



THE ANALYSIS AND PREDICTION OF FETAL PARAMETERS USING AN ARTIFICIAL INTELLIGENCE PREDICTIVE MEDICAL SYSTEM

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ABSTRACT

This thesis “Development of an artificial intelligence predictive medical system for analysis and prediction of fetal parameters” was motivated by the high rate of fetal loss in Nigeria which mostly occurs as a result of wrong medical predictive system. To solve this problem, software that will identify the fetal parameters that predicts the gestational age was developed. The new model will be a hybrid model. It will combine the Nägele’s Rule and Mittendorf Rule to predict the foetal parameter. The new model will take the average of the two models as the predicted date of delivery. In this new system, it is noteworthy to name some ways of determining gestational age based on Last Menstrual Period (LMP). Therefore the proposed model will be a combination of the two model taking average of the number of days to be added to the LMP. This will be used to determine the Expected Date of Delivery in the new system designed. A platform for solving complication problems due to low and excessive birth weights at delivery by accurately estimating fetal parameters (Fetal Weight, Fetal Age, Conception Date, and Delivery Date) was implemented. This was implemented using externally generated data by combining the independent information about fetal size obtained from the three different approaches (i.e, clinical examination, quantitative assessment of maternal characteristics, ultrasonographic fetal biometry). Expert system methodology and Object Oriented Analysis and Design Methodology (OOADM) were adopted in the design of the predictive system. The new system allows the patients to access their antenatal visit records from any internet access point and the software developed helps physicians to accurately estimate the gestational age of the fetus and hence provide a support tool for estimating Gestation Age and to establish accuracy indicators that will provide tolerances for its later use in growth and health evaluation.

INTRODUCTION

To improve the healthcare system for expectant mothers, accurate determination of gestational age (GA) is essential for the provision of appropriate obstetric and neonatal care, including treatment of infections during pregnancy with drugs that may be contraindicated in the first trimester, detection of growth restriction and post term pregnancies (42

weeks gestation), provision of antenatal corticosteroids during preterm labour, and decisions regarding whether to administer or withhold intensive care to extremely premature infants (Rijken, 2012). Fetal crown-rump length (CRL) measured by ultrasound between 7⁺⁰ and 13⁺⁶ weeks gestation is the recommended method for precise dating of spontaneously conceived pregnancies (Butt, 2014). Beyond 14 weeks, ultrasound up to 24 weeks is the upper recommended limited for accurate dating using other fetal biometry measurements including head circumference(HC) and bi-parietal diameter (BPD) (Mehta, 2012). However, in resource-limited settings GA assessment is prone to inaccuracy. While several publications have demonstrated successful sonography in resource-limited settings, quality routine ultrasound is rarely available (Wylie, 2013).

METHODOLOGY

System Analysis

Analysis of the Existing System

In hospitals, medical record documentation requirements in the Prenatal and Postpartum Care measure to identify prenatal visits that occur during the first, second and third trimesters. Identify gestational age at birth from the hospital record (e.g., admission write-ups, histories and physicals, discharge summaries or labor and delivery records) or birth certificate. Gestational age is the number of completed weeks that have elapsed between the first day of the last normal menstrual period and the date of delivery. If gestational age is not available, assume a gestational age of 280 days (40 weeks).

