Dementia Detection for Elderly People using Robotic Process Automation

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Abstract- In modern day technology, among the elderly population, there is an increased prevalence in dementia. However, there is a delay in dementia diagnosis over the recent years. So there is an integral need for improvisation of dementia diagnosis in every part of the nation across the globe. Dementia screening remains controversial, although strong preference is given for screening dementia, mainly for hospital inpatients. Here the objective is to implement screening, to alert family members about the condition of patients. The entire screening process is achieved using Robotic Process Automation where automatic screening and validation of the mental state of the elderly people is recognized and shared with their respective family members.

Keywords- Dementia, Delay in diagnosis, Screening process, Robotic Process Automation.

I. INTRODUCTION

In order to be dragonized with dementia, the elderly people are required to see medical professionals or operate the application on tablet PC. This means they need to go all the way to the hospital to get operated on those devices to feel a lot of pressure to take the test which have psychologically and physiologically imposed strain on them. Moreover, the questioning, rating, preparation of machines and providing feedback to the elderly people takes a lot of time for the medical professionals who conduct the tests for dementia detection. Also missing an opportunity to take the test also leads to progress in dementia without any realization by the elderly people. So dementia should be detected at an early stage and also it should not provide any kind of stress throughout the entire screening process for the elderly people. Therefore, we developed a system that a communication robot objectively evaluates dementia based on conversation with the elderly and alerting their family members through social media about the progress.

II. MOTIVATION

Since dementia is a type of cognitive disease whose progress takes a long period of time, finding a solution for it once it has affected the elderly people in a large scale is not effective. Thus to achieve prevention of dementia it is necessary to have an early detection of dementia thus restricting it to some amount. The detection process is achieved by home monitoring by means of an interactive session which evaluates their psychometric and linguistic skills. This paper tells how the human-computer interaction is implemented to achieve the dementia detection at early stages.

A. SCOPE

The scope of this project is maximum avoidance of cognitive impairment and other advanced levels of dementia at early stages.

B. OBJECTIVE

1. Early detection of dementia
2. Reduces questioning and feedback time for medical professionals
3. Relieves stress out of the patients.
4. Alarms family members on patient’s state of health

III. METHODOLOGY

The methodology design is based on Mini Mental State Examination which focuses on two aspects, one the psychometric analysis of the patient is identified by means of proposing various judgmental situations to analyze the patient’s state of mind and the second one is to examine their memory skills based on their day to day activities and experiences in their past. The type of patients to be evaluated are categorized as [1] patients over 50 years of age [2] patients suffering from any neurological disorder [3] patients suffering from minor skull damage due to past accidents. The activities based on psychometric skills are based on MMSE methodology and evaluating their past experiences can be gathered from their family members. These methodologies are implemented on the communication robot which provides a friendly and a convenient interaction with the elderly people and makes the process in a short and efficient manner.
A. Purpose of Robot

Our main purpose of using a robot is to provide an ease of use for the patients because the users that we deal with are above the age of 50 and therefore manual effort provided by them would be less if most of the activities are carried out using voice recognition and hand-written systems.

B. Psychometric Analysis

The inclusion of psychometric skills is to evaluate the mental capabilities and behavioral style of patients, that is how well do they have a basic sense of knowledge in personality characteristics and cognitive abilities. This provides how much the user is attentive and interactive to the current state. The cognitive abilities of the user are evaluated based on the following sample categories:

- Fig.2 Pattern sequence
  The above figure deals with what pattern should appear next in the given sequence from the list of options. The subject may get confused over the shape selection due to multiple choices and this provokes their cognitive abilities.

- Fig.3 Mirror images
  This figure explains another psychometric analysis feature which deals with identifying the mirror images of words. The patient might find it difficult if they do not have a strong base in recognizing letters and alphabets. Therefore, it also evaluates the linguistic abilities of the patient to a minor extent.

C. Personal Experiences

The communication robot would ask certain personal questions to the patient like their date of birth, age, past experiences etc. and answers for these set of questions could be acquired from the patient’s family members for correct evaluation.

IV. WORKING

For this project the working process has been divided into five different phases to carry the entire screening process

1) Data Gathering Phase

This phase deals with acquiring the personal data of the patient which consists of their present and past activities. The data which has been collected from the family members is fed into the robot. So, the information regarding the patient’s family members is also fed to the robot in order to alert them about the patient’s progress. The data which has been set for psychometric analysis is also fed to the robot at this stage.

2) Communication phase

Here the robot communicates with the patient by means of having an interactive questionnaire which consists of both the personal and psychometric questions. This phase monitors how the patient responds to these activities and records the answers given by the patient which would be validated in the further stages.

3) Analysis phase

The responses which has been given by the patient is analyzed in this stage where the robot ensures whether all the activities has been correctly responded by the patient if not it would ask the patient to complete the unattended activities which moves back to the communication phase.

4) Validation Phase

The responses which have been collected from the patient would be evaluated in order to test their cognitive abilities. If the scores acquired by the patient is equal to or above the threshold value (say 6 out of 10) then the patient is categorized as normal but if the scores obtained are less than the threshold value, then
patient is categorized as treatment required. Therefore, the categorization of the patient’s state of health is identified in this stage.

5) Delivery Phase

Once the score has been obtained the results should be forwarded to the family members whose information have already been acquired by the robot in the initial stages. The alert would be provided to the family members irrespective of the categories that the patients fall under after the completion of test.

The tests would be automatically conducted by the robot in a periodic manner (say weekly wise) and the scores acquired in each set of time period would be collected to produce the aggregate result which would be compared with the threshold value. The periodic scores would be compared in a graphical representation.

V. ARCHITECTURE AND WORKFLOW

The above figure explains the flow of process in our project where patient data and family member’s data are acquired and fed to the robot which later involves interacting with the patient who may respond to the activities imposed by the robot and the robot analyses the activities performed by the patient validates it compares it with the threshold value and finally sends an alert message to the family members of the patient. The communication, analysis and validation process is performed in a periodic manner and then the final results would be sent as an alert to the family members via social media or any other communication medium.
VII. FUTURE SCOPE

Currently we are performing the screening process which covers only the dementia detection section. In the future we would try not provide dementia detection but also implement methodologies to diagnose dementia at the initial stage instead of progressing it towards the complex stages. Moreover, we are trying to perform these activities in various dialects so that it would be beneficial for people across the globe.

VIII. CONCLUSION

Due to the robot’s cost and time efficiency, easy interactivity with the patients it has reduced the workload of both the patients and the medical professionals. The periodic comparison of scores obtained by the patients is shown in a graphical format to the family members which would help them to identify the methodology behind this process. Also it has been represented as an alert to the family members who would come to know about the progress of dementia and would eradicate it at early stages.

IX. REFERENCES


[10] Thanchanok Chaisewikul et al,” Memory Skill Games for Elderly People to Prevent Dementia”,2018 Seventh ICT International Student Project Conference(ICT-ISPC) 08 November 2018


