Keshav Jindal et a. International Journal of Recent Research Aspects ISSN: 2349-7688, Vol. 3, Issue 3, September 2016, pp. 106-111

A Multi Agent Structural Design For Production Scheduling Using Distributed Case Based Reasoning

Keshav Jindal[1], Dr. Ripuranjan Sinha[2], Dr. S. Srinivasan[3]

[1]Research Scholar, Suresh Gyan Vihar University Jaipur

[2]Professor & Associate Dean, Suresh Gyan Vihar University Jaipur

[3]Professor & Head, P.D.M Engineering College, Bhadurgarh, Haryana

***Abstract*- In these days, the production system of particular items must deal with globalization, proliferating product variety, organizational barriers, and quick information sharing. Consequently, appropriate tools are needed to efficient support supply chain management. We believe that multi-agents are good candidates to overcome these challenges. In this research work, we propose MAS based Decision support system (DSS) which is a Multi-Agent System (MAS) to run the production activities efficiently. This research work is totally focused on the problem of designing of the Decision support system with aiming of running the production activities effortlessly. Such system is a well-known indication of coordination difficulty in conservative production system.**

Keywords-DSS, DCBR, MAS, CBR

I. INTRODUCTION

In Artificial Intelligence, there exist multiple technologies and mechanisms that can be utilized to implement the efficient communication and ordination between various entities. The intelligent agent is one of the emerging fields of AI. The intelligent agent is automatic; cooperative and own knowledge base. The groups of the intelligent agents build the multi-agent system.

The MAS technology guarantees proper communication, coordination and information flow among a mixture of functions in the DSS. The MAS based Decision Support System is incorporated with a model management system which includes Case Based reasoning (CBR), Data Mining Systems and several mathematical models. This system will minimize the causes of the decision to a great extent. The DSS processes recognize the organization goals, their objectives, outlining policies, strategies and controls for its effectiveness and well-organized implementations. The DSS should be energized to congregate any newfangled challenges from numerous instructions including suppliers, customers and supplementary exterior and interior factors. For this purpose, the strong modeling technologies are required to maintain the complexity involved in DSS. Also business changes fast, collaboration and coordination are vital in DSS, the combination of SOA and MAS is the perfect solution for the organization to meet its objective. The Decision support system consists multiple entities for managing the customer requirements and fulfilling the organization goals. As simple view, the DSS may be considered following elements as given below:

• Fundamental elements

These elements define the overall basic configuration for the completing the Decision support operations. There are mainly emphasized on the productions and transport decisions.

• Strategic elements

These elements manipulate the decisions involved in whole Decision support activities such as information flow, inventory control, and demand forecasting and product delivery.

II. REVIEW OF MULTI AGENT BASED ON DSS

Collinson PO (1997) proposed Health Intelligence System is a straight included decision support system (DSS) considered to get together the necessities designed for intelligent real time scientific information managing in important checkup surroundings plus establishment for the expansion of the subsequently propagation of intellectual health mechanism. Clinical HIS is an object oriented structure developed in C++ to execute under Microsoft Windows as an origin intelligent agent [8].

Maurice E. Cohen (2002) presents an achievement of neural networks in analysis depends not single on knowledge method and system organization except also on information superiority. If inadequate data are obtainable, additional data should be integrated. In this effort, expert resulting meta information complement a hierarchy of neural networks so as to jointly act as an intellectual agent. [9].

Balter J (2002) in this article, the writer presents a MAS structure for data mining. This appliance, foundation on a network line, presents a set of functionalities permitting operating several cases and more than thousands of neurological examinations amass in a health check database. The plan is to extort health data using data mining algorithms as well as to provide an information foundation with relevant data. The multi agent policy gives the opportunity to deal out the information managing procedure involving quite a lot of independent things. This structure offer a corresponding with flexible information handling.[10]

Zaid Hassan (2002) proposed as a container for an intellectual agent base structure for information detection in a dispersed healthiness care surroundings containing several assorted healthcare information warehouse.

