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A Survey on Knowledge representation learning

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Abstract

Knowledge representation is among AI's most basic questions as well as one of its most essential notions. Extension data mining, on the other hand, generates transformable information, that expands knowledge base required for the generation of an extension strategy. Utilizing finite automata, we now have a novel way to describe knowledge in the context of the data mining. This paper offer a brief review of the structure and techniques that have been developed in this different discipline.

Keywords: Data Warehouse, Data Mining, Clustering, Data Integration, Pattern evaluation, Knowledge representation, Retrospective tool.

1. INTRODUCTION

In the past, knowledge representation techniques in Artificial Intelligence (AI) provided powerful mechanisms for the hierarchical storage of knowledge and to manipulate them with deductive inference. Such systems used intelligent rules to perform effective clustering and classification of documents so that it is possible to perform fast retrieval. However, the storage techniques were used only in knowledge-based systems but not in database systems. Hence, the natural language sentences used in e-Learning scenario are to be stored in database systems. In such a scenario, suitable indexing techniques are not provided for cloud databases. Therefore, the knowledge representation techniques from AI can be used for logical representation of data and a corresponding mapping to the physical database can be made to store the data in the database systems.

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It is widely accepted in cognitive research that there are indeed two primary methods for representing knowledge: First, there is also symbolic approach, that also uses nodes to represent concepts but also arcs to show relationships in between concepts to represents knowledge visibly; second, there's also the descriptive logic approach, where it uses more formal language to construct categorization definitions but also algorithms to decide on relationships in between the concepts [1]. A conventional notion of knowledge representation is used by both methods, in that concepts are defined using a set of qualities that are either adequate or essential [2]. When it comes to building large-scaled knowledge bases, these approaches have proved effective, but there are substantial issues that prevent their practical applications to the agents functioning in a social context. Among the issues are:

- Costly and time-consuming idea acquisition
- Difficulty in defining and identifying features
- A lack of expressive capacity to adequately reflect the circumstances

Representation of the knowledge in artificial intelligence is called Knowledge Representation (KR). An intelligent agent's ideas, intentions, as well as judgements are examined to see whether they can be articulated in a way that can be used by machines. Modeling intelligent behaviour for just an agent is a major goal of (KR) Knowledge Representation.

Using a method known as Knowledge Representation and Reasoning that is (KR, KRR), the information from the actual world is represented so that a computer can comprehend and use it for solving real-world issues, such as conversing with humans in natural language. Rather than just storing information, AI's approach to the knowledge representation enables a computer to draw on that material and develop the same level of reasoning abilities as a person. [3].

AI must be able to represent a diverse array of knowledge:

- Objects
- Events
- Performance
- Facts
- Meta-Knowledge
- Knowledge-base

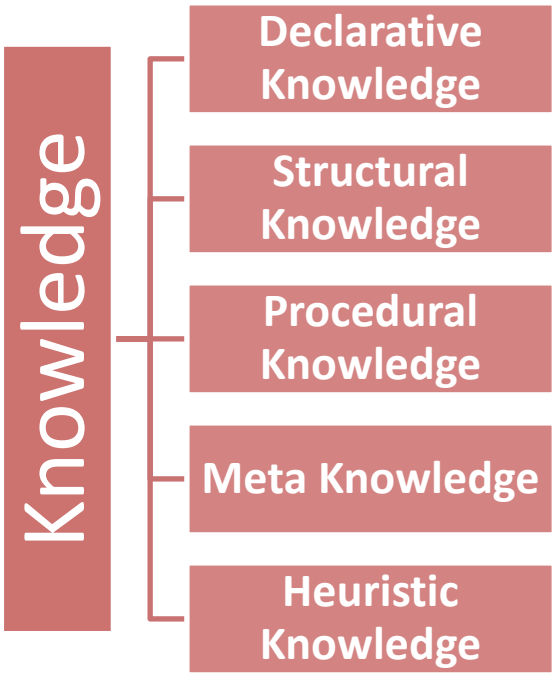

Figure 1: Different Types of Knowledge

- **Declarative Knowledge** – It is a declarative phrase that incorporates ideas, facts, as well as objects.
- **Structural Knowledge** – Knowledge of the link between ideas and things is a fundamental problem-solving skill.
- **Procedural Knowledge** – Having a working knowledge of how to accomplish a task is the responsibility of this term.
- **Meta Knowledge** – In those other words, "meta knowledge" refers to information about the other sorts of information.
- **Heuristic Knowledge** – This demonstrates a certain level of expertise in the sector or subject matter.

2. The relation between knowledge and intelligence:

Intelligence and the creation of artificial intelligence both rely heavily on knowledge of the actual world. In order for AI agents to seem clever, they must have access to knowledge. Only by having some prior information or experience of the input can an agent correctly act on it [4].

How would you respond if you were confronted with a stranger who spoke a language we do not really understand? The same holds true for agents' intelligent behaviour.

