

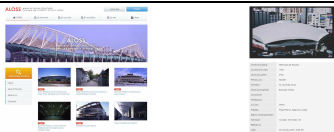
Research Article

ALOSS: A structure information retrieval system of existing shell and spatial structures in the world

K. Ishikawa^{*}, M. Iso, K. Inoue

Department of Civil Engineering and Architecture, Faculty of Engineering, University of Fukui, Bunkyo 3-9-1, Fukui-shi, Fukui-ken, Japan
**Corresponding author. Tel.: +81776278588; Fax: +81776278746; Email: ishikawa@u-fukui.ac.jp (K. Ishikawa).*

GRAPHICAL ABSTRACT



ALOSS (<http://aloss.jp>) Specific structure

HIGHLIGHTS

- ALOSS is an acronym for “Album of Spatial Structures”.
- The URL of ALOSS is <http://aloss.jp>.
- ALOSS was created by a team based at the University of Fukui, Japan.
- It is mainly based on information collected by Mr Isono, who is a structural engineer.

KEYWORDS

Database of spatial structures
Retrieval data system
Existing shell and spatial structures
Chronological order data
Album-like database
Album of Spatial Structures (ALOSS)

ABSTRACT

ALOSS is an acronym for “Album of Spatial Structures”. This is the name for a database of spatial structures from all over the world containing building names, photographs, addresses, architects, structural engineers, completion years, and so on. This database was established in Japanese and English languages on the internet in 1997. It is mainly based on information collected by Mr. Isono, who is a member and official photographer of IASS (International Association for Shell and Spatial Structures). He is a structural engineer with specialty in membrane structures. The URL of ALOSS is <http://aloss.jp>. So far, ALOSS has data on over 2000 structures, and this number is increasing steadily. Information relating to ALOSS is stored in a computer system at the University of Fukui, Japan and this information is being continually updated and refined. The purpose of this paper is to describe ALOSS, and to explain the manner in which it may be used to retrieve information. The results revealed that ALOSS is a useful source of information for students, architects and engineers interested in study of various types of the shell and spatial structures. It applies a pictorial and a keyword search method. This paper presented precisely and briefly all the basic aspects of ALOSS and especially the way of finding specific information about required spatial structure. The chronological chart is also presented by classification in the viewpoint of the structural system using the retrieval way of ALOSS. The structural material and the system innovation of spatial structures are shown among the technological development progress corresponding to the proposed chronological chart.

© 2017 Ababil Publishers. All rights reserved.

1. Introduction

Records of outstanding buildings information such as photographs, architects, construction years and so on may give an inspiration of the future vision. An idea of the future vision may be generated by putting one search keyword on another search keyword. This is a reason why an information retrieval system is needed to store a large amount of information with respect to existing spatial structures all over the world by means of the internet system.

ALOSS is an electronic version of information database about shell and spatial structures collected by Mr Isono, who is associated for the Jubilee book [1]. It is a photo-album with over 2000 photographs from all over the world and reviewed

information such as buildings’ names, addresses, structural engineering, completion years and so on. In order to make ALOSS website to be useful for architects and engineers in learning about the latest innovation in all aspects of spatial structures, it requires the cooperation of other information sources from around the world. This collection of materials is of great value for architects and engineers [2-3]. To make this database available through the internet, a website named ALOSS was created by a team based at the University of Fukui, Japan. In addition to the material collected by Mr. Isono, it is intended to allow ALOSS to expand and incorporate information from other sources [4-6].

The purpose of this paper is to describe ALOSS, and to explain the manner in which it may be used to retrieve

information. The chart is also presented by classification in the viewpoint of the structural system according to the chronological order by using the retrieval way of ALOSS. The structural material and the system innovation of spatial structures are investigated among the technological development progress corresponding to the proposed chronological order. The technological development in the viewpoint of ecology and changes in the environment will need

to realize a future vision of the shell and spatial structures. In this study, an idea will appear by putting one search keyword on another search keyword by means of an interface of ALOSS. ALOSS is available to make a useful chart and show an outstanding structural system in university lectures and so on. The chronological chart of the shell and spatial structures by means of an interface of ALOSS is also useful to see the technological progress and the future vision.

