AC 2011-1318: MEASURING THE PERFORMANCE OF THE ENGINEER-ING DESIGN GRAPHICS JOURNAL

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Measuring the Performance of the
Engineering Design Graphics Journal

Introduction

The *Engineering Design Graphics Journal* (*EDGJ*) recently transitioned from being a print-only journal to being an online-only journal aided by Open Journal Systems (OJS). Developed and administered by the Public Knowledge Project, OJS is an integrated open source journal management and publishing system that facilitates the publication of over 2000 journals. The following are among OJS' numerous features:

- it is installed locally and locally controlled;
- editors can configure requirements, sections, and the review process;
- submission and management of all content is accomplished online;
- a subscription module is available with delayed open access options;
- comprehensive indexing of a journal's content is part of a global system;
- reading tools for content is based on the discipline and editors' choice;
- email notification and commenting ability are available for readers; and
- complete context-sensitive online help support is available.

The continued success of any journal in transition, however, must include consideration of the journal's various users. Authors must be able to negotiate the submission, editorial, and publication process. Reviewers need to continue evaluating manuscripts. Editors need to work with authors and reviewers with relative ease. However, sustaining a journal's performance can only be achieved by the editorial staff with the aid of data and the use of statistics to ascertain its performance. While there are numerous applications and performance measures a journal can use, and many more that online journals can pursue, the focus of this study was to begin measuring the performance of the online *EDGJ* by reporting on the most frequently visited articles published by the online *EDGJ*. Google Analytics (GA) was used to collect the data and to produce the statistics for this study.[1, 2] This Google application was designed to assist an endeavor improve their website return on investment by tracking and analyzing traffic data. The purpose of this study was to determine the viability of using GA to measure the performance of the online *EDGJ*.

The *EDGJ* was first published in December 1936 as the *Journal of Engineering Drawing*.[3] It is the official publication of the Engineering Design Graphics Division (EDGD) of the American Society for Engineering Education (ASEE). The Division itself received formation approval from the Society for the Promotion of Engineering Education (forerunner of ASEE) in 1930.

Up through the publication of Volume (Vol) 72, issues of the *EDGJ* had been printed and physically mailed to those entitled to receive issues. On Aug 24, 2009, following an eighteen month self-study, the online-only *EDGJ*, aided by OJS, was launched (B. Yang, personal communication, August 24, 2009).

Including the most currently archived issue of the *EDGJ*, Vol 74 No 2, thirty issues across thirteen, three-issue volumes of the *EDGJ* have been archived. Many of the earlier issues were

scanned and uploaded as resources permitted. Several volumes are presently incomplete and may consist of one or two issues. As resources and interest permit, other issues will be uploaded.

As an application for tracking and analyzing traffic data, GA, however, is not without its limitations. It relies on what is known as a "page tag", or what GA refers to as a GA Tracking Code (GATC). Ad filtering programs can block GATCs, thus distorting the statistics. For sites that receive a high volume of traffic, GA limits its analysis to a sample of visits. The greatest impact on GA's performance, however, is the blocking or elimination of cookies. While some of the limitations can be mitigated or taken into consideration, they cannot be, admittedly, overcome completely.

