المؤتمر العالمى الاول

للعماره والفنون الاسلاميه الماضى والحاضر والمستقبل

أكتوبر   2007 م   –   1428هـ

دراسة العماره الاسلاميه

بإستخدام الوسائط الرقميه

Studying Islamic Architecture Using Digital Media

ENCYCLOPEDIA OF ISLAMIC ARHITECTURE

EIA

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2007

مقدمه :-

للحضارة الإسلامية إسهامات فعالة في التراث الإنساني بوجه عام . والعمارة الإسلامية جزء حيوي من هذا التراث ، وهي وعاء وانعكاس لجانب من الفكر الإنساني الحضاري الذي امتد عبر المكان والزمان ليشغل حيزا في الأرض امتد من الصين شرقا إلى الأندلس غربا ؛ وامتد في حيز الزمان ليشغل بدايات القرن الثامن الميلادي حتى وقتنا الحاضر.

هذا التراث يحتوى على قدر هائل من الابداعات المعماريه التى تحتاج الى جهد علمى يعيد صياغتها فى هيئة مجموعات من المعلومات التى يسهل تداولها وأجراء العمليات البحثيه عليها مستفيدين فى ذلك من علوم قواعد البيانات Data Base .

هذا البحث هو النهج النظري لدراسة عملية تفيد من إكتشاف المعرفه وتقنيات العرض للحصول على فهم جديد للتراث المعماري. هذه الدراسة تمثل محاولة لإنتاج موسوعه رقمية للعمارة الاسلامي EIA - .Encyclopedia of **I**slamic **A**rchitecture - وفق منهاج توثيقى خاص يعبر عن فهم شامل وعميق للعمارة الاسلاميه و يتميزبالتحليل والتصنيف المترابط الذى يجيد التعامل مع هذا التراث الحضارى .

فى هذا النطاق، نحن نتعامل مع قدر كبير وهائل من البيانات التى تحتاج أن توضع في سياقها المعلوماتى والى تصنيفها وتحليلها وتصحيحها ، وتلخيصها من أجل الحصول على المعلومات المنظمة بالشكل الذى يتيح الافاده منها وإخراجها من حيز المعرفه المتحفيه الى أفاق التطبيق التفاعلى .

من هذا المنطلق أيضاً هناك حاجة واضحة لنظم وأدوات فعالة لاسترجاع المعلومات وتحليلها، للافاده منها فى دراسة هذا التراث المعمارى.

Abstract

This research is the theoretical approach for a case study which makes use of knowledge discovery and representation techniques to obtain a new understanding for architectural heritage. This case study is an attempt to produce a digital encyclopedia for Islamic architecture, **EIA,** an acronym for Encyclopedia of Islamic Architecture.

EIA is assumed to be a new approach for Islamic architectural documentation in the digital era. The concept for **EIA** rose from the extreme importance of having a deeper comprehensive understanding to Islamic architecture with a coherent analytic methodology in dealing with this historical heritage, which is one of the most important elements in human history and civilization.

Introduction

Islamic architecture spread over a huge land area and expanded in a wide span of time. Within this scope, Islamic architecture formed a homogenous ingredient of human arts and architecture. And within this scope we are dealing with a situation where a great amount of data needs to be contextualized, categorized, analyzed , corrected , and condensed in order to obtain information that are organized to characterize this particular situation.

Therefore , a need for effective systems and tools for information retrieval and analysis had became more apparent , and , concerning historical heritage - in general – the problem may become more difficult regarding the complexity and the expanded variations in time and place for Islamic architecture regarding building types , architectural elements , and basic formative elements .

Knowledge based information systems (KBIS) For EIA

Issues of computer –based or knowledge- based vision, which involve the automated interpretation of images, are being adapted to serve our aim to have a new understanding of this heritage. Concerning historical heritage- in general - the problem may become more difficult regarding the complexity and the expanded variations in architectural elements, time, and place.

