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A Technological Breakthrough: Empowering Breast Cancer Imaging through Augmented Reality Visualization on Android Based Platforms

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Abstract:- As a treatment of 'Breast cancer,' the interest in using the mechanism of Augmented Reality (AR) using the method of image guidance has been growing for the past few years. The fast-growing dangerous motion of breast cancer is the center of this interest, and every case of this deadly disease can be different." Technological Breakthrough: Enhancing Breast Cancer Imaging with Augmented Reality Visualization on Android-Based Platforms" explores standardization efforts aimed at developing solutions to make AR guidance more accessible for breast cancer patients. As Android device is very available nowadays scanning the images in this platform for biopsy pictures individuals facing challenges due to their condition can benefit from this technique. The study highlights the specifications of AR-based devices, such as virtual information sections, visualization imaging modes, tracking techniques, and types of AR displays. Considering all the critical factors the experience of AR technology for guiding breast cancer treatment is now a well adopted idea. Widespread use of reality in settings could be facilitated by having accurate and easily accessible image specifications. This would ensure the precision of treating breast cancer patients who are battling this type of malignancy and aid their recovery process.

Keywords:- *AR Technology, Convolutional NeuralNetwork, Biopsy Image, Benign Cell, Malignant Cell.*

I. INTRODUCTION

Traditionally the treatment of breast cancer is the same in every place that involves removing the tumor from the breast tissue. First, for this doctor needs to locate the cancer cells.

By the wire localization method, doctors used to locate the tumor, and this is the common start of the treatment. The wire used gets inserted to guide the oncologist in detecting the affected tumor part of the breast that needs to be removed. However, this process has its limitations as it needs to be guided during the operation itself making it challenging for the breast surgeon to adequately plan and prepare for surgery. This can result in increased risks to the patient's health and unnecessary prolongation of surgery time. To get better results and make the process more affordable. Augmented reality (AR) technology can be used to remove the challenges that are addressed by this process. AR overlays computer-generated images onto real-world environments providing a representation of the treatment process, for accuracy and success rates. For a better and easy treatment, if the doctors use this technology the possible results for detecting the lymph node placement ultimately enhance the effectiveness and efficiency of treatment.AR display methods can vary, including image monitoring-based approaches, video-based techniques, or projected images. It needs some time to get a better result and this process can be essential in terms of better treatment. The research provides advantages overall including:

- The current approach for detecting and examining breast cancer cells is outdated time time-consuming, and lacks accuracy for patients. Using augmented reality (AR) to visualize breast cancer cells offers a departure from methods.
- We aim to create and visualize biopsy images in the world through augmented reality.
- Leveraging AR technology, we seek to explore features for treating patients with breast cancer .
- Our goal is to extend this implementation by incorporating image processing techniques alongside AR technology enabling the visualization and scanning of 2D models into augmented visuals.
- We will showcase our proposed architecture through a demonstration.
- The paper of the study is as follows: (II)Presents related work, the Proposed model will be discussed in (III), the result will be viewed in (IV), and (V)will discuss the conclusion and future work.

II. RELATED WORKS

In the research system, it has been observed that despite the availability of advanced technologies doctors still predominantly rely on traditional treatment methods resulting in a lower survival rate for cancer patients. This investigation introduces an MR picture-based AR framework [2],[15] that effectively utilizes needle biopsy outside the MR image. By incorporating procedure MR images into the patient's space this AR framework provides additional information that