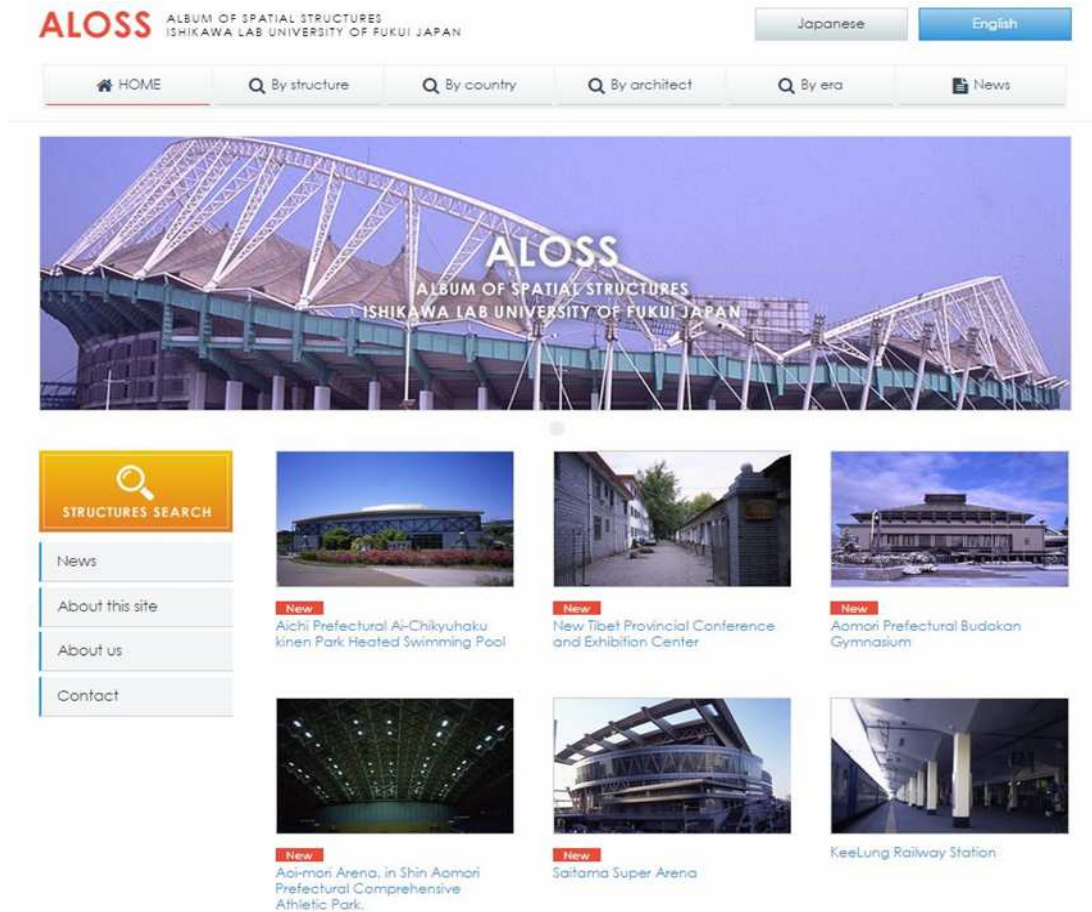


Fig. 1 Top page of the new ALOSS (<http://aloss.jp>).

2. Construction of the new ALOSS

The top page of ALOSS is shown in Fig. 1. ALOSS inherited and promoted the information about shell and spatial structures collected by Mr Isono [1]. The previous ALOSS [2-4] mainly classified information into three types such as structural systems, countries, some outstanding architects and engineers. And ALOSS has a sophisticated information retrieval system. The database of shell and spatial structures in the world has been updated since 1997.

