]	1998	Review	India	235	9.79
24	Dynamics of parallel manipulators by means of screw theory [30]	2003	Research	Mexico, Italy	228	12.00
25	Stiffness analysis of overconstrained parallel manipulators [31]	2009	Research	France	228	17.54
26	Design and workspace analysis of a 6-6 cable-suspended parallel robot [32]	2004	Research	USA	225	12.50
27	Performance evaluation of parallel manipulators: Motion/force transmissibility and its index [33]	2010	Research	China	222	18.50
28	Design, manufacture, stress analysis, and experimental tests of low-noise high endurance spiral bevel gears [34]	2006	Research	USA, Spain, Japan	219	13.69
29	Analytically evaluating the influence of crack on the mesh stiffness of a planetary gear set [35]	2014	Research	Canada	216	27.00
30	A comparison of revolute joint clearance models in the dynamic analysis of rigid and elastic mechanical systems [36]	2002	Research	Netherlands	211	10.55
31	Direct position analysis of the Stewart platform mechanism [37]	1990	Research	Italy	211	6.59
32	Workspaces of planar parallel manipulators [38]	1998	Research	France, Canada	210	8.75
33	A rolling bearing fault diagnosis approach based on LCD and fuzzy entropy [39]	2013	Research	China	207	23.00
34	A model for the study of meshing stiffness in spur gear transmissions [40]	2013	Research	Spain	206	22.89
35	Force capabilities of redundantly-actuated parallel manipulators [41]	2005	Research	Canada	204	12.00
36	Design, analysis and realization of tendon-based parallel manipulators [42]	2005	Research	Germany	203	11.94

4. Regions of origin of publications

This section deals with the analysis of the regions of origin of the publications in *Mechanism and Machine Theory* journal from 1990 to 2020. For this purpose, the total 4130 publications have been identified with respect of 76 countries or territories of the authors. Table 4 lists all the 76 regions that contributed to the journal.

Tab. 4 List of countries or territories that contributed to *Mechanism and Machine Theory* journal and their corresponding number of publications in the years 1990-2020.

Algeria (2)	Denmark (25)	Jordan (6)	Norway (5)	Sweden (12)
Argentina (8)	Egypt (16)	Kazakhstan (5)	Oman (1)	Switzerland (12)
Armenia (3)	Finland (11)	Kenya (1)	Pakistan (1)	Taiwan (262)
Australia (106)	France (207)	Kuwait (5)	Poland (76)	Thailand (2)
Austria (55)	Germany (131)	Lebanon (7)	Portugal (33)	Tunisia (18)
Belarus (1)	Greece (31)	Lithuania (1)	Puerto Rico (3)	Turkey (107)
Belgium (34)	Hong Kong (26)	Macao (12)	Romania (26)	UK (193)
Brazil (37)	Hungary (19)	Malaysia (6)	Russian Federation (23)	Ukraine (5)
Bulgaria (19)	India (235)	Malta (1)	Saudi Arabia (8)	United Arab Emirates (7)
Cameroon (1)	Indonesia (2)	Mexico (39)	Serbia (22)	USA (603)
Canada (293)	Iran (91)	Montenegro (2)	Singapore (50)	Venezuela (4)
China (1145)	Iraq (5)	Morocco (1)	Slovakia (6)	Viet Nam (11)
Colombia (1)	Ireland (11)	Netherlands (52)	Slovenia (11)	Undefined (80)
Croatia (7)	Israel (33)	New Zealand (9)	South Africa (4)	
Cyprus (1)	Italy (263)	Niger (1)	South Korea (100)	
Czech Republic (18)	Japan (72)	North Macedonia (1)	Spain (184)	

Table 5 presents the top 30 countries or territories in terms of publications in *Mechanism and Machine Theory* journal. The minimum number of publications equal to 20 was the threshold utilized to define a leading country or region. From the data registered in Tab. 5, it can be observed that China (1145), USA (603), and Canada (293) have been at the forefront and are instrumental for *Mechanism and Machine Theory* journal. These three countries represent nearly 50% of the total number of publications. A similar conclusion can be drawn in terms of the number of citations, and *h*-index. Furthermore, as shown in Tab.5, Portugal (57.48), Singapore (40.60), and India (37.83) are the leading countries in what concerns the average number of citations per publication in the journal in the timespan 1990-2020.

