CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

The Internet and the World Wide Web have become dominant everywhere in recent years, surpassing all other technological developments in history. Currently the usage of internet is not restricted to any domain. Education is a highly significant domain where the internet is used extensively, to enhance and improve the quality of the teaching learning process.

1.2 E-LEARNING SYSTEM

E-Learning or Web-based learning is becoming a research area, in which the web and learning converge at all levels, whether in the elementary school, college, or business. The rapid development of e-Learning is based on the astounding growth of the internet and the emergence of new advanced technologies. E-learner may have access to all kinds of learning materials 24 hours a day, seven days a week, at any possible location around the world. The rapid growth of web based courses for education and training impose challenges to e-learning systems, to generate content according to the level of the learner.

Online learning or e-learning provides flexible learning alternatives compared to the traditional classroom learning, such as the possibility for the
e-learners to gain knowledge at their own pace, without being constrained by location or time.

In an e-learning system, the presentation of the content could reach the e-learner easily. The content presented has to be authentic and attractive.

1.2.1 Sports E-learning System

Physical education and sports, represent a very interesting area characterized by interdisciplinary. Sports provided by the different related sciences, such as human and social sciences, biomechanics, mathematics, management and so on. Jinga (2003) and ICT (2004) had discussed by informatics, which has discovered in the physical education and sports a huge application area.

According to popa (1993), Derard (2000) and Epuran (2005), build up the competences required by modern technology, both to the education benefit and for an assisted sports training process. Competences efficiently to use computer tools when designing, teaching and evaluating the physical education and sports discipline and to draw up functional products, able to enhance pupils’ attractiveness to the physical education and sports. Teachers’ specialty competences in physical education and sports field at the theoretical level to identify the possibilities of using audio-visual aids in the educational process specific to physical education and sports field. The education process based on the e-learning system provides the learners more and more frequent opportunities to acquire new competences as presented by Grigore (2005).

Learning is one of the main priorities in adults’ education. Physical education and sports field specificity, the e-learning system into a curriculum designed to improve the in-service teachers’ professional standards as presented by monica et al (2011).
According to Gyorgy Katona (2007), Sports play a key role in maintaining one’s health, bringing about completeness and improves one physically and psychologically. The e-learning developed physical education material such as sports recreation, Leisure time sports theory and practice I and II have been designed.

1.3 PHYSIOLOGICAL VARIABLES IN SPORTS

The role of the physiological variables is very important. In sports, the physiological variable plays a vital role. The physiological variable of an e-learner decides whether he/she is capable of performing the e-learners’ sports training activity.

Training promotes self-confidence and tolerance for higher sports levels and competition. The dynamics of training involves the manipulation of the training load through the variables: intensity, duration and frequency. In addition, sports activities are a combination of strength, speed and endurance, executed in a coordinated and efficient manner with the development of sport (Morgan et al 1987).

Athletics is a major factor that determines an athlete’s shape, and at a higher level, an athlete may perform and attain results close to the e-learner’s maximum potential as presented by Bompa (1999). During a competition, physiological peaking is critical for optimal results and represents a point in time, when fitness and fatigue differences are maximised in favor of the overall performance outcome, as claimed by Banister and Calvert (1980).

In order to improve skill and performance in competition, athletes must prepare a training process where the physiological objective is to improve the body function and optimise performance. The training process
involves the repetition of exercises, designed to induce automation in the execution of a motor skill, and develop structural and metabolic functions that lead to increased physical performance. Viru (1995), reported that the goal of training is to increase the ability to sustain the highest power output or speed of movement for a given distance or time. According to Hawley (2002) the training process, overcoming training and competition stresses promotes will power, self-confidence and tolerance for higher training and competition demands, as stated by Schmolinsky (1996)

Kellmann and Kallus (1999) suggested that recovery encompasses the active processes of re-establishing the psychological and physiological resources, so that the athlete may tap those resources again either during competition or training.

Ganong (2000) stated that the control of the heart rate is mediated by the sympathetic and parasympathetic nerves. The heart rate is accelerated by some factors, such as inspiration, anger, excitement, painful stimuli, fever and exhaustive exercise. The heart rate is slowed by expiration, fear and increased intracranial pressure. In general, the pulse rate corresponds to the heart rate and can be used as a fitness indicator.

Ehab Mostafa Kamel Abdel-Naser (2010) had proposed to investigate the effects of exhaustive exercise and pulse rate, performance time and blood concentrations of lactate, testosterones in basketball players.

Hence, this research work focuses on developing an e-learning system the for sports domain with high significance of the physiological variable.

1.4 ONTOLOGY FOR SPORTS

According to Kosmas Petridis (2006), in the multimedia annotation framework, the domain ontologies are meant to model the content layer of the
multimedia content, with respect to specific real-world domains, such as sports events like tennis. All domain ontologies are explicitly based on or aligned to the DOLCE core ontology, and thus connected by high-level concepts, which in turn, assure interoperability between different domain ontologies at a later stage.

The system builds a Sports Domain Ontology that enables to extract sports news from sports related web sites. Especially, the football league is the main target of the system. There exist a variety of sports named entities (objects), named entities relations (relationships) and instances (attributes). The ontology creation uses the Protégé-OWL editor. This domain ontology consists of (32) classes, (20) Object properties and (9) Datatype properties,( Russell and Norving (2003) and Nwe Ni Aung, Thinn Thu Naing (2011)).

