

-Keynote Address-

**Aligning Decision Engineering towards achieving
Development Goals in Sri Lanka**

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Abstract: *Decision-making is fundamental to all human endeavors. The study to the process of decision-making provides us some important insights. Information plays a vital input to decision-making. Providing “good” information for efficient and effective decision-making in an organization can be highly beneficial. Technology and Information Systems can be aligned to enable “good” information and assist in effective and efficient decision-making. Techniques in AI and data mining can be applied for decision-engineering. This talk aims to consider some examples in Sri Lanka where decision-engineering may be used for significant results.*

-Invited Talk-**Ontology – What and Why?**

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Abstract: *Today ontologies are very popular in many areas of computer science including Knowledge Management and are being used in a variety of applications. There are many definitions for the term “Ontology”. Also, different applications use different contents and structures in building ontologies. This paper gives a brief account on why ontologies are needed, how they are defined and used in knowledge management.*

Key words: Ontology, Knowledge Sharing, Knowledge Management

1. Introduction

Today, the term “Ontology” has become a popular term in the fields of Knowledge Management and the World Wide Web (WWW). It can be seen in the literature that the term “Ontology” has been used in different applications in many different ways with different meanings ranging from list of terms to comprehensive knowledge structures. In many recent publications the term “Ontology” has been used loosely without providing a proper definition and describing the structure and the composition.

Historically, the concept of “Ontology” was born in Metaphysics, a branch of philosophy. In the Oxford dictionary [5] the term “Ontology” is defined as “the branch of metaphysics dealing with the nature of being” and in many other dictionaries the term is given a similar meaning. It is believed that the term has introduced first by Aristotle in his attempt to classify things in the real world. During 1990’s the Artificial Intelligence (AI) community has introduced the term to knowledge management research to facilitate knowledge sharing and reuse.

Knowledge is indispensable for intelligent systems and Knowledge bases are used to capture the encode knowledge. AI research community has realized the value of comprehensive knowledge bases and the difficulty and complexity in constructing them ever since they have started constructing knowledge bases. Hence, they were searching for ways for reusing knowledge across different applications and communities. However, disparate vocabularies, implicit constraints and representations used to encode knowledge in knowledge bases makes knowledge sharing difficult. One of the approaches proposed by them to accomplish a shared understanding of knowledge is to agreeing on an appropriate way to conceptualize the domain of interest, and then to make it explicit in some language. They have coined the term “Ontology” for such knowledge representations.

2. Definition of Ontology

In AI, Ontology is defined as **a formal, explicit specification of a shared conceptualization** [1]. A conceptualization is an abstract, simplified view of the world or some phenomena

intended to be used for some purpose [3]. Conceptualizations are intentional semantic structures that encode implicit knowledge of objects, relationships and constraints on objects and live on the minds of the people (Figure 1). An explicit description of such a conceptualization represented by using an agreed upon formalism is generally referred to as an Ontology.

Conceptualizations are language independent, while ontologies depend on languages. Also, an ontology should be machine-readable. One other important aspects of an Ontology is that it should represent some consensual knowledge (reflecting a shared conceptualization) of a group of people.

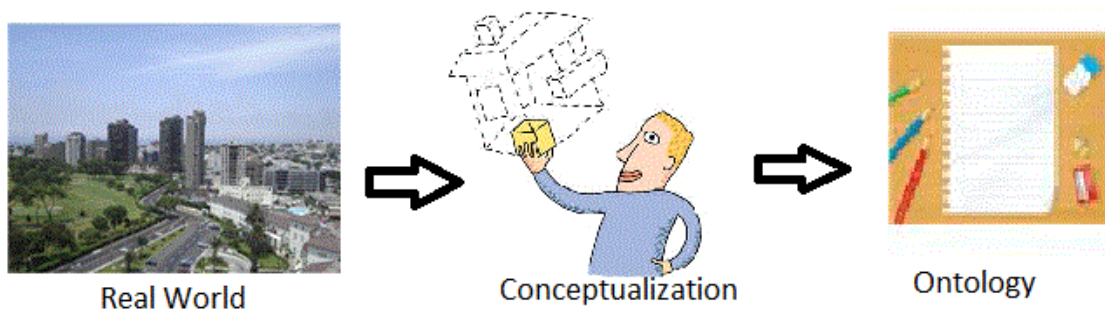


Figure 1: Real World Vs Ontology

A typical ontology comprises of names of entities representing the objects and phenomena in the universe of discourse with descriptions of what the names mean, and formal axioms that constrain the interpretation and use of these terms.

