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A Multi-Input Approach for a System for Semantically Relevant Art Creation

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Abstract: Since the advent of Web 2.0 and the flourishing of user-generated content online, the demand for secondary media has increased. The overall value of blog posts, written stories, articles, and other written content is increased by the addition of media such as images.

At the same time, common sense knowledge bases and Natural Language Processing tools continue to improve. While random methods of creating artwork are numerous, methods for creating meaningful, related artwork are lacking.

The aim of this paper is to describe a system-in-progress called ConAr for Japanese, which dynamically creates artwork through the extraction of concepts and common-sense knowledge, lexical and information, descriptive expressions, and affect information using ConceptNet, WordNet, MURASAKI, and ML-Ask.

Key words: ConceptNet, WordNet, Computational Art, Affective Processing

1. Introduction

User content on the Internet has drastically increased in recent years, much of it in user-generated content. This type of content is not professionally created, and the creators of such content often do not have the means, funds, or time to provide multimedia content to accompany written works.

Many methods of close-to-random art generation exist, many of which create fascinating pictures. However, since this artwork is devoid of any semantic meaning, and are not directly applicable to such user content. To remedy this, the authors aim to create meaningful output to be interpreted by the user and are in the process of creating a system called ConAr (short for "Conceptual Artist") for this purpose in the Japanese language. The system utilizes existing natural language processing tools such as ConceptNet, a common-sense knowledge base [1]; WordNet, a lexical knowledge base [2]; MURASAKI, metaphoric expression web-mining tool [3]; and ML-Ask, an affect recognizer [4].

ConceptNet and WordNet were chosen for the richness of their relations concerning of real world concepts as well as for their availability. MURASAKI was chosen for its ability to extract information about concepts from the web, and ML-Ask was chosen for its ability to extract affect information from utterances.

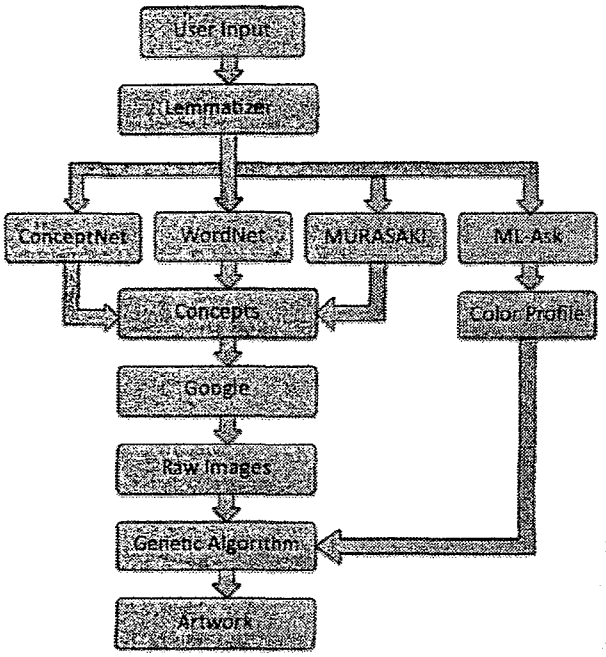

Figure 1. The ConAr System Flow

2. The ConAr System

ConAr operates in three phases and is designed to be extensible.

First, user input is parsed and conceptual, lexical, metaphoric, and affect information is extracted.

Next, ConAr collects images associated with these concepts from the Web.

In the final phase, the information and images from previous phases are combined into semantically meaningful artwork using a genetic algorithm.

ConAr is a work-in-progress, and as such the following describes the system in its future finished form. Refer to the final section for a description of the current status.

2.1 Concept and Lexical Extraction Phase

User input is first separated into words using ConceptNet's Japanese front-end parser created by Roberts, et al [7], itself a front end for the well-known Mecab parser [5]. Stop words and duplicates are removed, and all words are reduced to lemma form.

Using the lemma forms input, four sub-phases are invoked:

1) Query ConceptNet for conceptual relations.
2) Query WordNet for related lexical entries.
3) Query MURASAKI for descriptive.
4) Query ML-Ask for affective content.

The results of sub-phases 1, 2, and 3 are concepts that are combined and ranked for relevance. Relevance for a given concept is calculated through a simple voting algorithm: each time a concept appears in a relation with any concept extracted from the main text, it receives a single vote. Votes are treated as raw scores and not scaled.

The result of sub-phase 4 is affective state information to be used to create color profiles by mapping affective states to appropriate colors according to the research performed by Valdez et al[6]. These profiles are used later to create images with appropriate emotional messages.

2.2 Image Retrieval Phase

The top 10% of the ranking concepts extracted in the previous phase are selected and searched for through the Google Image Search API (arbitrary user selection of concepts is possible and is used to break ties).

The results of the image search are then filtered through interactive user selection.

2.3 Image Creation Phase

ConAr uses a Genetic Algorithm (GA) to create the final artwork. The GA operates by defining the operators listed below. These operators constitute an artwork style. Styles are arbitrary, of any number, and at the control of the creator of the style. The operators in each style have access to information and images extracted in previous phases, internal GA state, and any other arbitrary data, including user-supplied options.

Operators:

populate – Creates a random GA organism. Determines the initial state of images the GA will work on.

fitness – Gives numerical score indicating how "good" a given GA organism is. Determines the basis on which the GA will attempt to make better images.

mutate – Randomly modify a given GA organism. Determines how the GA will vary organisms between generations.

crossover – Create a new GA organism given two parent organisms. Determines how the GA will combine organisms.

3. Current Status and Future Work

Future work for this project is primarily the implementation of the remaining parts of the system. At the time-of-writing, Concept and lexical extraction is functional, but linkage to MURASAKI and ML-Ask has not been completed. Image extraction is complete and functional and the image generation phase is currently underway.

The first improvement planned once the system is function is in the concept and lexical extraction phase. Ranking of related concepts is crude at this point. To remedy, integration of ConceptNet's gisting functionality and Divisi, a semantic network framework developed by MIT[8], are planned.

The interesting portion left in ConAr development will be in the creation of styles. Since styles are open ended, may have arbitrary parameters, and allow randomness, a great deal of work is likely required to create engaging imagery. A few of elementary styles to be implemented are:

1. A style that stamps images into a target artistic composition.
2. A style that creates photo collages with color map.
3. A style that combines text input with images.

Most styles are likely to make use of the color map created by ML-Ask affect analysis.

4. Conclusion

ConAr is a new system in development for the semi-automatic creation of semantically relevant artwork to accompany textual works. The system uses a variety of different sources to inform its creation of the final artwork.

ConAr is a system-in-progress, and requires further work before it can be evaluated as a whole.

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