

Expert system is a computersystem that emulates the decision making ability of a human expert. That is, itacts in all respects like a human expert. It uses human knowledge to solveproblems that would require human intelligence. The expert system representexpertise knowledge as data or rules within the computer. These rules and datacan be called upon when needed to solve problems. HIV/AIDS is a knotty viraldisease that is very common in the modern world. HIV/AIDS is a serious diseasethat affects the white blood cells directly. If left unchecked at the earlystage, it results to serious complications including death. Though the diseasecannot possibly be cured completely for the time being, it can be well managedor controlled and the patient can live a very healthy life. Early HIV/AIDSdiagnosis plays a crucial role in HIV/AIDS control, and can prevent furthermedical complications. This studypresents the design and development of a medical expert system for HIV/AIDSdisease and its support diagnosis, gives information about complications andacts as HIV/AIDS diagnosis trainer. It uses rule based approach to collect dataand forward chaining inference technique. This system provides a userinteractive, menu driven environment. Symptoms and risk factors associated withHIV/AIDS are taken as the basis of this study. In case of diagnosis, the systemasks a bunch of questions about the symptoms and risk factors through theexpert system user to the person diagnosed, where the person gives a yes or noanswer to perform risk analysis and a check on possible opportunisticinfections associated with the disease. According to the answers, the systemgives percentage possibility and advice for laboratory test where final testresult is then given out through a colour matching of the test result with someresults available in the deigned expert system. Persons diagnosed to benegative are then advised through the expert system user on how to staynegative, while the persons diagnosed positive of the virus are enrolled forcollection of drugs so as to stay alive and healthy. The system is drawn upwith PHP/MYSQL expert system building tool in Windows environment where all theknowledge are embedded for effective decision.

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CHAPTER ONE: INTRODUCTION

1.1BACKGROUND OF THE STUDY

The quality of service delivery all around the world is continuously improved by the usage of computer-based applications. These applications are mostly built based on artificial intelligence which is the area of computer science that focuses on the creation of machines that can perform functions considered as intelligent by humans. These functions performed by the machines are highly sensitive and require knowledge in the domain where these machines are designed to act as if originally, they are in control of situations. The ability to create such machine has intrigued humans since the advent of technology, and today, with the introduction of computers and great research of ages into the field of Artificial Intelligence programming techniques, the production and design of smart machines is becoming a reality as researchers can now build a system which can mimic human thought and understand human behaviour via expert system technology (Nilsson, 1990).

An expert system is a computer application that performs a task that would otherwise be performed by a human expert, such tasks include but are not limited to making financial forecast, scheduling routes for delivery vehicles, diagnosing human illnesses, and several others. Most expert systems are designed to take human place while others are designed to aid humans. To design an expert system, the domain of the knowledge field is required, so an individual needs to be able to study how the human expert makes decisions and translate the rules used into terms that the computer would understand. Expert system is an example of a symbolic paradigm being one of the two major paradigms for developing intelligent systems in the field of artificial intelligence (<http://www.webopedia.com/>). To however get a detailed understanding about expert systems, a brief history of Artificial Intelligence is unavoidably necessary.

The quest for Artificial Intelligence is as modern as the frontiers of computer science and as old as antiquity. The concept of thinking machine began as early as 2500 BC, when the Egyptians looked to talking statues for mystical advice (Haack, 2004). Artificial Intelligence as both a term and a science was coined 120 years later, after the operational digital computer had made debut. In 1956, Allen Newell, J.C Shaw and Herbert Simon introduced the first Artificial Intelligent program, the Logic Theorist to find the basic equations of logic as defined in *Principia Mathematica* by Bertrand Russell and Alfred North Whitehead. For one of the equations, the Logic Theorist surpassed its inventor's expectations by finding a new and better proof. Suddenly a true thinking machine that knew more than its programmers evolved and led to the development of another system called the General Problem Solver (G.P.S). They were developed to imitate human problem solving protocols regardless of the information contained in the domain, however, as time progressed they were said to be weak a method as they covered weak information about their domain of study which led to weak performance in problem solving involving complex domains (Nilsson, 2009).