Ontologies are often confused with taxonomies. A taxonomy typically classifies data in a particular domain in a hierarchical form whereas an ontology is a statement of a logical theory. There are a number of key differences between an ontology and a taxonomy.

1. ontologies need not to be limited to taxonomic hierarchies (Example WordNet [6], CYC [4])
2. An Ontology has a richer internal structure as it includes both relations and constraints between the concepts.
3. An Ontology represents a certain consensus among the intended users.
4. Ontology is machine readable.

3. Use of Ontologies.

To build intelligent systems and AI applications, knowledge must be captured, processed, reused, and communicated. Ontologies can be used to facilitate all these tasks. Ontology based system development binds the developers to use the objects and relationships in the universe of discourse consistent with the ontology. This allows knowledge to be shared among developers in a consistent manner. Since ontologies are machine readable, application can be developed to process knowledge automatically.

Ontologies are used in many different applications. Some of these applications are listed below.

- Information retrieval.
- Knowledge representation and sharing.
- Semantic Web.
- Software engineering.
- Natural-Language processing.
- Multi-agent systems.
- Database design.

The following diagram illustrates an example of how an ontology can be used to share operational data among several application [2].

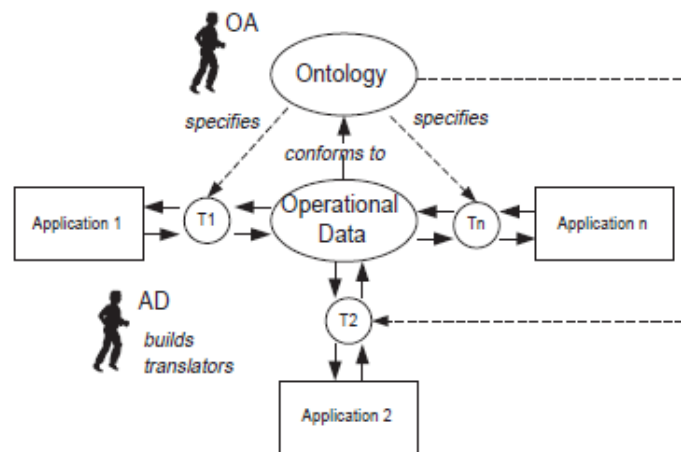


Figure 3: Sharing knowledge among applications by using an ontology

Today, Ontologies have taken an indispensable part of the Semantic Web and in future Ontologies are expected to play a major role in a variety of applications.

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Varanageema: A Theoretical basics for English to Sinhala Machine Translation

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Abstract: This paper reports on a theoretical based approach to the English to Sinhala machine translation by exploiting the concept of Varanageema (conjugation). The concept of Varanageema in Sinhala language presents how we can derive various word forms from a given base word. Sinhala is an inflectionary and morphologically rich language than English language. For instance, Sinhala noun contains 27 conjugation forms while a verb has more than 36 conjugation forms. A large number of language constructs in Sinhala have been handled by conjugation. For instance, conjugation handles person, number, preposition, tense and active/passive. Use of conjugation also contributes to drastically reduce the number of words to be stored in lexical databases. Since the concept of Varanageema can be expressed by a set of rules, it can be easily applied to the rule-based implementation of machine translation systems.