Tab. 5 Top 30 countries of *Mechanism and Machine Theory* in the years 1990-2020.

Rank	Country or territory	Publications	Publications per year	Citations	Citations per publication	<i>h</i> -index
1	China	1145	38.17	30796	26.90	75
2	USA	603	20.10	20684	34.30	71
3	Canada	293	9.77	10559	36.04	54
4	Italy	263	8.77	8554	32.52	48
5	Taiwan	262	8.73	6725	25.67	45
6	India	235	7.83	8890	37.83	47
7	France	207	6.90	7307	35.30	46
8	UK	193	6.43	5630	29.17	44
9	Spain	184	6.13	5033	27.35	37
10	Germany	131	4.37	4222	32.23	34
11	Turkey	107	3.57	2214	20.69	25
12	Australia	106	3.53	2934	27.68	30
13	South Korea	100	3.33	2967	29.67	33
14	Iran	91	3.03	2431	26.71	30
15	Poland	76	2.53	1343	17.67	20
16	Japan	72	2.40	2247	31.21	25
17	Austria	55	1.83	1453	26.42	20
18	Netherlands	52	1.73	1244	23.92	18
19	Singapore	50	1.67	2030	40.60	25
20	Mexico	39	1.30	1368	35.08	20
21	Brazil	37	1.23	844	22.81	19
22	Belgium	34	1.13	698	20.53	16
23	Portugal	33	1.10	1897	57.48	17
24	Israel	33	1.10	737	22.33	15
25	Greece	31	1.03	739	23.84	16
26	Hong Kong	26	0.87	642	24.69	13
27	Romania	26	0.87	554	21.31	14
28	Denmark	25	0.83	698	27.92	16
29	Russia Federation	23	0.77	410	17.83	11
30	Serbia	22	0.73	663	30.14	15

5. Leading authors

In this section, the most prominent authors that published their research results in *Mechanism and Machine Theory* are presented and analyzed. For this purpose, the productivity and impact of the top authors are utilized as indicators to identify the leading investigators. Table 6 lists the top 35 notable authors of the journal, who have published at least 15 works in the period between 1990 and 2020. From the data collected in Tab. 6, Jorge Angeles (Canada) is the most productive author of *Mechanism and Machine Theory* journal with a total of 50 works, representing an average of publications per year equal to 1.67. Jorge Angeles is the only author with 50 papers published in the journal in the timespan 1990-2020. Jian Dai (UK) and Clément Gosselin (Canada), with 42 and 40 publications, respectively, occupy the rank the top 2 and 3 positions, respectively. Furthermore, Clément Gosselin holds the largest number of citations (2253) and T.S. Mruthyunjaya (India) is the leading author in terms of average number of citations per publication (128.50). Paulo Flores (Portugal) and Damien Chablat (France) ranked in the top 2-3 positions, respectively, with respect to the number of citations per publication. Additionally, 28.57% (10/35) of the leading authors originate from China, followed by USA (11.43%) and India (11.43%). Finally, it should be noticed that the top 35 authors of *Mechanism and Machine Theory* published 18.55% (766/4130) of the total number of publications, collected 22.53% (26834/119117) of the total number of citations, and represented 15.79% (12/76) of the countries or territories of the publications.

Tab. 6 Top 35 authors of *Mechanism and Machine Theory* in the years 1990-2020.

