Lecture Notes in Electrical Engineering 365

Felix Pasila
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Editors

Proceedings of Second International Conference on Electrical Systems, Technology and Information 2015 (ICESTI 2015)

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Contents

Introduction

This book includes the original, peer-reviewed research papers from the 2nd International Conference on Electrical Systems, Technology and Information (ICESTI 2015), held during 9–12 September 2015, at Patra Jasa Resort & Villas Bali, Indonesia.

The primary objective of this book is to provide references for dissemination and discussion of the topics that have been presented in the conference. This volume is unique in that it includes work related to Electrical Engineering, Technology and Information towards their sustainable development. Engineers, researchers as well as lecturers from universities and professionals in industry and government will gain valuable insights into interdisciplinary solutions in the field of Electrical Systems, Technology and Information, and its applications.

The topics of ICESTI 2015 provide a forum for accessing the most up-to-date and authoritative knowledge and the best practices in the field of Electrical Engineering, Technology and Information towards their sustainable development. The editors selected high quality papers from the conference that passed through a minimum of three reviewers, with an acceptance rate of 50.6 %.

In the conference there were three invited papers from keynote speakers, whose papers are also included in this book, entitled: "Computational Intelligence based Regulation of the DC bus in the On-Grid Photovoltaic System", "Virtual Prototyping of a Compliant Spindle for Robotic Deburring" and "A Concept of Multi Rough Sets Defined on Multi-Contextual Information Systems".

The conference also classified the technology innovation topics into five parts: "Technology Innovation in Robotics, Image Recognition and Computational Intelligence Applications", "Technology Innovation in Electrical Engineering, Electric Vehicle and Energy Management", "Technology Innovation in Electronic, Manufacturing, Instrumentation and Material Engineering", "Technology Innovation in Internet of Things and Its Applications" and "Technology Innovation in Information, Modeling and Mobile Applications".

In addition, we are really thankful for the contributions and for the valuable time spent in the review process by our Advisory Boards, Committee Members and Reviewers. Also, we appreciate our collaboration partners (Petra Christian

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On behalf of the editors Felix Pasila

Chapter 66
Surakarta Cultural Heritage Management Based on Geographic Information Systems

Ery Dewayani and M. Viny Christanti

Abstract Tangible cultural heritage is the legacy of physical artifacts from past generation in a nation. Indonesia is a nation which is rich in cultural heritage. Surakarta is a city that has a lot of historic buildings and other physical cultural heritage. Preservation of the cultural heritage of Surakarta can be done in various ways. One way to preserve it is to create an integrated documentation and renewable. In this research, we try to build Geographical Information System (GIS) based on web. The making of GIS of Surakarta cultural heritage, intended to facilitate the inventory, monitoring, follow-up and can be used as a reference for determining policy related to the cultural heritage conservation. Surakarta GIS is complemented with a function to register the historical heritage. Registration can be done by either the local community or the manager of the historical heritage. This function can also assist the government in obtaining the data of other historical heritages that have not been registered, so that the heritage can be protected by the government. The system is built using MapServer and PostgreSQL to manage spatial data.

Keywords Geographic information system · Mapserver · Postgresql · Surakarta · Tangible cultural heritage

66.1 Introduction

Indonesia is a nation that has a lot of cultural heritage. Surakarta is one of the cities that have a history of high heritage value and become the city's identity, so that the building and the region must be preserved [1]. Surakarta have many physical cultural heritage, especially physically immovable cultural heritage. National culture is something that must be preserved as a heritage and that preservation was done for the sustainability of this nation. Preservation of culture can be done in

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different ways. From maintaining, promoting and pass them from generation to generation. The cultural heritage itself can consist of two major categories i.e. tangible cultural heritage and intangible cultural heritage [2]. While on The World Heritage Convention article 1, tangible cultural heritage consist of 3 categories, i.e. monument, groups of buildings and sites [3].

