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An Android Application for Assisting Dementia Patients

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ABSTRACT

Dementia is a term used to depict a category of indications influencing memory, thinking and social capacities seriously enough to disrupt your everyday existence. Changes faced by dementia patient includes trouble in communicating, planning, problem-solving, memory loss etc. Due to lack of knowledge dementia patients are either lock up at home, sent to mental hospital or ignored. Caretakers and doctors can look after the patient once in a day or week but they can't be 24X7 with the patient. Technology is advancing and Mobile Health has turned into a quickly developing innovation for patients. Various solutions were developed for dementia patients like Application for mind games, find a Doctor, GPS tracker, analyze behavior etc. It has become vital to foster something that can help patients in tackling their everyday tasks. This project describes an application which is developed to assist patients, caretakers as well as family members. Application can run on all android devices and include functionalities like track location of patients using GPS, contain medicine reminder so that patient can take medicine on time, to-do list so that patient can remember work they need to complete, QR Code scanning to get care taker details and location sharing. This system includes features which can help to improve their health without losing their freedom as well as assist caretakers.

INTRODUCTION

In the rapidly evolving landscape of healthcare technology, the need for innovative solutions to support dementia patients has become increasingly critical. Dementia, a syndrome that significantly impairs memory, cognitive abilities, and daily functioning, affects millions of individuals worldwide, posing challenges not only to patients but also to their caregivers and healthcare providers. To address these challenges, we introduce our Android application designed specifically to assist dementia patients in maintaining their independence, improving their quality of life, and easing the burden on caregivers.

Our application leverages cutting-edge technologies intuitive user interfaces to provide personalized and adaptive support. It offers features including memory aids, medication reminders, daily activity scheduling, and emergency assistance, all tailored to the unique needs of dementia patients. By facilitating better management of daily tasks and enhancing communication with caregivers, our application aims to foster a safer and more supportive environment for individuals living with dementia.

This innovative tool not only empowers patients to engage more actively in their daily routines but also provides caregivers with valuable insights and support, thereby enhancing overall care and monitoring. With a user-friendly design that accommodates varying levels of cognitive impairment, our application stands as a beacon of hope in the quest to improve dementia care and support systems.

OBJECTIVES

The primary objectives of our Android application for assisting dementia patients are multifaceted, aimed at addressing both the needs of the patients and their caregivers. First and foremost, the application seeks to enhance the independence and quality of life of dementia patients by providing them with intuitive tools to manage their daily activities and routines. This includes features such as customizable reminders for medications, appointments, and daily tasks, which help patients maintain a sense of autonomy and reduce the cognitive load associated with remembering essential activities.

Another key objective is to improve safety and provide immediate support in emergency situations. The application is

equipped with an emergency alert system that can notify caregivers or emergency services at the touch of a button, ensuring that help is readily available when needed. Additionally, the app aims to foster better communication and coordination between patients, caregivers, and healthcare providers. Through features like shared calendars, progress tracking, and real-time updates, caregivers can stay informed about the patient's status and needs, enabling more effective andresponsive care.

Furthermore, the application is designed to offer cognitive support through engaging activities and exercises that are tailored to the individual's cognitive abilities, promoting mental stimulation and slowing the progression of dementia symptoms. By integrating these diverse functionalities into a single, easy- to-use platform, our application strives to be an indispensable tool in the daily lives of dementia patients and their support networks, ultimately contributing to a more supportive and enriched care environment

RELATED WORK

In the realm of technology-assisted care for dementia patients, numerous initiatives and applications have been developed to address various aspects of this complex condition. One notable example is the Dementia Support App, which provides personalized reminders, safety alerts, and a caregiver communication platform. This app emphasizes the importance of real-time updates and remotemonitoring, similar to the features we aim to implement.

Another significant contribution is the Memory Lane TV application, which focuses on cognitive stimulation through curated video content tailored for dementia patients. It uses therapeutic media to engage patients, improve mood, and stimulate memories, showcasing the potential of multimedia tools in dementia care. Our application draws inspiration from this by integrating cognitive exercises and memory aids that leverage multimedia elements.