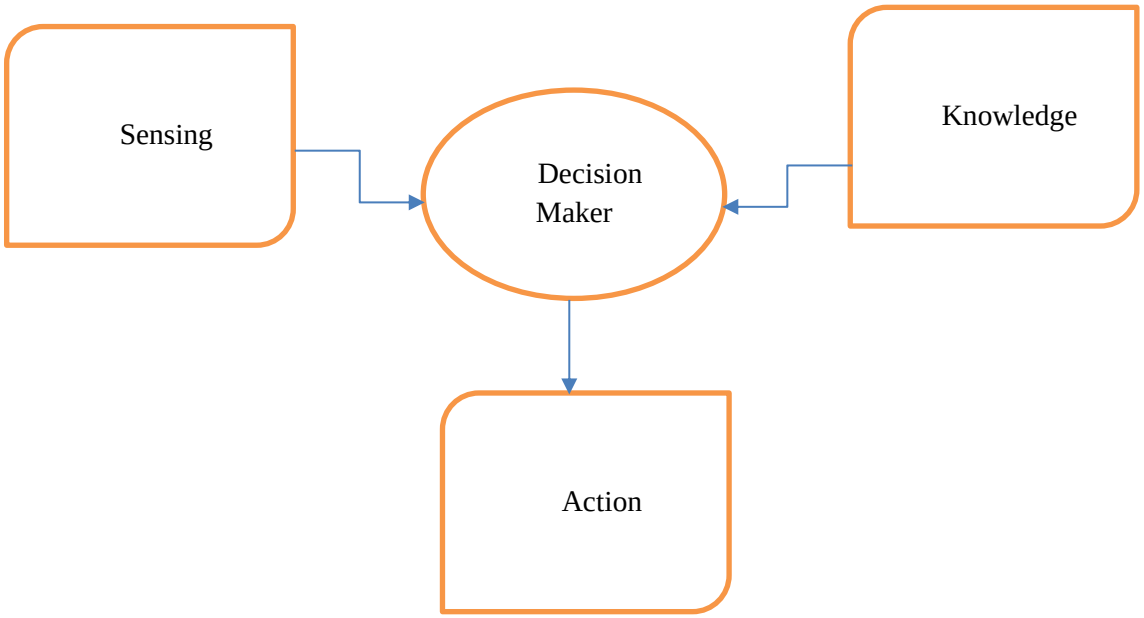

Figure 2: Example of intelligent behaviour

As seen in the flowchart above, the decision maker makes decisions based on information gleaned from environmental sensors and experience. However, intelligent behaviour cann't be shown if indeed the knowledge component is absent.

3. Life Cycle Of Knowledge Management

There are normally eight phases in the life cycle of a knowledge management project. Starting with the production of knowledge and ending with its use [5]. The eight distinct phases of information management, as well as a tracking function, are all required for managing information, even whether something multimedia for the marketing or even the heuristics for decision-making. Knowledge Management life cycle is made up of these phases:

1. Knowledge creation or acquisition
2. Knowledge modification
3. Immediate use
4. Archiving

5. Transfer
6. Translation/repurposing
7. User access
8. Disposal

The idea of "knowledge" is undergoing significant transformation in light of the fast growth of the knowledge-based economy. The first step in any discussion about knowledge management is to understand what the term "knowledge" really means. Facts about the concepts of the "knowledge" that have been widely accepted include: the significance of awareness throughout an acquisition of knowledge, inseparability of the knowledge as well as its carrier, the distinction among knowledge as well as data, and the preconditioned nature of other forms of knowledge, among others. As seen in Table no. 1, each degree of knowledge has an own hierarchical structure. In the first layer of a hierarchy, we have data. Objects or even events may be described in terms of their data. They don't have a clear goal in mind. Sometimes, data isn't included within the activity at all. Aside from fixing a specific issue, data collecting is sometimes carried out without regard. The information has been at the very second level of hierarchy. In contrast to data, information has a more precise purpose wherein the data are integrated with process of it's own processing in order to achieve. Questions like 'where,' 'what,' 'when,' 'who,' and 'how' all start with "what," "who," and so on.

Table 1: Levels of Knowledge

Level Example	**Execution of the order on employment**	**Purpose**
Data	There are many things to consider, such as employee's name, date of hiring, educational background, department, and position.	Nothing of interest to learn here.
Information		Understanding - what
Knowledge	Request towards data base of the young workers employed in last year (identity of employee, date of hiring, qualification, division, job)	Understanding -how To find out why
Wisdom	Upon being hired, the order is automatically fulfilled.	Nothing of interest to learn here.

Knowledge is found at the apex of the food chain. The "how" issue is answered through training as well as the dissemination of knowledge. Rather than just being a collection of facts, knowledge is a state of mind that includes the capacity to synthesise information from many sources and organise those efforts in order to achieve a certain goal. A "why" inquiry is indeed fourth degree of knowledge in hierarchy. Wisdom may be defined as "meta-knowledge," example, "knowledge of the knowledge" itself. In the cognitive psychology, "wisdom" has a broader definition. These human skills are often connected with the wisdom:

- Achieving a successful outcome by balancing the many interests;

- To integrate new information by considering opposing viewpoints
- To recognise your own errors and limits in knowledge;
- To identify and articulate the difficulties (as the consequence of the creative thinking).