GA produces over 80 reports that characterize a site's performance and GA continues to release new features. These reports can be accessed by numerous means including the links appearing on the left side of the GA page or through Dashboard—see Figure 1.
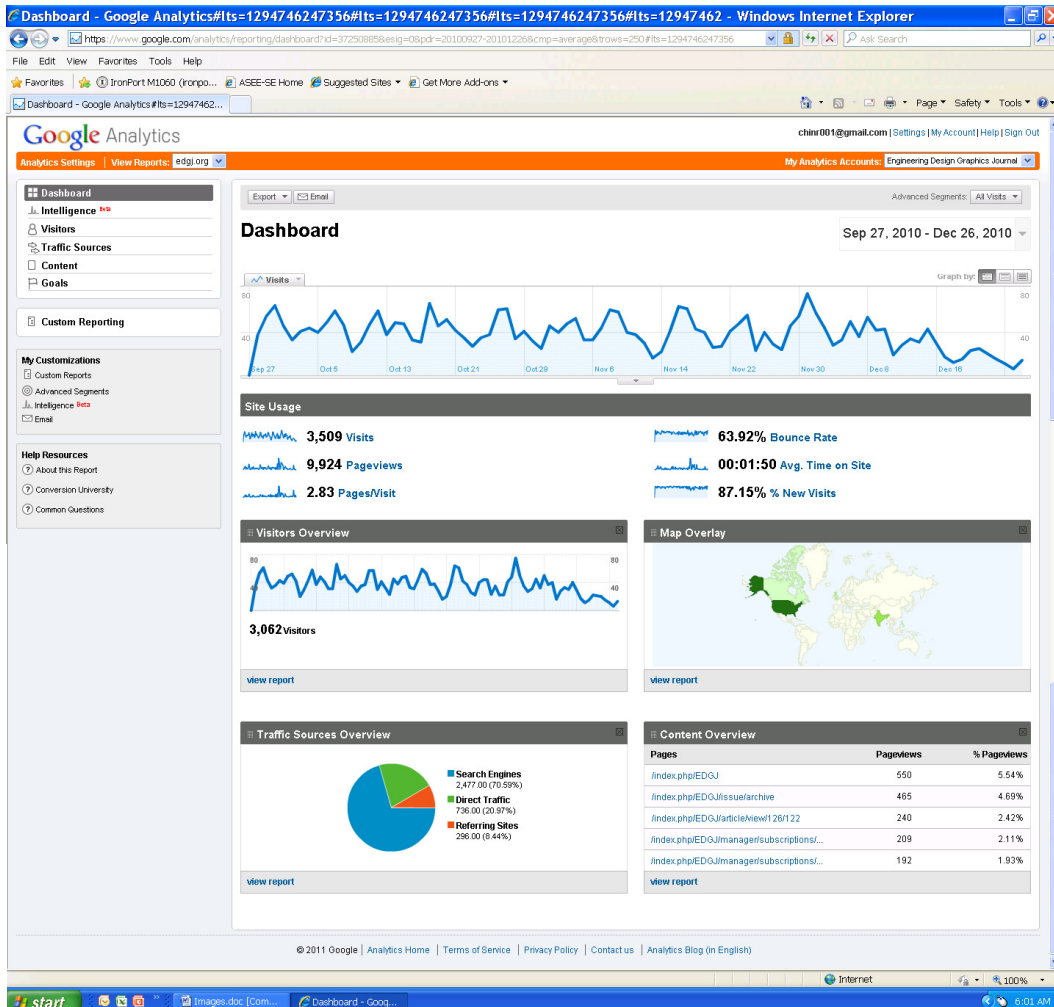