Additionally, applications like Care Clinic offer comprehensive health tracking and, management tools that include medication reminders, symptom tracking, and appointment scheduling. These features underscore the necessity of comprehensive daily management tools in dementia care, which we incorporate into our own app to help patients maintain their routines and health.

The Therapy app also presents relevant features, particularly its medication adherence functionalities and health journal. This app highlights the effectiveness of combining health tracking with user-friendly interfaces, guiding our approach to designing an accessible and intuitive application for dementia patients.

Research studies, such as those documented in the Journal of Alzheimer's Disease, have explored the efficacy of digital interventions in enhancing the cognitive functions and overall well-being of dementia patients. These studies often point to the positive impacts of regular cognitive exercises and structured routines, reinforcing our commitment to integrating similar features.

Moreover, the development of assistive robots, like PARO the therapeutic robot, illustrates the potential of using technology to provide companionship and emotional support to dementia patients. Although our application does not include robotic components, the underlying principle of using technology to create a supportive environment aligns with our goals.

In summary, our application builds on the successes and insights of these existing technologies and research findings. By integrating personalized daily management tools, cognitive stimulation activities, and robust caregiver communication features into a single, user-friendly platform, we aim to provide a comprehensive solution that addresses the multifaceted needs of dementia patients and their caregiver.

DESIGN

The word system is possibly the most overused and abused term in the technical lexicon. System can be defined as the “a set of fact, principles, rules etc., classified and arranged in an orderly form so as to show a logical plan linking the various parts” here the system design defines the computer based information system. The primary objective is to identify user requirements and to build a system that satisfies these requirements.

Design is much more creative process than analysis. Design is the first step in the development of any system or product. Design can be defined as “the process of applying various techniques and principles for the purpose of defining a device, a process or a system in sufficient detailto permit its physical realization”.
It involves four major steps they are:

1. Understanding how the system is working now;
2. Finding out what the system does now;
3. Understanding what the new system will do; and

4.Understanding how the new system will work.

So as to avoid these difficulties, a new system was designed to keep these requirements in mind. Therefore the manual process operation has been changed into GUI based environment, such that the user can retrieve the records in a user-friendly manner and it is very easy to navigate to the corresponding information.

Input Design
Input design is the bridge between users and information system. It specifies the manner in which data enters the system for processing it can ensure the reliability of the system and produce reports from accurate data or it may results in output of error information.

Output Design
Outputs from the computer system are rewired primary to communicate the results of processing to the uses. They also used to provide a permanent copy of these results for later consultation / verification. The main points on designing an output are deciding the media, designing layout and report to be printed. The outputs are designed from the system, aresimple to read and interpret.

Data Flow Diagram
A DFD is a logical model of the system. The model does not depend on the hardware, software and data structures of file organization. It tends to be easy for even non-technical users to understand and thus serves as an excellent communication tool.

DFD can be used to suggest automatic boundaries for proposed system at pa very high level; the entire system is shown as a single logical process clearly identifying the sources and destination of data. This is often referred to as zero level DFD. Then the processing is exploded into major processes and the same is depicted aslevel one DFD.

There are many modules in this application. Some of the modules are sensor manager module, threshold monitor module, contact manager module, SMS sending module, timer module, reply verification module and call manager module.

The block diagram below shows the different modules and the relationship between them. First the accelerometer will be running in the background and when the value crosses the threshold the fall is detected. This activity comes under the sensor manager module and the threshold monitor module. In the timer module timer is started within managed. In the SMS sending module the SMS is sent to the contact which contains the GPS coordinates and also the key.

When the reply is received by the broadcast receiver it is verified whether the reply message contains the key or not. This is done in the SMS verification module .

