Ontology Based Batik Image Retrieval For Domain Knowledge

Fikri Budiman
Dian Nuswantoro University
Semarang, Central Java, Indonesia
fikri.budiman@dsn.dinus.ac.id

Abstract— Batik from Indonesia has been acknowledged by UNESCO as an Intangible Cultural Heritage of Humanity, recognized in the manufacturing process which is known as Wax-resist Dyeing hereditary. Diversity motifs and vibrant colors that have meaning philosophy of life into knowledge that needs to be introduced. With the progression of internet technology, the web has a number of data batik is very large, it is necessary for ontology in creating domain knowledge of batik. Ontologies are used to improve Content Based Batik Image Retrieval (CBBIR) system performance in overcoming the problems of semantic gap. This research aims to build a model of ontology that represent low-level differences in color, texture, and shape batik features with high-level concepts as batik understandable by users. Testing the success of the model is done by calculating the similarity, precision and recall on the success of batik image recognition.

***Keywords*—Ontology, Semantic Gap, Batik Image Retrieval, Knowledge.**

INTRODUCTION

Batik is Indonesia's cultural heritage that has been recognized by UNESCO through the international world since October 2, 2009 as "Reperesentatif List of The Intangible Cultural Heritage of Humanity". In this regard, UNESCO recognized and distinguished with batiks from other countries is the technical process of making a unique use of closing wax with a "canting" and "cap", or what is known as the wax-resist dyieng, as well as generating pattern motif in the form of cultural symbol that has meaning to the philosophy of life and identity of the people of Indonesia.

Previous research authors to introduce more diversity motifs of batik, namely in the form of "e-supermuseum batik Indonesia" (budiman et.al,2012), designed a model merging the functions of the e-museum with the e-marketplace. In the e-supermuseum still use relational database, less storage model is dynamic and there is a lack of knowledge in terms of storage with batik motifs that are interrelated. Problems relational database of semantic web technologies which have amounts of data very large batik, required data model based ontology as metadata that contains domain management knowledge to be able to process and understand information diversity motifs of batik. Existing knowledge is used to understand in recognizing motifs of batik image retrieval based content. Thus the model development Ontology can overcome the semantic gap in understanding the meaning of the keywords that exist on the motifs of batik, so as to facilitate machine in understanding the information to improve services for users. In this ontology is needed for solving semantic gap, i.e. the gap between visual meaning low level feature with textual meaning high level feature (mimi and thyagharajan,2014;manzoor and balubaid,2015). Ontology Base Batik Image Retrieval (OBBIR) tried to low level batik image mapping feature to a hig level ontology concept, using a domain specific ontology for image capture relevant batik as expected users.

This research is the development of a Content-Based Image Retrieval Batik (CBBIR) that can solve the problems of semantic gap. Some previous research conducted for pattern recognition motifs of the original batik Indonesia (rangkuti *et.al*.,2014;putra *et.al*,2011;moertini dan sitohang,2005). Introduction motifs of batik done to show identification of the origin of batik (rangkuti *et.al*.,2014) and the uniqueness of the texture and shape of his motives, so that matching can be performed to identify the origin of the image of the target with a characteristic in the dataset of images. On such research (rengkuti et.al.,2014) in analyzing the texture character used wavelet transform daubechies type 2 methods and invariant moment. On the research of (moertini and sitohang, 2005), use some algorithm to preserve to know a good algorithm for performen cluster and classification of batik is based on color, contrast, and the motive for the compatibility of consumer personal appearance of batik. The use of wavelet is also done on the research (putra et.al.,2011), batik pattern for extraction using wavelet transform with a combination of discrete wavelet transform and rotate wavelet filter.

CBBIR on the semantic web with storage of images that are very much with the difference in the name field will occur simantic gap, so that there is taking against irrelevant images and information is missing from the picture is relevant (Ashwini D Gudewar and Leena R Ragha,2012). To minimize the semantic gap in the search mechanisms, the necessary knowledge base to understand content, i.e. by way of creating a domain ontology using topological relations interrelated knowledge in applying the introduction to motifs of batik. Areas of research that will be done is address the image retrieval in overcoming a semantic gap, i.e. with domain knowledge building as batik knowlede based, ontology provides domain knowledge required by the approach of combination between the meanings of the visual or textual as high level feature as users know with low level fiture contain content owned by pictures, so the machine can visualize batik picture as human beings do.