Xiaofeng Tong, Qingshan Liu, Lingyu Duan, Hanqing Lu, Changsheng Xu, Qi Tian (2005) had proposed a unified semantic shot representation framework for a sports video.

The Semantic Information Retrieval System (Jun Zhai, Kaitao Zhou, 2010) is mainly concerned with retrieving information from a sports ontology using the SPARQL query language. It retrieves specific information from the ontology. The sports related information is queried from the ontology and done using SPARQL language.

Ontology is the basis of representing the semantic information for a particular domain. Rashmi Chauhan et al (2012), proposed a conceptual model for ontology based semantic information retrieval, and constructed an ontology for the sports domain. Query expansion techniques have been broadly applied for information retrieval. A semantic query expansion technique that includes a mathematical model to compute the semantic
similarity between concepts and an algorithm for query expansion, based on domain ontology, is designed.

The input keyword provided by the e-learner will be matched with the sports ontology. Further, a query template has been designed with all the constraints of all the physiological variables. The query template provides the details of whether the e-learner is suitable for learning sports training activity (physiological variable).

1.5 CONSTRAINT SATISFACTION PROBLEM

In general, the concept of a constraint satisfaction problem (CSP) is fundamental in constraint programming.

A constraint satisfaction problem consists of:

- a set of variables \( X = (x_1, x_2, \ldots x_n) \)
- a set of domains \( D = (D_1; D_2, \ldots D_n) \) such that for each variable \( x_i \in X \) there is a domain \( D_i \);
- a set of constraints \( C = (c_1, c_2, \ldots c_k) \) such that the scope of each constraint is a subset of \( X \). The domain of a variable is a set of all considered values that can be assigned to the variable. Usually, it assumes finite discrete domains. A solution to a CSP is a complete instantiation of the variables in \( X \) satisfying all the constraints in \( C \).

Planning and scheduling techniques had important applications of constraint satisfaction models and tools. Most real-world problems can be cast as highly coupled planning and scheduling problems, where resources must be allocated so as to optimize the overall performance objectives. Therefore,
solving these problems requires an adequate mixture of planning, scheduling and resource allocation to competing goal activities over time in the presence of complex state-dependent constraints. Solutions to these problems must integrate resource allocation and plan synthesis capabilities, which can be efficiently managed by using constraint satisfaction techniques (Roman Bartak et al 2009).

The sports domain has no constraints other than type constraints; there are not even any functional dependencies. The academic domain, on the other hand, is an interesting choice, as it has sophisticated Constraints posing a stress-test to the reasoning phase in our PROSPERA system. For academic relations, the seeds obtained from the ontology are used. All instances for a given relation already in the ontology were treated as seeds, as represented by Carlson (2010).

1.6 PROBLEM DEFINITION AND OBJECTIVES OF THE THESIS

The problem defined in this thesis is as follows:

To provide e-learners with an optimized solution for sports training activity, using the constraint satisfaction problem through the e-learning system.

The proposed architecture takes the e-learning system as its basis with additional ontology and CSP.

The objectives of the thesis are

1. To provide an efficient sports e-learning system based on physiological variables and physical training activity.
2. To provide ontological support for enhancing the keyword queries given by the e-learner.

3. Developing and implementing an efficient CSP for the knowledge representation of physiological variables for sports e-learners.

4. To formalize the sports activity learning through planning and scheduling.

The above specified objectives have been addressed by the following contributions of the thesis.

1.7 CONTRIBUTIONS OF THE THESIS

The major contribution of the thesis is the design of an e-learning system for the sports domain. The physiological variables are interrelated with each other. A sports e-learner needs to have knowledge about these relationships. Through this sports e-learning system, the e-learner can efficiently query and improve his knowledge of the physiological variable and physical activity training. The e-learning system responds to any correct keywords, by matching the ontology, and stores the information in the query template. The query template plays an efficient role, as it can respond to repeated queries with minimal time. The e-learning system uses the indexed query template and responds immediately. An e-learner of the sports domain may have different values for the various physiological variables. The knowledge and understanding of these physiological variables improve the physical activity training. The constraint satisfaction problem is used at the e-learner level, and satisfies the values of the constraints among the physiological variables, and thereby plans and schedules the constraints of the activity. The proposed keyword specified by the e-learner generates an optimized result from the e-learning system, as it satisfies all the constraints
using the CSP solver. Collaborative learning has been incorporated simultaneously and the number of elements can collaboratively learn which leads to a deeper understanding of the course content (sports content).

1.8 ORGANIZATION OF THE THESIS

This thesis is organized as follows: Chapter 1: Introduces the research work and provides the background information.

Chapter 2: Presents a detailed literature survey of the field of e-learning, ontology and the constraint satisfaction problem.

Chapter 3: Describes the methodology for the development of the e-learning system and instructor systems.

Chapter 4: Describes the development of ontology for the sports domain, and also the query template for the e-learner retrieval system.

Chapter 5: Creates the sports person physiological variable, and also the development of constraint satisfaction problem for physiological variables and physical activity.

Chapter 6: Presents the planning and scheduling constraints in Artificial Intelligence and the development of e-learners’ retrieval information from the CSP solver.

Chapter 7: Suggests some improvements to the system, and future avenues for research on the topic.