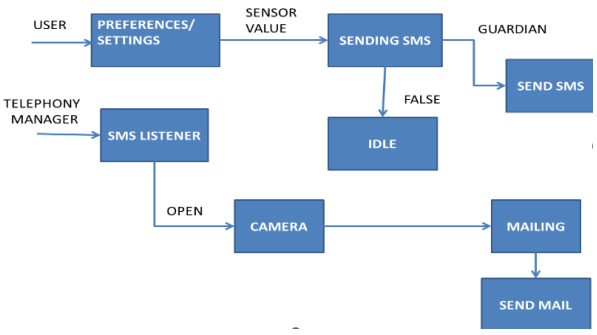


Figure 1:Data flow diagram

IMPLEMENTATION

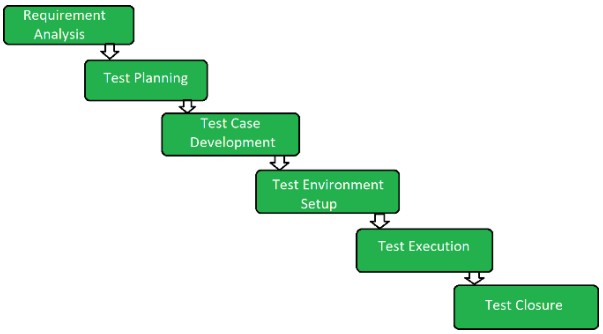
This chapter discuss how our project is implemented in android cellular phone. The design part of the project explains how the control flows in our application which includes the flow chart of our application runs and the block diagram consisting of all the modules in our system and the connection between them. Developing an Android application to assist dementia patients involves a comprehensive approach to address memory support, safety, cognitive stimulation, and communication needs. The app should feature daily reminders for medications, appointments, and activities, as well as photo and name recognition to help patients recognize family members and friends. Safety features are crucial, including real-time GPS tracking with geofencing alerts, an emergency button for quick caregiver or emergency service notifications, and fall detection using the phone's accelerometer. Cognitive exercises such as brain games and music therapy should be incorporated to stimulate mental activity and provide emotional comfort. Communication tools must

include user- friendly voice and video calls, simplified messaging with large text and voice-to-text options, and photo sharing to help maintain connections with loved ones.

Testing

Testing is the process used to help identify the correctness, completeness, security, and quality of developed computer software. A technical investigation, performed on behalf of stakeholders that is intended to reveal quality-related information about the product with respect to the context in which it is intended to operate. Process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub assemblies, assemblies and/or a finished product It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

White box and black box testing are terms used to describe the point of view a test engineer takes when designing test cases. Black box being an external view of the test object and white box being an internal view. Software testing is partly



intuitive, but largely systematic. Good testing involves much more than just running the program a few times to see whether it works. Thorough analysis of the program under test, backed by a broad knowledge of testing techniques and tools are prerequisites to systematic testing. Software Testing is the process of executing software in a controlled manner; in order to answer the question “Does this software behave as specified?” Software testing is used in association with Verification and Validation. Verification is the checking of or testing of items, including software, for conformance and consistency with an associated specification. Software testing is just one kind of verification, which also uses techniques as reviews, inspections, walk-through. Validation is the process of checking what has been specified is what the user wanted actually.

- Validation: Are we doing the right job?
- Verification: Are we doing the job right?

Testing Fundamentals

Software testing is an important element of S/W quality assurance and represents the ultimate review of specification, design and coding. The increasing visibility of S/W as a system element and the costs associated with an software failure are motivating forces for well planned, through testing. Though the test phase is often thought of as separate and distinct from the development effort--first develop, and then test--testing is a concurrent process that provides valuable information for the development team. There are at least three options for integrating Project Builder into the test phase: Testers do not install Project Builder, use Project Builder functionality to compile and source-control the modules to be tested and hand them off to the testers, whose process remains unchanged. The testers import the same project or projects that the developers use. Create a project based on the development project but customized for the testers (for example, it does not include support documents, specs, or source), who import it. A combination of the second and third options works best. Associating the application with a project can be useful during the testing phase, as well. We can create actions to automatically run test scripts or add script types and make them dependent on the modules to test.