Information arbitrates information modernism, particularly from several assorted information possessions, is a monotonous procedure as well as imposes important prepared restrictions on end consumers. We exhibit that independent, susceptible plus anxious intelligent agents nearby an occurrence to manufacture end-user leaning, enclosed, significance extra decision support scheduling services for healthcare proficient's, manage as well as strategy manufacturer, without the required for a priori methodological information. While effectual healthcare is stranded in good message, knowledge allocation, continuous knowledge and energetic events, we utilize intelligent agents to execute an Agent based Data Mining Info arrangement that provide a collection of healthcare oriented decision support scheduling services.[11].

Okba Kazar (2004) presents an The medicine domain is an enormous surroundings differentiate by its communal plus disseminated decisional feature, along with its organization of mind, necessitating a announcement and a composite organization of the a range of scientific shapes of orientation among the various medical departments, doctors and patients. The introduction of multi-agents system into the medical fields facilitates the management of the decisions and the actions, and ensures the communication and coordination by reducing the errors of diagnosis and treatment, and by improving time required to seek the medical resources, and other medical departments. The purpose of this article is to recommend a multi-agents system (M.A.S), which allocates the analysis on three agents. Every agent is a expert intelligent in the direction of choose plus corresponding through the additional agents. [12].

Horacio (2004) presented a physical condition agent, its get better the categorization of brain tumors throughout multi agent decision support (MADSS) over a scattered system of restricted list. Physical condition Agents determination not single expand new example detection technique for a distributed categorization along with investigation of DNA data, other than as well define a technique to evaluate the superiority with usability of a new applicant confined list surrounding a situate of new suitcases, foundation on a consonance achieve [13].

Zhou et al. (2013) improved the assurance stage of stock assortment contain the expansion of an intelligent decision support system called TradeExpert, which help, not replaces, collection managers. TradeExpert unspecified the position of a imaginary securities forecaster competent of analyze stocks, calling promote turn, and creation recommendation. It had a information pedestal of stock trading proficiency, and a case base of precedent occurrence and outcome of decisions. By combine knowledge-based difficulty solve with case-based reasoning, TradeExpert show forms of intelligent performance not up till now experiential in conventional decision support systems and specialist scheme. The innovation of this investigates lied in its submission to analogical reasoning and knowledge based decision manufacture [14].

Yin et al. (2014) developed a CDSS for prime annoyance disarray judgment foundation on rule based and case-based reasoning in regulate to reproduce a annoyance specialist's thoughts procedure. Initially, the new case was appraise by rule-based reasoning, the rules approach from annoyance clinical principle; Subsequently, if rule-based reasoning was incapable to get precise respond, case-based reasoning would find the nearly all comparable case in case files based on comparison corresponding. In exacting, they defined a comparison scheming technique for main annoyance case. The concluding results demonstrate that the planned approach enhanced the analytic correctness noticeably compare to the rule-based principal annoyance judgment systems [15].

Mello et al. (2015) presented a decision support method explained by a common decision-making procedure, aid by the CBR representation, because ITIL do not recommend declaration of occurrence with similarity as well as IT surroundings hardly ever found consistency for calculation by similarity. Thus, the intent was to make possible decision-making plus generate consistency in the declaration of occurrence allowing for calculation by similarity. A example build with the structure JColibri serve to authenticate the suggestion of this occupation [16].

III. PROBLEM FACED IN EXISTING MAS BASED DSS

In the process of implementing the DSS, the MAS technology builds and creates multiple intelligent agents. These intelligent agents are being designed with predefined roles and responsibilities. With specific roles and responsibilities, these intelligent agents are being directed to achieve their own goals. It is possible in single intelligent agent application environment. But in case of the multi-agent system, there is a system goal but having no global overview. For achieving the system goal there must be coordination between these intelligent agents in the multi-agent system.

Coordination problem

The problem of coordination in multi-agent systems is of critical importance in implementing the DSS phenomena. In the DSS system, one type of intelligent agent is stimulating with accomplishment of various objectives. In another case, the actions to being performed by one agent depend on that action performed by another. Hence the failure of one agent to coordinate its outcome with others could be major terrible. If the Demand Agent fails to coordinate the forecasting values to the Production Agent, the Manufacturer Agent will not capable of preparing the production schedule and Inventory Agent will not capable of making the decisions regarding the inventory control. There exits numerous reasons for facing the difficulties in achieving effective coordination in a multi-agent system.