Data Flow Diagram (DFD) of the Existing System

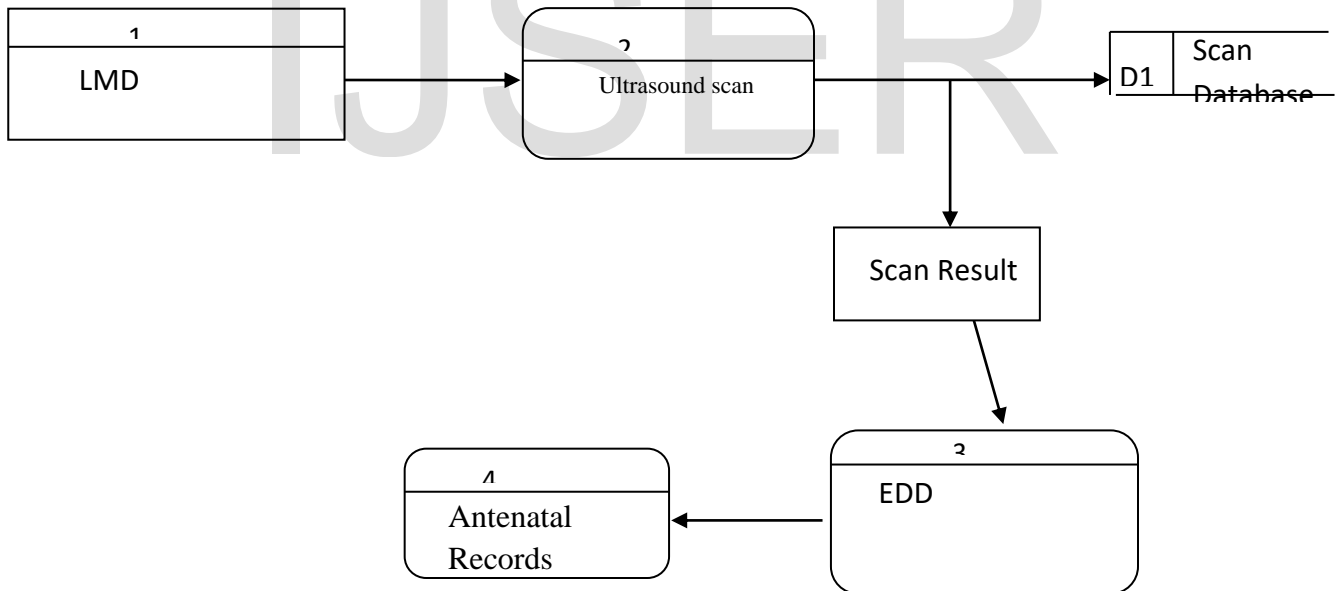


Fig 1.0: Data Flow Diagram of the existing system

Analysis of the Proposed System

The development of an artificial intelligence predictive medical system for analysis and prediction of foetal parameters is design to be used by healthcare centers and maternity homes to monitor the foetal development.

The new model will be an expert system and a hybrid model. It will combine the **Nägele’s Rule** and **Mittendorf Rule** to predict the foetal parameter. The new model will take the average of the two models as the predicted date of delivery.

Justification of the Proposed System

Reduction of still births and complications in delivery is a major aim of this thesis hence it justifies the need to implement the system to help expectant mothers have accurate predicted date of delivery in order to enhance safe delivery.