Issues of computer –based or knowledge- based vision, which involve the automated interpretation of images, could be adapted to serve our aim to have a new understanding of this heritage

For that we are seeking a methodology for extending the reach of (KBIS) techniques from *classification* issues (for which they are already well established) to the problems that involve the *identification* issues *figure 1.*

ISLAMIC ARCHITECTURE → ANALYSIS → CLASSIFICATION → IDENTIFICATION → MODEL

Figure 1: Methodology procedure.

These identification issues model the characterized Islamic architectural elements (which is our case study) – either quantitatively or qualitatively –and propagate effects among topological linked elements representing composition units or subunits as apart of a comprehensive concept of Islamic architectural formation and style.

Therefore such (KBIS) will generate descriptions of basic, intermediate, and final states of these modeled elements (in terms of patterns of system units attributes) that are identified to validate the descriptive power of the model.

Computer display technology, information retrieval and analysis already provide solid building blocks for creating useful research, prototyping and information seeking process which comprise a number of activities from topic formulation to database search and browsing through accessed document thus, provides a mechanism for creating a model for the users information need that is useful in each of these phases of the information seeking process. This model provides the architectural information that is empirically believed to best represent the content of this kind of heritage (Islamic Architectural heritage), beside being a platform for achieving all accumulated information elements , embedding a design information frame work as a mechanism for representation of design knowledge , -KBIF- knowledge based information frame work *figure 2.*
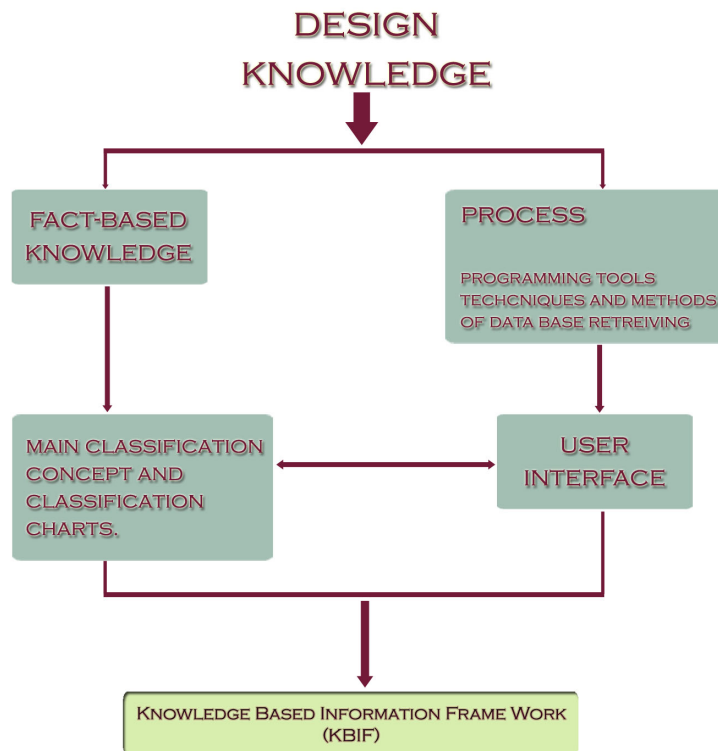

DESIGN KNOWLEDGE

FACT-BASED KNOWLEDGE

PROCESS

PROGRAMMING TOOLS TECHCNIQUES AND METHODS OF DATA BASE RETREIVING

MAIN CLASSIFICATION CONCEPT AND CLASSIFICATION CHARTS.

USER INTERFACE

KNOWLEDGE BASED INFORMATION FRAME WORK (KBIF)

Figure 2. -KBIF- Knowledge Based Information Frame work for Islamic architectural heritage.

This frame work defines the fact – based architectural knowledge through process – based knowledge. This KBIF have an open structure to accommodate any additional concepts and relations as necessary.

This frame work provides a common technical platform for information, communication and collaboration between architects, historians, and archeologists.

This frame work also provides data representation, data visualization, and collaborative design data base – driven environments.

