

Design and Development of Electronic Prescription and Patient Information Systems for Developing World

By

Dr Boniface Ekechukwu* and Chidi Obi **Dr Arinze Nweze*

*Department of Computer Science, Nnamdi Azikiwe University, PMB5025 Awka, Anambra State, Nigeria

** Dept of Information Technology, National Open University, Awka Center

***Dept of Computer science, Caritas University, Enugu

Abstract

Recommendation of appropriate Drugs and limited availability of medical experts, make it difficult for a patient to receive immediate attention and appropriate drug recommendation. Time wasting is involved. Our hospitals are known for long queues due to few medical experts for diagnosis and treatment of patients. These patients undergo stress of obtaining a hospital card, registering with the hospital, seeing the medical expert and receiving drug recommendations. Unavailability of Medical Experts is a serious problem. This research was conducted using diabetes as a case study. Owing to the nature of diabetes as a disease, one may not find a medical expert in a critical moment of need. The available medical experts may have several hospitals expected to cover at the same time. Thus, he has very limited time to attend to the patients. This system is developed to assist the patient specially when expert doctors are not available.

Introduction

The importance of this study cannot be over emphasized. This work will be of great importance to the: Medical Doctors: Medical professional like nurses: Government and hospital management: Diabetic patients: Public and less privileged.

The research started based on the needs of the people for: the development of software that will enhance faster diagnosis of Diabetes; early detection and treatment

of the disease-Diabetes: reducing stress and inadequacies associated with the manual diagnosis of diabetes by medical doctors: software that will also assist in managing the limited number of medical experts: improvement of the manual diagnosis of the medical experts: will make the data of patients easily available for future use: It will also give a more accurate result from the test we run and have good data for results obtained. This project does not intend to replace the medical doctors with computers, rather to ease the problems doctors face in the diagnosis of diabetes. This work will be of great importance to the doctors who have several patients to attend to, within a very limited time. They will easily diagnose and prescribe drugs with the support of computerized expert system for diagnosis of diabetes.

Background Studies

Artificial intelligence is a term that was first used by John McCarthy at Dartmouth College in 1956 to describe computer that have the ability to mimic or duplicate the functions of human brain. Many artificial intelligence (AI) pioneers that attended this first conference predicted that computers would be as "smart" as people by 1960s.

John McCarthy who coined the term in 1956 defined it as "the science and engineering of making intelligent machines". Wikipedia's Encyclopedia (2007) defines artificial intelligence as "the intelligence of machines and the branch of computer science that aims to create it". Artificial intelligence is also defined as "the study and design of intelligent agents", where an intelligent agent is a system that perceives its environment and takes action that maximizes its chances of success.

The field was founded on the claim that a central property of human's intelligence—the sapience of Homo sapiens—can be so precisely described that it can be stimulated by a machine. Therefore, artificial intelligence is defined as computer programs that are derived from a branch of computer science that deals with the manipulation process which results to an intelligent actions and goals. It is also seen as the science and engineering of making intelligent machines, using intelligent computer programs which

is related to the similar task of using computers to understand human intelligence. It is building computer programs that can exhibit intelligent behaviour. It is concerned with the concepts and methods of symbolic inference or reasoning by a computer and how the knowledge used to make those inferences will be represented inside the machine.

Intelligence covers many cognitive skills including the ability to solve problems, learn and understand languages. Artificial intelligence addresses all of those but most progress to date in artificial intelligence has been made in the area of problem solving. The concepts and methods for building programs that reason about problems rather than calculate a solution. The central problems of artificial intelligence include such traits as reasoning, knowledge, planning, learning, communication, perception and the ability to move and manipulate objects.

Dr. Anthony Sforza stated "with smart doctor you can fully document a patient visit, write a new prescription, complete electronic method coding and have a bill ready to go electronically in an average time of 1.5 minutes". This means that with "smart doctor" in use, one would receive medical attention, prescriptions and bill within 1.5 minutes. Thus, patients would spend a very short time in the hospital, while the doctor would be able to attend to several patients within a very short time.

Gary L. Robertson, M.D (Northern western University Chicago, Illinois, U.S.A) defined it as a disorder in which there is an abnormal increase in urine output, fluid intake and often thirsts. It causes symptoms such as urinary frequency, nocturnal (frequent awakening at night to urinate) or enuresis (involuntary urination during sleep or bedwetting). Urine output is increased because it is not concentrated normally. Consequently, instead of being a yellow color, the urine is pale, colorless or watery in appearance and the measured concentration (osmolality or specific gravity is low).