The foundation of Artificial Intelligence covers several disciplines including but not restricted to philosophy, mathematics, psychology, computer engineering and linguistics. The connectionist paradigm evolved from a model proposed on artificial neurons that mimics the structure of human brain, the model was proposed in 1943 by McCulloch and Pitts. The rise of Artificial Intelligence continued as Feigenbaum and others at Stanford began the heuristic

programming project (HPP) to investigate other problem domains that could benefit from the expert system technology. By this the next major effort was in the area of medical diagnosis, MYCIN was developed by Bruce Buchanan and Dr Edward Shortliffe to diagnose bacterial infection in the blood using about 450 rules. MYCIN is the most widely known expert system in the era of the growth of Artificial Intelligence because of the two reasons below as coined from (Feigenbaum and Buchanan, 1993)

I Its design was based on interviews with several doctors that specialized in particular domains, hence, it contains a number of heuristic rules used in identifying certain infections by physicians.

II It led to the later development of EMYCIN (Empty MYCIN) which was the first expert/knowledge-based system shell, the development time of EMYCIN was considerably reduced as compared to MYCIN, the researchers developed EMYCIN by taking all the rules out of the system and leaving just an empty shell in which other developers in other domains can just plug in their knowledge base.

From the dark ages also known as the birth of Artificial Intelligence to the era of great expectations also known as the rise of Artificial Intelligence, expert systems have been providing pre-selected rules for decision making within specialized domains of knowledge but are limited by the fixed choice and by the date of the expert opinion embodied in the decision rules. Expert systems have been found to have profound impacts which include reducing time of task from days to hours, minutes to seconds. The benefits of expert system since this time include but are however not limited to improved customer satisfaction, improved quality of products and services, accurate and consistent decision making. They operate in hazardous environments where humans could be exposed to various risks; expert systems have featured and make things easier in various fields such as agriculture, education, manufacturing industries, banking, medicine, and so on. In medicine, diagnosis of patients' complicated conditions, clinical laboratory identification of bacterial infectious diseases and recommendation of treatments, surgery, emergencies, drugs and toxicology and dentistry are some of the domains for expert system development. Expert systems emulate the decision making ability of human experts, they are designed to solve complex problems by reasoning about knowledge like an expert, and not by following the procedure of a developer as in the

case in conventional programming (Meech, 2006).

1.2 STATEMENT OF THE PROBLEM

The continuous increase in population without a corresponding increase in medical infrastructure has brought about drastic limitations in health care sector, this has made it necessary to think of designing an expert system that can assist the health sector in the diagnosis of HIV/AIDS. The idea of this system is backed by the following facts which show how limited human expertise is as compared to an expert system as coined from Juhola, *et al.* (1995);

Human experts are inconsistent: As each day goes by, human day to day decisions are rarely consistent, this leads to invalid decision making in the field of HIV/AIDS diagnosis, hence the idea of building an expert system that can work consistently and continuously is deemed necessary.

Human experts die or retire: Human experts do not live and work forever, they tend to retire with time and others even die leading to a reduction in workforce.

Human experts are at times deliberately biased: A diagnostic expert might tend to be deliberately partial in releasing the result of a test so as to hide certain information for selfish reasons.

Human experts do not process large amount of data quickly: The procedure of diagnosis involves a number of steps before results are made available, handling of this data are often not easy for the human brain, but as the computer is capable of handling large data in micro seconds, the thought of a diagnostic system is necessary.

Human expertise is very scarce: It takes considerable amount of time to understand the procedure for manual diagnosis of HIV/AIDS since persons who specialize in such are scarcely available, the design of this system will counter such limitations as an easy to use manual will be documented.

Human experts lack confidentiality: One of the major reasons why most persons are scared of HIV/AIDS diagnosis is the issue of non-confidentiality of test results, with the use of a diagnostic system which shall involve the use of the expert machine, test results will be secured in a database.

1.3 JUSTIFICATION OF THE STUDY

The relevance of this study cannot be overemphasized as the numerous challenges faced in

the medical area of HIV/AIDS are so obvious that most health practitioners tend to shy away from providing services of such nature as described by this study, this has put much work load on the few agencies offering such services, which are mostly non-governmental organizations. An expert system for diagnosing HIV/AIDS is therefore a system with enormous level of significance that cannot be undermined, this system will be of great benefit to not just man but also government and health sectors. The obvious challenges faced by the government, health sector and individual are enough to suggest that the relevance of the system are not limited to but include the following; **Professionalism:** This system shall contain valid and well researched algorithm that shall aid in decision making, this decision support system shall be written on the basis of the manually collected data and enhanced through well designed syntax to take decisions that are seen to be from facts already programmed, by this the system tends to be very professional and reliable. The system is also not prone to mistakes and can be easily updated.

HIV/AIDS DIAGNOSTIC SYSTEM

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Regards!!!