In regulate to create more knowledgeable decisions; the agents have to obtain a vision of the task structures of other agents. For solving the problem of coordination in the multi-agent system, multiple coordination models are being developed for generating the cooperative distributed computing environment in which agents interrelate and assist to accomplish their own goals along with fulfilling the system goals of the community. In a

cooperative computing environment, the agents have typically individual potentials that help in solving the entire problem.

There may be two ways of achieving the coordination between these intelligent agents. In the first model, the agents are working with collectively motivated or collectively interested mode by nature as they are aimed to work in such way to achieve a common goal along with its predefined roles and responsibilities. This model is totally oriented on the concept of the cooperation between the agent groups. This model is found suitable only for the closed connected systems where the agent groups are designed with the priori along with interaction protocol and the strategy for each agent. There exists another possible model in which the agents are self motivated or self interested agents by nature because every agent has its individual goals and perform the tasks in competition with the other agents for achieving these goals. This model is totally oriented on the concept of the competition. The competition may be defined in terms of the resource allocation or awareness of convincing tasks.

This model requires the agents to coordinate their specific actions with other agents for the purpose of ensuring their consistent behavior. This model is found suitable for open systems that allow designing the agents for dissimilar entities for different working status. These issues are not specified and known at design phase. For achieving the coordination of the activities occurred in MAS, and then inconsistency may occur due to the occurrence of the multiple activities by different intelligent agents at the same time. There is one of the fundamental approaches to crack these conflicts may be known as the negotiation. The negotiation may be defined as the process of identifying interactions based on communication and reasoning concerning about the circumstances and intentions of other agents. In MAS based DSS, both models are found inefficient in implementing the coordination between the various activities performed by various intelligent agents during achieving common goals. Hence we require some better technology for achieving the coordination of DSS activities.

3.2 Incapability of learning

All the intelligent agents in existing MAS based DSS system are incapable of learning from the working environment. These agents are not capable of gaining the experience from the past solving problems during its operations. They take the decisions using the rule-based reasoning approaches. In the rule-based reasoning approaches, there exist the rules for determining the next actions to be taken for completing the DSS operation.

The wastage of the past experience of problem solving is main drawback of this approach. This method is not capable to exploit the past knowledge of difficulty solving. This approach is not looked like the human reasoning approach. The human reasoning utilizes the past experience of problem solving during past time periods. Hence to implement the human decision-taking process in the decision activities so the architecture should be modified for building the intelligent agent in the MAS based DSS system.

IV. PROPOSED SYTEM ARCHITECTURE

In last section we have discussed the problem faced in the existing the Multi-agent decision support system. These problems formulate the worst force on the performance of the decision support system. Such scheme is not able of production schedule efficiently. Without removing the above difficulty, the DSS system will be not capable of fulfilling the customer requirements timely with achieving the organization goals. There may be following solutions of these problems given below:

In our Proposed System Architecture case based reasoning (CBR) is organized by passing on diverse case base to every agent, which is conducted by the information association provided by coordinator. Managerial arrangement can be defined according to two dissimilar methods:

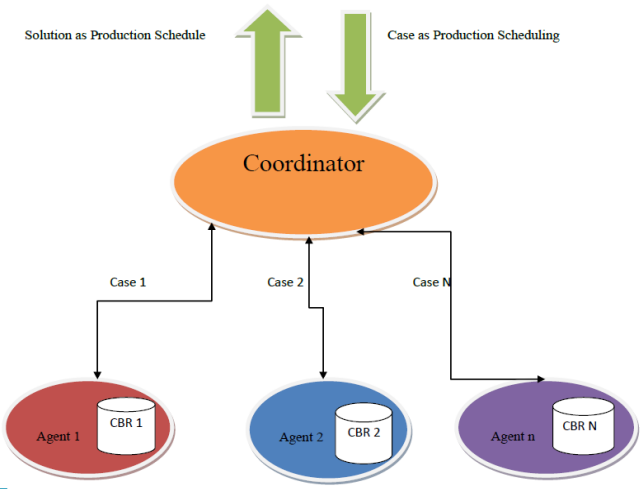

Figure 1. Distributed Case Bases with Agent

- Functional bifurcation by ability, so that informatio4.n from the producer, supplier or the distributor is reserved individually, whilst forecasting with a known seller is shared.
- Spatial decomposition by data basis or judgment point, where a few overlapping of data might be happen. Interactions of knowledge's with dissimilar dealer are used to asses a latest forecasting. Both organizations are appropriate approaches in a production field. Thus, here CBR agents as part or causes of information. CBR agents are accomplished to correlate with each one, they meet the expense of their hold decision (retailer and confidence), then, a coordinator agent formulate a final decision based on a weighted determination scheme. Now, we want to solve a new case C to be solved, the coordinator agent distributes the case C to each case based reasoning agent. Every agent j calculates its own estimation subsequent a case based reasoning (CBR) performance. As a consequence, each agent sends its individual result back to the coordinator (e.g., 0 for not found the cases and 1 for find the results or infirmity samples) and a assurance δ in its approximation. Both, approximation as well as δ

is the result of the CBR retrieve and revision phases. Examine than in secluded schemes, δ is not give but it is in the multi agent system (MAS) methods. The δ cost is determined as an occupation of the cases mainly likes to C plus the percentage among positive and negative explanation of these nearly all similar cases is also taken into description. Every one agent pursues the same retrieve and reuse approach, but they use different information.

The coordinator agent finds the answer to the case based on the explanations of the dissimilar agents. For that reason, the coordinator keeps a weight w_j relating to the consistency on every agent j. The weights have been entered by the customers or learned by the tool. Using agent weights and assurance in the forecasting, the coordinator agent brings together all the confirmation in relation to optimistic confirmation (v+) and unenthusiastic cases (v−).

V. PROPOSED CBR FRAMEWORK

This part presents an explanation of our proposed CBR system. The structural design of this scheme is shown in Figure 2. It has many sections. These are: Case source training module, case base ontology, case retrieval engine, case query parser, and human interface modules. The next sections describe the architecture of the proposed framework for details.