Preserving means maintain for a very long time, because it can be imagined if 5 or 10 years again, the cultural heritage may no longer exist or have changed into another form. For example in Italy, the criteria and the aims of protection have changed, so that it does not tend only to preserve and manage the existing assets as well as to proceed with legal and administrative measures, but also to exploit the assets through a more complete knowledge of them [4]. Preservation effort is a maintenance effort for a very long time. Therefore, it is necessary to develop conservation as a sustained effort.

Computers can be used as a place of gathering, archiving, management, analysis and generate output geographic shape [5]. The use of these technologies can enable people to access and disseminate information. One of the ideas that can be developed is the manufacture of GIS for mapping the physical cultural heritage in Surakarta and surrounding region. The system built implemented for: (a) the acquisition and verification of data, (b) the compilation of data, (c) the storage of data, (d) changes or updating of data, (e) management and data exchange, (g) access and data presentation.

Geographic Information System (GIS) will map each activity related to spatial data and associated with the local geography. Hopefully, this mapping can give an idea or information on activities occurring graphically linked with the condition of the cultural heritage in Surakarta and surrounding areas. The purpose of this system is to provide information that can be used by public and private agencies designated to protect and utilize the cultural heritage (such as architects, archaeologists, historians and others). Moreover, it can also be used by ordinary people who are interested in cultural heritage.

In this study, the collaboration process has been conducted with the Department of Spatial Planning (*Dinas Tata Ruang Kota*) and the Department of Tourism (*Dinas Pariwisata*) of Surakarta. This collaboration has been established for 2 years. Data collection and data analysis is done intensively in 2014. Based on interview with some of managers of historical tourism destination and Head Section of Maintenance and Protection Zone and Heritage Buildings City Hall Surakarta, they state that there are some of objects not registered as cultural heritage. So the government cannot protect this object, although the object is historical object.

66.1.1 Cultural Heritage

Based on article 1 of Law No. 5 of 1992, an object can be referred to as ‘objects of cultural heritage’ is man-made objects and natural objects which are moveable or

not moveable, that are considered to have significant value for the history, science and culture [6]. While the location that containing or suspected to be the objects of cultural heritage called 'sites'. Based on world heritage in 1995, cultural heritage consist of three categories, there are monuments, groups of buildings and sites [3].

In general, people familiar with the cultural heritage is an ancient building which is protected by the government. But more broadly, cultural heritage is preserved by the local communities and the livelihoods are protected by law from the danger of extinction. Based on the analysis and field research, not the entire physical cultural heritage is protected by the government. There is some physical cultural heritage that has not been included in the cultural heritage so that the heritage is not protected by the government.

People who become owners or managers of buildings and areas of cultural heritage have rights and obligations to register the object. Once the object has been examined and declared complies with the requirements of the cultural heritage, then the object will get the sign in the form of a label that is placed near the object. Label is a sign that the object is registered in the government's decree of cultural heritage and the right to be protected.

66.1.2 Surakarta Cultural Heritage

Thomas Karsten, a Dutch architect who also designed a number of ancient buildings in Surakarta say, a process that must be done before setting Surakarta as objects of cultural heritage is mapped the historic district. There are three classes that distinguish; first class is two palace complexes in Surakarta (Mangkunegaran and Pakubuanan), class two ancient buildings around the first grade and third grade are other ancient buildings beyond first class and second class [7].

The first class of the region shall be maintained the original form of the building, for any reason in these places should not be reduced or plus building. While in the second grade covers an area around the first-class area that still has the old city structure and contains ancient buildings. This area also includes the former European residential, Pacinan, Kampung Laweyan and so on. Preservation of ancient buildings can be done through four forms of conservation, among others Preservation, Rehabilitation, Reconstruction and Revitalization [6].

The determination of the direction of preservation for potential building done by classifying potential building into two, namely the high potential and low potential [8]. Categorization of buildings into a high or low potential status can be viewed from various aspects of assessment. Aspects of the assessment can be determined based on the value of cultural meaning and condition of the building or object. The assessment process carried out beforehand by experts of cultural heritage.