Materials and Methods

Wikipedia Encyclopedia (2007) defines Artificial intelligence as "the intelligence of machines and the branch of computer science that aims to create it". This means the

ability of a machine to reason intelligently as a human being. The machine is able to take decisions that are correct.

Artificial Intelligence is a broad field that includes several special areas such as Robotics, Vision Systems, Natural Language Processing, Learning System, Neural networks and Expert System.

Robotics: The word "Robot" was popularized by Karel Capek's 1920 play. This word "Robot" comes from the Greek word "robot" meaning unpleasant or difficult work. A robot is a machine that acts like human. It has hands and legs, and can hold or move some physical objects. It is associated with computer control system.

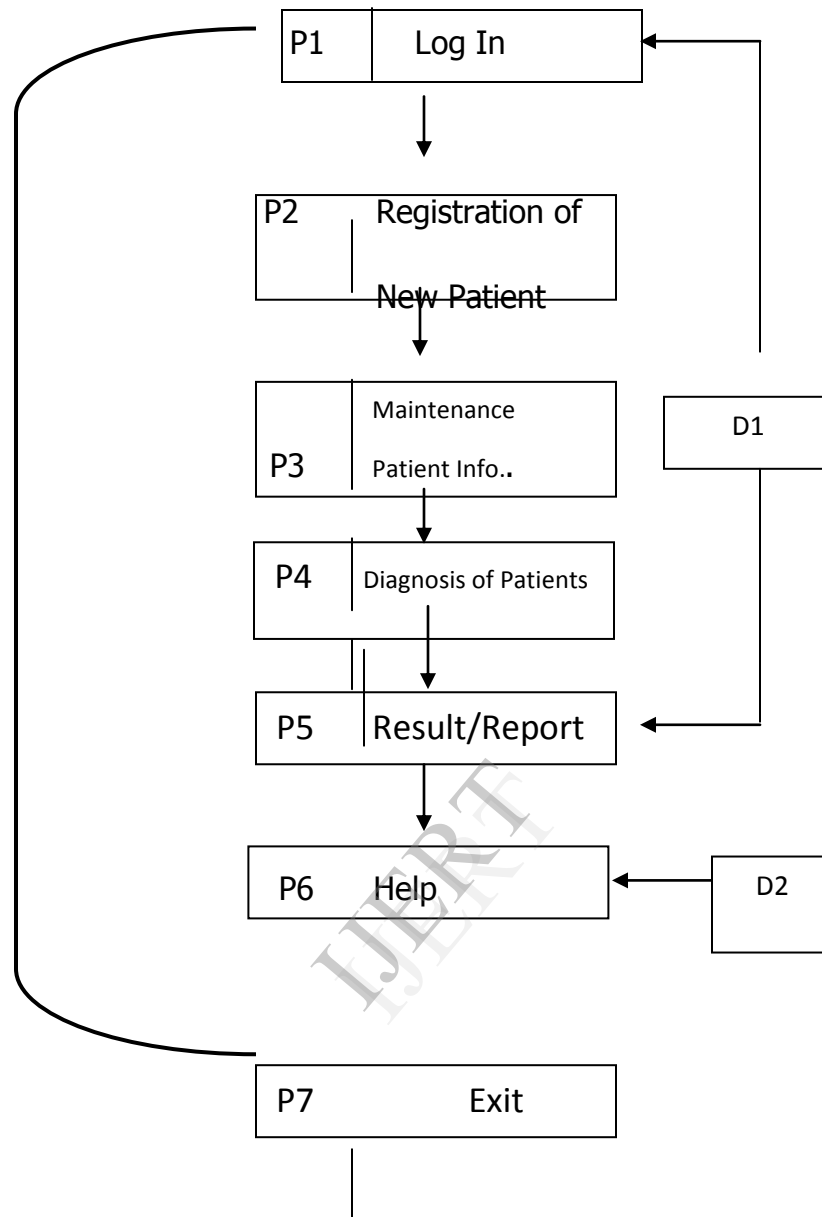
There is another area of artificial intelligence, which includes hardware and software that permit computers to capture, store and manipulate visual images and pictures. The vision system is used by United States Justice Department to perform finger print analysis with almost the same level of precision as human experts. The speed with which the system can search through a database of fingerprints has brought a quick resolution to many long standing mysteries. Vision System is also effective at identifying people based on facial features. Canesta, a start-up firm in California, uses infrared light and photographic chips to give computer device a three dimensional image of objects. In the same way, vision system can be used together with robots, to give some machines sight. Expert systems are computer programme that are derived from a branch of computer science research called **Artificial Intelligence (A.I)**. Artificial Intelligence programs that achieve expert level competence in solving problems in task areas by bringing to bear a body of knowledge about specific tasks are called knowledge based or expert systems. Often the term expert system is reserved for programs whose knowledge base contains the knowledge used by human experts. The two terms **Expert system (E.S)** and **Knowledge-based system (KBS)** are often used synonymously. The area of human intellectual endeavor to be captured in an expert system is called the "task domain". Task refers to the area within which the task