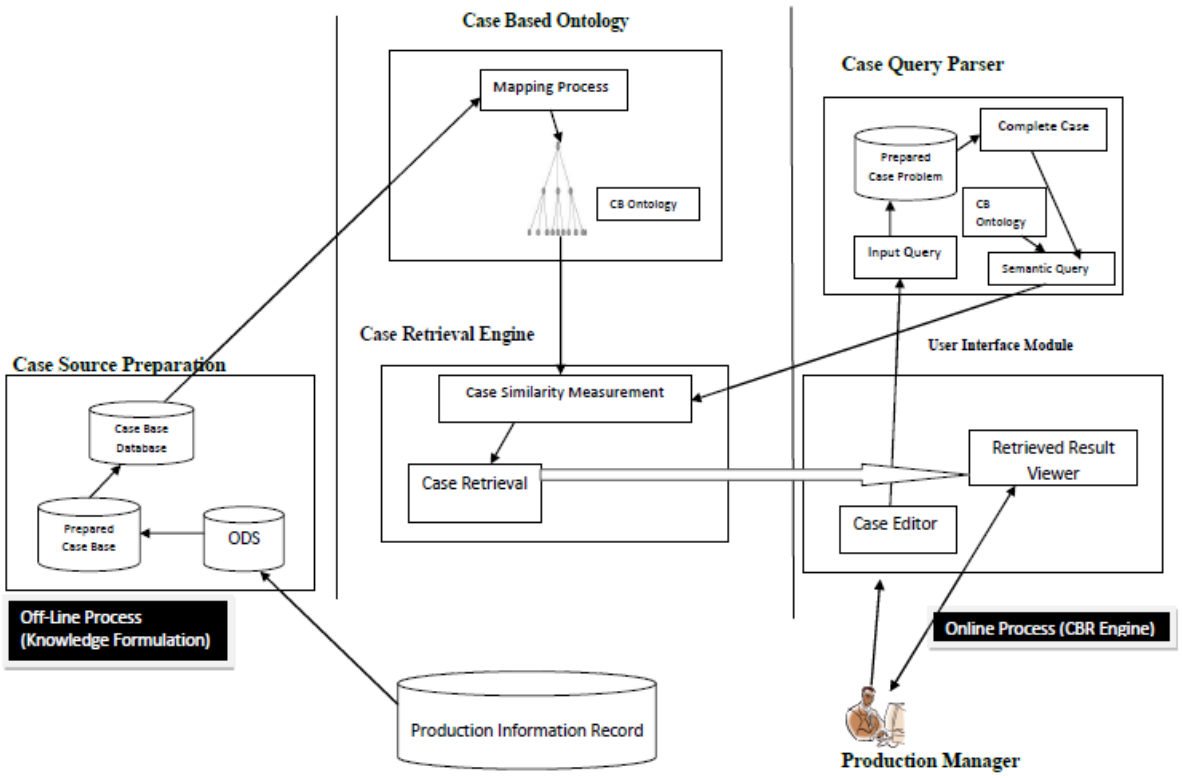

Figure 2 Working of Proposed CBR Framework

Case source training module

This section organized the PIR (Production Information Record) raw information to a case base configuration as well as contented. It composed the production's characteristics associated to a production system commencing distributed PIR systems and accumulated in an Operational Data Store. After that, this information was cleaned, in addition to consistent. Features weights were deliberated using mechanism knowledge algorithms. In conclusion, the prearranged case base was fuzzified in a relational database.

Case-base ontology population

We have created a fuzzy database for the proposed EER (Extended Entity-Relationship) model and filled it with different cases of production system. These data have been collected from the Production department of 20 products in Durge Motors. This record is the basis for populating our proposed case base ontology.

Case query parser module

In this module production manager enters the new product explanation in the query form; this structures the new case exclusive of a solution. Subsequently, the query is break or converts in the form of sub query and coded with the similar approaches used for the case base ontology to assist similarity and planning. The new difficulty organization is altered into the fuzzy case base ontology expressions by several strategies; then, the semantic query is throwing to the Case Retrieval Engine to calculate the similarity among the query notions and the notions of the innovative semantic query difficulty.

Case retrieval engine module

In case-base ontology, the cases are exhibit as idea instances and their features as associations as well as belongings. The case retrieval algorithm exploit the organization with contented of the ontology to examine

the semantic comparison between the features and consequently for the cases.

VI. CONCLUSION

Distributed Case Based Reasoning (DCBR) is an imperative method in artificial intelligence, which erstwhile functional to different kinds of troubles in a extensive range of fields. Selecting case illustration formalism is serious for the appropriate procedure of the generally CBR system. A distributed case based reasoning which mechanism to supporting the expansion along with testing of production decision making in a distributed surroundings. Now, we are listening carefully on innovative user friendly interface considered for testing production actions. The new methods comprise a jointly method for agents under a weighted scheme, approaches that hold knowledge for coordination and cross validation for spatial and functional MAS organizations. We show the use of the technique during researches conceded out with a production database, and we demonstrate how easy it is to evaluate distributed methods that keep obviously distributed production association. In this approach of Distributed case-based reasoning, the multi-agent system becomes more powerful for managing the decision support activities. With the help of the case-based reasoning, the production managers are capable of deriving the most efficient decisions instead of using rule-based reasoning approach. This approach does not allow propagating the past errors made in the past DSS decisions at various levels. The existing MAS based DSS system has ignored the role of the coordinator agent. This entity plays very important roles in the modern complex distributed decision support system. With the help of the coordinator agent, the proposed MAS based DSS have implemented the roles and responsibility of the decision support activities for managing and coordinating the DSS activities. The proposed system can reduce the coordination problem more efficient manner. The usage of the distributed case base enables the intelligent agent to access the cases stored at different locations. It makes the proposed system to work in distributed mode.

VII. REFERENCES

[1]. P. V. Petrov and A. D. Stoyen, "An intelligent-agent based decision support system for a complex command and control application," Proceedings Sixth IEEE International Conference on Engineering of Complex Computer Systems. ICECCS, pp. 94-104, Tokyo, 2000.

[2]. Zhou zhi, Jinliang Wei and Deng Qiangang, "A fuzzy multi-objective decision-making method for agent-based negotiation," International Conference on Natural Language Processing and Knowledge Engineering, Beijing, China, pp. 203-208, 2003.