This frame work is a web-based information environment that can manage and present data for general users, designers, and researches *Figure 3*.
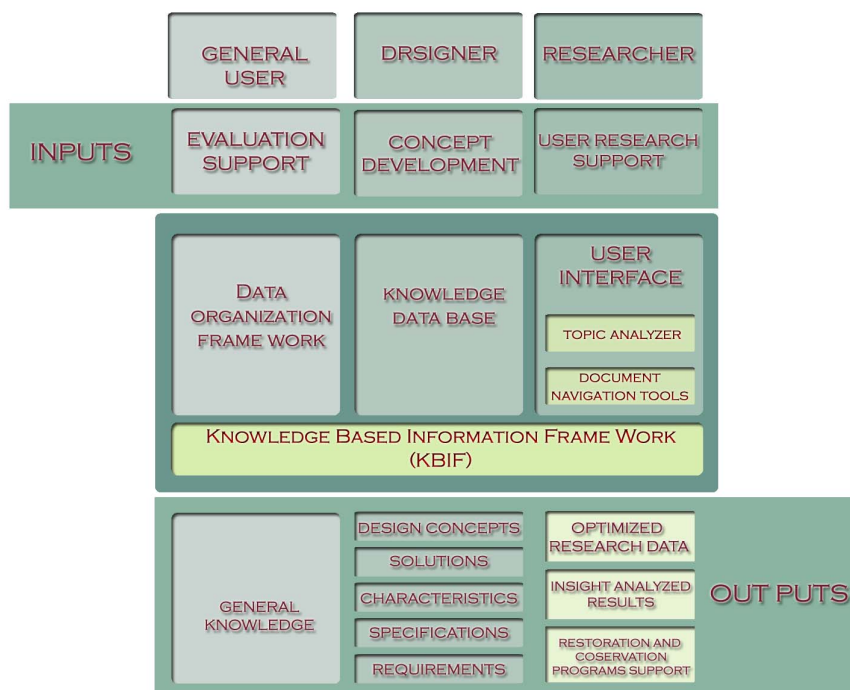

Figure 3. The web-based information environment for **EIA.**

Classification System for EIA

The purpose of a classification is to describe the structure and relationships of the constituent elements, to achieve economy of memory and facilitate communication, and to ease observations and retrieval of information. A classification is a first step in organizing knowledge.

To classify, is to group a collection of *elements* into mutually disjoint subsets for a

specific purpose. The sets are ranked in a level order where sets with a higher rank include sets with a lower rank.

To classify *properties of elements* is in principle the same as to classify the elements having these properties, since the element-property dichotomy is a purely conceptual operation. *Elements*, *relations* and *attributes* are the three basic entities. Attributes are associated with elements through relations *Figure 4*.

Figure 4. Classification hierarchy

Creating data-base for EIA

According to the **analytic classification** chart shown in figure 4, we will have a dramatic amount of information or data being stored in electronic format.

Analyzing data can provide further knowledge by going beyond the data explicitly stored to derive knowledge. This is where **Data Mining or Knowledge Discovery in Databases (KDD)** has obvious benefits for any enterprise.

The term data mining has been stretched beyond its limits to apply to any form of data analysis. Some of the numerous definitions of Data Mining, or Knowledge Discovery in Databases are:

Data Mining, or Knowledge Discovery in Databases (KDD) as it is also known, is the nontrivial extraction of implicit, previously unknown, and potentially useful information from data. This encompasses a number of different technical approaches, such as clustering, data summarization, learning classification rules, finding dependency networks, analyzing changes, and detecting anomalies.

