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Breast Cancer Knowledge Based System

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Abstract*: The Knowledge-Based System for Diagnosing Breast Cancer aims to support medical students in enhancing their education regarding diagnosis and counseling. The system facilitates the analysis of biopsy images under a microscope, determination of tumor type, selection of appropriate treatment methods, and identification of disease-related questions. According to the Ministry of Health's annual report in Gaza, there were 7,069 cases of breast cancer between 2009 and 2014, with 1,502 cases reported in 2014. In an era dominated by visual information, where 65% of the population are visual learners, the Knowledge-Based System serves as an effective tool to aid long-term information retention by utilizing visual and textual resources. The system features a user-friendly interface, enabling students to diagnose the disease and expand their understanding. Furthermore, it can be accessed via smartphones. The Knowledge-Based System comprises three primary components: Firstly, it provides specific patient-oriented questions to familiarize students with the questioning process. Secondly, it facilitates the analysis of biopsy sample images to determine their integrity and identify potential infections. Lastly, the system incorporates animated videos illustrating various approaches for treating breast cancer.*

Keywords*: Breast Cancer, Knowledge Based System, Expert System, Artificial Intelligence*

1. INTRODUCTION

In the current era, scientific advancements are uncovering more crucial diseases, identifying their causes, and providing treatment and diagnostic guidelines. The vast amount of information and databases available on various diseases necessitates the systematic organization of this knowledge for easy accessibility by researchers, doctors, and patients. The demand for computerized systems is rapidly increasing to establish a conducive environment that facilitates effective communication between doctors and patients, allowing for a comprehensive understanding of diseases, their progression, and treatment options.

Cancer, defined as the abnormal growth and uncontrolled proliferation of cells that may metastasize, encompasses numerous types classified into different groups. Among these, breast cancer holds significant prominence as the second most prevalent cancer. Understanding the specific characteristics and stage of the disease is crucial in providing appropriate treatment and effectively conveying this information to the patient.

Previous studies have shown that early diagnosis of diseases greatly improves the healing process. Therefore, the researcher has undertaken the development of a new system with a user-friendly interface, aiming to assist doctors and medical students in the treatment process.

The new system comprises three main components, each housing valuable information stored in a database. Moreover, the system is designed to be accessible through mobile devices. The Knowledge-Based System is divided into the following parts

1- The first part consists of a set of questions to be answered, with each question's weightage contributing to determining the degree of infection. This section aims to educate students about the disease's progression.

2- The second part focuses on diagnosing the samples using a microscope and provides an analysis of the degree of infection depicted in each image.

3- The final part concentrates on treatment, utilizing animated videos to deliver clear information on various treatment approaches.

. The system developed by the researcher offers medical students the opportunity to learn about breast cancer effectively. To ensure accuracy, the researcher collected disease data from specialists, including doctors specializing in breast cancer.

2. Motivation for the Research

The motivation for this research stems from the necessity to enhance the comprehension of breast cancer diagnosis and treatment. The objective is to enable students to access and review patient queries, as well as the methods, diagnosis, and microscopic analysis

of breast tissue experiments at any given time, without limitations. By addressing this need, the research aims to empower students with convenient and unrestricted access to vital information related to breast cancer, promoting a deeper understanding of the disease and its management.

3. Problem Statement

The presence of various types of cancers, including breast cancer, poses significant challenges for medical students. Breast cancer is currently the most prevalent cancer among women and ranks as the second most common cancer overall. Early detection plays a vital role in successful treatment, as studies have shown that identifying breast cancer in its early stages significantly improves treatment outcomes.

Medical students often face difficulties in comprehending the process of treatment, including its meaning and different stages. This lack of understanding can lead to misunderstandings and hinder their ability to provide optimal care. Additionally, there is a lack of easily accessible and comprehensive resources that provide a clear understanding of the disease and its treatment methods. As a result, medical students may struggle to gain knowledge about treatment options and surgical procedures.

To address these challenges, there is a pressing need for a Knowledge-Based System that can assist medical students in obtaining a clear understanding of breast cancer and its various treatment approaches. Such a system would provide accessible and comprehensive resources, allowing students to access information about the disease and treatment methods whenever needed, without any limitations. By providing this knowledge-based system, medical students can enhance their understanding of breast cancer and improve their ability to provide optimal care to patients.