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enhances real-world understanding. An AR clinical imaging system called D3D [12] is also utilized in this study. It offers 3D modeling with disparity enabling depth perception and head tracking. The D3D system reveals details that may not be visible with standard imaging techniques. In an application of reality [3],[5],[10] projected images assist doctors in accurately locating tumor's during surgical planning for breast removal procedures. For some women patients goes through by the surgeries who have lumpectomy as sometime their range went high, in some cases this surgery makes their mental health unstable and thus it makes the process more time consuming for their treatment. Lumpectomy, also known as breast-conserving surgery is now the treatment, for early-stage breast cancer [9]. A fibre optoacoustic guide (FOG)combined with reality (AR)offers tumours localization and intuitive surgical guidance with minimal disruption. The use of 3D tumours [16],[11] visualization through augmented reality (AR) has become the preferred approach for breast surgeons. This mobile AR imaging system consists of four stages starting with capturing images, from Computed Tomography (CT)or magnetic resonance imaging (MRI) and processing them into slices [14],[18],[20]. The AR system operates on a digital assistant (PDA) with a built-in camera. By leveraging consumer devices and requiring minimal installation this application provides users with an immersive three-dimensional view of the surgical environment.

III. PROPOSED MODEL

In this section, we will be using augmented reality (AR) as a means of discovering tumors of the breast in a 2D vision. Our objective is to assess the breast virtual modeling which will be used to display 2D tumor's. The key step for this strategy is to build 2D slices of photos of breast tumor shots using 2D modeling techniques only after evaluating the images that would be taken after analyzing the breast tumor pictures. We utilize this imaging quality having offered a method of employing approaches to show the skin of the perception, by which the outcome will create an extensive illustration for better understanding of every aspect of this picture. As an image in the six degrees of movement allowed the outcome of the tumor's will be displayed on a smartphone. In our working process, the accuracy comparison is not finished yet but the 2D neoplasm visualization is perfect in the design and test phase. As the AR scan representations allowed a direct understanding of breast growth on the far side and the visible direction approaching proper diagnostic assay objectives, the framework is seen as connected with increased visualization skills in nursing. We have divided this process into 4 stages. The substages are organized sequentially from the system's contribution to the production stage, with detailed clarification. Cellphones that have an Android facility can be easily used for this process. It will use Magnetic Resonance Imaging (MRI) or CT filter to obtain pictures that are appropriate for catching basic force change of a breast illness with a high target.

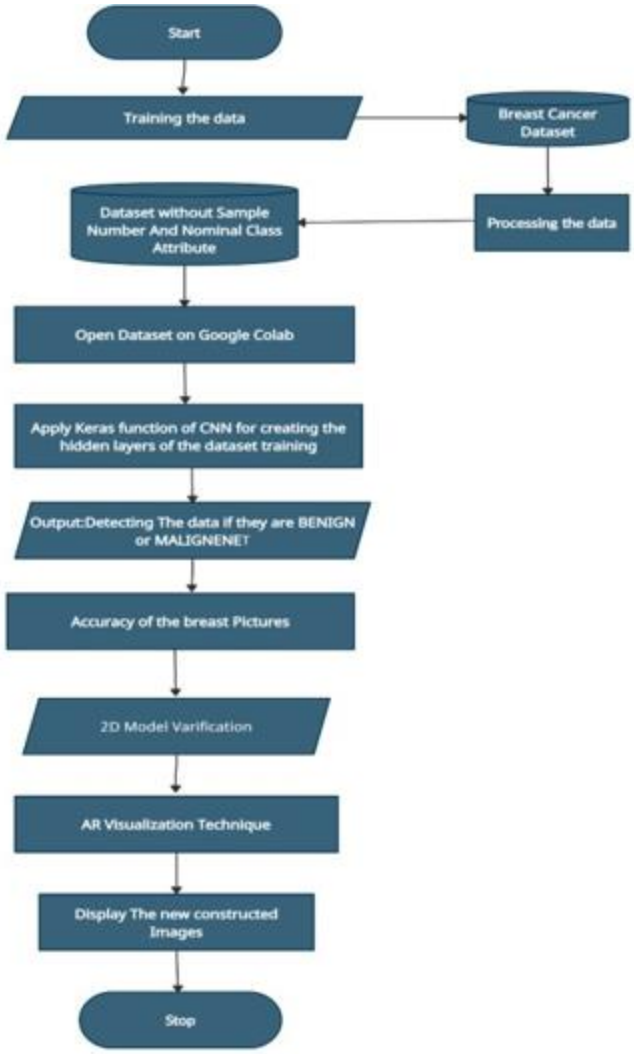

Fig.1: The proposed Architecture for the AR visualization.