The following diagram summarizes the some of the stages/processes identified in data mining and knowledge discovery by Usama Fayyad & Evangelos Simoudis, two of leading exponents of this area:
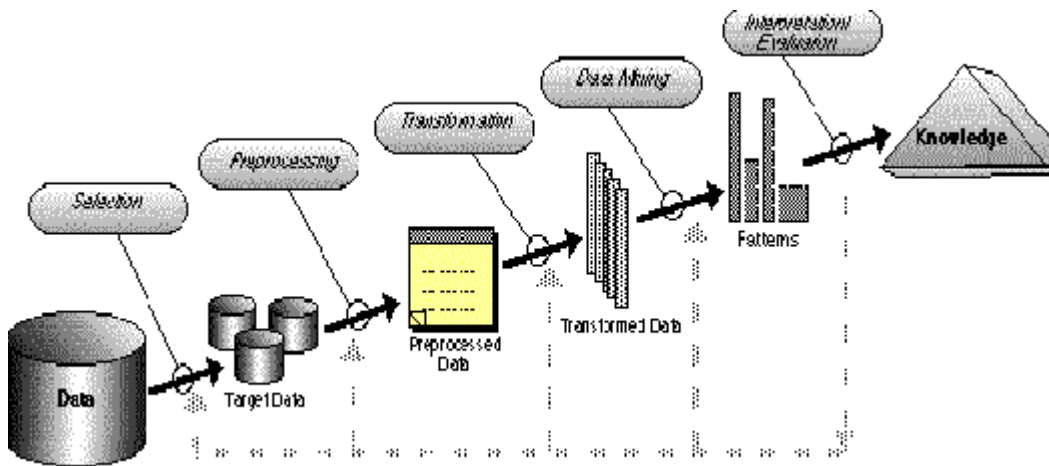
The phases depicted start with the raw data and finish with the extracted knowledge which was acquired as a result of the following stages:

1 Selection - selecting or segmenting the data according to the *classification system* mentioned before and through a criteria concerning the cybernetic relations between:

    1.1. Regions/ cities.

1.2. Islamic dynasties.

1.3. Hierarchy of Architectural elements within the urban fabric and the building itself If. This hierarchy goes into three categories:

1.3.1 Building types.

1.3.2 Architectural elements.

1.3.3 Basic elements.

2 <u>Preprocessing</u> - this is the data cleansing stage where certain information is removed which is deemed unnecessary and may slow down queries. Also the data is reconfigured to ensure a consistent format as there is a possibility of inconsistent formats because the data is drawn from several sources.

3 <u>Transformation</u> - the data is not merely transferred across but transformed in that overlays may added such as the demographic overlays. The data is made useable and navigable.

4 <u>Data mining</u> - this stage is concerned with the extraction of patterns from the data. A pattern can be defined as given a set of facts(data) F, a language L, and some measure of certainty C a pattern is a statement S in L that describes relationships among a subset Fs of F with a certainty c such that S is simpler in some sense than the enumeration of all the facts in Fs.

5 <u>Interpretation and evaluation</u> - the patterns identified by the system are interpreted into knowledge which can then be used to support human decision-making e.g. prediction and classification tasks, summarizing the contents of a database or explaining observed phenomena.

OLAP (an acronym for 'Online Analytical Processing) database servers use multidimensional structures to store data and relationships between data. Multidimensional structures can be best visualized as cubes of data, and cubes within cubes of data. Each side of the cube is considered a dimension. Multidimensional databases are a compact and easy to understand vehicle for visualizing and manipulating data elements that have many inter relationships *figure 5.*
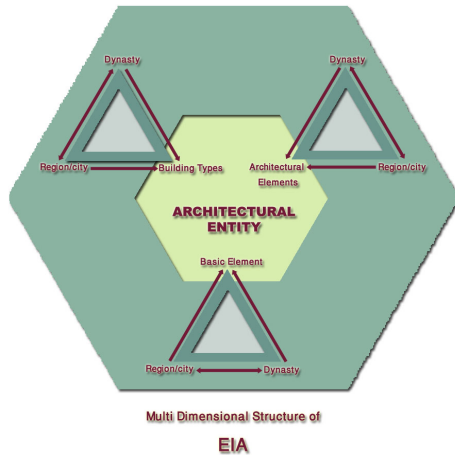
Figure 5. Multidimensional structures to store data and relationships between data.