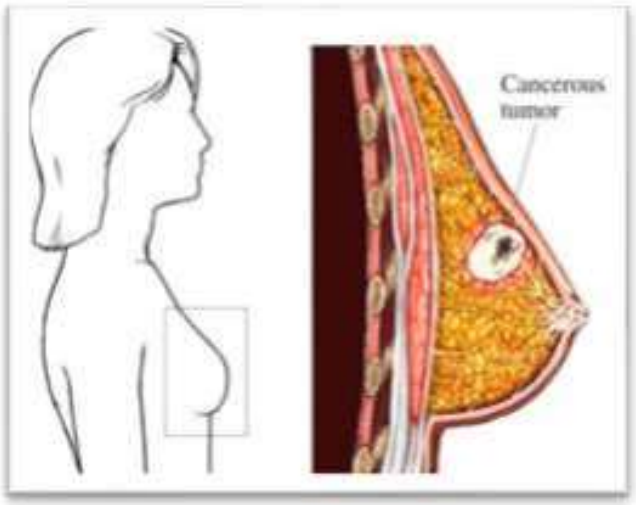
4. Research Questions

In light of the problem statement, this research seeks to address the following questions:

1- What are the most suitable applications to be utilized for the Knowledge-Based System?

2- How can the Knowledge-Based System be effectively employed to enhance medical students' learning?

3- What are the potential benefits that doctors can derive from the implementation of the Knowledge-Based System?



5. Research Objectives:

The primary objectives of this research are as follows

1- To determine the level of the disease for each patient, enabling a better understanding of the disease progression and treatment requirements.

2- To streamline the process of treatment explanation for doctors, effectively saving their time and facilitating clear communication with patients regarding the intended treatments.

3- To provide a user-friendly and accessible platform for medical students to obtain comprehensive information about the disease, particularly benefiting those who are new to the field.

4- To develop an educational program with an engaging and easily navigable interface, ensuring effective knowledge transfer and understanding of breast cancer.

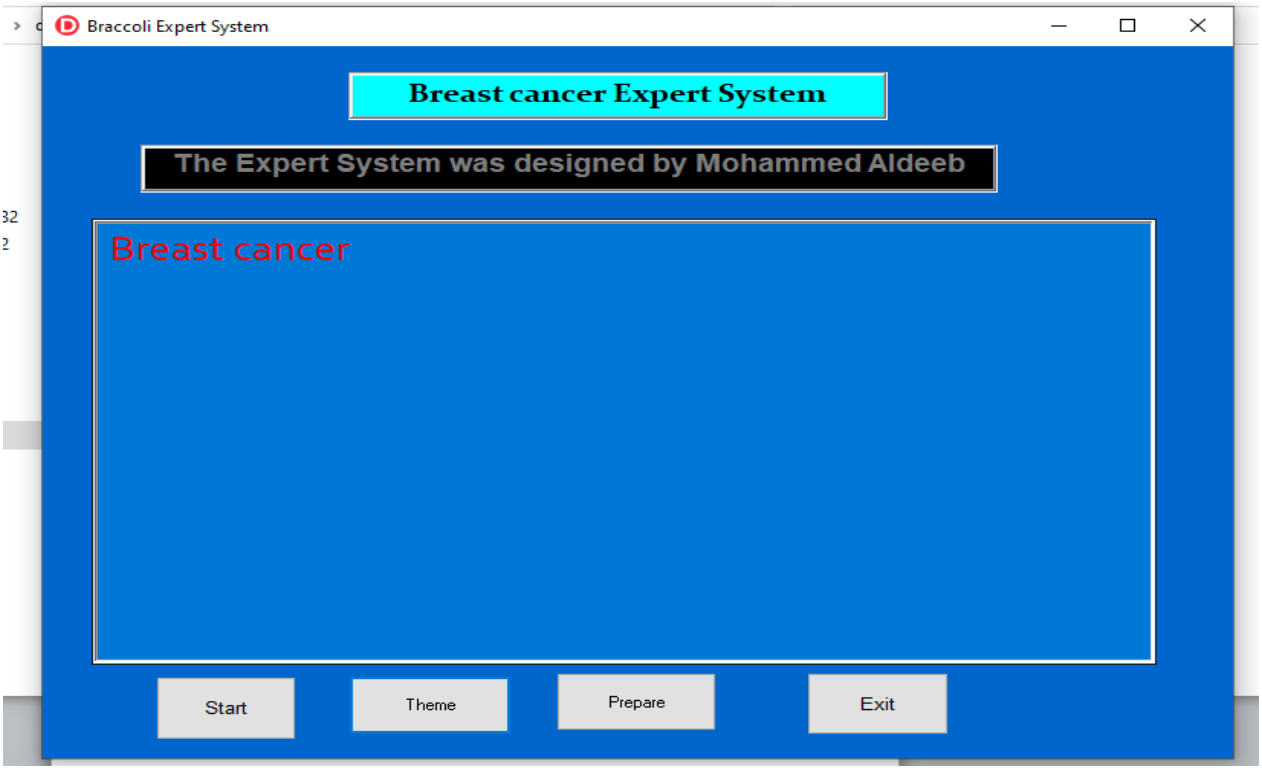
6. Significance of the Research:

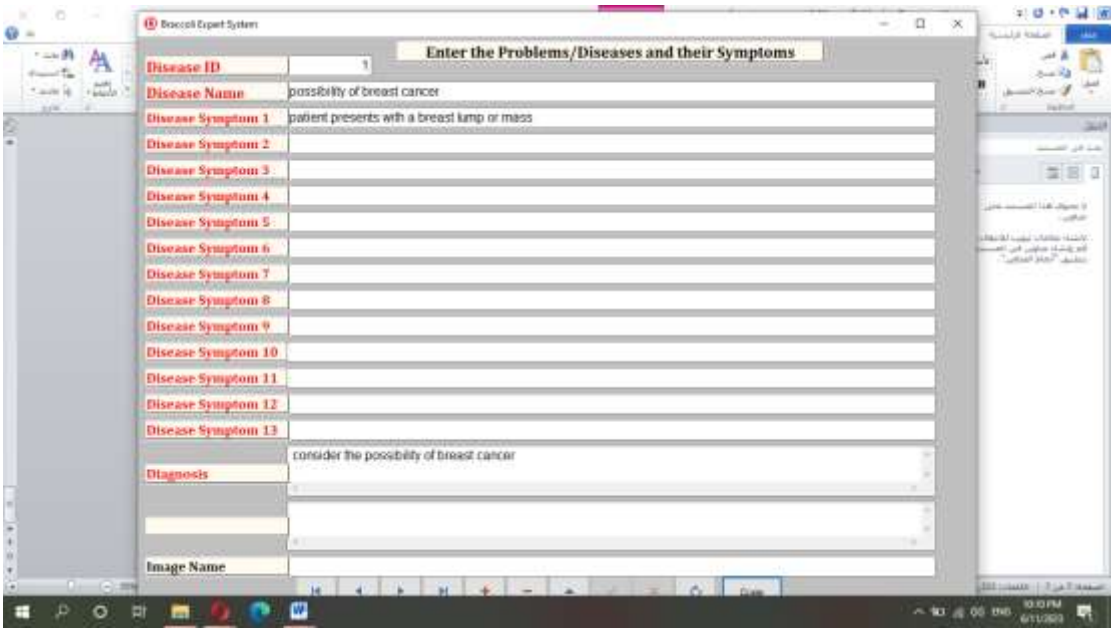
This research holds significant importance for individuals residing in Gaza, as it pioneers efforts to enhance their understanding of breast cancer. Particularly, medical students stand to benefit greatly from the study, as it provides them with a comprehensive and easily comprehensible Knowledge-Based System. Through the utilization of visual aids such as pictures and animations, the system aims to facilitate a clear comprehension of the disease among students.