RESULTS

Control Centre/Main Menu

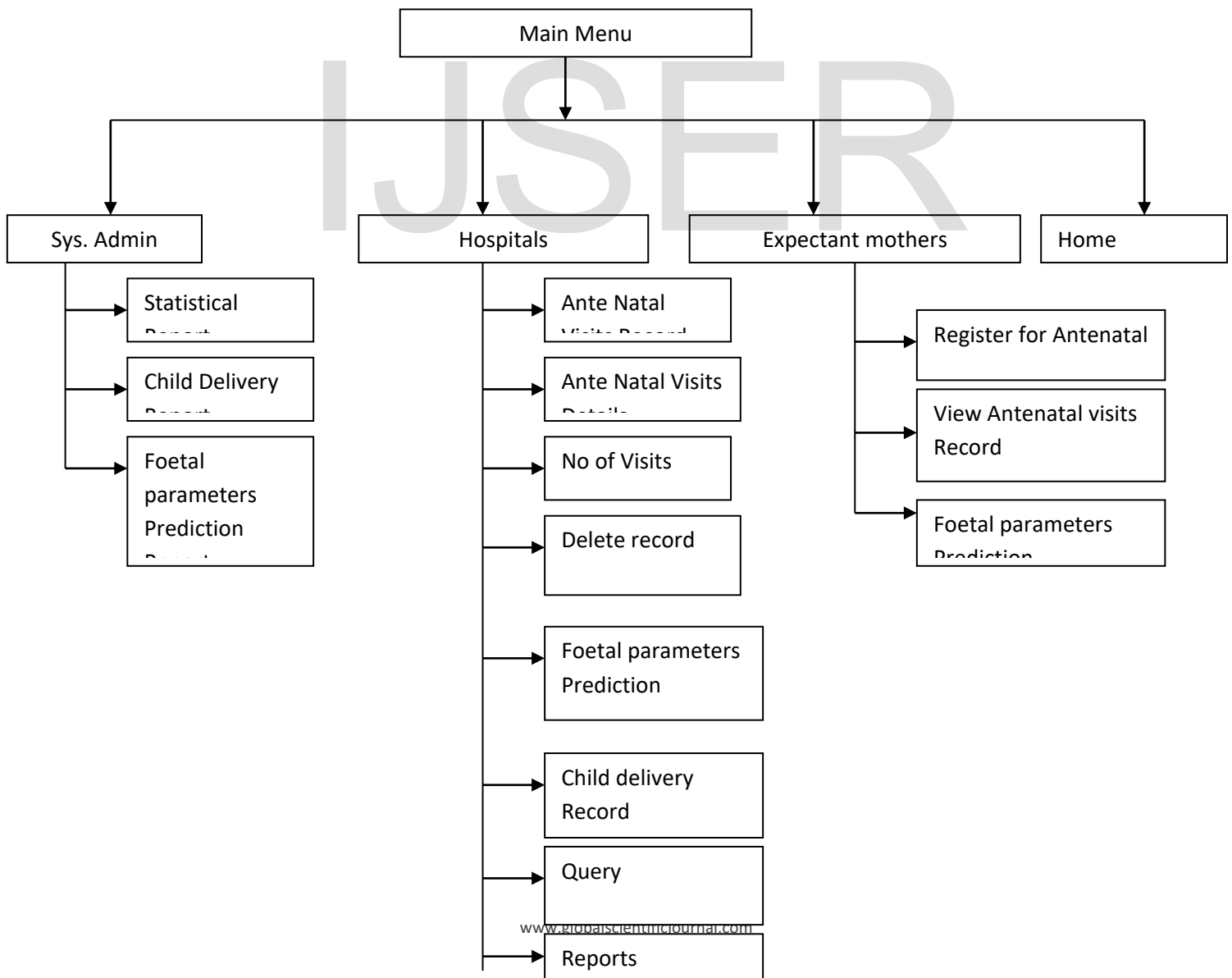


Fig. 2.0: Medical predictive system Main menu

Figure 2.0 shows the menu of the medical predictive system for comparative analysis of foetal parameters. Three levels of access was created; administrator, hospital staff, and expectant mothers. Each has a specified role to play in the model designed.