Figure 1. Google Analytics Report Interface

Visitors' reports and sub-reports (see the first two columns, Figure 2) provide statistics on visitor interaction with the site, the type of visitors, and statistics about how those visitors are viewing the site. Traffic Sources reports (see the third column, Figure 2) describe how different offline or online sources sent traffic to the site. Sources that are driving the most traffic to the site and the ability to spot trends can be gleaned from the graphs and charts that are provided. Content reports (see the fourth column, Figure 2) provide information on the pages in the site and how visitors interacted with each page. Some of the statistics provided include time on page, landing and exit page information, and a navigation summary. The purpose of Dashboard is to present high level statistics to the casual user and provide access to more in-depth report sets.[4]
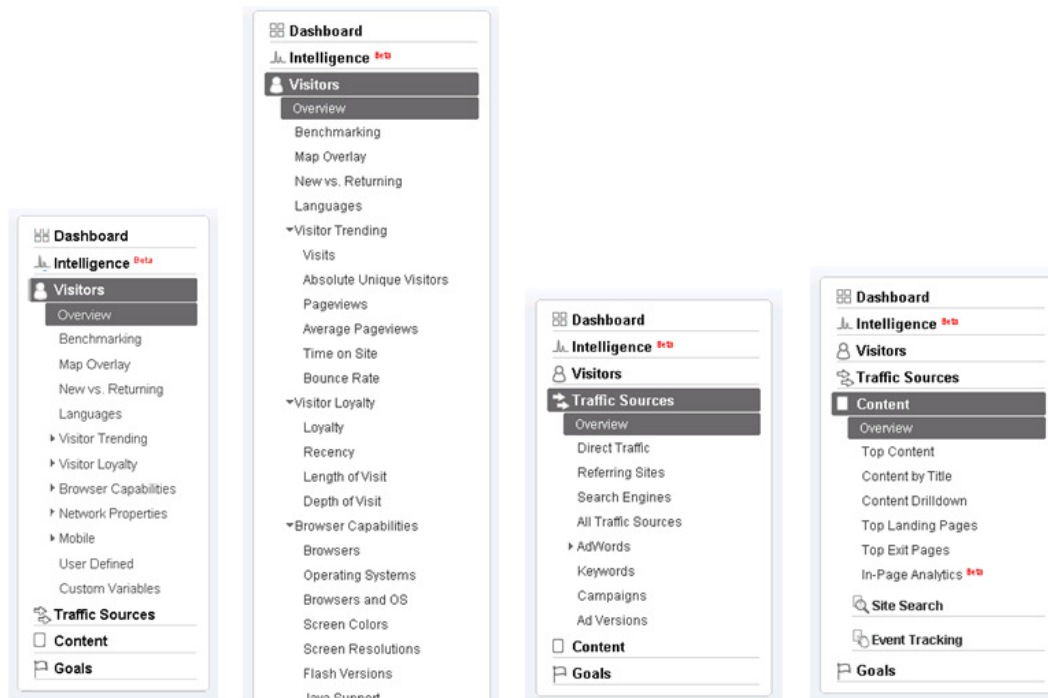

Figure 2. Accessing Reports.

For the purpose of this study—to report on the most frequently visited articles published by the online *EDGJ*, statistics available through Content reports > Content by Title (see the fourth column, Figure 2) > Portable Document Format (PDF) were examined—see Figure 3. Portable Document Format (PDF) is a form of Content by Title report, of which there are 287 for the online *EDGJ*—see Figure 4.

Method

On Sep 28, 2010, an *EDGJ* GA account was created and began collecting data (C. Skidmore, personal communication, September 28, 2010). To prepare this report, a decision was made to produce snapshots of selected statistics for the three month period between Sep 27, 2010 and Dec 26, 2010.

The Portable Document Format (PDF) page is accessed by clicking on the Content by Title link (see Figure 2, fourth column). According to Figure 4, the Content by Title page, Portable Document Format (PDF) pages are by far the most frequently visited. Also, this Page Title's statistics are higher than the remaining top ten displayed in Figure 4. This is understandable since all the articles are posted as PDFs.