OLAP is a technique by which the data sourced from a data warehouse or data mart is ***visualized*** and summarized to provide perspective multidimensional view across multiple dimensions. Since ***data warehouse*** is designed using a dimensional data model, data is represented in the form of data cubes enabling us to aggregate facts, slice and dice across several dimensions. OLAP tools provide options to drill-down the data from one hierarchy to another hierarchy.

Data Visualization

Data visualization makes it possible for the analyst to gain a deeper, more intuitive understanding of the data and as such can work well along side data mining. Data mining allows the analyst to focus on certain patterns and trends and explore in-depth using visualization. On its own data visualization can be overwhelmed by the volume of data in a database but in conjunction with data mining can help with exploration.

Data Warehousing

Data mining potential can be enhanced if the appropriate data has been collected and stored in a data warehouse. A data warehouse is a relational database management system (RDMS) designed specifically to meet the needs of transaction processing systems. It can be loosely defined as any centralized data repository which can be queried for business benefit but this will be more clearly defined later. Data warehousing is a new powerful technique making it possible to extract archived operational data and overcome inconsistencies between different legacy data formats.

As well as integrating data throughout an enterprise, regardless of location, format, or communication requirements it is possible to incorporate additional or expert information. In other words the data warehouse provides data that is already transformed and summarized, therefore making it an appropriate environment for more efficient DSS (Decision Support System) and EIS (**Executive Information System)** applications.

Conclusion

- **EIA** has developed and refined a model with a design of information retrieval system.
- This encyclopedia is based on the theoretically sound approaches in information and knowledge based theories and is adapted to serve the main target which is the digital documentation of Islamic architecture with its diversity and dominant unity.
- **EIA** is also an attempt to expand the traditional information analysis functions such as search and retrieval, filtering, document summarization, and data presentation methods to address the need of the users through customization of knowledge visualization management systems. Through this customization we can provide for Islamic architecture a foundation for future research information design activities, generating cognitive design concepts and prototyping and evaluating shared infoaestethics concepts.
- **EIA** is the result for the application of an analytic approach classification for Islamic architecture with an integrated comparative system which could lead to a new understanding, and a new work of interactive knowledge.
- Finally**, EIA** is an implementation of knowledge based information systems (KBIS), to Islamic architectural heritage in order to be introduced within an application environment where we can define and approach for information's derived from an analytic comparative methodology for understanding Islamic architecture through a main classification system *figure 6.*
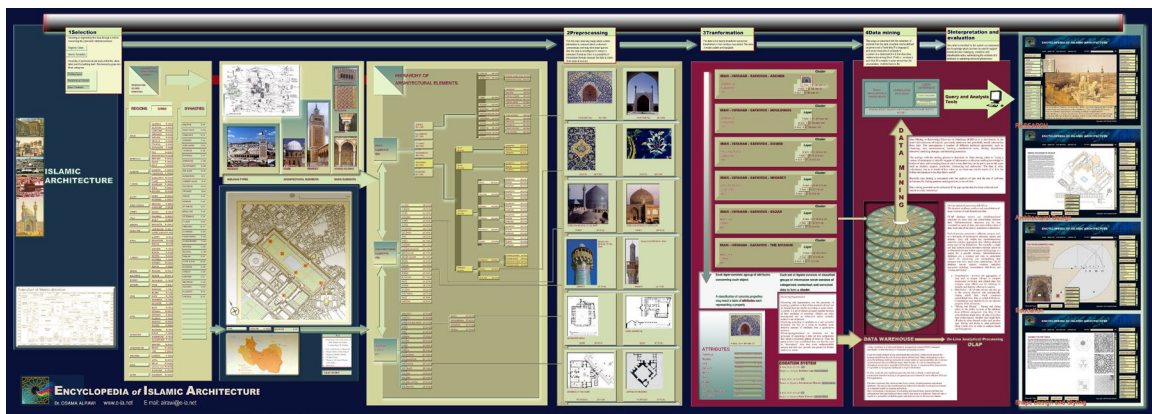

Figure 6- **EIA** interactive knowledge discovery and representation system.

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