is being performed. Typical tasks are diagnosis, planning, scheduling, configuration and design.

System Design

Every expert system consists of two principal parts: the knowledge base; and the reasoning or inference engine. Another important point to be noted in expert system is the knowledge presentation. Knowledge presentation formalizes and organizes the knowledge. One widely used representation is the "**production rule**", or simply "**rule**". A rule consists of an "**IF**" part and a "**THEN**" part (also called a condition and an action).the **IF** part lists a set of conditions in the same logical combination. The piece of knowledge represented by the production rule is relevant to the line of reasoning being developed if the **IF** part of the rule is satisfied. Consequently, the **THEN** part can be concluded, or its problem-solving action taken. Expert systems whose knowledge is represented in rule form are called rule-based systems. Another widely used representation is called the "**unit**" (also known as "frame, schema,"or"list, structure") is based upon a more passive view of knowledge. The unit is an assemblage of associated symbolic knowledge about an entity to be represented. Typically, a unit consists of a list of properties of the entity and associated values for those properties. Since every task domain consists of many entities that stand in various relations, the properties can also be used to specify relations, and the values of these properties are the names of other units that are linked according to the relations. One unit can also represent knowledge that is a special case of another unit, or some units can be "parts of" another unit.

The design of the new system is the architectural drawing and outlining of the specification document. It is the blue print of the system that is to be developed. It is done in two phases. The architectural design is the breaking down of the system into its components, called modules and the detailed design which is the actual design of each module.



The diagram above shows the details of the system.

P1: This process is responsible for logging on a new user with the insertion of a password.

P2: This process is responsible for registration of a new patient.

P3: This is responsible for the updating or maintenance of a patient's record.

P4: This process is responsible for the diagnosis of a patient.

P5: This process is responsible for querying the data base management and receiving report about a particular patient.

P6: This takes care of the help options.

P7: This helps the users to exit or log out of the program.

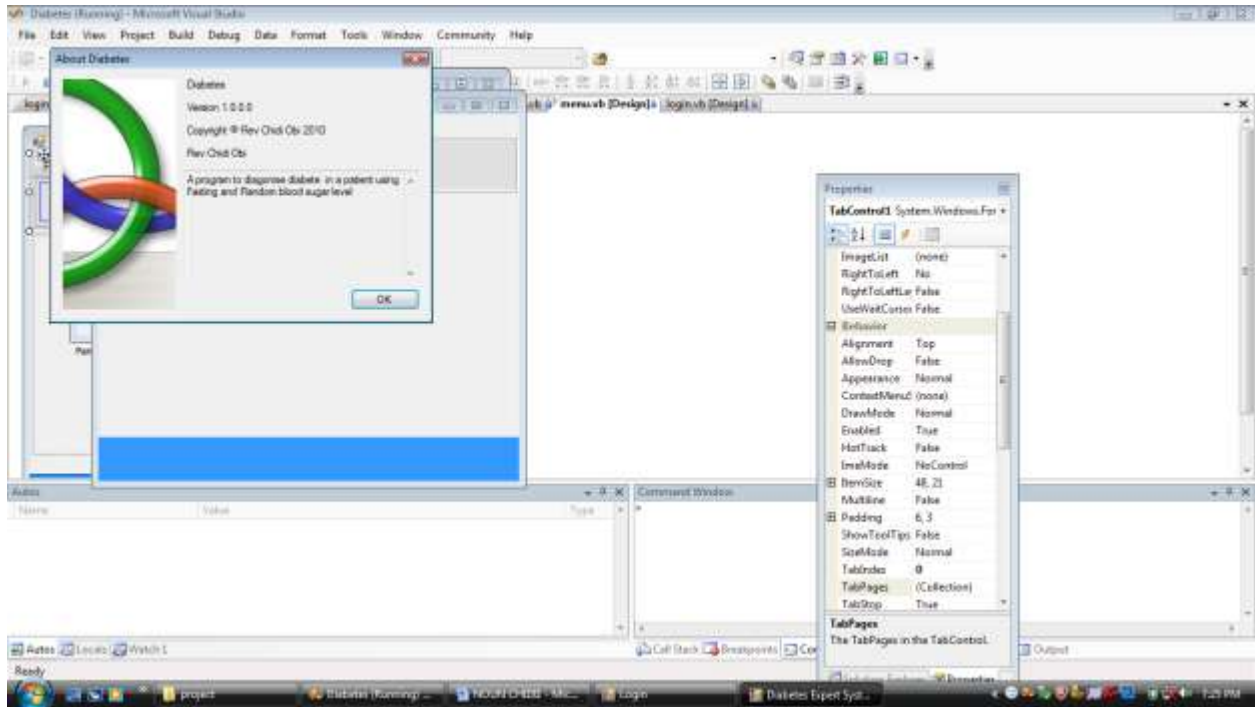
D1: This is the database where information about the patient is stored.