At this time The Department of Spatial Planning of Surakarta not has sufficient documentation to support the Surakarta cultural information, especially regarding to

the physical cultural heritage. Therefore, we collect all the primary and secondary data. Primary data collected directly in the field to do a photo shoot and interviews with locals. While secondary data obtained from The Department of Spatial Planning in the form of printed document.

66.1.3 Geographic Information System

Geographic Information Systems (GIS) is defined as a component which consists of hardware, software, geographic data and human resources that work together effectively to capture, store, repair, update, manage, manipulate, integrate, analyze, and display data in a geographic-based information [5]. To get spatial information, GIS using a location within a particular coordinate system, as a basic reference. Therefore, GIS has the ability to connect various data at a given point on earth, combine, analyze and finally mapped the results. GIS answer some questions such as: location, condition, trends, patterns, and modeling. These abilities are exactly what differentiate GIS from other information system.

Meanwhile, according to other sources, GIS is a set of computer hardware, software, data and people are combined to address spatial-based questions and provide new ways of looking at the GIS to find solutions or make decisions [9]. Based on these GIS functions, the GIS become a tool to preserve the cultural heritage. Data can be stored cultural heritage, renewable and known by the public. Cultural heritage which has changed shape, missing or unknown can still be traced back to this system.

66.1.4 Spatial and Non Spatial Database

Building a database to GIS is divided into two parts, namely spatial and non spatial database. GIS spatial database for this culture is built based on the results of data collection has been done in the previous year's study. Layer on the base map used is sub-district, district, provincial and village. Other spatial data classification carried out in several categories. Classification layer is the stage of grouping elements of spatial data in accordance with the theme of each.

At this GIS data classification carried into five parts, namely the reserve is not a tourist, not a cultural heritage tourist attractions, heritage sites, historical buildings and tourist attractions of historic buildings [10]. The purpose of this division is to locate the physical cultural heritage that has become the reserve or not, physical cultural heritage that are well known and become tourist attractions or just a cultural heritage of historic buildings.

As for non-spatial data, compiled based on data collected in the previous year's research. This Surakarta culture heritage GIS focuses on the registration process of

Table 66.1 Category of cultural heritage based on Surakarta Department of Spatial Planning

No	Categories	Description
1	Labeling	*Tugu, Tembaga, Granit*
2	Type of object	Traditional area: traditional and non-traditional
		Traditional house
		Colonial public building
		Worship building
		Gapura, Tugu, Monumen, PerabotJalan
		Open Space: *Makam*, Park, Open Garden and Open space
3	Conservation	Preservation, Rehabilitation, Revitalization, Reconstruction

cultural heritage. Heritage Surakarta divided into several categories. Data have been obtained from the study of literature, has been analyzed and can be divided into three categories: Labeling, Object Types and Forms conservation [6, 10]. In Table 66.1 we can see the contents of each category.

Next analysis is that the cultural heritage can be registered by: owner, family, business or other. This analysis done based on SK. No: 646/116/1/1997 about Determination of the buildings and the historical ancient region on Surakarta Municipality level II. People who become owners or managers of buildings and areas of cultural heritage have rights and obligations as specified in local regulations on cultural preservation. The owner of cultural heritage are entitled to legal protection in the form of a Certificate of Cultural Heritage and Status Certificate of Ownership is based on evidence, which was made by the local work unit that has tasks and functions in the field of cultural heritage.

66.1.5 Geographical Information System of the Surakarta Cultural Heritage

After the database is built, there should be an analysis of the needs of software and hardware to build a website. Specifications of the software that used to build a GIS divided into two sides, server side and client side. We build Surakarta GIS in Ubuntu 14.04 operating system environment. PostgreSQL with PostGIS extension is used as software for database management system. For map management and visualization, we use MapServer. At client server, user only need web browser. PostgreSQL and MapServer is open source software that support and facilitate the making of GIS [11].

GIS system is built with the main purpose to preserve the physical cultural heritage city of Surakarta. As is known physical cultural heritage can be a monument, groups of buildings and sites. This legacy can be a private, family or in open

spaces. Therefore, the government itself gave the opportunity to register the heritage to be protected by law.