As far as researchers know in previous studies (Md Nasir, Sherina Azlin and Md Noor,Nor Laila,2010,2011) the

ISBN : 978-602-9438-50-5

ontologies used for image recognition of batik as TMT-metadata based. In the research conducted at the ontology mapping Traditional Malay Textile (TMT) with Committee Intenational for Documentation (CIDOC)-Conceptial Reference Model (CRM) which is an ontology for cultural heritage information exchange and community museum. The weakness of use text based metadata in recognizing images (Ashwini D Gudewar and Leena R Ragha,2012) because there is a difficult picture to be described with words, and to get the correct query, the user must know the full knowledge domain. To overcome the problem can take advantage of with-based content by utilizing the technology of image processing, namely with batik motif searches based on similarity of textures and content information that has meaning and origin of the knowledge area motifs of batik.

The problem will be solved in this study are: How the development of segmentation and feature extraction model which can be used appropriately to produce a query by batik image content in products contain datasets which contain low level feature characteristic of the texture, shape, and color as the differentiating characteristic pattern motifs of batik. And How the development of domain knowledge in the form of high level ontology concept model by mapping low level image features to improve the results of penyepadanan classification in the introduction of the batik image datasets.

The success of applying ontology can be minimize got irrelevant image information (high precision) and can guarantee a relevant image information is not overlooked (high recall). To calculate the similarity, precision and recall on the success of the introduction of content based batik image retrieval with ontology using a weighted Directed Acyclic Graph (wDAG) schema (R Sarno *et al*.,2011;D Pramono, 2013).

BATIK PATTERN RECOGNITION

Batik of Indonesia recognized UNESCO instead of objects sold, but in the process of making a unique, manually performed hereditary by using the tool "cap"/"canting" and known as the Wax-resist Dyeing (Budiman,2012). Indonesia is rich in motifs so that the required knowledge to introduce the motif based on the region of origin for the identification of the origin of batik(rangkuti *et.al*.,2014). The research of digital image pattern recognition on batik as traditional cloth from Indonesia that existed until now is to develop an algorithm to recognize the unique feature as a characteristic motifs of batik (rangkuti *et.al*.,2014; putra *et.al*,2011;moertini dan sitohang, 2005).

CBBIR is an area of research that focus on image processing to be able to identify the features of diversity of batik motif. Introduction the motif is carried out by the research on the development of algorithms to be able to improve the introduction of the unique characteristics of each motifs of batik. Feature extraction stage was done to recognize and measure the characteristics of texture-based content, i.e. the combined approach of image data motifs of batik : the texture, color, and shape. Feature of Batik is a unique characteristic of batik picture object. So that the required processes of feature extraction to be able to distinguish or identify each motifs of batik. In the feature extraction of acquired characteristics of the object that has the power to be a differentiator for dataset and used in pattern recognition training (budiman,2015).

Introduction to batik relies heavily on the quality of the extraction of features, to get the dataset that contains the content characteristics motif or pattern of batik pictures, a good degree of accuracy is required. It is very influential in getting the results of the texture analysis for the introduction of the quality motifs. The features are characteristic traits of the unique texture of the image, which is used to be able to recognize the image through digital image processing. Feature extraction is performed to find the area of a typical feature in the image, the region can be distinguished on the basis of color, shape, and texture. Hallmark features is translated in the form of statistics in the form of the value of the standard deviation, mean, correlation, contrast, energy, entropy, and homogeneity. In producing the statistical value is the unique characterisitics of a few research method using wavelet transform, introduction to batik motifs (rangkuti *et.al*.,2014; putra *et.al*,2011; imanuddin *et.al*.,2010; moertini dan sitohang,2005). The method of wavelet transform according to the feature extraction using signals or data that a-periodic, intermittent, noisy, and transient (budiman,2015). The transformation of the wevelet analysis done with the time on different frequencies of the STFT (Short-Time Fourier Transform), and is developing a family of functions generated by the wavelet base y (x) is called the mother wavelet and then into a wide range of wavelet transform based method for simplicity in analyzing data on feature extraction process.

