Knowledge-Based Systems in the Information System of Indonesian Colonial Architecture

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Abstract. This research aimed to build information systems and database of colonial architecture to strengthen the data center of architecture, which can be used for reconstruction of heritage building. Information system database of colonial architecture utilizes knowledge-based system on the historical of colonial architecture, where attributes of colonial buildings are classified and represented in the knowledge tree and utilizes best first search techniques to data retrieval. The result is that the location, the period historical of the colonial architecture, the building function, the building styles (image) all can be used to feature information architectural elements of building character from the colonial building requested.

Introduction

Effort of architecture conservation or preservation is now covered a very broad range activity, ranging up from building until preservation areas. Cultural heritage building is a source of human culture that is very susceptible to damage. It is susceptible or damaged due to natural factors or vulnerable because of the age of the building (self destruction). Therefore, it seems necessary to mitigate the heritage buildings so that they did not really gone over the "disaster" that occurred.

Mitigation measurement is performed by collecting digital data of cultural heritage building. The objective is to save data from threats coming from both natural factors and human beings themselves. Saving data is an effective way to anticipate losing due to vulnerability of buildings [1].

The old city of Jakarta, formerly known as Oud Batavia is an essential part in the establishment history and development of Jakarta city. The old city of Jakarta had great potential economic, social and cultural, but its use has not been maximized to improve the region function. Even today it can be said that the Old City area experiencing decline in the quality of physical environment, economic, social and cultural.

The vulnerability problems of cultural heritage buildings found in the Old City of Jakarta as well. Colonial buildings, which is a heritage buildings, around the Stasiun Kota, Museum Fatahillah, Kali Besar up to the port of Sunda Kelapa, showed that 75% of the 170 of heritage buildings from the XVI century until early the XX century, in damaged condition (Figure 1) and danger of collapse [2].

Research Methods

Research and data collection for conservation of colonial building heritage as designed by Dutch, which was based on the peculiarities of the historical value of building and historical areas, has actually been done. But so far no research has been done which specifically analyze, summarize and compile attributes of colonial architecture. The attributes data should then be arranged in an information classification system that is structured and facilitate in search and deployment of scientific development for the benefit of Indonesian colonial architecture.
During this time, theory of knowledge representation and search processes in Artificial Intelligence has become basis for developing information retrieval systems of knowledge based. Historical attributes of colonial architecture can be represented as a database and knowledge base architecture of colonial Indonesia, which is an essential part in the development of information systems based on expert system, allowing for documentation system and an information retrieval Indonesian colonial architecture. Method of forward chaining is used to search information and techniques of tracking using best first search [4]. It is easier for user to obtain information of colonial building requested. 

Furthermore, database of characteristic attributes of colonial architecture is very beneficial in the effort for conservation activities. It includes reconstructing colonial heritage buildings that have been damaged or destroyed, which initially has unknown historical data and its data architectural physical elements.

**Result and Discussion**

**2D and 3D Modeling**

After obtaining data of architecture colonial buildings on location, such as blue print, picture of buildings in the past or documentation of building heritage, it would then be followed by conducting depictions process in 2D and 3D graphic models [5]. This process also known as digitizing data / objects, is utilizing software such as: Google Sketch-up and 3DS Max (Figure 2).
Knowledge Acquisition of Indonesian Colonial Architecture

Indonesian Colonial Architecture is part of the 'History of Architecture'. The history of architecture is the study of the events, architectural products, as well as the Figures in the past related to the development of architecture in the present and the future. The objective is as learning which could be used to improve quality of the architecture and environment (physical and social) in the present and the future. The history of architecture is usually studied by two things; place and time, whereas in the 'Architecture' we learn about function and style.

Knowledge Representation Tree

Knowledge representation tree is a formation process of knowledge representation tree based on the structure of a hierarchical system in historical search of Indonesian Colonial Architecture. It resulted from attributes: location, development period of the colonial architecture, the function of buildings and building styles (Figure 3.)

![Knowledge Representation Tree](image)

Figure 3. Knowledge representation tree of Indonesian Colonial Architecture.

Database of Colonial Architecture Knowledge

In relational database of colonial architecture Information System, there are 9 (nine) master table for storage of colonial architecture knowledge ie location, zones, sub-zones, period, category function, the function of the building, style category, building styles and architecture elements (Figure 4).
Searching of Information

On certain colonial building utilize forward chaining reasoning and best first search tracking technique. Attributes of colonial sequential facts, resulting conclusions i.e. architecture elements of colonial building searched by location, building period, function and style of the building (Figure 5).

**Figure 4.** Entity Relationship Diagram of Information System Colonial Architecture.

**IF**
- Locations in Jakarta L3
- Inner Fort Zone L31
- Sub Zone Kali Besar L312
- Period 1916 - 1945 P4
- Category Function of Office F1
- Function of cargo shipping office F12
- style category : modern architecture A3
- Art Deco A32

**THEN**
architecture elements of Art Deco for function of office building
IF the location in Jakarta, zone in Inner Fort, Subzone Kali Besar, Period 1916-1945, Function of cargo shipping office, Style category Modern Colonial, building style Art Deco, THEN the elements architecture of Art Deco for function of cargo shipping office will be displayed. (Figure 6).

**Conclusion**

In the era of advancing information technology and communication that can change the way of life in various fields, utilization of expert systems in the preparation of Information Systems of Indonesian Colonial Architecture was a strategic step. The step is required to encourage and be continued to develop a system of documentation and the search of component architecture that has resulted from a colonial architecture research that has been done by researchers in this field.
Information Systems of Indonesian colonial architecture can enrich Indonesian in the development of architectural concept that is based on local knowledge. Attribute data can be continuously and regularly added to be able to develop a comprehensive and sustainable knowledge base in architecture.

References