Rank	Author	Co-authors	Country or territory	Publications	Publications per year	Citations	Citations per publication
1	Jorge Angeles	57	Canada	50	1.67	1355	27.10
2	Jian S. Dai	67	UK	42	1.40	1395	33.21
3	Clément Gosselin	46	Canada	40	1.33	2253	56.33
4	Marco Ceccarelli	38	Italy	34	1.13	1137	33.44
5	Zheng Huang	47	China	28	0.93	1133	40.46
6	Hong-Sen Yan	33	Taiwan	28	0.93	733	26.18
7	Xianwen Kong	25	UK	26	0.87	756	29.08
8	Feng Gao	57	China	25	0.83	775	31.00
9	Gordon R. Pennock	20	USA	25	0.83	439	17.56
10	Tian Huang	33	UK	24	0.80	846	35.25
11	Huafeng Ding	32	China	24	0.80	531	22.13
12	Larry L. Howell	38	USA	23	0.77	1230	53.48
13	Ashitava Ghosal	21	India	22	0.73	766	34.82
14	Andrés Kecskeméthy	24	Germany	22	0.73	403	18.32
15	Zhanghua Fong	19	Taiwan	21	0.70	583	27.76
16	Just L. Herder	29	Netherlands	20	0.67	481	24.05
17	Ettore Pennestrì	21	Italy	20	0.67	281	14.05
18	A.C. Rao	6	India	18	0.60	513	28.50
19	Zongquan Deng	48	China	18	0.60	238	13.22
20	Philippe Wenger	23	France	17	0.57	905	53.24
21	Stéphane Caro	39	France	17	0.57	642	37.76
22	Shaoping Bai	25	Denmark	17	0.57	498	29.29
23	Yuefa Fang	16	China	17	0.57	479	28.18
24	T.S. Mruthyunjaya	8	India	16	0.53	2056	128.50
25	Paulo Flores	20	Portugal	16	0.53	1466	91.63
26	Damien Chablat	22	France	16	0.53	1055	65.94
27	Xianmin Zhang	32	China	16	0.53	715	44.69
28	Jinyuan Tang	26	China	16	0.53	375	23.44
29	Sandipan Bandyopadhyay	16	India	16	0.53	371	23.19
30	Xilun Ding	27	China	16	0.53	364	22.75
31	Caichao Zhu	28	China	16	0.53	303	18.94
32	Chung Biau Tsay	15	Taiwan	15	0.50	599	39.93
33	Jingshan Zhao	20	China	15	0.50	468	31.20
34	John Michael McCarthy	17	USA	15	0.50	391	26.07
35	Haijun Su	24	USA	15	0.50	299	19.93

6. Leading institutions

This section presents a summary of the leading institutions of *Mechanism and Machine Theory* in the years 1990-2020. Table 7 lists the top 31 leading institutions of the journal that have published at least 30 works in the period between 1990 and 2020. From the data registered in Tab. 7, Tianjin University (China) has the highest number of publications (100), Yanshan

University (China) has scored the uppermost number of citations (3245), and Université Laval (Canada) has collected the highest number of citations per publication (53.36). Yanshan University (China) and Tsinghua University (China) are the two only institutions whose total number of citations exceeded 3000. Université Laval (Canada) and Indian Institute of Science (India) are the two only institutions whose average number of citations per publication surpassed 50. Additionally, 35.48% (11/31) of the leading institutions of *Mechanism and Machine Theory* in the timespan 1990-2020 are from China, followed by Canada, France, India and Taiwan with 9.68 % each. Finally, it must be noted that the top 31 leading institutions of the journal published 37.48% (1548/4130) of the total number of publications, collected 40.38% (48103/119117) of the total number of the citations, and represented 14.47% (11/76) of countries or territories.

Tab. 7 Top 31 institutions of *Mechanism and Machine Theory* in the years 1990-2020.