The English to Sinhala machine translation system (BEES) has been designed and implemented as a Multi Agent System. Nine agents, namely, English Morphological Analyzer Agent, English Parser Agent, English to Sinhala Base Word Translator Agent, Transliteration Agent, Sinhala Morphological Generator Agent, Sinhala Parser Agent, Intermediate Editor Agent, Message Space Agent and the Request Agent have been implemented to drive the translation process. These agents operate on the domain ontology that comprises of four dictionaries, namely, English dictionary, Sinhala dictionary, English-Sinhala Bilingual dictionary and the Concept dictionary. BEES primarily shares the features with the Rule-based, Context-based and Human-assisted approaches to machine translation.

BEES has been evaluated through three steps. As the first step, all the language processing primitives such as morphological analyzers, parsers, translator and the transliteration module have been tested through the white box testing approach. In order to test each module, several online testing tools including English Morphological analyzer, English parser and Sinhala word generator have been implemented. By using these online tools each module has been completely tested through a carefully created test plan. In addition, an online evaluation test bed has been also implemented to continuously capture feedback from online users. This online evaluation test bed gives facilities to make different types of sentences using a given set of words. Word Error Rate and the Sentence Error Rate were calculated by using these evaluation results. Finally the intelligibility and the accuracy tests have been conducted through human support. The experimental result shows that the English morphological analyzer, English parser, the English to Sinhala base word translator, Sinhala morphological regenerator and the Sinhala sentence generator successfully work achieving 90% accuracy. Overall results of the evaluation show 89 % accuracy with a word error rate of 7.2 % and a sentence error rate of 5.4 %.

Sinhala to English Language Translator

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Abstract: Language translation has become a necessity for many people as the world moves towards a global economy. To translate from one natural language to another, Machine Translation (MT) is being used. Machine Translation is a complex and a difficult task. However a large number of MT Systems have been developed for many languages all over the world. In the Asian region, Indians have developed a variety of machine translation systems. Sinhala is an Indo-Arian Language and some Indian languages such as Pali, Sanskrit and Tamil are closer to Sinhala Language. Therefore we need to look closely at some existing MT systems especially the ones developed for Indian languages. Existing MT systems are Anusaaraka, Mantra, AngalaBarathi and Shakit.

Development of MT systems in Sri Lanka over the past decade has increased considerably. Most projects have considered translations from English to Sinhala. Translations from Sinhala to English have received much less attention and up to now no successful system has been invented. This project was developed as a system to translate sentences from Sinhala to English.

This paper reports the development of a windows based Sinhala to English Language Translator. Sinhala to English translation has a good demand in the field of translation. So we have designed the system to handle only simple sentences in one tense (Simple Present) of Sinhala Vocabulary. In generating the output we have considered only the active voice in the Sinhala written language. We have generated simple sentences of minimum 3 and maximum 6 words. When there are only 3 words, there should be the subject, the object and the verb. When it consists of more than 3 words, the sentence may have adjectives and adverbs. We have limited the number of words to six. The system is divided into three main modules, namely, Sinhala parser, Sinhala to English Translator and English parser. Sinhala parser receives validated source data. This parser works as a syntax analyser. The Translator translates Sinhala base word into English with the help of the only one database. The English parser works as a sentence composer. It receives mapped data from the database and composes grammatically correct English sentences. This parser is implemented using VB.NET.

The input of the system is a Sinhala sentence and output of the system is the English translation of the Sinhala sentence. After reading the input sentence, this system analyses the input by using the parsers. Next, our system finds the corresponding English word from the database using data mapping. The English parser helps the final translation. The present system can also handle the word to word translation.

This Translation System provides an accurate as well as a precise and unambiguous translation approach which is a precursor to remove the language barrier between English language & Sinhala language. Our system has been developed as windows based system that uses VB.NET. One major further development would be to develop a system to translate from Tamil to English.

Usage of Agent Technology for Distributed Medical Services Support

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Abstract: Modern Healthcare environment is an open environment characterized by shared and distributed decision making and management of care requiring the communication and coordination of complex and diverse forms of information between involved organizations and people. As health care market is very global patients as customers build interactions with a variety of health entities and due to the scarcity of resources in catering increasing demand ends up with long waiting times. Since most of the typical health systems don't adequately address the dynamic varieties of health needs of individuals effectively and efficiently, who are seeking for effective satisfaction with effective time utilization which is crucial in today's complex routines, addressing of that has become a real necessity in today's context.

