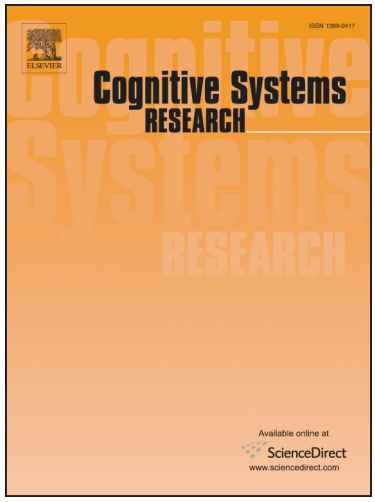

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Knowledge Network Model with Neurocognitive Processing Capabilities

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ABSTRACT

The prime focus of scientists and the researchers in the field of intelligent systems is oriented to understand and replicate information processing functionalities of the human brain network. There have been continuous efforts to develop an intelligent knowledge system that incorporates the neuronal processes involved in cognition. In this paper the authors give some details of their unique work on the development of a knowledge system with information processing functionalities moving towards cognitive processing of the human brain, using intelligent links and nodes with processing capabilities. The existing knowledge systems connect only the pieces of information represented by nodes of a network and connect nodes using connectors, referred as edges. The edge is an attribute defining a relationship (e.g. isA, hasA) between the nodes. These edges lack cognitive properties, and the nodes lack functional processing to support efficient information transfer between nodes. The main objective of this paper is to provide an overview of the characteristics of a neurocognitive knowledge network model (NCKM) developed by the authors. NCKM is a knowledge network with nodes and links developed to provide methods that deal with the cognitive processes of the human brain, useful for efficient information processing. These cognitive processes provide self-directivity and learning within the network for intelligent knowledge retrieval. This work opens up a pathway to ingrain cognitive and neuronal characteristics for information processing into knowledge networks.

Keywords

Self-directive; Cognitive processing; Neurocognitive Networks; Intelligent knowledge systems; Neurocognitive Knowledge network Model (NCKM)

1. INTRODUCTION

A knowledge system with information storage and processing capabilities comparable with the human brain has been the prime focus of artificial intelligence (AI) research.

The work in the field of intelligent knowledge systems commences to get answers to two fundamental questions: how knowledge is defined; and what does it comprise? There are different theories that define knowledge; there is no single definition at present. One such definition of knowledge is "a fact or a condition of knowing something with familiarity gained through experience or association" (Davis, Shrobe, & Szolovits, 1993; Denning, 2009). According to Merriam Webster's Dictionary, knowledge applies to facts or ideas acquired by study, investigation, observation, or experience. Authors believe that incorporating facts and interlinked concepts in the system constitutes knowledge.

Abbreviations: NCKM, NeuroCogntive Knowledge Network Model; KNN, Knowledge Network Node; AKU, Apex Knowledge Unit; SKU, subsidiary knowledge unit; ILS, Informledge System

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Knowledge that is the soul of a knowledge system has found its implementation in various systems like expert systems, web search engines, brain simulation, brain emulation projects and knowledge-Based Neurocomputing (KBN).

Various knowledge-representation techniques have been used for information storage in different knowledge systems. An expert system represents knowledge of a narrow domain as rules in the form of IF-THEN and an inference engine that control the application of the rules. Various application areas of expert systems are monitoring systems, diagnosis systems, design systems, investment analysis systems, and so on (Jackson, 1998). A web search engine consists of a huge repository of ranked web pages, that satisfies the user queries for information retrieval (Buettcher, Clarke, & Cormack, 2010). The user queries can be a keyword search, phrase search or document search (Liu, 2011).

Knowledge representation for brain simulation and emulation projects calls for sophisticated modeling and application of advanced principals derived from the interdisciplinary domain of computer science, physics, neuroscience and cognitive psychology. Brain