In this GIS system, the data of cultural heritage is presented complete with the history, location and label of the cultural heritage. Results of this GIS will connect the process of enrollment, management and storage of data with the physical cultural heritage map of the city of Surakarta. Each user can see where the location of the physical cultural heritage. The success of this research is expected to help in the preservation of the cultural heritage, in particular the physical cultural heritage in Surakarta and surrounding region. The Department of Spatial Planning and the Department of Tourism are expecting that this research could be implemented by the Surakarta government.

66.2 Result and Analysis

Data collection has been carried out and managed to find 74 locations of cultural heritage, and the data obtained some 62 photos of cultural heritage, cultural heritage label and the coordinates of its location. A total of 7 label of cultural heritage is not acquired by obstacles, such as heritage label is not installed, not found the location label reserve, requires permission from the owner or location of heritage buildings are being used for an activity. At Table 66.2 we can see the example of location, coordinate data of Surakarta cultural heritage and distance between location and tourism destination.

Table 66.2 List of cultural heritage location, complete with coordinate and distance to other destination

No	Location	Destination	Distance (km)
1	Bandara Adisucipto Yogyakarta Coordinate: S -7° 47.1219′, E 110° 26.2233′ address: Raya Solo KM. 9, 55282, Indonesia	Candi Sambisari	3.1
		Candi Prambanan	7.8
		Museum Prambanan	8.6
		Candi Plaosan	10.2
		Ratu Bokoh	9. 7
2	Candi Sambisari Coordinate: S 07° 45.811′, E 110°26.797′ address: Desa Sambisari Kelurahan Purwomartani Jalan Nasional 15 Depok, Sleman, Yogyakarta 55281, Indonesia	Candi Prambanan	9.2
		Museum Prambanan	10
		Candi Plaosan	11.6
		Ratu Bokoh	11.1

Table 66.3 Example pictures of the historic heritage of Surakarta

No.	Cultural heritage name	Coordinate	Photo	Label
1	Tugu Lilin Kelurahan Penumping	S 07°34′07.2″ E 110°48′ 19.8″		
2	Patung Slamet Riyadi Jalan Slamet Riyadi	S 07°33′55.3″ E 110°48′ 19.1″		

Review the location, shooting and coordinate reserve, guided by the management staff of cultural heritage label assigned by the Department of Spatial Surakarta. In addition, based on the observation, then there are 19 historic sites are considered to be a tourist attraction. That historic place is a place most often become a tourist destination by domestic and foreign tourists. The picture of cultural heritage and its label can be seen at Table 66.3.

When collected Surakarta data is done, we analyze the data, and then we found some facts that not all the historic place is the cultural heritage. Like, Mangkunegaran palace is one of the cultural heritages listed in SK No. 646/101-F/1/2012 and also became one of the most visited tourist attractions. Whereas Prambanan temple and museum is not listed as a cultural heritage though it is tourism place. Museum Radya Pustaka is listed as a cultural heritage place, but not as tourism place.

Geographical Information System of The Surakarta Cultural Heritage has following functions: display a map, pan and zoom throughout a map, identify features on a map by pointing at them, culture heritage registration, manage all culture heritage data and others. Surakarta GIS is divided into two sides of the admin and user. Admin side is for managers of Department of Spatial Planning Surakarta. Admin has functions to add, update and manage existing data.

The user side is the public at society, especially society the city of Surakarta. User can see information, history, photo and location of culture heritage. The users can also make the registration process of the cultural heritage that has not been registered in government offices. Registered cultural heritage will be reviewed by government agencies. If it has met the requirements listed in the law then the heritage will get a decree from the government.