3. A simple information retrieval system

ALOSS has adopted a pictorial search method. The framework of the current information retrieval system in ALOSS is designed to resemble a photo album. The album-like information retrieval system helps to speed up the process of finding specific information from a large volume of data about

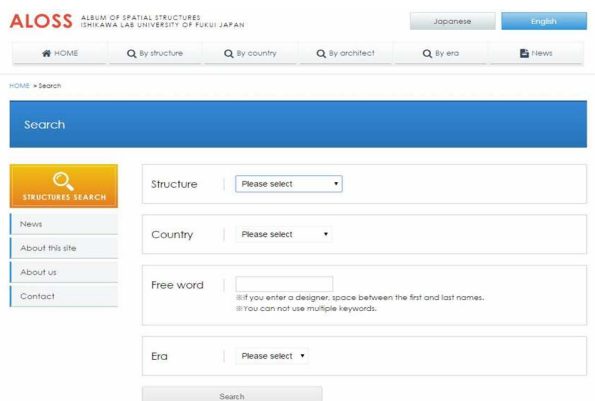


Fig. 2 Example of finding specific information in ALOSS.

shell and spatial structures. **Fig. 2** displays the example of finding specific information using ALOSS about the buildings with respect to the structural system, the country and the completion year and free word.

An example of the detail information about the specific structure is shown in **Fig. 3**. It includes names of buildings, structural systems, countries, construction years, addresses, architects, structural engineers, usages, admissions and a requirement for an admission, traffic access, a reference page of the proceedings, notes and so on.



Name of building	Mercado de Abastos
Construction year	1933
Structural system	Shell
Primary use	Market
Architect	M. Sanchez Arcas
Structural engineer	Eduardo Torroja
Constructor	
Professional	
Country	SPAIN
Address	Plaza Palma, Algeciras, Cadiz
Means of transportation	
Admission	Outside : OK Inside : OK
Reference	
Note	Structural system: Shell, RC

Fig. 3 Detail of information about the specific structure.

4. Chronological order of shell and spatial structures and remarks

The chronological chart of shell and spatial structures in the world until 2000 are given in **Table 1**. The catalogue information is also shown in **Fig. 3**. In particular, the completion year of the structure is precisely stored in ALOSS. The record of the completion year is very valuable for making the chronological chart. The chart is classified in the viewpoint of the structural system according to the chronological order by means of the information retrieval system. The structural material and the system in spatial structures are also displayed to see the technological development progress corresponding to the chronological order.

Several remarks obtained from the chart of **Table 1** are as follows:

(1) The spatial structures such as an arch structure and a shell structure are constructed in the early 20th century. And based on the structural technology progress of materials such as steel and concrete constructed in the 19th century.

(2) The rational structures such as a space frame and a cable structure have been developed in order to solve problems realization and the cost since the late 1950s.

(3) A pneumatic membrane structure and a tent structure are realized due to the development of a membrane material after the Second World War.

(4) Various structural systems such a tensegrity structure and a hybrid structure are designed and constructed in recent year. On the other hand, it is difficult to clarify the complex structures among the existing structural systems.

5. Conclusion

ALOSS is considered as a very useful source of information for students, architects and engineers interested in study of various types of shell and spatial structures. It applies a pictorial and a keyword search method. The study presents all the basic aspects of ALOSS and especially the way of finding the specific information about required spatial structure precisely and simply. In the second stage of creating a website on the internet is now achieved and ALOSS as a virtual information resource is now improved and expanded in various ways in comparison with the previous ALOSS. The album-like information retrieval system helps to speed up the process of finding specific information from a large volume of data about shell and spatial structures. ALOSS is available to make a useful chart and show an outstanding structural system in university lectures and so on. It is also resulted that the chronological chart of the shell and spatial structures by means of the information data of ALOSS is useful to understand the technological progress and seek the future vision of the new structural system.

References

- [1] Mungan I, Abel J (Editors). Fifty years of progress for shell and spatial structures, In celebration of the 50th Anniversary Jubilee of the IASS (1959-2009), International Association for Shell and Spatial Structures (IASS) 2011;v-vi.
- [2] Schlaich J. On some recent lightweight structures, *Journal of the International Association for Shell and Spatial Structures: IASS 2002*;43(2):66-79.
- [3] Saitoh M. Recent development of space structures in Japan. *Journal of the International Association for Shell and Spatial Structures: IASS 2001*;42(1-2):3-8.
- [4] Ishikawa K, Isono Y, Yamato D and Nooshin H. ALOSS-Album of spatial structures. *Journal of the International Association for Shell and Spatial Structures: IASS 2005*;46(3):187-194.