This paper presents a better approach in delivering assistance for health service seekers enabling enhanced accessibility to medical services streamlining the health care process adapting emerging technique of Multi Agent Technology which best would be deal with the complex nature of the health context enabling the self adaptation necessarily with the dynamically changing instances. Necessarily dynamic nature of the environment requires being adaptive to the changes taking newer decisions accordingly to co-evolve with the situation. So we believe that Agent Technology is powerful to deal with the dynamic nature of the health context via the effective communication enabled through the common space which would be beneficial to each associating entity that guarantees driving towards effective adaptable solution when compared to other technologies

Mainly system follows the basic agent model; request-resource-message-ontological model which comprises three main agent modules for channeling, medical tests and pharmacy services respectively are with activates necessarily based on the incoming requests and derives necessary conclusions through effective communication, coordination and negotiation. Basically patient, test, order agents are acting as request agents while channeling, test, pharmacy agents act as resource agents. By receiving user's health need as an input to the system, delivers best option availability to cater that particular need as the system output through the effective agent interaction takes place at the processing edge. For instance, when user specifies that he is looking for a channeling service then taking that as an input, processing takes place to find out which physician is the best suitable to cater with the disease condition and with the level of urgency. In finding out the conclusion since there are multiple doctors to deal with the request, agents communicate with each other via a common message space which facilitate effective communication which drives towards a successful conclusion. Basically at the primary level system has been facilitated to cater selected health needs including channeling physicians, getting medical tests done and purchasing the required medicines which can be further enhanced to cover wide range of health needs to gain a higher benefit to the health sector with this approach. For enhanced accessibility and for ease of use this work has presented as a web based approach integrating selected health entities including physicians, lab personnel, and pharmacists around the approach to facilitate user health needs enhancing the efficiency of overall health cycle effectively gaining the power of agent technology. In a longer run this can be improved to take this as a foundation to generate health framework using agent technology facilitating a broad range of health needs integrating all health entities around a single effort for an enhanced service delivery, service accessibility and for maximum satisfaction.

SAEE - Swarm of Agents for English Editing

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Abstract: In this knowledge economy, writing comprehensively is a major value-producing activity. Editing write-ups, to eliminate errors and to enrich them has always remained as a complex task, and proof reading by experts has been the general practice since a long time. Natural Language editing in an automated environment is a complex task and due to this complexity, current automated tools face the limitation of perfectly editing a given write up considering both syntactic and semantic accuracy. There are number of natural language editing tools available such as Microsoft Word, Open Office Writer, Abi World and both stand alone and web based style checkers. Due to the complexity of Natural Language Processing domain these tools are most of the times beaten by human proof readers. When considering all these facts, it is apparent that there is a need of autonomous, evolutionary, adaptive and dynamic approach for natural language editing.

As the solution ‘A Swarm of Agents for English Editing’ (SAEE) is an evolutionary approach for English editing, which addresses the complex nature of Natural Language Processing domain and provides an accomplished solution with the strength of Multi Agent Systems (MAS) technologies to address complex scenarios. Natural language editing has several aspects such as checking spelling, grammar, punctuation and semantic structures. Correct coordination between these different tasks is needed to edit a write up perfectly. Statistical, knowledge base, ontology and expert systems like approaches are used in natural language editing tools, but they lack the correct coordination among different aspects of editing thus, fail to come up with a satisfying output. SAEE provides a Multi Agent based solution where different agents negotiate with each other for an edited output. SAEE comprises a swarm of agents with six types of agents namely, spell checking agents, noun agents, verb agents, determiner agents, style agents and manager agent where each agent is activated upon a request, executed and killed at the end of the task. In this system, English editing task involves interaction among different agents who take care of different aspects of a sentence structure such as noun, verb and determiners. These agents together with the manager agent negotiate with each other to generate an agreeable output. A common message space which is an XML file is used to enable the communication and thus negotiates among different agents in the swarm. Agents in SAEE are developed using Jade framework and the system is developed using Java, and the ontology consist of Jazzy, an open source dictionary, grammar rules and style rules which are written in XML. When a paragraph is input to the system, it is broken down to sentences, and for each sentence the set of agents are created. Then these agents start processing each sentence, using the dictionary, grammar and style rules in the ontology and suggest the necessary changes. In such scenario, the verb agent and the noun agent may suggest two different changes to a sentence; grammatically both suggestions might be accurate. Nevertheless one might be the most appropriate for the domain. Therefore, manager agent compares a sentence with the two adjacent sentences (prior and post), and selects the most appropriate suggestions and applies it to the sentence. It is important to mention that there are limitations in handling the semantics of natural languages and it is a hard task to accomplish full semantic understanding in an automated environment. This limitation is common to SAEE as well. The output of the system is compared with the output of the same test cases of other editing tools and human proof readers to identify enhancement for the tool. SAEE is an evolutionary approach for natural language editing by the means of negotiation among different aspects of editing.