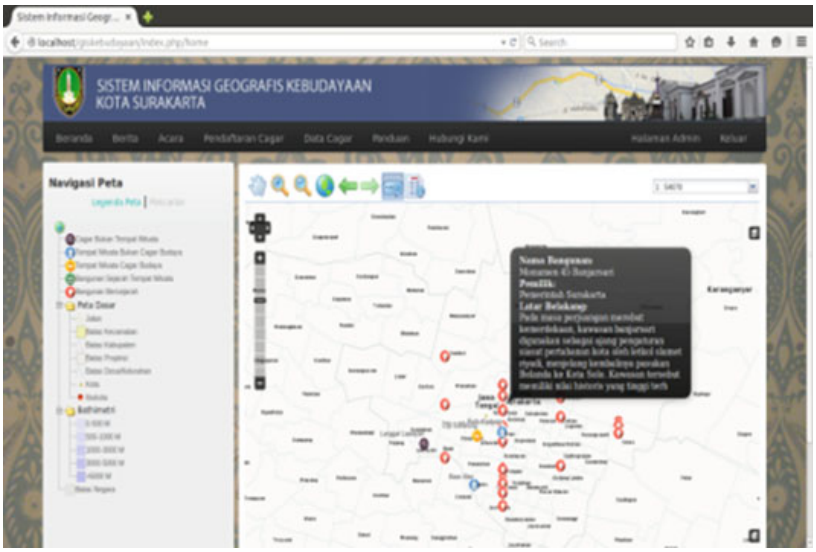

Fig. 66.1 Surakarta Map and the map legend

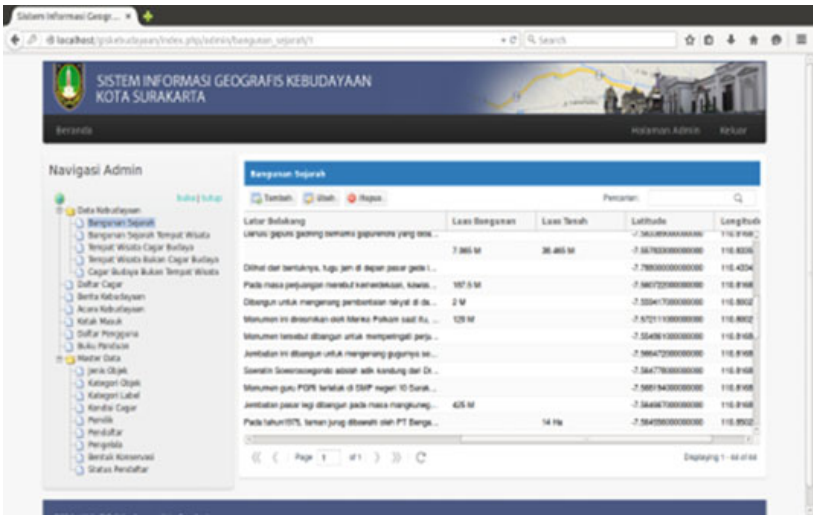

Fig. 66.2 Lists of cultural heritage

Figure 66.1 consists of a map of Surakarta and legends from one of the cultural heritage objects. Figure 66.2 is admin side that has list of cultural heritage. At Fig. 66.3 we can see categories of cultural heritage object that consist of tourism cultural heritage, tourism not cultural heritage and tourism historic building. the distribution of these categories, helping people to see the tourist attractions which have not become cultural heritage or cultural heritage which has not been promoted as a tourist or historic buildings which have not been registered as a cultural heritage. At Fig. 66.4 we can see the information of cultural heritage.

