Development Augmented Reality For Dementia Disease (DARD)

Nan Md. Sahar\textsuperscript{1,a}, E.M.N.E. MatNasir\textsuperscript{2,b} A.H. Zainudin\textsuperscript{3,c}

\textsuperscript{1,2,3}Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia, 86400, Parit Raja, Batu Pahat, Johor, Malaysia.

\textsuperscript{a}nan@uthm.edu.my, \textsuperscript{b}emdnasri@gmail.com, \textsuperscript{c}ge120027@siswa.uthm.edu.my

Keywords: Dementia, Augmented Reality and MAS

Abstract:
Nowadays, augmented reality technology has been widely used for medical purpose especially in handling the dementia patient. This technology were apply to dementia patient during the treatment. The aim for this research is to propose a new treatment to help dementia patient be like a normal person. This paper highlight how the application of augmented reality help the patient in improving their quality of life and analyze the result from memory assessment scales (MAS). The result shows the real condition of dementia patient, and there is a comparison before and after the test is conducted. The result are very important for pre and post test. This kind of result will be help in finding the suitable treatment for dementia disease.

Introduction

Augmented reality (AR) have high research interest. A lot of scientists and commercial field has realized AR as a new technology to improve the existing solutions and to unlock new applications that were not possible without AR. Besides gaming and entertainment community, other industrial engineering, medical and engineering field realized the potential of AR to be in medical field. Among the example are preoperative diagnoses, intraoperative navigation and postoperative control\cite{1}. This research focusing toward the alternative treatment for dementia disease by using the combination of augmented reality with medical assisting method.

Dementia is a non-specific syndrome in which affected the areas of brain function and affected memory, language, problem solving and attention. Dementia, unlike Alzheimer’s, is not a disease itself. Dementia appears the higher mental functions of the patient are involved initially. Eventually, in the later stages, the person may not know what day of the week, month or year it is, he or she may not know where he is and might not be able to identify the people around him. From that situation the person might have the first symptoms that is memory loss. Besides that, there are several symptoms might happen beside memory loss. The symptoms are moodiness and have a difficulties to communicate effectively. Unfortunately, there is no specific treatment for the dementia disease until now, but there is medication and various forms of therapy design to help manage symptoms and improve patient’s quality of life. The treatment that we use nowadays actually by giving a medicine or drug to slow down the dementia progress. Beside that, music also one of the alternative treatment for this disease. Therefore, this research were conduct to be one of the treatment to dementia disease.

The aim of this research is to investigate the relationship between augmented reality using marker method in improving dementia patient quality of life. By design the systems utilizing augmented reality technology for assist the patient in improve their quality of life, we can measure the the efficiency of the system to dementia patients.
Related Work

An overview of studies in pervasive healthcare [2] is given by Orwat et al. [3] and includes work on monitoring patients suffering from dementia and its most common shape, Alzheimer's disease. In [4], Megret et al. describe monitoring dementia patients using wearable video cameras including video browsing interfaces for dementia specialists to provide continuous feedback.

Possible techniques and setups needed to develop assessment, monitoring, and intervention systems are brought by Geoffrey et al. [5] where Geoffery et al. analyze the methods for detecting dementia with different approaches by using human electroencephalogram. A lot of work has been done so far in monitoring dementia patients using wearable sensors such as a textile technology [6].

In terms of deploying pervasive systems in nursing homes for analyzing dementia patients in their daily life, Gruner et al. [2] introduce their research in detecting human interaction events in a hallway of a nursing home using indoor location.

A study with parallels to our own is described in [7]. Lin et al. introduce an RFID-based assessment and safety monitoring system. This system intends to guard dementia patients indoors and outdoors (when they try to leave safe areas or come close to hazardous areas) providing an alert system for caregivers and ways of assessing the state of dementia. However, unlike in our research, the assessment is performed by implementing the augmented reality screening procedures in a variety way based on case study instead of deriving it from sensor data.

Methodology

Experimental Set-Up:

Figure 1 shows the set-up for DARD. The application has been built by using BuildAR software. There are three major parts in DARD that consist marker, camera, and LCD display. The marker functions as the tag name for the object that will be read by the camera. Then, the camera function as the detection engine for augmented reality application that will detect and capture the image or object from the marker before transferring the data to the LCD display. While, the LCD display is to display all the information that the camera detects from the marker. The flow as same as the block diagram in figure 2. The sequence of the system as in figure 3 were follow the following options:

i. Information appearance: When the camera detects the marker, Picture will
appear based on the marker.
ii. Information details: Information such as name, relationship and etc. will appear below the marker.
iii. Information stop: When the camera doesn’t detect the marker.

Figure 2: Block diagram for DARD

Case Study: Remember the relative
The system has been tested with a 65 years old woman. Based on diagnosis, the patient having dementia in stage 2. The symptoms that this patient have is occasional lapses in memory, usually undetectable to family and friends. So that, the pre and post test were done towards the patient. The pre test, we using a voice for those words and the post test we using augmented reality, DARD. The patient is given 30 seconds for recall back the image and the word that we give. The example of the word that will be shows is same as in figure 3 for DARD.

Figure 3: DARD Application

Preliminary Result and Discussion

![Pre Vs Post Chart]
The preliminary result shows that the graph for pre and post test for this research. As we can see there were a lot of difference between pre and post test. Each test were repeat in 10 times to get the efficiency of the test. Each result were difference based on a few factor such as the environment during the test were held and the condition of the patient itself. The assessment were done by using memory assessment scale (MAS) specific in recall back the information that appear on the marker.

**Conclusion**

In this case study, we can see the result for pre and post test towards the patient itself. Before the session with DARD, the patient was not able to know the information detail of the stranger. After this session, the patient was able to know the information detail of the stranger and can remember it well. This first result is quite impressive because it demonstrates that DARD exposure is effective for the treatment cognitive impairment. This first experience using DARD to treat dementia patient is very important because it demonstrates that it is possible to use DARD to treat cognitive impairment.

**References**