A good extraction results will largely determine the success of the classification in pattern recognition. Image classification algorithm has also become the realm of research in fixing the percentage increase in the introduction of the batik motifs based on the dataset generated from the features extraction process. Classification algorithms into the realm of research is the development of softcomputing : fuzzy logic, neural network, and genetic algorithms.

ONTOLOGI-CBBIR

The Web has a large amount of data, to be able to understand and make decisions about the required semantic web. The essence of the semantic web technologies are applied for the representation of information becomes onthology forms knowledge base that can be understood and processed by machines. (Ashwini D Gudewar and Leena R Ragha,2012). Ontology change views toward document-oriented knowledge related in the domain of knowledge, and can be used in knowledge management system, because ontology contains the related knowledge. Ontology-based data model is used to store a database of knowledge. In an attempt to resolve the gaps of understanding the meaning of the key then done designing ontology for storing information and become a good basis for building a semantic function, so that the machine can facilitate ontology to process and understand information so that it is able to improve services for users.

Image Retrieval is the calculation of similarity in the image, on the image search CBBIR batik similar based on color, texture, side edges of the image, and based on the shape of the motifs (rangkuti *et.al*.,2014). To improve efficiency and user friendly CBBIR performance on the semantic web is to build a search mechanism that can be minimized got irrelevant

ISBN : 978-602-9438-50-5

image information (high precision) and can guarantee a relevant image information is not overlooked (high recall).

The result of CBBIR can be improved as in Ashwini, i.e. research with storage indexing image on semantic by creating meaning based index structure by using concept-based model with a dependent domain ontology (Ashwini D Gudewar and Leena R Ragha,2012). In this dissertation done development model with topological relation ontology which supports analysis of texture patterns of hybrid information through color, form, and texture, with the approach of the content features characteristic parameters of statistics.

Domain Knowledge motifs of batik can be built Ontology using Protege OWL (Ontology Web Language) or RDF Resource Description Framework) format. In defining a hierarchy of domain ontology concept/class using the RDF Schema, RDF is used to describe the image metadata storage in accordance with the ontology, and to query the class on the protege is supported with SPARQL. Ontology with information from the hybrid object that exists at the image of batik can facilitate CBBIR in enhancing the recognition of batik making imagery on semantics web. That can be the object of research here is data source Ontology, command ontology, and the user-view ontology (user mapping-view with command onthology, and mapping command onthology with local schema data source onthology).

PURPOSE SYSTEM

This research was developed to achieve the CBBIR efficiency and user friendly on the semantic web. Ontology to improve CBBIR with classifying batik knowledge components specifically in accordance with what is required of the user, it is done by constructing the comprehensible symbols of the human form can be processed by the engine, thus the ontology being the liaison between humans and machines. This research area will generate a search mechanism that can minimize irrelevant information (high precision) and ensure relevant information is not overlooked (high recall). On the initial steps required to define hierarchy and the concept of domain knowledge specifically of batik correctly, as this effect on the results of the classification. Then proceed to map out low level image features to high level ontology concept, using a domain specific ontology of knowledge which can be used for image capture is relevant in accordance with the request of the user.

Ontology models developed using domain knowledge in the form of topological relation connectedness information content in the objects found in the batik motifs based on knowledge of the meaning and origin of the regions. In the image there are various combinations of batik object (the domain ontology), which needs describing relationships between objects in the information content to be presented more the image of batik motif. Domain knowledge batik constructed in accordance with human visual perception and knowledge about batik motif. The domain is a combination concept containing the class from batik motifs and objects which are the characteristics of each of the batik motif. On every object has a data property in the form of low level feature which is the result of a content feature extraction of batik motif.