System Flowchart

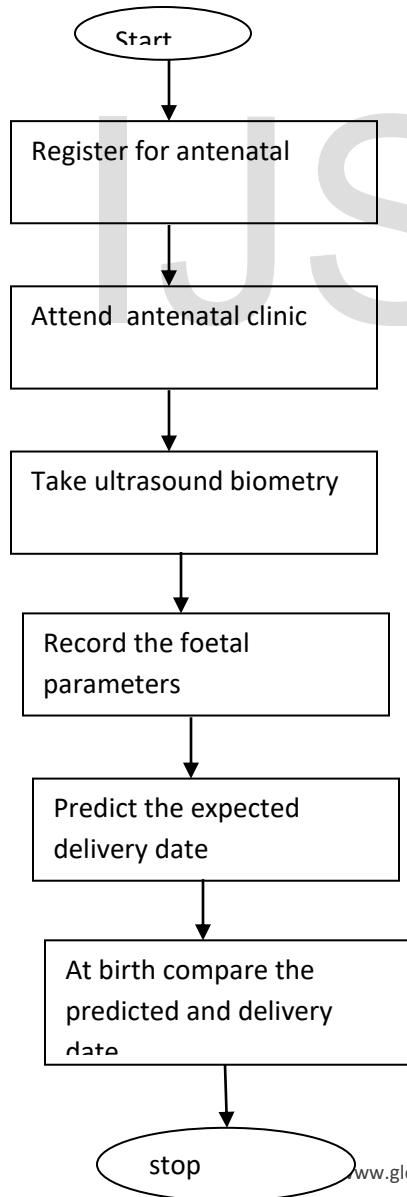


Figure 3.0: System Flowchart

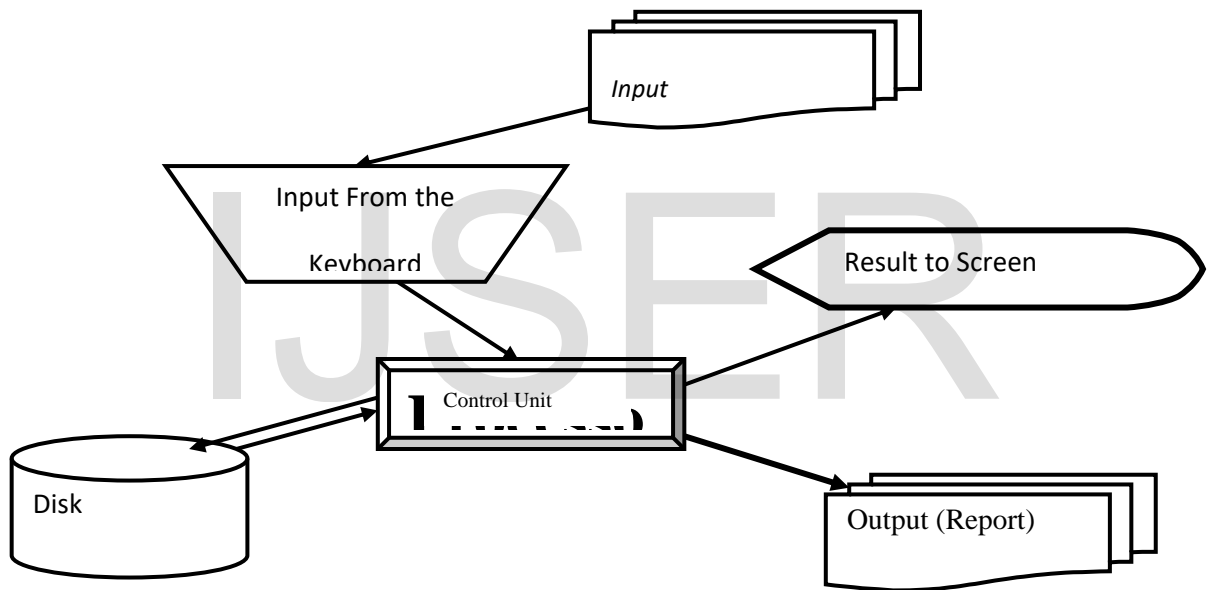


Fig. 4.0: System Flowchart

SYSTEM IMPLEMENTATION

Proposed System Requirements

The system requirement is divided into software and hardware requirement. Below is the detailed requirement for the proposed security mode.

Hardware Requirements

Table 1.0: Hardware Requirement

Hardware	Minimum System requirement
Processor	2.4 GHZ processor speed
Memory	4 GB RAM

Log In Form	Expected to see the Log In form so that one can log in.	When clicked on log in, a form appeared where you can enter your username and password.
Home Page Form	The expected result was the screen from where you can decide to call up any of the sub systems	The home page enables user to have access to other sub systems
Signup Form	Is expected to be used by pregnant mother for antenatal registration	When clicked on the sign up button, it displayed a form where the user can fill the pregnant mother record for starting antenatal clinic and the system generated a registration number automatically for each person that registers.
Hospital button	Expected to be used by hospital admin to login to the new system	This button displays the hospital admin login form where the user name and password is verified before gaining access to the restricted area
Patients button	Expected to allow registered antenatal mothers to access their data	The button displayed a form when you are required to enter registration no and phone number. Once validated, the person can view her details and all the antenatal clinic visits.
Antenatal visits button	Expected to be used to enter antenatal clinic records	The form was used to post the antenatal clinic record to the database
Foetal parameters prediction button	The button is expected to display a form where the gestational age with EDD will be predicted	The form was used to predict the gestational age and the EDD with foetal weight and BPD
Child delivery button	Expected to display a form for registering child birth	When clicked on the button, a form was displayed where the child delivery record was entered and submitted to the database

No of visits button	Expected to display the no of antenatal visit of an expectant mother	The button when clicked on displayed the record of antenatal visits of a selected expectant mother and the total no of visits
Statistical report button	It is expected to display all the registered antenatal records across various hospitals	The button when clicked on displayed all the registered antenatal records with their respective health centers and total.
Report	In this module, it is expected to be used to view report	When you go to this module, antenatal register, antenatal visit report, child birth report, and foetal parameters prediction report can be viewed
Delete button	To be used to delete record from the database	When clicked on delete button, the selected record was deleted from the table in the database
Help and support form	Expected to be used to submit help requests online	The form allows users to send request for attention or direction on antenatal issues.

CONCLUSION

This thesis have attempted to discuss a particular possibility of an ES to solve problems of complications primarily due to low and excessive birth weights at delivery by accurately estimating foetal parameters (*Foetal Weight, Foetal Age Conception Date, And Delivery Date*) using Ultrasonographic Foetal Biometric Data. The primary goal of expert system research is to make expertise available to decision makers and technicians who need answers quickly. There is never enough expertise to go around - certainly it is not always available at the right place and the right time. But computers loaded with in-depth knowledge of specific subjects can bring decades worth of knowledge and solution to a problem. If we must investigate and solve those ultrasonographic foetal biometry method of estimation that has been described over the decades as complicated, labour -intensive, limited by suboptimal visualization of foetal structures, costly and specially requiring trained personnel, we will have to build into the estimation the use of a Computer Wizard (An Expert System).

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