[3]. Wen-Guo Ai, Jie Sun and Hui Li, "A distributed marketing decision support system based on multi-intelligent-agent," *Proceedings of International Conference on Machine Learning and Cybernetics* vol.1, pp. 233-238, 2004.

[4]. P. Becvar, L. Smidl, J. Psutka and M. Pechoueek, "An Intelligent Telephony Interface of Multiagent Decision Support Systems," in *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)*, vol. 37, no. 4, pp. 553-560, July 2007.

[5]. M. Xu, "Production Scheduling of Agile Manufacturing Based on Multi-agents," Second International Symposium on Knowledge Acquisition and Modeling, Wuhan, pp. 323-325, 2009.

[6]. S. Fournier, A. Ferrarini and E. Tranvouez, "A multiagent decision support system for scheduling repair - application to socio-technical organizations," *2010 Fourth International Conference on Research Challenges in Information Science (RCIS)*, Nice, France, pp. 365-374, 2010.

[7]. D. Kalogeropoulos, E.R. Carson and P.D. Ilinson," Clinical-HINTS: Integrated Intelligent ICU Patient Monitoring and Information Management System", US National Library of Medicine National Institutes of Health, Stud Health Technol Inform, Vol. 43, pp. 906-1010, 1997.

[8]. M. E. Cohen, D. L. Hudson," Meta Neural Networks as Intelligent Agents for Diagnosis", Neural Networks, IJCNN '02. Proceedings of the International Joint, IEEE, Vol. 1, No. 3, Pages 233 – 238, 2002.

[9]. J. Balter, A. Labarre-Vila, D. Ziebelin, C. Garbay," A knowledge-driven agent-centred framework for data mining in EMG", US National Library of Medicine National Institutes of Health, C R Biol, Vol. 325, No. 4, Pages375-82, 2002.

[10]. S. Z. H. Zaid, S. S. R. Abidi and S. Manickam," Leveraging Intelligent Agents for Knowledge Discovery from Heterogeneous Healthcare Data Repositories", US National Library of Medicine National Institutes of Health, Vol. 90, Pages 335-340, 2002.

[11]. O. Kazar, Z. Sahnoun and L. Frecon," Multi-agents system for medical diagnosis", International Conference on Intelligent System and Knowledge Engineering, Vol. 1, pp. 1265- 1270, 2008.

[12]. H. Gonzalez-Velez, M. Mier, C. Arus, B. Celda, S. V. Huffel, P. Lewis, A. Peet and M. Robles," Agent-Based Distributed Decision Support System for Brain Tumour Diagnosis and Prognosis" Applied Intelligence, Spring Link, Vol. 30, No. 3, pp. 191-202, June 2009.

[13]. Nikolaos F. Matsatsinis, Pavlos Delias, "Implementing an Agent-based Decision Support System for Task Allocation: a Multi-criteria Approach", pp. 128-141, 2004.

[14]. H. Zhou, "Modeling Stock Analysts Decision taking: An Intelligent Decision Support System," 14th ACIS

International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing, Honolulu, HI, pp. 29-34, 2013.

[15]. Z. Yin, L. Min, X. Lu and H. Duan, "A clinical decision support system for primary headache disorder based on hybrid intelligent reasoning," 7th International Conference on Biomedical Engineering and Informatics, Dalian, pp. 683-687, 2014.

[16]. M. Clerc and J. Kennedy, "The particle swarm - explosion, stability, and convergence in a multidimensional complex space", IEEE Transactions on Evolutionary Computation, 6(1) pp 58.73, 2015.

[17]. Barber, K.S., T. H. Liu, and D. C. Han, "Agent oriented design- Technical report: TR98-UTLIPS-AGENTS", the University of Texas at Austin, 1999.

[18]. Weerdt, M. de, A. ter Mors, and C. Witteveen, "Multi-agent Planning: An introduction to planning and coordination" in Handouts of the European Agent System Summer School, pp. 1-32, 2005

[19]. R. M. A. Mateo, L. F. Cervantes, H. Yang and J. Lee, " Mobile Agents using Data mining for Diagnosis Support in Ubiquitous Healthcare", Agent and Multi-Agent Systems: Technologies and Applications Lecture Notes in computer Science, Springer link, Vol. 4496, Pages795-804, 2006.