After moments of optimism and predictions of quick advancement, AI as just a scientific subject has experienced periods of stagnation or e decline whenever the findings acquired began to sound unconvincing as well as investment inside the research activity significantly fell. When artificial intelligence (AI) approaches were put to use within real economy inside 1970s, the rise of expert systems as well as knowledge-based systems (KBS) was clearly linked to "success stories."

The distinction among "information" as well as "knowledge" is critical in the notion of the knowledge representation, which is the basis for developing KBS (see Table no.-I). Facts concerning the precise characteristics of things, events, as well as processes are known as data. The term "raw data" refers to the information that a computer collects, saves, plus processes. Data is stored in databases (DBs) at KBS, which are known for their large volume and cheap cost per information unit. Information is a tool for elucidating the truth for the general public (data). "But what's it? How does it work? ", these are the kind of questions that information provides answers to. Querying databases for information is one instance of how data may be accessed.

In the context of an application domain, knowledge is described as the objective rules that enable experts to create and solve issues. Because knowledge is utilised to make decisions, it is indeed an understanding of how one should behave. Practice as well as professional experience are the means through which one gains knowledge. Knowledge may also be defined as "meta-data" or even "data about data," which is well-structured kind of data. Knowledge bases (KBs) are being used to store an information, which have a relatively modest volume as well as a high cost.

4. Artificial intelligence impact in knowledge management

The effect of AI on (KM) which is Knowledge Management is wide-ranging, but we can say that AI has such an impact over the availability and speed of real-time processing of the big data, the ease with which knowledge could be discovered, the improvement of the customer relationships, the maintenance of current content throughout knowledge bases, as well as the improvement of company management. Big data may now be accessed and processed in real time thanks to AI. Artificial Intelligence (AI) is increasingly being used to handle the massive amounts of data that are now being exchanged between people and divisions of a company, both locally, nationwide, and worldwide, and to swiftly turn them into meaningful information. Unstructured data like text, photographs, videos, and other visual representations may be analysed by AI to uncover new patterns and insights. Natural language processing, even Semantic search including machine learning are some of AI tools that make it simpler for workers to get information they need. Artificial intelligence (AI) makes it easier to find information

in a company's vast knowledge base. Employees may search company's knowledge base utilizing natural language thanks to semantic search as well as natural language processing in the AI. Machine learning tracks search phrases as well as user behaviour throughout the time to make predictions well about kinds of things people are searching for in workplace. By linking data from many sources, AI makes information more accessible. Artificial intelligence aids workers who are unsure of where to seek for information. Workers may link and aggregate knowledge across many systems using AI-powered software, allowing all the employees to access information regardless of the where it is housed. Customer service may be greatly improved with use of AI, which can create and use fresh information about customers' behaviour as well as demands. Search engine optimization (SEO), to enhance organic search performance, marketing for content, to personalise content output for every user as well as, generally, to adapt towards the needs of user depending on learning from the previous behaviour, are instances of AI have been used in the Chatbots, the mapping possible solutions gathered from past conversations. Archetypes with in data may be recognised by AI, allowing for better segmentation as well as handling of customers.[6].

Utilizing machine learning technology, AI aids workers in locating the most current information in company's knowledge base. User-rated information would no longer be sent by AI as well as will instead be replaced with content that better satisfies user intent. When AI is utilised to facilitate or enhance managerial activities, it may strengthen overall management of organisation. Artificial intelligence (AI) models that self-learn enable businesses to swiftly adapt following changes within patterns of an internal or external data as well as underlying economic circumstances. When you utilise AI to maximise value of your data as well as go from the predictive analytics towards prescriptive analytics, you can make better as well as quicker choices [6]. The following are some examples of AI-powered toolkits: [7] considers 1) Evie for the meeting scheduling, 2) Aiden AI for the growth empowerment, 3) Datasine for the email content personalization, 4) Attest for the strategy validation, 5) Unito for the work maintenance, 6) Freeagent for financial and accounting simplification, as well as 7) Bizplan for business planning perfection] as the most important.

Artificial Intelligence has been shown to have a positive influence on the management of the knowledge in a variety of ways. "Artificial intelligence has already brought a huge contribution to the excellence and effectiveness of KM in term of thinking and problem-solving methods, but also through knowledge acquisition, modelling and processing, decision support systems, intelligent tutors, planning, scheduling and optimization systems"[8].

Conclusion

The advancement of information technology has made it possible for us not just to collect data but also to transmit it to appropriate people in real time and error-free. Such raw facts are transformed into information and subsequently into knowledge via a series of intermediary processes in the Knowledge Management strategies. Experts in their fields play an important part in this. Predictions and forecasts

based on the knowledge management inputs are generated by artificial intelligence programmes. These results are put to good use in a wide range of fields, from medical diagnosis to stock market forecasting. The quality of artificial intelligence (AI) systems' output is directly related to the quality of its knowledge management. For even more precise estimates of any of the system, particularly business-related systems that already have a lot of data, information technology must be used to develop these principles. Researchers in relevant domains have been expected to do so.

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