Rank	Institution	Country or territory	Publications	Publications per year	Citations	Citations per publication	<i>h</i> -index
1	Tianjin University	China	100	3.33	2507	25.07	30
2	Ministry of Education China	China	98	3.27	2229	22.74	28
3	Yanshan University	China	93	3.10	3245	34.89	34
4	Beihang University	China	75	2.50	2388	31.84	26
5	Chongqing University	China	73	2.43	2136	29.26	24
6	Shanghai Jiao Tong University	China	70	2.33	1907	27.24	25
7	Tsinghua University	China	69	2.30	3127	45.32	28
8	Université McGill	Canada	67	2.23	2258	33.70	26
9	National Cheng Kung University	Taiwan	67	2.23	1804	26.93	26
10	Harbin Institute of Technology	China	61	2.03	1516	24.85	23
11	Indian Institute of Science	India	54	1.80	2859	52.94	25
12	Laboratoire des Sciences du Numérique de Nantes	France	46	1.53	1950	42.39	25
13	Université Laval	Canada	45	1.50	2401	53.36	24
14	King's College London	UK	45	1.50	1548	34.40	21
15	Beijing University of Technology	China	41	1.37	725	17.68	18
16	The Ohio State University	USA	40	1.33	1619	40.48	20
17	Universita di Cassino e del Lazio Meridionale	Italy	39	1.30	1232	31.59	21
18	CNRS Centre National de la Recherche Scientifique	France	39	1.30	1226	31.44	20
19	Purdue University	USA	37	1.23	679	18.35	14
20	Delft University of Technology	Netherlands	36	1.20	884	24.56	13
21	Beijing Jiaotong University	China	36	1.20	830	23.06	17
22	Nanyang Technological University	Singapore	33	1.10	1510	45.76	21
23	University of Toronto	Canada	33	1.10	1040	31.52	13
24	Northwestern Polytechnical University	China	33	1.10	660	20.00	16
25	Universidad del Pais Vasco	Spain	33	1.10	530	16.06	14
26	National Taiwan University	Taiwan	33	1.10	516	15.64	13
27	School of Mechanical and Aerospace Engineering	Singapore	31	1.03	1472	47.48	21
28	Indian Institute of Technology Delhi	India	31	1.03	877	28.29	19
29	National Chung Cheng University	Taiwan	30	1.00	1005	33.50	19
30	Institut National des Sciences Appliquées de Lyon	France	30	1.00	800	26.67	15
31	Indian Institute of Technology Madras	India	30	1.00	623	20.77	16

7. Trends decade by decade

The evolution of *Mechanism and Machine Theory*, decade by decade, is summarized in this section. For this purpose, the top 10 regions of origin of publications, authors, institutions and keywords are considered as the key indicators. Tables 8-10 present the data relative to those aspects of the journal performance. Additionally, Tab. 11-13 list the top 10 most cited papers in each decade, as well as the corresponding publication year, type of document, country of the publication, number of citations, and citations per year.

Tab. 8 Top 10 leading countries or territories, authors, institutions and keywords of *Mechanism and Machine Theory* in the timespan 1990-2000.

Rank	Top 10 countries	Top 10 authors	Top 10 institutions	Top 10 keywords
1	USA (215)	T.S. Mruthunjaya (14)	National Cheng Kung University (28)	Mechanisms (253)
2	China (86)	Zheng Huang (13)	University of Toronto (23)	Kinematics (237)
3	Canada (78)	Miomir Vukobratović (13)	Yanshan University (20)	Mathematical Models (190)
4	Taiwan (74)	Joseph Duffy (11)	Institute Mihailo Pupin (18)	Manipulators (144)
5	India (57)	I.S. Kochev (11)	Indian Institute of Science (16)	Degrees Of Freedom (84)
6	Turkey (37)	Clément Gosselin (10)	Beijing University of Technology (16)	Dynamics (78)
7	France (35)	Kenneth H. Hunt (10)	Newcastle University (15)	Machine Design (69)
8	Italy (32)	A.C. Rao (10)	University of Florida (15)	Optimization (61)
9	UK (32)	Michael R. Smith (10)	University of Novi Sad (14)	Algorithms (58)
10	Australia (30)	Bhaskar Dasgupta (9)	National Taiwan University (13)	Computer Simulation (58)

Tab. 9 Top 10 leading countries or territories, authors, institutions and keywords of *Mechanism and Machine Theory* in the timespan 2001-2010.