iAgri – An Agent Based Agricultural Information Provision

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Abstract- Agriculture is one of the most important areas for researches anywhere in the world. Since most of these researches are not IT related, still there are scares of technologies that can be used to increase the effectiveness and the efficiency of agriculture. Currently, Sri Lankan farmers suffer from unavailability of timely information and also from the high cost spent to obtain the limited amount of reachable information. Also, there is no common space to improve transparency of agricultural information. There are some systems like aAqua, eSagu, NADSS, MAXCROP project, ARIS, CLAES etc which could be found mostly in India, but the contribution of these systems to the agricultural sector is limited due to the traditional technology barriers from which they have been implemented. Despite these various implementations, Farmers find it difficult to derive complete and accurate information about agriculture though they are available, because information is disseminated in such a way that a single farmer can access only a very little fraction of information.

This project aims to manage the agricultural value chain effectively and efficiently by providing a common space for the accurate and complete information to farmers, so that they can decide appropriate ways of accomplishing the agricultural product life cycle. An agent based Agricultural Value Chain Management System (iAgri) has been developed to accomplish the above aim. The main difference between iAgri and other related systems is that the first one respectively is a multi-agent system, while all the other systems which are not multi agent systems rather than traditional web based systems with a back end agricultural data base. iAgri divides complete agricultural value chain in to 6 phases namely Deciding, Seeding, Preparing and planting, Growing, Harvesting and packing, Selling and provides necessary accurate, complete information based on each stage. To facilitate the information need of the users, the system consists of 5 categories of agents which are User Interface agent, User Profile agent, Message agent, Data Base agent and Value Chain agent. Value Chain agent can further create agents based on the particular value chain stage of the crop, once a user requests particular information (Seeding agent, Deciding agent etc...). Initially, a user has to log in to the system by entering the user name and the password. If the user is a new user, then the user has to register with the system before using it. When the user post a request for particular information through User Interface agent by selecting the crop, value chain stage and the district, User Profile agent picks the user information and pass it to the Message agent. The User Profile agent stores some information of the user, so that the stored information will be helpful in the future to recognize the user, when the user logs into the system later. The Message agent post the message on the message space for which all the other agents can access. Then the interested resource agents (Value Chain agents) are initiate and search for relevant accurate information from other agricultural information sources. Data Base agent also searches the local data base for the related information and all information will be passed to the Message agent. Then the best useful information will be presented to the end user via User Interface agent. The agents are developed using JADE framework with the message space being an XML to implement the web platform, J2EE was used. According to the evaluation based on the accuracy, completeness and the usefulness of the offered information, the outcome of the project is a success. All the initial objectives were achieved successfully. This has been a new experience for the agriculture domain which would be useful for the future work in information technology as well.

Recruitment Support System with CV Classifier Expert System

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Abstract: Recruitment Support System (with CV classifier) is a Web based system in which jobseekers can register online and apply for jobs and do the selection test. It involves uploading CV, classifying CVs, and recommending job categories that matches the CV the most. The system is developed as a web based environment to provide a user friendly, online and multi-user access environment. An Expert system is used for the classification of CVs.