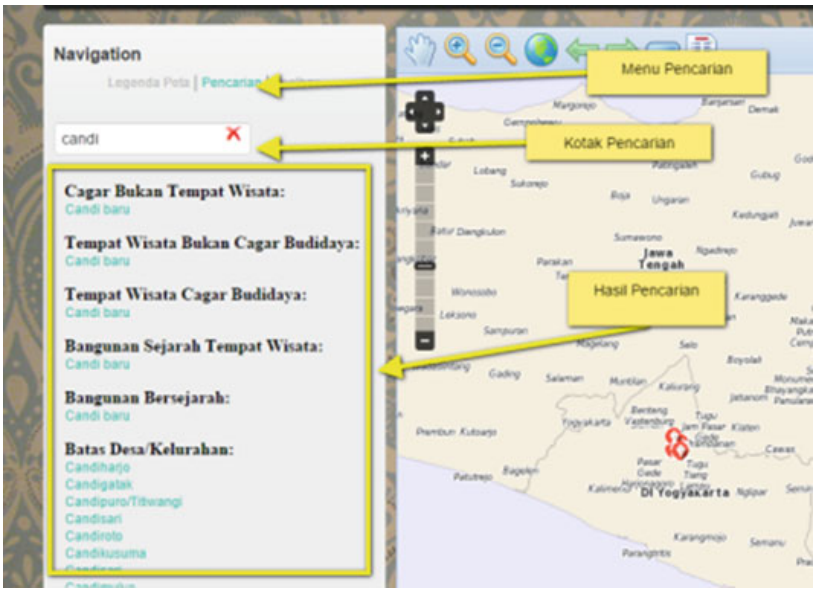

Fig. 66.3 Categories of cultural heritage

Fig. 66.4 Information of cultural heritage

66.3 Conclusion

This study has successfully collected data historic sites and cultural heritage is based on regulations in Surakarta. Such data has been validated directly to the informant. Researchers also managed to collect primary data and secondary data in accordance with the data recorded in the local government. The original data in the form of complete documents obtained directly from the Department of Spatial Surakarta.

Surakarta GIS is complemented with a function to register the historical heritage. Registration can be done by either the local community or the manager of the historical heritage. This function can also assist the government in obtaining the data of other historical heritage that have not been registered in order to be protected by the government.

GIS Culture Surakarta already meets the required specification data analysis. Implementation is done to Department of Spatial Planning Surakarta. Expected results of this GIS can be beneficial and improve the affection of the people of the physical cultural heritage of the city of Surakarta. Building a GIS system, is as a proof of the government's attention to the physical cultural heritage of this nation. Hopefully, this concept of GIS can be implemented for other cities.

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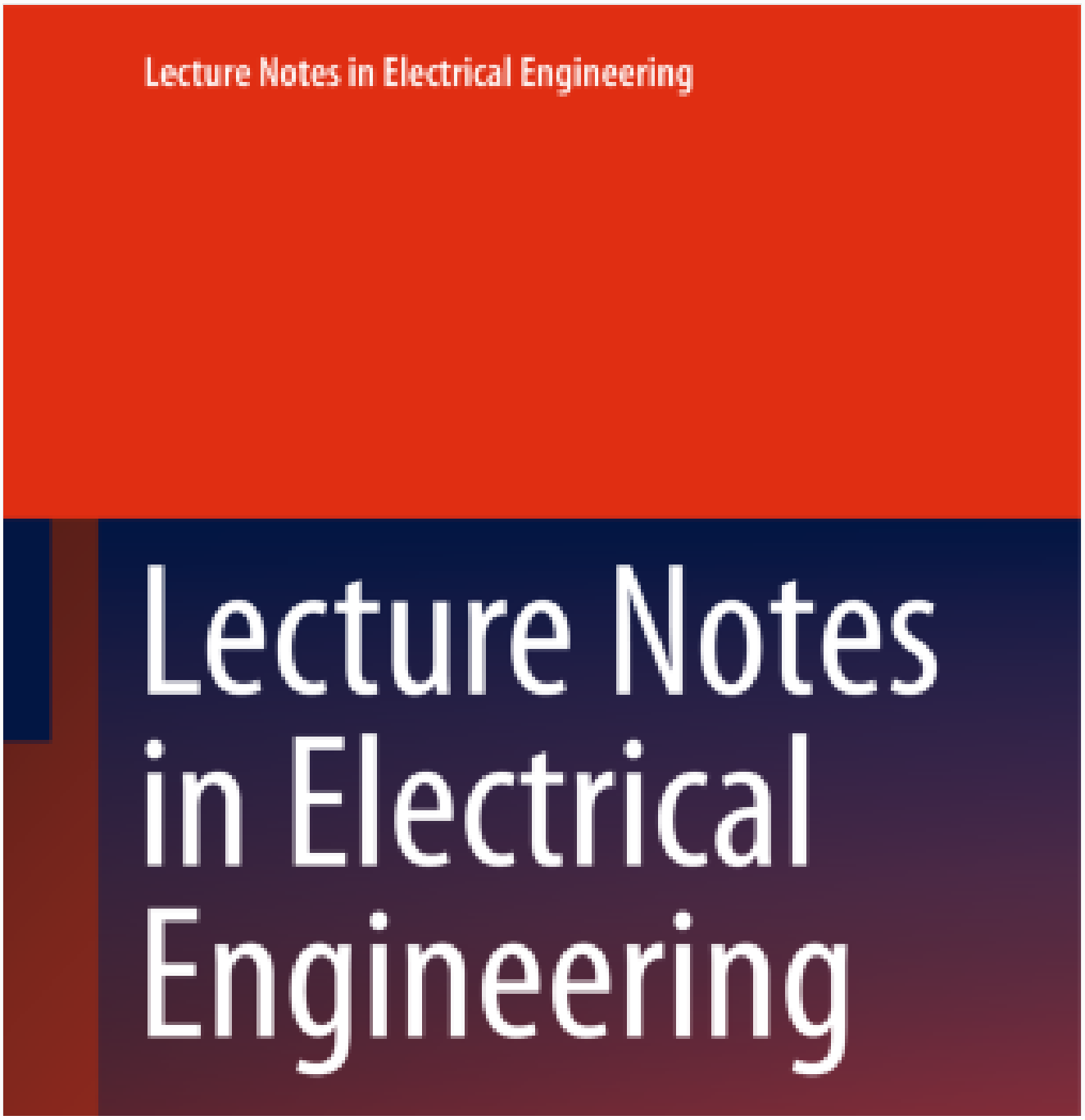

