Publish or Perish! The most important CAD/CAM research paper ever……

Last week saw the release of the annual league table of academic research journals. Although the competition for prestige publishing is less intense in CAD/CAM research than say Physics, it is still interesting to check out the performance of one's favourites.

But beyond the commercially calculated impact factors, free bibliometric software is now allowing the automated interrogation of Google scholar's database to identify all sorts of statistics including "the most important CAD/CAM research paper ever published" (allegedly)!

Publish or Perish!

The big event in the academic world last week was the publication of the latest journal impact factors which give a score to the relative importance of individual academic journals. To academics this is super important because it is one of the ways University administrators and governments use to measure quality when assessing research performance for, say, promotion or the award of funding.

The measurement is imperfect, and even unfair, in several ways, but despite its imperfections it is currently the only widely accepted measure. Without going into the small print, I believe a journal's impact factor is a measure of how often an "average article" in that journal has been cited in a particular year.

The production of impact factors is a commercial business run by Thomson-Reuters. So although you can go to their website, only subscribers can get access to the list. Indeed reproduction of the whole list infringes copyright although it is ok to repeat individual results. http://thomsonreuters.com/content/press_room/sci/448197

The size of impact factor vary with academic disciplines, so a journal like "Nature Photonics" has an awesome impact factor of 25, well above others in that area like, say "Optics Letters" that only manages a score of 3.7.

What is a good journal impact factor in the world of CAD/CAM? This is only (a personal opinion) but I would say somewhere between 0.5 and 3.5. However it really depends what you consider to be a "CAD/CAM journal", some publications like the highly rated TPAMI (IEEE Transactions on Pattern Analysis and Machine Intelligence, impact factor 3.5ish) isn't interested in say "NURBS surfaces" but does do "CNC feature recognition".

Similarly one clear winner from the newly released rankings is Elsevier's "Computers in Industry" with an impact factor of over 2 (for the first time).
http://www.elsevier.com/wps/find/journaldescription.cws_home/505646/description#description

But although they do carry papers on, say, "path planning for CNC machining" they are also (as the name suggests) happy to report work on "RFID tags".

In contrast the long established "Computer Aided Design" Journal, which is strongly focused on hardcore CAD/CAM, has an impact factor of around 1.5. http://www.elsevier.com/wps/find/journaldescription.cws_home/30402/description# So the narrower a journal's scope, the smaller the circulation, the fewer the citations and the lower the impact factor. In other words its all relative to the size of academic pond you are swimming in!

But regardless of their magnitude I wonder if a journal's impact factor really matters to the practicalities of research today? Time was that unless you published in a high profile journal no one would see your work (because of the limited circulation of lesser publications). But Internet search engines have changed all that.

Indeed Google aren't simply making it easy to find academic papers, they are also enabling the "democratisations" of journal ranking through the increasingly impressive Google Scholar search engine. This free service has allowed the development of plug-ins like the one at http://www.harzing.com/pop.htm which calculate an array of publication metrics from automated Google scholar queries (note the application only appears to work with Windows Explorer, Firefox etc need to be closed down when running it).

Harzing program is well worth a play, although it doesn't yet draw information from all the same sources as Thomson-Reuters you can still entertain yourself by using it to list the most cited papers in the leading journals (i.e. the "best" papers ever).

So for Computer Aide Design, Harzing's "Publish or Perish" program says the top 13 most cited papers are:

http://j.r.corney.googlepages.com/CADpaperCites.jpg

Number	Citations	Authors	Title	Year
1	1158	E Catmull, J Clark	Recursively generated B-spline surfaces on arbitrary topological meshes	1978
2	746	D Doo, M Sabin	Behaviour of recursive division surfaces near extraordinary points	1978
3	658	T Varady, RR Martin, J Coxt	Reverse engineering of geometric models: an introduction	1997
4	401	S Joshi, TC Chang	Graph-based heuristics for recognition of machined features from a 3D solid model	1988
5	286	W Boehm…	Inserting new knots into B-spline curves	1980
6	271	JJ Shah	Assessment of features technology	1991
7	262	W Ma, JP Kruth	Parameterization of randomly measured points for least squares fitting of B-spline curves and …	1995
8	251	R Light, D Gossard	Modification of geometric models through variational geometry	1982
9	239	W Bouma, I Fudos, C Hoffmann, J Cai, R Paige	Geometric constraint solver	1995
10	222	K Ho-Le	Finite element mesh generation methods: a review and classification	1988
11	197	K Lee, DC Gossard	A hierarchical data structure for representing assemblies: part I	1985

		S Jayaram, HI		
12	194	Connacher, KW Lyons	Virtual assembly using virtual reality techniques	1997
13	188	R Bidarra, WF Bronsvoort	Semantic feature modelling	2000

And for the new kid on the block (relative to CAD-J) ASME Journal of Computing and Information Science in Engineering (JCISE):

Number	Cites	Authors	Title	Year
		M Kantardzie, AN	Data mining: Concepts, models, methods, and	
1	290	SRIVASTAVA	algorithms	2005
2	134	TK Dey, S Goswami	Tight cocone: a water-tight surface reconstructor	2003
		S Szykman, RD Sriram,	The role of knowledge in next-generation product	
3	81	WC Regli	development systems	2001
		M Ciocoiu, DS Nau, M		
4	69	Gruninger	Ontologies for integrating engineering applications	2001
		A Cardone, SK Gupta, M	A survey of shape similarity assessment algorithms	
5	68	Karnik	for product design and manufacturing applications	2003
		S Redon, MC Lin, D	Fast continuous collision detection for articulated	
6	59	Manocha, YJ Kim	models	2005
		M Foskey, MC Lin, D		
7	55	Manocha	Efficient computation of a simplified medial axis	2003
		SH Ahn, V Sundararajan,		
8	51	C Smith, B Kannan, RD'	CyberCut: an internet-based CAD/CAM system	2001
9	48	GG Wang	Definition and review of virtual prototyping	2002
		R Sinha, C Paredis, VC	Modeling and simulation methods for design of	
10	45	Liang, PK Khosla	engineering systems.	2001
11	42	KH Shin, D Dutta	Constructive representation of heterogeneous objects	2001
		JJ Shah, D Anderson, YS	A discourse on geometric feature recognition from	
12	42	Kim, S Joshi	cad models	2001
		R Bidarra, N Kranendonk,	A collaborative framework for integrated part and	
13	41	A Noort, WF Bronsvoort	assembly modelling	2002

http://j.r.corney.googlepages.com/jcisecites.jpg

I'm not claiming any great accuracy for the above (simply what the free application software returned) but it is 'food for thought', and perhaps gives some idea about what research has had, or is having, the biggest impact on today's CAD/CAM systems. Indeed it suggests 'Catmull and Clark's 1978, paper on "Recursively generated B-spline surfaces on arbitrary topological meshes" is the most important CAD/CAM paper ever written!