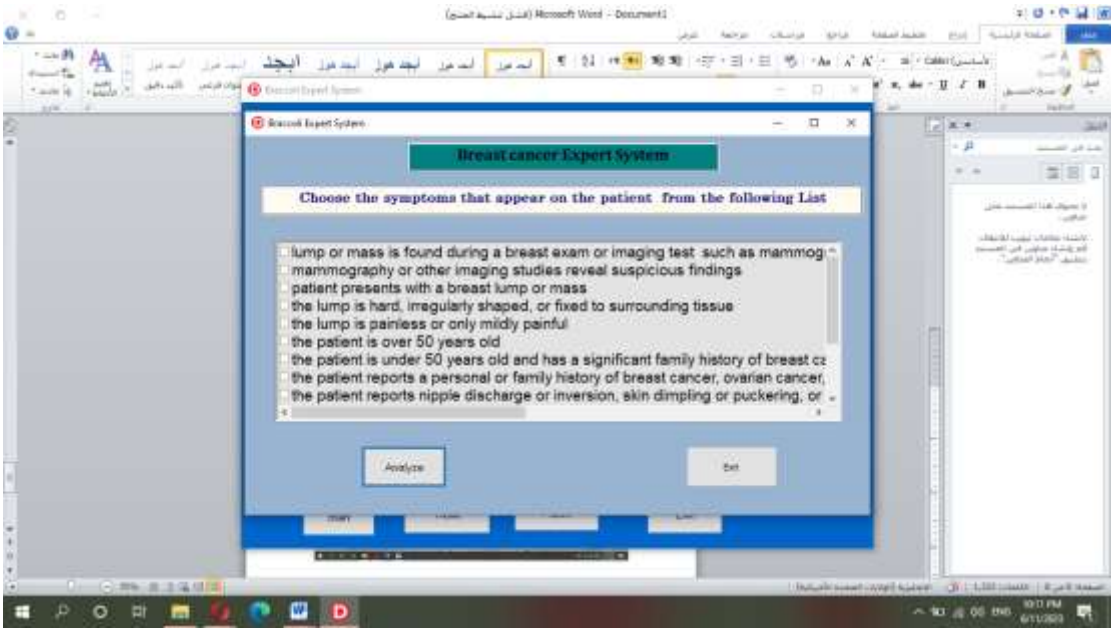
The application developed as part of this research plays a crucial role in diagnosing the disease. It analyzes the data inputted into the system and employs a question-based approach to learn about the symptoms associated with the disease. By combining these functionalities, the research contributes to creating a comprehensive and user-friendly system that aids in the accurate diagnosis of breast cancer.

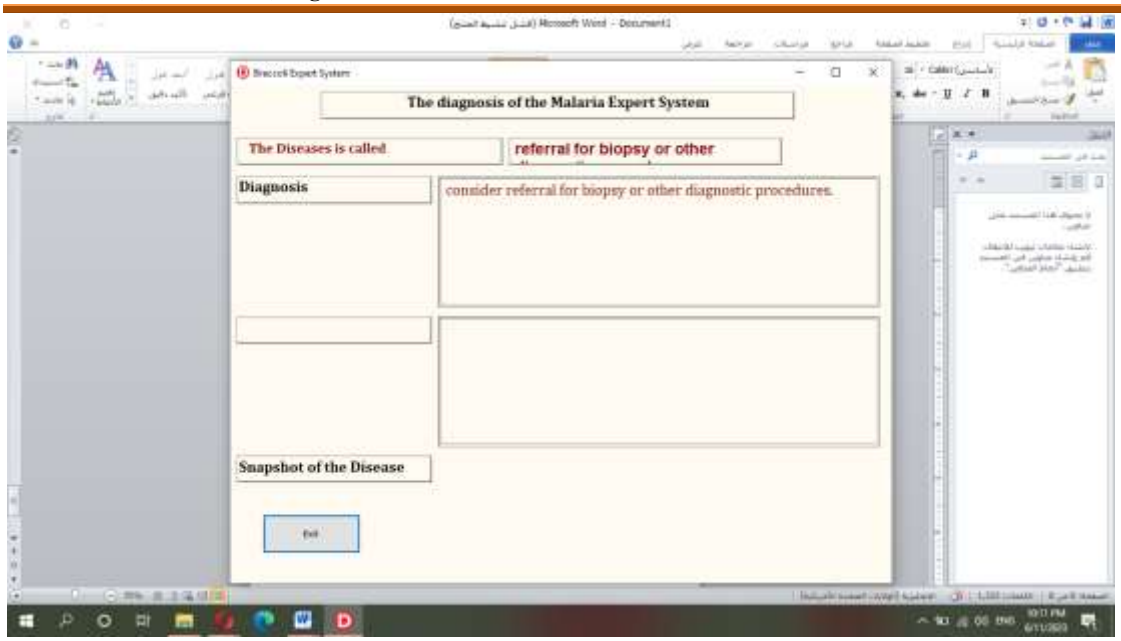
7. The Application Areas of Knowledge Based Systems