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The set of journals have been ranked according to their SJR and divided into four equal groups, four quartiles. Q1 (green) comprises the quarter of the journals with the highest values, Q2 (yellow) the second highest values, Q3 (orange) the third highest values and Q4 (red) the lowest values.

Category	Year	Quartile
Industrial and Manufacturing Engineering	2008	Q3
Industrial and Manufacturing Engineering	2009	Q3
Industrial and Manufacturing Engineering	2010	Q3
Industrial and Manufacturing Engineering	2011	Q3
Industrial and Manufacturing Engineering	2012	Q3

SJR

The SJR is a size-independent prestige indicator that ranks journals by their 'average prestige per article'. It is based on the idea that 'all citations are not created

equal'. SJR is a measure of scientific influence of journals that accounts for both the number of citations received by a journal and the importance or prestige of the journals where such citations come from It measures the scientific influence of the average article in a journal, it expresses how central to the global scientific discussion an average article of the journal is.

Year	SJR
2008	0.137
2009	0.129

Citations per document

This indicator counts the number of citations received by documents from a journal and divides them by the total number of documents published in that journal. The chart shows the evolution of the average number of times documents published in a journal in the past two, three and four years have been cited in the current year. The two years line is equivalent to journal impact factor ™ (Thomson Reuters) metric.

Cites per document	Year	Value
Cites / Doc. (4 years)	2007	0.000
Cites / Doc. (4 years)	2008	0.326
Cites / Doc. (4 years)	2009	0.224
Cites / Doc. (4 years)	2010	0.191
Cites / Doc. (4 years)	2011	0.218
Cites / Doc. (4 years)	2012	0.169
Cites / Doc. (4 years)	2013	0.156
Cites / Doc. (4 years)	2014	0.148
Cites / Doc. (4 years)	2015	0.145
Cites / Doc. (4 years)	2016	0.162
Cites / Doc. (4 years)	2017	0.197
Cites / Doc. (4 years)	2018	0.259
Cites / Doc. (4 years)	2019	0.309
Cites / Doc. (3 years)	2007	0.000
Cites / Doc. (3 years)	2008	0.326

Total Cites Self-Cites

Evolution of the total number of citations and journal's self-citations received by a journal's published documents during the three previous years.
Journal Self-citation is defined as the number of citation from a journal citing article to articles published by the same journal.