Upon closer examination of the Portable Document Format (PDF) page and with some knowledge of the *EDGJ* site address scheme, articles can be retrieved from the *EDGJ* website by copying and pasting the address from Portable Document Format (PDF) page into the *EDGJ* web address field.
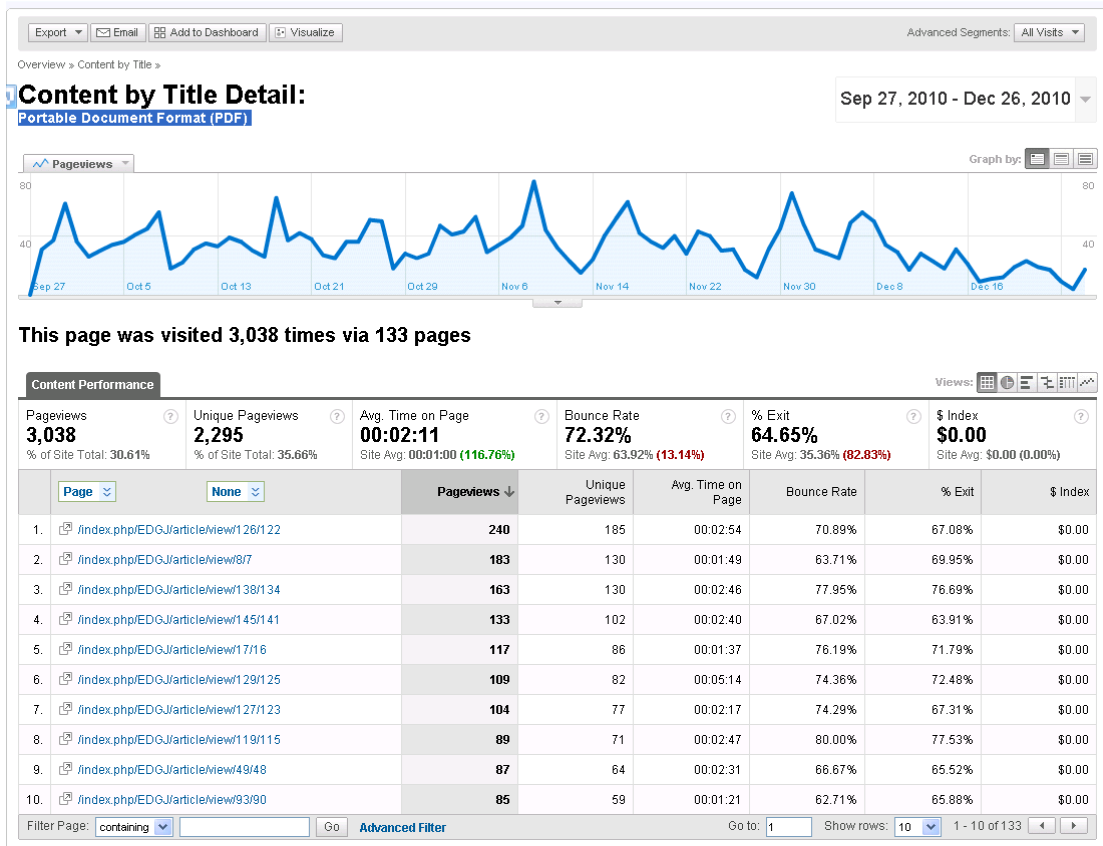

Figure 3. Portable Document Format (PDF) Page.