Rank	Top 10 countries	Top 10 authors	Top 10 institutions	Top 10 keywords
1	China (182)	Marco Ceccarelli (16)	Tsinghua University (29)	Kinematics (279)
2	USA (174)	Clément Gosselin (14)	Yanshan University (24)	Manipulators (191)
3	Taiwan (100)	Jorge Angeles (13)	National Cheng Kung University (23)	Mathematical Models (164)
4	Canada (89)	Zhanghua Fong (13)	Université McGill (20)	Machine Design (150)
5	Italy (82)	Ashitava Ghosal (12)	Shanghai Jiao Tong University (19)	Mechanisms (144)
6	India (80)	Hong-Sen Yan (12)	Università di Cassino e del Lazio Meridionale (18)	Degrees Of Freedom (138)
7	France (60)	Zheng Huang (11)	National Chung Cheng University (16)	Optimization (109)
8	Spain (49)	Jinsong Wang (11)	Indian Institute of Science (16)	Computer Simulation (105)
9	Turkey (32)	Damien Chablat (10)	Université Laval (15)	Algorithms (89)
10	UK (32)	Gordon R. Pennock (10)	Laboratoire des Sciences du Numérique de Nantes (14)	Problem Solving (88)

Tab. 10 Top 10 leading countries or territories, authors, institutions and keywords of *Mechanism and Machine Theory* in the timespan 2011-2020.

Rank	Top 10 countries	Top 10 authors	Top 10 institutions	Top 10 keywords
1	China (877)	Jian S. Dai (34)	Ministry of Education China (97)	Mechanisms (470)
2	USA (214)	Jorge Angeles (29)	Tianjin University (84)	Kinematics (406)
3	Italy (149)	Xianwen Kong (23)	Chongqing University (72)	Stiffness (244)
4	UK (129)	Huafeng Ding (21)	Beihang University (66)	Degrees Of Freedom (242)
5	Canada (126)	Tian Huang (21)	Harbin Institute of Technology (51)	Manipulators (239)
6	Spain (118)	Zongquan Deng (18)	Shanghai Jiao Tong University (51)	Robots (154)
7	France (112)	Just L. Herder (18)	Yanshan University (49)	Gears (151)
8	India (98)	Ettore Pennestrì (18)	Tsinghua University (39)	Finite Element Method (144)
9	Taiwan (88)	Andrés Kecskeméthy (17)	Université McGill (38)	Dynamics (141)
10	Iran (77)	Xilun Ding (16)	King's College London (36)	Mechanical Engineering (140)

Tab. 11 Top 10 most cited papers published in *Mechanism and Machine Theory* in the timespan 1990-2000.

Rank	Title	Year	Type	Country	Citations	Citations per year
1	The Stewart platform manipulator: A review [9]	2000	Review	India	586	26.64
2	A Newton-Euler formulation for the inverse dynamics of the Stewart platform manipulator [12]	1998	Review	India	417	17.38
3	Lie group of rigid body displacements, a fundamental tool for mechanism design [13]	1999	Research	France	400	17.39
4	An algorithm for solving the direct kinematics of general Stewart-Gough platforms [15]	1996	Research	Canada, Austria	338	13.00
5	Load sharing characteristics of planetary transmissions [16]	1994	Research	USA	334	11.93
6	Simulation and design of underactuated mechanical hands [27]	1998	Research	Canada	254	10.58
7	Optimum design of 3-DOF spherical parallel manipulators with respect to the conditioning and stiffness indices [28]	2000	Research	China	241	10.95
8	Closed-form dynamic equations of the general Stewart platform through the Newton-Euler approach [29]	1998	Review	India	235	9.79
9	Direct position analysis of the Stewart platform mechanism [37]	1990	Research	Italy	211	6.59
10	Workspaces of planar parallel manipulators [38]	1998	Research	France, Canada	210	8.75

Tab. 12 Top 10 most cited papers published in *Mechanism and Machine Theory* in the timespan 2001-2010.