- [5] Yamato D, Ishikawa K, Isono Y, and Nooshin H. ALOSS-album of space structures. Space Structures 5, Thomas Telford, London 2002;683-692. Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium 2010, Shanghai, Spatial Structures–Permanent and Temporary, November, Shanghai, China, 2010; 8-12.
- [6] Ishikawa K, Thu H, Tada E and Isono Y. ALOSS 2010-Album of spatial structures in China, Japan and Vietnam,

Table 1 Chronological chart of shell and spatial structures in the world.

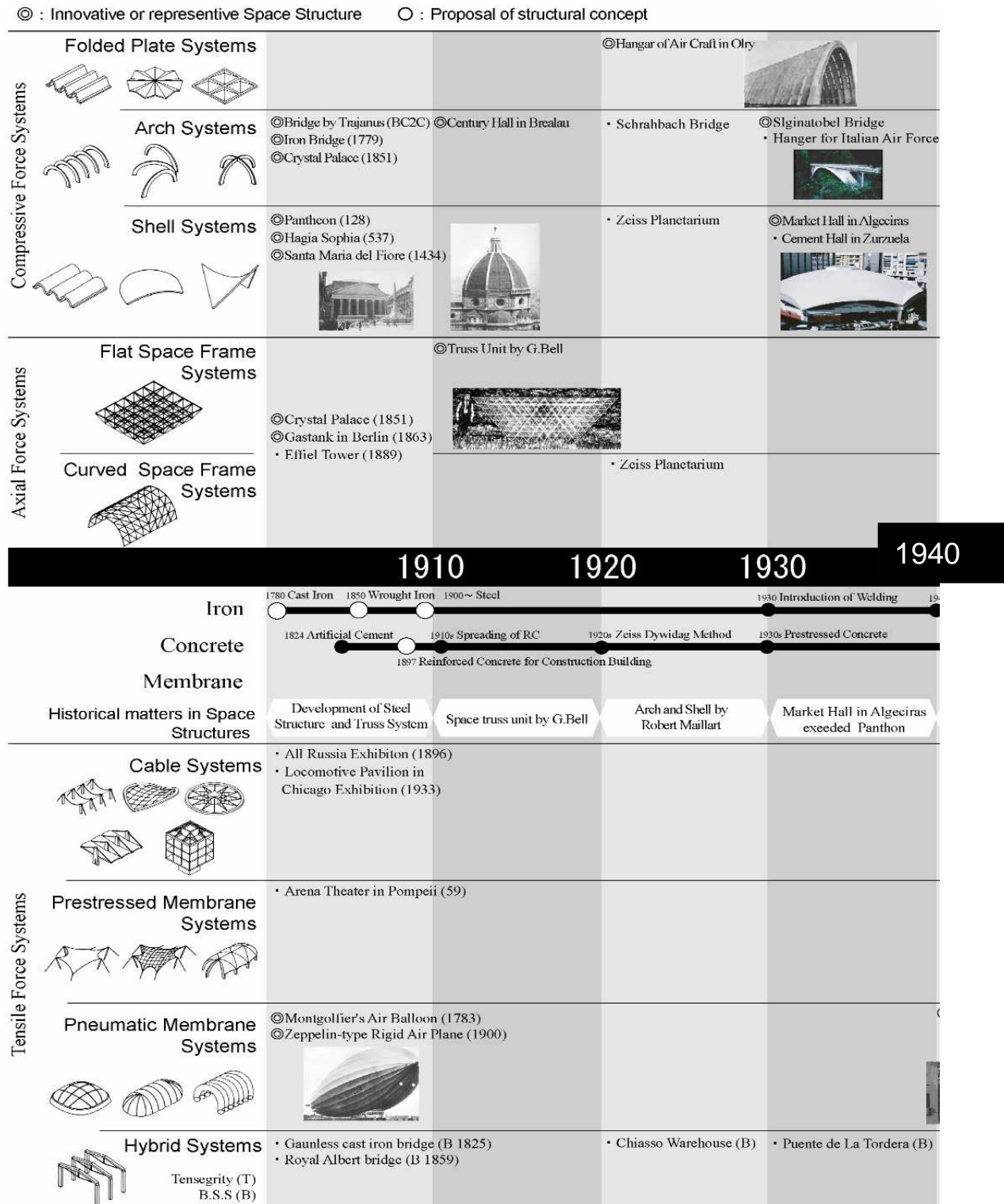





























Table 1 (continued).