As an example, to access any of the sites appearing in the Portable Document Format (PDF) page (see Figure 3), we begin by accessing the *EDGJ* Webpage—see Figure 5. Then a link of interest is copied from the Portable Document Format (PDF) page and pasted into the web address field—see Figure 6.
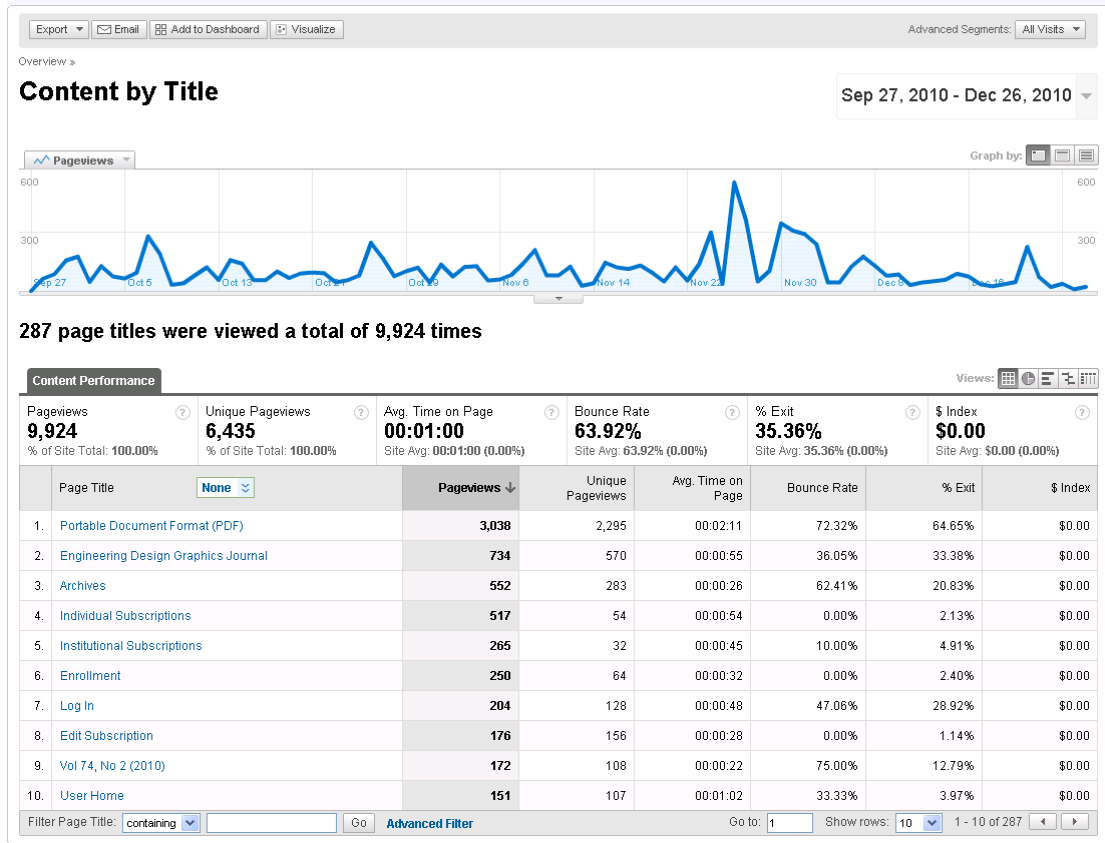
Figure 4. Content by Title Page.

In this illustration, the full address of the most frequently visited Portable Document Format (PDF) page is used: http://www.edgj.org/index.php/EDGJ/article/viewFile/126/122—see Figure 6.

Figure 5. http://www.edgj.org/index.php/EDGJ

Figure 6. http://www.edgj.org/index.php/EDGJ/article/viewFile/126/122

Shortly after landing, the most frequently Portable Document Format (PDF) page, which is a feature article, is retrieved—see Figure 7.

Spring · 1999

Developing 3-D Spatial Visualization Skills

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ABSTRACT

The development or improvement of 3-D spatial visualization skills is often cited as one of the major goals of engineering design graphics education. Historically, improvements in spatial skills were achieved as a by-product of a graphics education that often included several semesters of instruction in manual drafting technique. As the engineering curriculum evolved through time, traditional graphics instruction was "squeezed" from two directions simultaneously. First and foremost, engineering programs were required to reduce the total number of credits to graduation, often resulting in fewer credits available for graphics instruction. Second, pressure was exerted on graphics educators to include additional topics such as CAD, design, and creativity in their introductory courses. Instruction in manual drafting technique was greatly reduced or eliminated altogether in favor of sketching and/or computer applications. Throughout this evolutionary process, the objectives of graphics education have changed accordingly. Increased emphasis has been placed on the development of 3-D spatial skills in these courses, however, many graphics educators, who themselves