Rank	Title	Year	Type	Country	Citations	Citations per year
1	Dynamic analysis of flexible manipulators, a literature review [7]	2006	Review	India, Germany	738	46.13
2	Literature survey of contact dynamics modelling [8]	2002	Review	Canada	601	30.05
3	An atlas of physical human-robot interaction [10]	2008	Review	Italy	513	36.64
4	New kinematic structures for 2-, 3-, 4-, and 5-DOF parallel manipulator designs [14]	2002	Research	China	354	17.70
5	A new method for smooth trajectory planning of robot manipulators [17]	2007	Research	Italy	321	21.40
6	Shift dynamics and control of dual-clutch transmissions [18]	2007	Research	USA	314	20.93
7	Literature review of automotive vehicle engine mounting systems [19]	2001	Review	USA	301	14.33
8	Multiple finger, passive adaptive grasp prosthetic hand [21]	2001	Research	Canada	285	13.57
9	Mobility of mechanisms: A critical review [22]	2005	Review	France	282	16.59
10	A study on dynamics of mechanical systems including joints with clearance and lubrication [23]	2006	Research	Portugal, USA	275	17.19

Tab. 13 Top 10 most cited papers published in *Mechanism and Machine Theory* in the timespan 2011-2020.

Rank	Title	Year	Type	Country	Citations	Citations per year
1	Compliant contact force models in multibody dynamics: Evolution of the Hertz contact theory [11]	2012	Review	Portugal, USA	430	43.00
2	Mesh stiffness calculation of a spur gear pair with tooth profile modification and tooth root crack [20]	2013	Research	China	298	33.11
3	Analytically evaluating the influence of crack on the mesh stiffness of a planetary gear set [35]	2014	Research	Canada	216	27.00
4	A rolling bearing fault diagnosis approach based on LCD and fuzzy entropy [39]	2013	Research	China	207	23.00
5	A model for the study of meshing stiffness in spur gear transmissions [40]	2013	Research	Spain	206	22.89
6	Analytical modeling, optimization and testing of a compound bridge-type compliant displacement amplifier [43]	2011	Research	China	200	18.18
7	Enhanced stiffness modeling of manipulators with passive joints [44]	2011	Research	France	189	17.18
8	A comprehensive survey of the analytical, numerical and experimental methodologies for dynamics of multibody mechanical systems with clearance or imperfect joints [45]	2018	Review	China, Portugal, USA	186	46.50
9	Rolling bearing fault diagnosis under variable conditions using LMD-SVD and extreme learning machine [46]	2015	Research	China	180	25.71
10	A fault diagnosis method based on local mean decomposition and multi-scale entropy for roller bearings [47]	2014	Research	China	173	21.63

8. Concluding remarks

This report aimed at presenting a bibliometric overview of *Mechanism and Machine Theory* journal in the years 1990-2020. The data collected from Scopus database was organized by combining qualitative and quantitative analysis in terms of publications, citations, authors, regions of the author of publications, among other journal key features. This study can be useful in terms of the characterization of the trajectory of the journal, as well as in what concerns the future trends of the mechanism and machine science community. It is hoped that the present work can inspire the finest minds, in particular the young investigators in the area of theory of machines and mechanisms, to release their best research.

The main findings of this study can be condensed as follows:

- *Mechanism and Machine Theory* journal published 4130 works in the timespan 1990-2020, which scored a total of 119117 citations.
- The number of publications and citations has been increasing year after year. China was the leading country with highest number of publications, followed by USA and Canada.

- Jorge Angeles (Canada) was the most productive author of *Mechanism and Machine Theory* in the years 1990-2020, followed by Jian Dai (UK), and Clément Gosselin (Canada).
- T.S. Mruthyunjaya (India) was the author with highest number of citations per publication.
- Tianjin University (China) was the institution with highest number of publications.
- Kinematics, Mechanisms, and Manipulators were top 3 keywords of *Mechanism and Machine Theory* journal from 1990 to 2020.

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