TESTING OBJECTIVES

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MAINTENANCE

The term "software maintenance" is used to describe the software engineering activities that occur following delivery of a software product to the customer. The maintenance phase of the software life cycle is the time period in which a software product performs useful work. Maintenance activities involve making enhancement to software products, adapting products to new environments and correcting problems. Software product enhancement may involve providing new functional capabilities, improving user display and modes of interaction, and upgrading external documents. Adaptation of software to a new environment may involve moving the software to a different machine. Problem correction involves modification and revalidation of software to correct errors. The enhancement of this project can be accomplished easily. That is, any new functional capabilities can be added to the project by simply including the new module in the homepage and giving a hyperlink to that module. Adaptation of this project to a new environment is also performed easily.

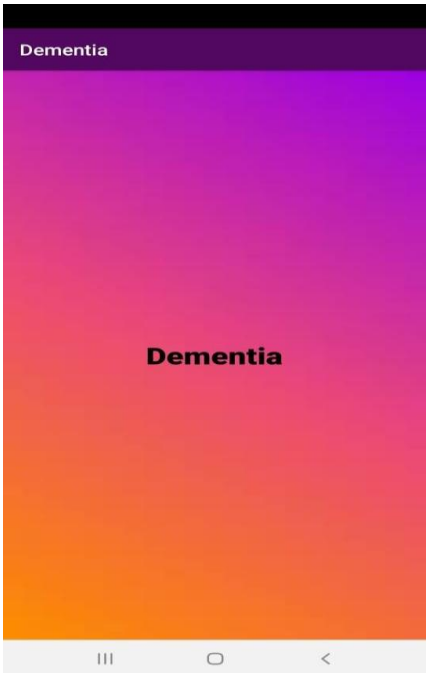
Corrective Maintenance Even with the best quality assurance activities, it is likely that they customer will uncover defects in the software. Corrective maintenance changes the software to correct defects.

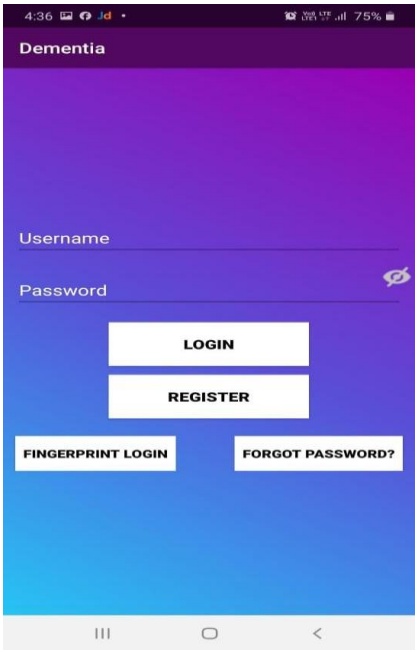
Adaptive Maintenance An activity that modifies the software to properly interface with a changing environment. The system has been modified so that various change include to the new system. In case of Fund Transfer, adoptive maintenance has been performed, that is in earlier system (character based UNIX system) changes are fixed and if any new changes are to be included, was a difficult task. Now provisions are given so that the user can define various changes. Such as it designed to accommodate the new change in further.

Enhancement Maintenance As software is used, the customer/user will recognize additional functions that will provide benefit. Perceptive maintenance extends the software beyond its original functional requirements. In the case of visual cryptography, system can be added new functions such that the user can able to retrieve the information in a user friendly and it will be very helpful forfuture development.

