Generating Creative Ideas Through Patents

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Abstract. This paper describes a creativity support system for assisting human creative activities through patents. It integrates problem definition, reminding, creating, evaluating, and visualizing modules to automatically generate creative ideas. The system utilizes natural language processing techniques to map the patents to vectors by which related patent objects are automatically reminded around the given problem. These reminded objects are divided into text fragments, from which new idea can be generated through an interactive genetic algorithm. The system differs from existing creativity support systems in that it automatically reminds patents and generates creative ideas. This has been empirically validated by the conducted experiments.

1 Introduction

Most people facing ill-structured problems tend to think within a bounded, familiar, and narrow subset of the potential solution space, thus they routinely overlook up to 80\% of the potential solution space\cite{12}. Thus lots of creativity support systems are proposed to help people solve these problems\cite{3,4,5,6}. Two primary approaches to study creativity support systems are used: intuitive and logical\cite{8}. Intuitive methods use mechanisms to break what are believed to be mental blocks, such as the cognitive network model (CNM) of creativity\cite{1} and the four-phase framework for creativity\cite{13}. Logical methods involve systematic decomposition and analysis of the problem, relying heavily on technical databases and direct use of science and engineering principles. To integrate with aforementioned two approaches, a new theory called Computational Creativity Dynamics (CCD) is proposed\cite{20,9,11,12}. Based on this theory, we develop a creativity support system named PatentProducist that emphasizes the usage and access of patent information. The reason is that patent gazettes reveal over 90\% of research results for the patents, while more than 80\% of information is not enclosed in academic theses and publications\cite{11}. PatentProducist focuses on the very beginning of the creative design process, going from “no ideas” to “some ideas”, which hopefully include “some potentially important design concepts”. These novel ideas are provided for user as creative stimuli for further thinking.
2 Patent-Based Creativity Support System

CCD provides a framework for mathematically integrating the various aspects of creativity that are commonly omitted or treated haphazardly by existing methodologies. We have applied it to develop an interactive prototype creativity support system called PatentProducist to generate the novel ideas using patents.

2.1 System Architecture

The system is structured into several parts, as shown in Fig. 1, where problem definition, reminding, creating, evaluating, and visualizing modules serve as to generate creative ideas. Patent Search Engine searches and captures recent patent abstracts and full text into the local patent database. Learning module aims at acquiring inventive knowledge, construction of patent tree and domain knowledge either interactively or semi-automatically from patent databases using statistical approaches. The patent database consists of Chinese patents, which supplies a large amount of text data for the system to remind and create new ideas using natural language processing techniques and computational creativity techniques. The knowledge base involves knowledge such as Inventive principles for elimination of engineering conflicts, inventive standards, etc. These kinds of knowledge are summarized from TRIZ Theory.

![Fig. 1. Architecture of System PatentProducist](image)

2.2 Problem Definition

Problem definition module provides the interface for the user to define the problem they want to solve. It aims to define the problem clearly in a concise and simple manner. Users just input the text name of the object they want to design, and choose some existing exemplars similar to the problem from the patent database by searching on several keywords. If he does not become conscious of words