We propose to use an Expert System (ES) to classify the CVs according to required qualifications. Normally, CV classification is done manually in the existing recruitment systems. The expert system is designed considering the following factors for classification; education level, professional qualification, technology/platform skills and skill level, working experience in the relevant field. User can directly input particular factors using the web page, then Inference Engine go through the input factors using backward chaining and finally gives the suitable job category as the output. To get input details a set of questions are asked from the user.

Visual Studio 2005 ASP.NET (C#.NET coding environment) is used to design Inference Engine and the Knowledge Base is implemented by using XML. XML defines a textual format for representing structured data. And also uses MS SQL Server 2005 to design the Data Base to store the CV, and other details of the candidates.

There are so many web based systems for recruitment processes in the world to recruit people. But the CV classification portion is normally done manually in those systems. In this system we limit the scope to the field of software development. If the system needs to be expanded for more job areas (Civil, Electronics, and Agriculture...etc.) only the knowledge base should be altered adding particular factors by as education qualifications, professional qualifications, skills, and experience. Final target of this system is to find the most suitable job to a particular candidate according to his/her education qualifications, professional qualifications, skills, experience and etc.

Resilience Modeling of Value Chains

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Abstract: Effective management of value chain dynamics in today's IT driven global economy has become a key to success in almost every organization. Resilience modeling of value chains has become a complex process due to the uncertainty of customer demand, market variations, increasing complexity of business processes, and numerous competitors' as well as unforeseen events during fulfillment. Hence we need an adaptive, flexible and responsive solution to achieve this scenario.

Multi Agent Systems could provide a common space for enabling the interaction among Value chain entities. This paper describes the development of an agent-based software system to assist in decision-making regarding value chain management and to achieve resilience modeling of value chains in the milk powder industry in Sri Lanka. Such a system can be applied to different types of industries with some domain specific modifications. The core architecture is built around the concept of Multi Agent Systems since Agent Technology has been identified most suitable for modeling complex scenarios where the interconnected and distributed entities show a behavior full of uncertainty. Value chain is modeled in terms of agents to represent each value chain entity namely as consumer agents, retailer agent, wholesaler agent and factory agent. Agent's capabilities of rationality, adaptability, social ability and communication have been used to achieve a resilient modeling of value chains. Communication among value chain agents is accomplished with the concept of message passing between request and resource agents through a message space. Consumer agents are the request agents and the retailer agent, wholesaler agent and the factory agent act as resource agents. Ontology keeps the knowledge required to execute the business processes of each agent. Testing and evaluation of what-if scenarios and making the best possible decision for value chain modeling is enabled with the combined approach of Multi Agent Systems and Simulation. There are 100,000 consumer agents in the model and they are affected by the promotion actions and word of mouth factor of other consumers of the product. Retailer agent is responsible for meeting dynamically changing consumer demand continuously in order to gain high consumer satisfaction. Wholesaler agent is responsible for providing products to the retailer agent on demand by making orders from the factory. Factory Agent is responsible for fulfilling the orders made by the wholesaler agent. Each agent is capable of making best decisions to gain highest consumer demand and profit at a given time. Communication among the agents is implemented using ACL (Agent Communication Language) message passing concept. The ontology is modeled using XML as well as java files.

The novelty of this research consists of agent based modeling combined with the power of simulation in a stochastic environment in order to achieve value chain resilience. The system presents a resilient value chain model from the perspective of adaptability that provides achievement of the management goals with a sufficient degree of stability and crisis-resistance instead of the "ideal" optimal plans which fail in real perturbed execution environment. Not only this adaptive and dynamic understanding of value chains, but also the solution methods are new in the value chain management domain. In future researches, we would focus on further investigation into value chain agent's interrelations and their dynamics as well the interrelation of business processes and information systems. In modeling advertising and contact promotion the psychological conditions of the each consumer should be also taken into account in future.