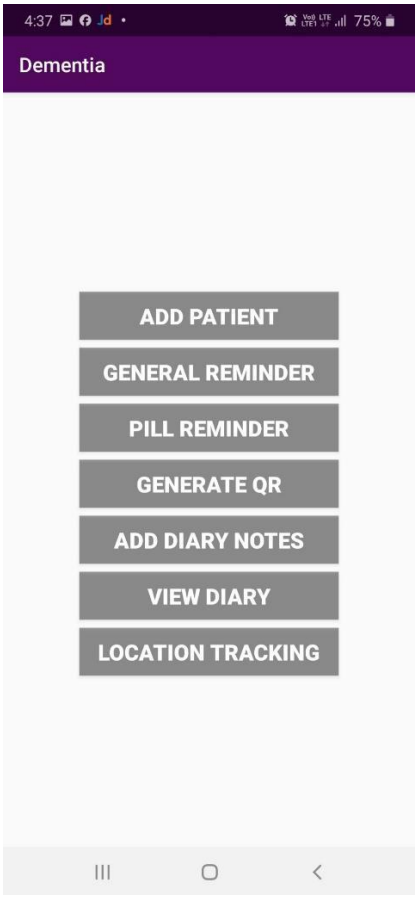
RESULTS

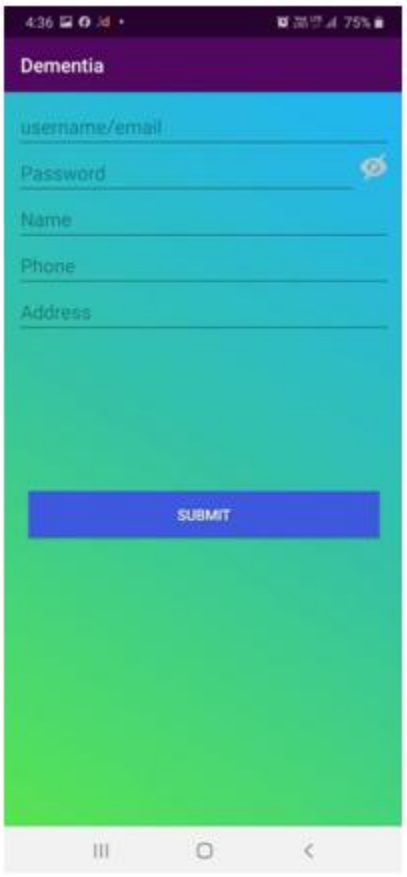
The result of developing an Android application to assist dementia patients is a comprehensive and user- friendly tool that significantly enhances the quality of life for both patients and their caregivers. The app provides daily reminders for medications, appointments, and activities, helping patients maintain a routine and reducing the burden on caregivers. Photo and name recognition features help patients identify family members and friends, mitigating the confusion and anxiety associated with memory loss.



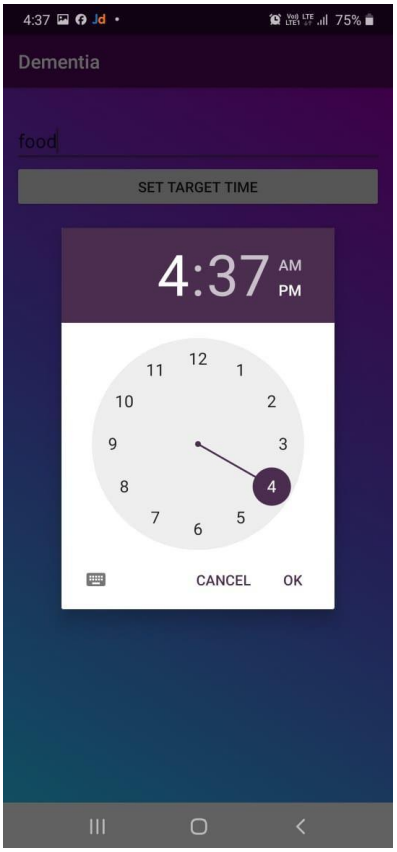


Snap Shot: 1-Splash screen Snap Shot: 2-Login Screen.





Snap Shot:3- Register Screen Snap **Shot:4: -Menu**



Snap shot: 5: Target **Snap Shot:6-Timer setter**

Snap shot:7: QR code Snapshot:8: location track

CONCLUSION

To sum up, we have tried to provide basic functionality in the application. Hopefully this will satisfy user's need and in our country still awareness is very less regarding digitalization of ordinary "Medical Health Care" system. Here Instead of finding a solution to handle such patient family prefers to admit them in to Mental Hospital or imprison them in room.

- Future Improvements can be possible in this application, we can add health bulletin and alerts in this system. Health bulletin would be very much helpful to stay in touch with recent development in medical and drugs.
- Several functionality can be possible in emergency contact section like we may have photograph of caregivers so it would be easy for patient to remember identity of family member or caretaker, as mentioned earlier that Dementia patient suffers from memory loss so through this patient canidentify their relatives or caretakers.
- Voice based navigation would be add charm in the functionality of system.

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