In building a mapping between the low level features and high level concept can use Description Logic (DL). In this case the DL used to describe relations between the image featured in the ontology. Implementation of Domain Knowledge Ontology using DAML + OIL (DARPA Markup Language + Ontology Interface Language) which is already present in OWL. RDFs (RDF-Schema) is used in defining a hierarchy of domain ontology concept/class, objeck, and data properties. RDF is used to describe the processing image metadata storage in accordance with the ontology on the web, so it can be coded for, exchanged, shared and used. To query the domain knowledge supported by SPARQL.

CONCULUSIONS

From reference to previous studies can be said to address the problem of semantic gap on CBBIR process very precisely by building knowledge domain ontology for batik motifs based on the meaning and origin of the production area. Expectations from this research can generate a contribution in the field of semantic web technologies, namely the form of knowledge management systems motifs of batik from Indonesia based domain knowledge ontology.

To support the mechanism of search engines based on the introduction of of batik motifs based on content, the successful application of ontologies should be able to minimize to get information that is not a relevant image (high precision) and can ensure that relevant information is not lost image (high recall). To calculate the similarity, precision and recall on the success of image recognition batik motifs with ontology based on content that can use weighted Directed Acyclic Graph (wDAG) schema.

REFERENCES

Ashwini D Gudewar and Leena R Ragha. 2012, “Ontology to Improve CBIR System”,*International Journal of Computer Applications*52(21):23-30,

Budiman, Fikri., Sudaryanto, Slamet., Susanto, Ajib., 2012, “Database Design for e-supermuseum Batik Indonesia”, National Conference on KOMMIT. Universitas Gunadarma Depok Jawa Barat.

Budiman, Fikri, 2015, “Study of Wavelet Transformation Method for feature Extraction Characteristics Based In Identifying Authenticity Indonesian Batik”, International Conference on Information Technology and Engineering Application, Universitas Binadarma Palembang.

Imanuddin, 2010, “Batik Identification Based On Batik Pattern And Characteristics Using Fabric Pattern Feature Extraction”, Undergraduate Program, Faculty of Industrial Engineering, Gunadarma University.

Manzoor, Umar., Balubaid, M.A., 2015, “Semantic mage Retrieval : An Ontology Based Approach”, International Journal of Advanced Research In Artificial Intelligence, vol.4 No.4, www.ijarai.thesai.org

Moertini, Veronica S., Sitohang, Benhard, 2005,“Algorithms of Clustering and Classifying Batik Images Based on Color, Contrast and Motif”, PROC. ITB Eng. Science Vol. 37 B, No. 2, 2005, 141-160.

ISBN : 978-602-9438-50-5

Md Nasir, Syerina Azlin and Md Noor, Nor Laila, 2010,"*Construction of batik heritage ontology through automated mapping"*. In: Knowledge Management International Conference 2010 (KMICe2010), 25-27 May 2010, Kuala Terengganu, Malaysia.

Md Nasir, Syerina Azlin and Md Noor, Nor Laila, 2011, "Automating the Mapping Process of Traditional Malay Textile Knowledge Model with the Core Ontology". In: American Journal of Economics and Business Administration 3 (1): 191-196, 2011, ISSN 1945-5488, Science Publications.

Mimi R.I., Thyagharajan K.K, 2014, "Semantic Image Description for Ontology Based Image Retrieval System", International Journal of Applied Engineering Research, vol.9 No.26, Research India Publication.

Putra, Ricky Eka., Suciati, Nanik., Wijaya, Arya Yudhi., 2011 "Implementing Content Based Image Retrieval For Batik Using Rotated Wavelet Transform And Canberra Distance", Articles Bali International Seminar On Science And Technology, Bali-Indonesia.

Rangkuti, A., Haris, Harjoko, Agus., Putro, Agfianto Eko, 2014, "Content Based Batik Image Retrieval", Journal of Computer Science 10 (6): 925-934, Science Publications.

Rangkuti, Abdul Haris, 2014, "Content Based Batik Image Classification Using Wavelet Transform And Fuzzy Neural Network", Journal of Computer Science 10 (4): 604-613, Science Publications.

ISBN : 978-602-9438-50-5