Figure 7. http://www.edgj.org/index.php/EDGJ/article/viewFile/126/122
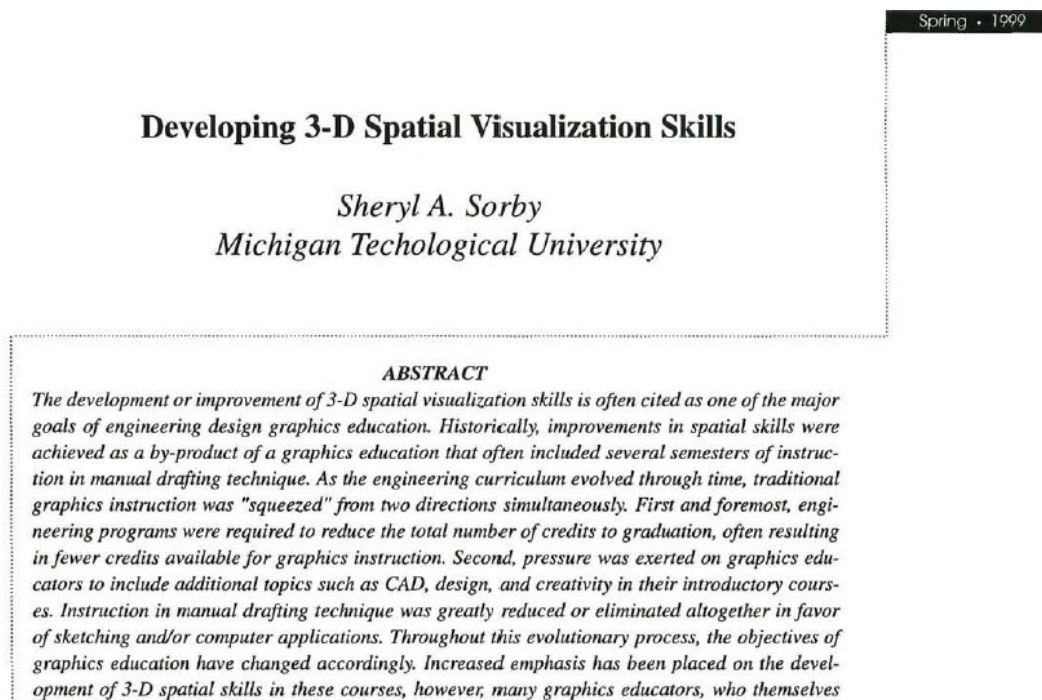
Results

In an examination of the *EDGJ* Dashboard (see Figure 1), which was set for the study's date range—Sep 27, 1010-Dec 26, 2010, the number of visits is line graphed based on the period selected. Below the line graph is the at-a-glance view of the *EDGJ's* key metrics.

During the study period, the Journal was visited 3,509 times. Journal pages were viewed (Pageviews) a total of 9,924 times. The average pageview was 2.83 times and the average time on site was a minute, fifty seconds. The proportion of single-page visits or visits resulting from this page or set of pages (Bounce Rate) was about 64%. And the proportion of new visits during this period was about 87%. Beneath the at-a-glance view of the *EDGJ's* key metrics are report

snapshot modules—Visitors, Traffic Sources, Content, and a Map Overlay, which is a form of Visitors report. Modules can be added or deleted from this area to suit user needs.

These data along with GA data collected on the online *EDGJ* for the first month and a half since deploying GA[5] appear in Table 1 for comparison.

	Sep 27-Nov 12, 2010	Sep 27-Dec 26, 2010
Visits	1,999	3,509
Unique Visitors	1,791	3,062
Pageviews	4,753	9,924
New Visits	89.49%	87.15%
Visits from Countries/Territories	87	105
Visits from the United States	729	1,317
Proportion of Visits from the US	36.50%	37.53%

Table 1. Gross Performance Comparisons.

At a glance, there does not appear to be any anomalies. Visits, Unique Visitors, Pageviews, Visits from Countries/Territories, and Visits from the United States all are trending upward. The proportion of New Visits and Visits from the US appear to be holding steady. Also, the reader is reminded that the first month and a half data are included in the three month statistics.

The statistics on all the *EDGJ* PDF files, which includes all feature articles, is presented on the Portable Document Format (PDF) page (see Figure 3), which is a detailed Content by Title report. The content performance statistics are presented in Table 2. It compares the performance of the PDF file visits with the performance of *EDGJ* visits in general.

	EDGJ	PDF	(PDF vs EDGJ)
Pageviews	9,924	3,038	(30.61%)
Unique Pageviews	6,435	2,295	(35.66%)
Avg. Time on Page	1:00	2:11	*(116.76%)*
Bounce Rate	63.92%	72.32%	*(13.14%)*
% Exit	35.36%	64.65%	*(82.83%)*

Table 2. Content Performance Comparisons.