A. Image Acquisition

To obtain an MRI with multispectral features , forced energy minimization must be used to measure the multispectral images . Before this , we processed the images in *Google Collab* utilizing *CNN* technology for data training and a variety of tasks . This study worked using it after validating the accuracy of the images , and it can also split data from images into Malignant and Benign cells , confirming the afflicted cell for cancer and the rate of risk of them . As a result , the relationship between the segment vectors of each region and the order targets.

B. 2D Model Reconstruction

Cancer models, in 2D, can be reconstructed based on the sectional images. We create a framework using a 256*256*256 grid, from the images that have been filtered using Gaussian techniques (binary image) specifically extracting the area of breast tissue. This allows for a visualization and understanding of the cancer cell growth through a 2D reconstruction process.

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C. AR Visualization Technique

The procedure, for creating an augmented reality (AR) representation involves stages. Firstly images are obtained using computed tomography or magnetic resonance imaging (MRI). Then a 2D model is constructed. This virtual 2D model of breast cancer is applied to a breast model. Accurately traced using an open-source tool. This tool allows experiences with 2D objects. Provides a final scanning application to assist in locating cancer beneath the model's skin. The data will be uploaded to a smartphone or tablet device enabling visualization of the cancer in 3D with features like zooming and rotating. Additionally, intensive tasks such as edge detection and perspective evaluation are performed on images with reduced resolution. In this case, the images are resized to a resolution, for scene capture and restored to their original size during image alignment.

D. Display

The displaying process needs to have a combination between the 2D slice visioning and the construction of a 360-rotation process because of this the most versatile and massively used option is the mobile phone as it can easily contrast with the AR technique. The camcorder has been configured for space between the cameras. For effective image quality, we can now easily use Mobiles and tablets as they are very much available in every country now. As the power consuming options as well as the data quality have been improved a lot because of this in this era using a mobile phone for displaying the images is required for this step. For running 2D tracking of paper markers and seamlessly integrating 2D/3D graphics into the environment at interactive speeds these Android mobile phones are getting perfect day by day. They also offer high-resolution image transfer capabilities, impressive graphics, and ample memory capacities.

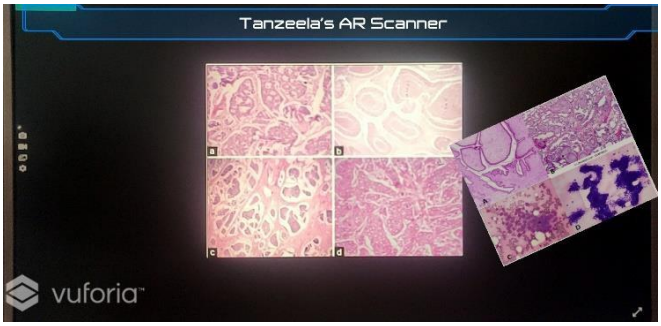

Fig.2: Cancer Cell (Benign and Malignant) that are developed in the breast are divided as per their quantity.

IV. RESULT

Using the Unity developing tool we implemented this AR application for visualizing breast lump images of breast cancer patients. This approach takes advantage of high-quality smartphones that are commonly found in households today. To get started simply use the built-in camera option on your cellphone. Install the application. The scanning process for each image takes 3 to 4 seconds and a message saying "scanning" will appear before it begins. One of the challenging aspects in assessing any approach is determining the training and testing sets. In this case, we can break down the task of "Scanning" into two operations: scanning and classification. To evaluate its effectiveness, we compared this app to an AR representation of breast biopsy photos that accurately depicts cancer cell presentation in a training simulation. It's possible to capture the pictures from different angles for proper viewpoints. There were many similarities between many models of this process but in our one, we get some better accuracy for the outputs. Here Fourier transform can find the frequency domain of that image.