	<ul style="list-style-type: none"> ©Assembly Hall in UNESCO 	<ul style="list-style-type: none"> • U.S.A.F. Academy 				
<ul style="list-style-type: none"> • Pavilion in Torino 		<ul style="list-style-type: none"> • Memorial Arch 				
<ul style="list-style-type: none"> • Air Force Hanger in South Dakota 	<ul style="list-style-type: none"> ©Sport Hall in Rome ©Restaurant in Xochimilco 	<ul style="list-style-type: none"> • Garden Center in Zuchwil • TWA Terminal Building 	<ul style="list-style-type: none"> • Sydney Opera House • ENSA Ski School 	<ul style="list-style-type: none"> • Finger Museum 	<ul style="list-style-type: none"> • Super Dome, NMU 	
	<ul style="list-style-type: none"> ○Hanger Project by K. Wachsmann 		<ul style="list-style-type: none"> ○Festival Plaza • National Exhibition Center 	<ul style="list-style-type: none"> • Crystal Cathedrale • N.Y. Convention Center 	<ul style="list-style-type: none"> • La Pyramide 	
	<ul style="list-style-type: none"> • Tokyo International Trading Center • Union Tank Dome • Trade Fair in Brno 	<ul style="list-style-type: none"> ©Biosphere (ex-US Pavilion) 	<ul style="list-style-type: none"> • New Orleans Super Dome • Split Stadium 	<ul style="list-style-type: none"> • Hanger Dome • Palau d' Esporta Sant Jordi 	<ul style="list-style-type: none"> • Space Theater in Taipei 	
1940	1950	1960	1970	1980	1990	2000
<ul style="list-style-type: none"> 1940s Large-scale suspension bridge in U.S. 1950s Space Truss 1960s RH Method 1950s Trend of naked-concrete design 1960s Dywidag-Spannbeton Method and Free Cantilevering Method 1946 Membrane for Construction Building 1960s Use of Nylon 1970s Use of Polyester, Teflon, Glass fiber 1983 Glass fiber covered by Silicon 						
<ul style="list-style-type: none"> ○ Collapse of Tacoma Narrows ○ Appearing of Space Frame and Cable Structures ○ Tent Structure at Pavilion in EX-Montreal ○ Pneumatic Membrane Structures to Permanent Building ○ Advancement in PC technology ○ Needs of sustainable development 						
<ul style="list-style-type: none"> • Collapse of Tacoma Narrows Bridge 	<ul style="list-style-type: none"> ©Dorton Arena • Yale Hockey Rink 	<ul style="list-style-type: none"> ©National Indoor Stadium in Tokyo 	<ul style="list-style-type: none"> • Federal Reserve Bank 	<ul style="list-style-type: none"> • Renalt Center 	<ul style="list-style-type: none"> • Alamo Dome 	
	<ul style="list-style-type: none"> ©Tent in Kohn Dance Square 	<ul style="list-style-type: none"> ©Ex-Montreal West Germany Pavilion 	<ul style="list-style-type: none"> • Multi Hall in Mannheim • La Verne University 	<ul style="list-style-type: none"> • Riyadh International Stadium • Grand Arche 	<ul style="list-style-type: none"> • Denver International Airport • Millennium Dome 	
<ul style="list-style-type: none"> ©Radar Dome 			<ul style="list-style-type: none"> ©Fuji Group Pavilion ©U.S.A Pavilion 	<ul style="list-style-type: none"> • Carrier Dome • Metro Dome • B.C.Place • Tokyo Dome 	<ul style="list-style-type: none"> • Tropicana Field 	
		<ul style="list-style-type: none"> ©Aviary in London Zoo (T) 	<ul style="list-style-type: none"> • Fencing Stadium (T) • Gymnastic Stadium (T) • HSBC (B) 	<ul style="list-style-type: none"> • Marine Midland Arena (T) • Georgia Dome (B) 		

Chronological Table of Space Structures in the world

To cite this article: Ishikawa K, Iso M, Inoue K. ALOSS: A structure information retrieval system of existing shell and spatial structures in the world. Journal of Advanced Civil Engineering Practice and Research 2017;5:2-6.

To link this article: <http://ababilpub.com/download/jacepr5-2/>