According to the GA data compiled during the study period, approximately one-third of all pageviews and unique pageviews can be attributed to visits to *EDGJ* articles. The average time on PDF pages was over twice that of visits to *EDGJ* pages in general. The proportion of single-page visits to PDF pages was slightly higher than that of visits to *EDGJ* pages in general. And the proportion of site exits from PDF pages was almost twice what the *EDGJ* pages in general experienced.

In order, the other four pages that were among the highest visited pages included (see Figure 3):

- /index.php/EDGJ/article/view/8/7 (Drafting the Basics by Lamb and Kurtanich)
- /index.php/EDGJ/article/view/138/134 (Application of 3D CAD for Basic Geometric Elements in Descriptive Geometry by Chen)
- /index.php/EDGJ/article/view/145/141 (Spatial Visualization Measurement: A Modification of the Purdue Spatial Visualization Test - Visualization of Rotations by Branoff)
- /index.php/EDGJ/article/view/17/16 (Cam Design Projects in an Advanced CAD Course for Mechanical Engineers by Ault)

The reader, however, is cautioned. There are four other measures that are available—Unique Pageviews, Avg. Time on Page, Bounce Rate, and % Exit. Pageviews refers to a view of a page, whereas Unique Pageviews refers to the number of sessions during which that page was viewed one or more times. Bounce Rate refers to the proportion of single-page visits or visits resulting from this page or set of pages. Percent (%) Exit is the proportion of site exits that occurred from this page or set of pages. The proportion may include visitors who have concluded their business, or it may mean the page or site was not of interest to the visitor.

The five *EDGJ* articles that ranked highest with respect to the number of sessions during which that page was viewed one or more times (Unique Pageviews) were as follows:

- index.php/EDGJ/article/view/126/122 (Developing 3-D Spatial Visualization Skills by Sorby)
- index.php/EDGJ/article/view/138/134 (Application of 3D CAD for Basic Geometric Elements in Descriptive Geometry by Chen)
- /index.php/EDGJ/article/view/8/7 (Drafting the Basics by Lamb and Kurtanich)
- /index.php/EDGJ/article/view/145/141 (Spatial Visualization Measurement: A Modification of the Purdue Spatial Visualization Test - Visualization of Rotations by Branoff)
- /index.php/EDGJ/article/view/17/16 (Cam Design Projects in an Advanced CAD Course for Mechanical Engineers by Ault)

The five *EDGJ* articles that ranked highest with respect to Avg. Time on Page were as follows:

- /index.php/EDGJ/article/view/30/29 (Techniques for Creating Animations for Technical Presentation by Lieu)
- /index.php/EDGJ/article/view/24/23 (Teaching Integrated Design and Manufacturing, Course Structure and Assessment by Higley)
- /index.php/EDGJ/article/view/43/42 (Assessment Measures and Outcomes for Computer Graphics Programs by Colwell, Whittington, and Higley)
- /index.php/EDGJ/article/view/107/103 (Student Reaction to an Interactive Compact Disk on Engineering Graphics by Lieu
- /index.php/EDGJ/article/view/158/152 (Message from the Chair "A Christmas Carol" by Connolly)

Weighted Sort (see Figure 9) is another option for assessing site traffic. This relatively new GA feature weights the results by associated columns. The five *EDGJ* articles that ranked highest with respect to a Weighted Sort were as follows:

- /index.php/EDGJ/article/view/138/134 (Application of 3D CAD for Basic Geometric Elements in Descriptive Geometry by Chen)
- /index.php/EDGJ/article/view/119/115 (Assembly Modeling by Sriraman)
- /index.php/EDGJ/article/view/139/135 (Incorporating Rapid Prototyping Into the Engineering Design Curriculum by De Leon and Winek)
- /index.php/EDGJ/article/view/129/125 (New Technologies for Engineering Graphics by Miller)
- /index.php/EDGJ/article/view/17/16 (Cam Design Projects in an Advanced CAD Course for Mechanical Engineers by Ault)