D2: This is the database where information about the help option is stored.

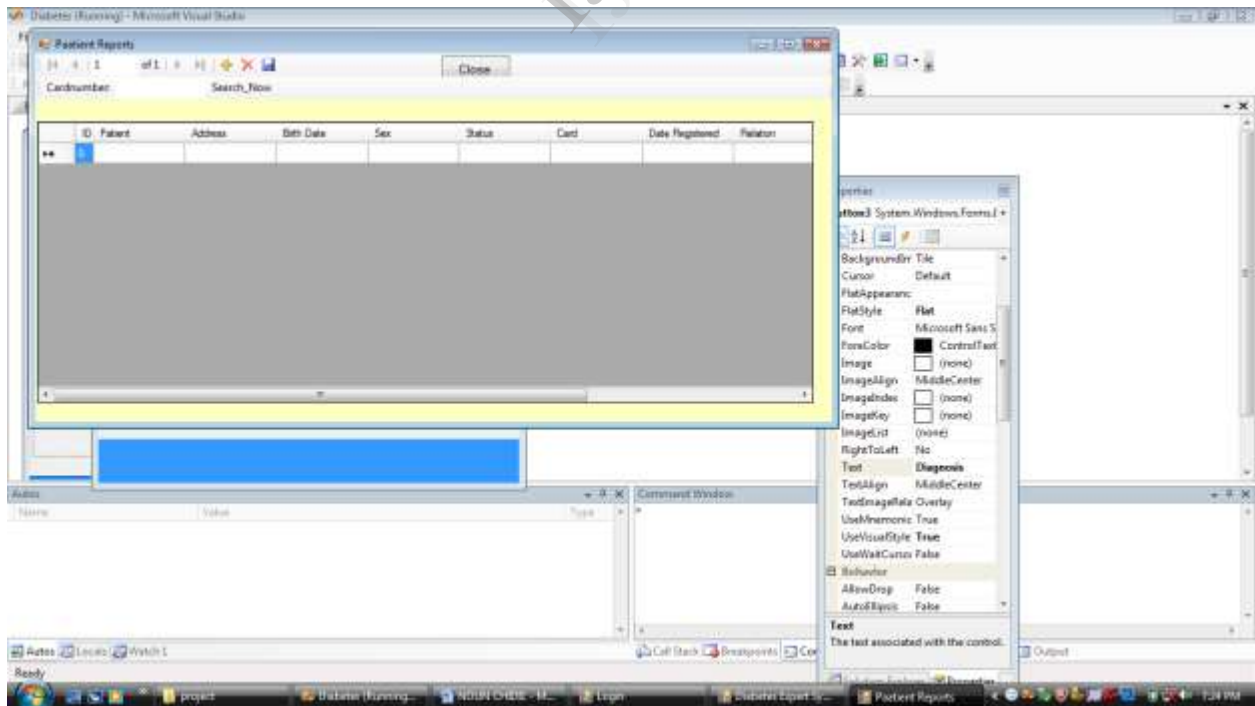
Results and Discussions

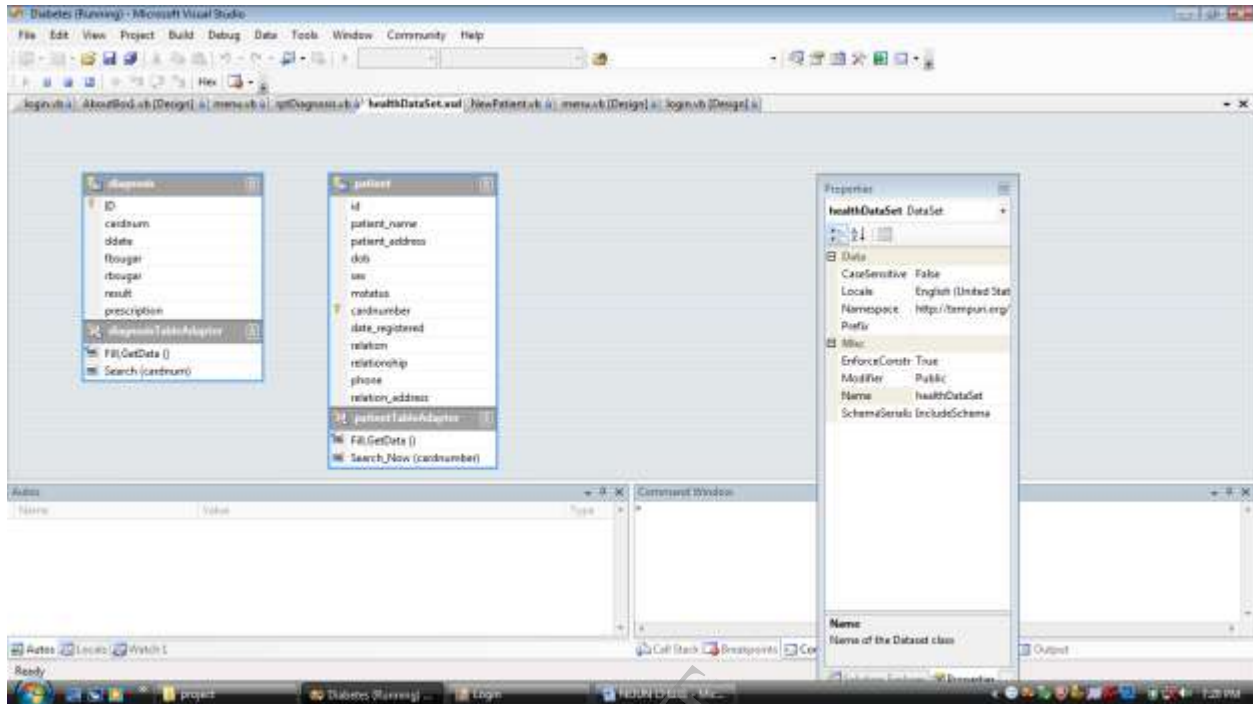
In the hospitals, patients usually wait for a longtime before receiving medical attentions. Patients sometimes require the services of a doctor or nurse at the time they are not available. In order to solve or reduce this problem, a computerized diagnosis system is recommended for every clinic or hospitals.

However, this project is not designed to substitute medical practitioners in the health sector. Rather, it shows how computer programs, expert systems can be used in medical diagnosis (diabetes) and files can be kept in a database for appending and retrieval in our hospitals.



IJERT





References

- 1 Control, *Cervical Cancer Screening in Developing Countries: Report of a WHO Consultation*, Geneva: World Health Organization, 2002. As of August 24, 2011:
- 2 *Expert System and medical Issues* Thomson Learning. pp. 741 pages. ISBN 0-324-06188-9.
- 3 French,C.S.(1993).*Data processing and information technology*” Dp publication Ltd, London.
- 4 Gregory Hastings, Nejhddeh Ghevondian, “A selforganizing estimator for hypoglycemia monitoring in diabetic patients”, 20th annual international conference of IEEE engineering in medicine and biology society, Vol. 20, No 3, 1998.

- 5 T.Jayalakshmi and Dr.A.Santhakumaran, “A novel classification method for classification of diabetes mellitus using artificial neural networks”. 2010 International Conference on Data Storage and Data Engineering.

IJERT