Cites	Year	Value
Self Cites	2007	0
Self Cites	2008	0

Self Cites	2009	2
Self Cites	2010	3
Self Cites	2011	8

External Cites per Doc Cites per Doc

Evolution of the number of total citation per document and external citation per document (i.e. journal self-citations removed) received by a journal's published documents during the three previous years. External citations are calculated by subtracting the number of self-citations from the total number of citations received by the journal's documents.

Cites	Year	Value
External Cites per document	2007	0
External Cites per document	2008	0.326
External Cites per document	2009	0.219
External Cites per document	2010	0.189

% International Collaboration

International Collaboration accounts for the articles that have been produced by researchers from several countries. The chart shows the ratio of a journal's documents signed by researchers from more than one country; that is including more than one country address.

Year	International Collaboration
2007	11.11
2008	9.44
2009	10.18
2010	10.07
2011	6.67

Citable documents Non-citable documents

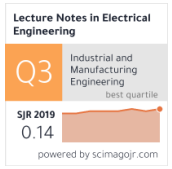
Not every article in a journal is considered primary research and therefore "citable", this chart shows the ratio of a journal's articles including substantial research (research articles, conference papers and reviews) in three year windows vs. those documents other than research articles, reviews and conference papers.

Documents	Year	Value
Non-citable documents	2007	0
Non-citable documents	2008	2
Non-citable documents	2009	26
Non-citable documents	2010	62
Non-citable documents	2011	99

Cited documents Uncited documents

Ratio of a journal's items, grouped in three years windows, that have been cited at least once vs. those not cited during the following year.

Documents	Year	Value
Uncited documents	2007	0
Uncited documents	2008	36
Uncited documents	2009	348
Uncited documents	2010	889
Uncited documents	2011	1418
Uncited documents	2012	2085



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D

DR GARIMA SRIVASTAV 2 months ago

HIII IS THIS JOURNAL ABDC INDEXED IF YES THEN WHICH CATEGORY

reply

Melanie Ortiz 2 months ago

SCImago Team

Dear Garima,
Thank you for contacting us. SJR is a portal with scientometric indicators of journals indexed in Elsevier/Scopus. Unfortunately, we cannot help you with your request referring to the index status. We suggest you consult the mentionned database directly. Best Regards, SCImago Team

SCImago Team

R

Roli 7 months ago

Hi dear Elena,
Is this journal a ISI journal ?

reply

Melanie Ortiz 7 months ago

SCImago Team

Dear Roli, SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR. We suggest you to consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

SCImago Team

S

Sanjoy Kumar Debnath 2 years ago

My name appeared in Book wrongly.What can I do?

reply

Ihsan 2 years ago

Dear Sir,
may i Know the impact factor of this Book Series?
Thanks so much.

reply

A

Ali.M 6 months ago

Dear author you can check the Scoups.com and you will find the index and the impact of this Journal. Based on Sjr they put 0.13. Indexing 68.
Thank you.

Melanie Ortiz 6 months ago

SCImago Team

Dear Ali,

Thanks for your paticipation! The SJR for 2018 is 0.134, as you can see above. Best Regards, SCImago Team

SCImago Team

M

Md. Sazzadur Rahman 11 months ago

0.19

Elena Corera 2 years ago

SCImago Team

Dear Ihsan, SJR uses Scopus data, our impact indicator is the SJR. Check our page to locate the journal. We suggest you consult the Journal Citation Report for other indicators with a Web of Science data source. Best Regards, SCImago Team

SCImago Team

S

Sanjoy Kumar Debnath 2 years ago

Lecture Notes in Electrical Engineering is a status of proceeding or journal?

reply

Elena Corera 2 years ago

SCImago Team

Dear Sanjoy, that information is available in the journal's report," Book Series". Best Regards, SCImago Team

SCImago Team

Elena Corera 2 years ago

SCImago Team

Dear Sanjoy, we suggest you locate the author's instructions on the journal's website. Best Regards, SCImago Team

SCImago Team

Elena Corera 2 years ago

SCImago Team

Dear Sanjouy, that information is available in the journal's report, "Book Series". Best Regards, SCImago Team

SCImago Team

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