This page was visited 3,038 times via 133 pages

Content Performance   Views:

Pageviews	Unique Pageviews	Avg. Time on Page	Bounce Rate	% Exit	$ Index
3,038	**2,295**	**00:02:11**	**72.32%**	**64.65%**	**$0.00**
% of Site Total: 30.61%	% of Site Total: 35.66%	Site Avg: 00:01:00 (116.76%)	Site Avg: 63.92% (13.14%)	Site Avg: 35.36% (82.83%)	Site Avg: $0.00 (0.00%)

☑ Weighted Sort

	Page	None	Pageviews	Unique Pageviews	Avg. Time on Page	Bounce Rate	% Exit ↓	$ Index
1.	/index.php/EDGJ/article/view/138/134		163	130	00:02:46	77.95%	76.69%	$0.00
2.	/index.php/EDGJ/article/view/119/115		89	71	00:02:47	80.00%	77.53%	$0.00
3.	/index.php/EDGJ/article/view/139/135		39	32	00:01:39	77.42%	82.05%	$0.00
4.	/index.php/EDGJ/article/view/129/125		109	82	00:05:14	74.36%	72.48%	$0.00
5.	/index.php/EDGJ/article/view/17/16		117	86	00:01:37	76.19%	71.79%	$0.00
6.	/index.php/EDGJ/article/view/12/11		46	38	00:03:36	78.12%	78.26%	$0.00
7.	/index.php/EDGJ/article/view/8/7		183	130	00:01:49	63.71%	69.95%	$0.00
8.	/index.php/EDGJ/article/view/78/75		49	40	00:01:41	0.00%	77.55%	$0.00
9.	/index.php/EDGJ/article/view/102/98		56	46	00:01:32	81.08%	75.00%	$0.00
10.	/index.php/EDGJ/article/view/47/46		28	24	00:02:21	86.96%	82.14%	$0.00

Filter Page: containing ▾ [ ] Go **Advanced Filter**   Go to: 1   Show rows: 10 ▾   1 - 10 of 133 ◄ ►

Figure 9. Weighted Sort Results.

Discussion

The focus of this study was to begin measuring the performance of the online *EDGJ* by reporting on the most frequently visited articles published by the online *EDGJ*. The purpose of this study was to determine the viability of using GA to describe the performance of the online *EDGJ*.

While it has its limitations, GA appears to be a viable application for assessing the performance of the online *EDGJ*. Over time, and as additional GA features are developed and deployed, some of the limitations may be mitigated. For the time being, however, the user and readers of reports that rely on GA statistics must be mindful of GA's limitations.

GA also appears to be a viable means of examining the nature of the more frequently visited articles published by the online *EDGJ*. Once again users and readers of reports that rely on GA statistics must be mindful of GA's limitations. As an example, the Avg. Time on Page statistic could be skewed if a visitor takes an extended break while parked on a given page. With respect to % Exit, GA is not sophisticated enough to ascertain the reason behind a given statistic.

GA does provide a variety of statistics for assessing the performance of an online journal like the *EDGJ*. Future studies will profile the *EDGJ* site with respect to (a) the number of new and returning visitors and how extensively they interact with the site's content (Visitors reports)[6]; (b) drilling down into aspects of visit quality (i.e. average pageviews, time on site, bounce rate, etc) and visit characteristics (i.e. first time visitors, returning visits, etc); (c) the different kinds of sources that send traffic to the *EDGJ* site (Traffic Sources reports)[7] including traffic trends, what's driving the trends, whether visitors click a bookmark to come to the site or typed a site URL directly into their browser, whether visitors clicked to the *EDGJ* site from another site, whether visitors clicked to the *EDGJ* site from a search engine result page, and the like; and additional studies will be conducted on (d) pageview volume, the pages that were most responsible for driving pageviews, how users interacted with the E*DGJ* site, and statistics related to how they found the *EDGJ* site in the first place (Content).[8] GA appears to be a viable alternative for accessing statistics that can help ascertain the *EGDJ's* performance and thus sustain its performance.

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