Agent based autonomous Graphic Design Tool “PICTURE IT”

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Abstract: In the modern world all the activities are done by the use of communicating through very precise as well as an unambiguous Medias. Most of the time people are used to convey messages in black and white. It's true that it conveys the message in correct manner. But most of the time public doesn't like to read so much. That's why people try to convey their messages by displaying those using posters, brochures and leaflets. To convey their message very precisely through such media, it should be properly designed by people who have expertise knowledge of graphics as well as design principals. So if a person who doesn't have such expertise knowledge wants to design a poster or a cover page of a book, he should hire that kind of expert. Sometimes, it may not be affordable for an ordinary person to get his work done.

This paper reports on the development of an Agent based autonomous Graphic design tool which helps the user to design art work with less involvement with the tool. This tool is designed using a powerful technology called Multi Agent Systems. PICTURE IT is a designing tool that solves all the problems occur in designing any paper work and improves the efficiency and preciseness which are mostly required. This tool is a computer based designing tool which has an intelligence that gives the designer a convenient and user friendly environment and it builds the user's confidence as well. It is different from other applications that had been implemented for design purpose. That is, it consists of some kind of intelligence that helps the user to use his or her imagination to design a successful media to convey the message. This tool will provide answers to the many questions in designing a poster, cover page, letter heads, brochure etc. When we consider designing it consists of different inputs and outputs. The main source of inputs is the user. First the user has to select the country according to the culture or the country that he is going to address through his master piece. The country agent handles all the color schemes related to it. Then all the other agents activate when a necessity occurs. The main problem that has to be addressed is the way to identify the colors of the background and the foreground by the color agent because it important to identify them because the images or the colors that we use to fill the spaces are changes every time. It is essential to identify a color identification methodology for it. In implementing these technologies, we had to use several approaches or tools to address our requirements through those technologies. Inter communication between agents is also a very important factor when designing these kinds of intelligent tools. There should be a mechanism to do the intercommunication between agents. It means it should handle the messages pass through the message space. PICTURE IT has several agents like font agent, color agent, background agent, alignment agent etc. To present a marvelous design these agents should communicate with each other and perform their tasks when it is necessary. We have identified functional requirements and non functional requirements of this tool. To verify them that they do their appropriate task we should implement a test strategy. Since this tool is used by people, the main parameter that will take to test this is people. It means the users. They are the most capable part/role in the test strategy. We should let the people who know about design principals and design techniques to use this tool and then get their feedbacks of pros and cons of it. Also we give this tool to ordinary people to work with and let them to do their corresponding design. Then get their feedbacks as well about advantages as well as the draw backs. By analyzing the results we can identify further improvements to be done in the future.

Online Student Support Agent System

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Abstract: University courses often include group projects as an important means of developing ability for teamwork and interpersonal skills. Group projects give students an opportunity to discuss their views and share their skills of the subject with their colleagues, as they apply theory to practice. For online programmes, online teamwork is a problem for many reasons such as getting familiar with team members, finding out about other team members' abilities, agreeing who should do which tasks, communications between team members and keeping up-to-date with progress that has been made on the project. The application of software agents to various online tasks had led to research into the ways in which agents may be used to support students online. In particular software agents may be used to help students to share information with others and undertake group projects online. One main problem that in online team work is allocation of tasks for each student due to lack of face-to-face communication. This system is proposed to support these students in allocating tasks for projects.

For task allocation, we consider student's preferences, free time, estimated time for a given task and the student's average performance for a similar task. The student user has to give preferred tasks and free time available to the system. The tutor gives the estimated time for each task and sends assignments to students. Returned answers to assignments are marked by the tutor and values are given for student performance in the areas tested by the assignment. There are 3 agents designed for student preferences, calculating time allocation and calculating student performance for a given task. An algorithm is designed to be used by these agents to communicate and come up with an acceptable solution. When allocating tasks for the first time, administrator should give weight values (default 3.0) for each agent. From the second iteration the system will fine tune and assign proper weight values.

This web based system was developed in Java environment with a MySQL Server 5.1 database. JSP (Java Server Pages) and Servlets were used to develop the web part. The agent was developed as a Java class. The IDE used was Netbeans 6.1. This system can run on any computer and makes users' (students and tutors) task of allocating processes easier.

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