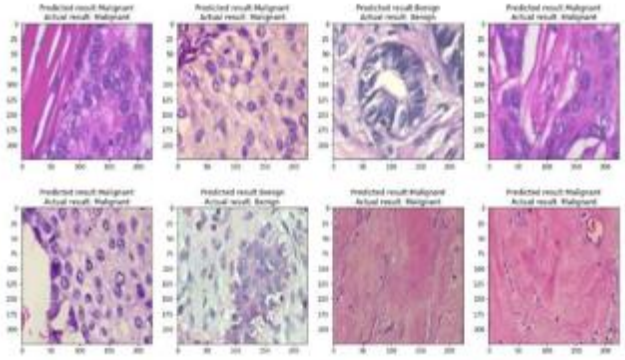

Fig.3: Predicted and Actual Result of the Breast Cancer cell.

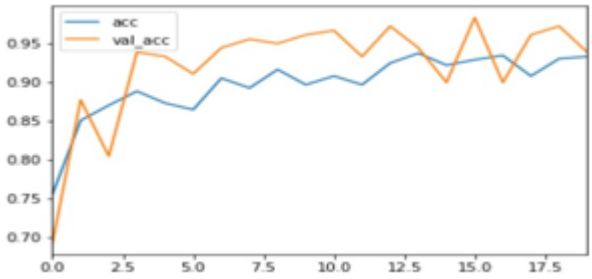

Fig.4: Accuracy level for the Malignant and Benign cell throughthe Google Colab.

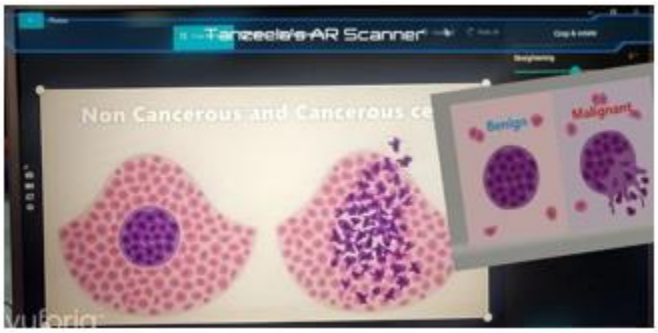

Fig.5: Scanning and Protectional image of Breast Cancer cell through Augmented Reality.

We tried to get some feedback from some users in the testing phase and we got reviews that it was easy to detect cancer cells by this AR visualization methodology. By using this the satisfactory results between the women were very high as it's a very easy process to use this app. We used the dataset of the cancer cell pictures; 96% accuracy was received during the testing phase. For zooming or rotating the process of 2D modeling was used that gave a proper understanding of the cancer cells spreading situation. Based on the evaluation reports this application has shown effectiveness in detecting cancer cells. Although it can be quite expensive it offers the

benefit of saving time. Providing accurate results. Moreover, it allows women to undergo breast cancer screening by minimizing movements.

V. CONCLUSION AND FUTURE WORK

Augmented reality is promising and having less time for better accuracy as well visualizing the images of the breast cancer cell. The availability of proper and easy 'Image specification' that should guarantee the accuracy required for the treatment of the Breast Cancer Patient which can easily help them for repairing their stage of sickness. In the future, there will be an evaluation of how this technology can be utilized by people, from backgrounds. Scan vision technology proves to be highly suitable and advantageous for breast surgeons as they can review images during the procedure. Currently, this AR innovation has not been implemented in Bangladesh. However, there are plans to utilize this software for treating breast cancer patients in the future. While this application may require smartphones, with AR capabilities it is still a cost-effective option compared to other methods of breast cancer testing. By using the app, the doctors will be able to treat patients more easily than ever before, as using this application they will be able to have the allowance to visualize breast cancer lumps images in a short time and the surgeons will also be helped by this application in the treatment or the operation.

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