From its early days of infancy when MYCIN was earliest pioneer, Knowledge Based System (ES) have been developed in broad walks of life, in different areas and disciplines range from statistics, geology, and electronics to medicine. In fact, the sky has no limit! To highlight on this issue, a kaleidoscope of the Knowledge Based Systems developed in their particular fields is mentioned here. Williams recommended a prototype Knowledge Based System for the propose of complex statistical experiments. GEOPLAY is information based Knowledge Based System developed by the U.S. Geological Survey that is obtainable for explorations in the oil and gas manufacturing [7]. Craker & Coenen proposed Knowledge Bazaar, the concept of which a model for the development of ES and knowledge basis are produced dynamically using knowledge supplied by self-appointed internet community. The philosophy supporting the Knowledge Bazaar is the examination that knowledge can be accumulating, not from a limited number of experts or expert sources, but dynamically from internet users as they solve problems and suggest advice [8]. Perhaps, all the related studies are best encapsulate in the paper by Liao where ES methodologies in almost all applications have been reviewed by the author for a span of a decade starting from the year 1995 [9].




Broccoli Expert System
Enter the Problems/Diseases and their Symptoms
Disease ID
1
Disease Name
possibility of breast cancer
Disease Symptom 1
patient presents with a breast lump or mass
Disease Symptom 2
Disease Symptom 3
Disease Symptom 4
Disease Symptom 5
Disease Symptom 6
Disease Symptom 7
Disease Symptom 8
Disease Symptom 9
Disease Symptom 10
Disease Symptom 11
Disease Symptom 12
Disease Symptom 13
consider the possibility of breast cancer
Diagnosis
Image Name


Broccoli Expert System
Breast cancer Expert System
Choose the symptoms that appear on the patient from the following List
lump or mass is found during a breast exam or imaging test such as mammog
mammography or other imaging studies reveal suspicious findings
patient presents with a breast lump or mass
the lump is hard, irregularly shaped, or fixed to surrounding tissue
the lump is painless or only mildly painful
the patient is over 50 years old
the patient is under 50 years old and has a significant family history of breast ca
the patient reports a personal or family history of breast cancer, ovarian cancer,
the patient reports nipple discharge or inversion, skin dimpling or puckering, or
Analyze
Exit



8. Conclusion

In conclusion, the "Breast Cancer Knowledge Based System" is a valuable tool that harnesses the power of artificial intelligence and expert knowledge to enhance the understanding and management of breast cancer. This system serves as a comprehensive resource for healthcare professionals, researchers, and individuals seeking accurate and up-to-date information about breast cancer.

By leveraging a knowledge-based approach, the system provides a centralized platform for storing, organizing, and retrieving pertinent information related to breast cancer. It incorporates various data sources, including medical literature, clinical guidelines, patient records, and expert insights, to deliver comprehensive and reliable knowledge.

The system's intelligent algorithms and decision-making capabilities enable it to analyze complex data, identify patterns, and generate meaningful insights. It can assist healthcare professionals in accurate diagnosis, treatment planning, and prognosis prediction, ultimately leading to improved patient outcomes.

Furthermore, the "Breast Cancer Knowledge Based System" plays a crucial role in empowering patients and their families with valuable information. It offers user-friendly interfaces, interactive features, and personalized recommendations, enabling individuals to make informed decisions about their healthcare journey.

As the field of breast cancer research and treatment continues to evolve, this knowledge-based system can adapt and expand its knowledge base to incorporate the latest advancements and discoveries. It has the potential to revolutionize breast cancer management by promoting evidence-based practices, facilitating collaboration among healthcare professionals, and driving continuous improvement in patient care.

In summary, the "Breast Cancer Knowledge Based System" represents a significant advancement in the field of breast cancer, harnessing technology and expert knowledge to provide a comprehensive and intelligent platform for enhancing understanding, diagnosis, treatment, and support related to breast cancer.

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