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Personal Assistant Robot System Using Node MCU

Borra Ramya[1], Deeksha N[2], Dhannarapu Guna[3], Divya M[4], Channappa Gowda[5]

Final year B.E Students (UG), Department of Information Science & Engineering, The Oxford College of Engineering, Bangalore, India[1,2,3,4]

Assistant Professor, Department of Information Science & Engineering,The Oxford College of Engineering, Bangalore, India[5]

ABSTRACT: In our case robot is mainly designed for this group of people as its main purpose is to offer assistance to an elderly or disabled person. The main objective of the project is to create a robot that can provide useful services, but that also exhibits personality and character. The robot will be designed for ease of interaction without requiring any training or expertise, and to serve the patient with water, food & tablet.Interactions between the end users and robot are done by using the natural English language which is taken as a command by the robot.

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KEYWORDS: Robotic Nurse, Helping paralyzed people, Updating family about medicines, Serving water, food and medicines to paralyzed people.

I. INTRODUCTION

We live in a world in which technology embraces us, makes our lives easier and more enjoyable. Technology is growing at an unexpectedly fast pace with the unveiling of the family friendly robots that play the role of a personal assistant at home.

Man has already started interacting with computers and smartphones. It is anticipated that social robots shall replace these computers and smartphones in the near future. This work is delving into the design of one such social robot, which supports the above proposition.

Although we all benefit from this emerging technology, certain groups of people need more help and support then others: elderly or disable people. For them technology means a way of having an almost normal life. So we focused our attention on an age old concept: the smart house, more precisely a personal assistant robot that is a part of the smart house paradigm. This robot is mainly designed for this group of people as its main purpose is to offer assistance to an elderly or disabled person.

II. RELATED WORK

In [1]Hospital nurse regularly bring her instrument to the patient using cart. They need to push or pull the cart to the patient bed and bring it back many times in a day. This can be tiresome for nurses because they need to treat many patients in the hospital. This research is mainly to solve this problem by constructing a mobile robot for nurses that is able to follow and carry the medical equipment and at the same time perform obstacle avoidance. In [2] Here, the authors present the ACCOMPANY project, a pan-European project which focuses on home companion technologies. The projects aims to progress beyond the state of the art in multiple areas such as empathic and social human robot interaction, robot learning and memory visualisation, monitoring persons and chores at home, and technological integration of these multiple approaches on an existing robotic platform, Care-O-BotR 3, and in the context of a smart-home environment utilising a multitude of sensor arrays. In [3] A major contribution and novelty of this project is the development of a human-robot interaction system and the new DTW algorithm capable of measuring the quality of imitation interaction between a humanoid robot and a human subject. This system enables consistent objective measurement of the imitation behavior that can be used to glean information about the ASD condition. In [4] Here, firstly the authors have presented user-centred design and aimed to evaluate the first system prototype after the requirements set by the preliminary focus groups and pilot experiments. To this end, they recruited elderly participants and asked them to realistically experiment some of the services in our test sites, because older people generally have difficulties to make the imaginative leap to seeing fictional demonstrations as representing an actual application. Secondly, study was focused on the evaluation of the MMUI only. In [5] Care-O-bot 4 is a general purpose service robot that is apt to adapt to different environments, situations and requirements. Its design blends in every configuration with the situation and it is able to create a positive emotional bond on all three levels (visceral, behavioral, and

reflective) providing the necessary social cues. As with its predecessors, the Care-O-bot 4 may be deployed in different environments from a home setting to a medical assistant and assumes different roles, where it is perceived as social actor.In [6]All trials were carried out in private homes of single-living senior adults. Each trial with one user lasted three weeks. In total, the robot was deployed for 371 days. Assessment by means of qualitative interviews and questionnaires took place at four stages of each trial: pre-trial, mid-term, end of trial, and posttrial (i.e. one week after the trial had ended). Results of the qualitative interviews as well as perceived safety measured by the Falls Efficacy Scale (FES) are reported here. Quantitative data were analyzed using SPSS by means of descriptive statistics and nonparametric methods (Friedman ranking-test). In [7] This paper presents the proposed experimental layout of the preliminary test to observe the initial response and behavior of ASD children when they are exposed to a humanoid robot NAO. The HRI procedure involves the robot executing basic, simple modules of interaction. The adaptation of real ASD characteristics in the proposed architecture can be applied to develop new therapy procedures applying close human-robot integration to cater various individual characteristics of autistic children. In [8] The paper discusses a novel human-robot communication system for people with disability using electromyography (EMG, signals via a Personal Digital Assistant (PDA). The system contains six primary components: the EMG signal processing, the Morse code command generate, the command decomposition, the robot task manager, the status User Interfaces (UIs), the event-trigged adaptation, and the database. In [9] Here, the authors has presented a service oriented architecture based application which is fully expandable without modifying the existing modules. This approach of creating plug-and-play based modules which could be added upon like present day android marketplace could only help the cause for making this application feature-rich. Also, by specifying the priorities of these modules or behaviors, they could help the robot be more intelligent through the use of the reactive architecture. In [10] The authors had developed a kind of personal assistant robot platform especially for students and employee to help to manage their learning, life and work better, in the fields of curriculum management, diary management, financing management and chatting system. They adopted the structured design method of MVC framework and the optimized algorithm. We created a dependable and convenient system that can effectively identify the information from a database and timely deal with it.

III. PROPOSED SYSTEM

We have proposed a robotic personal assistant for elderly person which can take care of the elderly. Robotic personal assistant can sense the person and help them with the essentials. The receptionist is fitted with a medicine chamber where it can keep the medicine. The robotic personal assistant can interact with the patients. The personal assistant serves the patient with water and also serve them with their medicines (tablets). The user gets notification about the medicine to be taken in their android application.

IV. METHODOLOGY

This stage is the underlying stage in moving from issue to the course of action space. Accordingly, starting with what is obliged; diagram takes us to work towards how to full fill those requirements. System plot portrays all the critical data structure, record course of action, yield and genuine modules in the structure and their Specification is picked. This assumes an essential part on the grounds that as it will give the last yield on which it was being working.
In our work we use four modules, these modules are listed below.

Initial setup: We are using Arduino uno microcontroller which is connected Bluetooth module. Here we made personal robot nurse. We made robot nurse by using DC motor, Wheel based car that will serve the medicine to patient. Another technology we are using android application to interact between patient and nurse. To active the robot nurse we used chargeable battery.

Water check: Robot will check water inside the water-tank. We have made the water-tank for one Liter. When water will be empty inside water-tank then robot nurse will give alert for empty water.

Process instruction: Robot will feed the patient when the patient is at meal time. After that When it comes time to feed, the robot will feed medicine to patient and water. When medicine time will come then robot nurse will give alert automatically.

Interaction patient to robot: Patient can use android app to interact with robot nurse. Patient can start the app for help from robot nurse. If the patient needs some water, robot nurse can serve the water. When patient will say something like “I need some water” then this speech will be convert speech to text using NLP algorithm and robot will get the instruction.

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V. SYSTEM ARCHITECTURE

The architectural configuration procedure is concerned with building up a fundamental basic system for a framework. It includes recognizing the real parts of the framework and interchanges between these segments. The beginning configuration procedure of recognizing these subsystems and building up a structure for subsystem control and correspondence is called construction modeling outline and the yield of this outline procedure is a portrayal of the product structural planning. The proposed architecture for this system is given below. It shows the way this system is designed and brief working of the system.

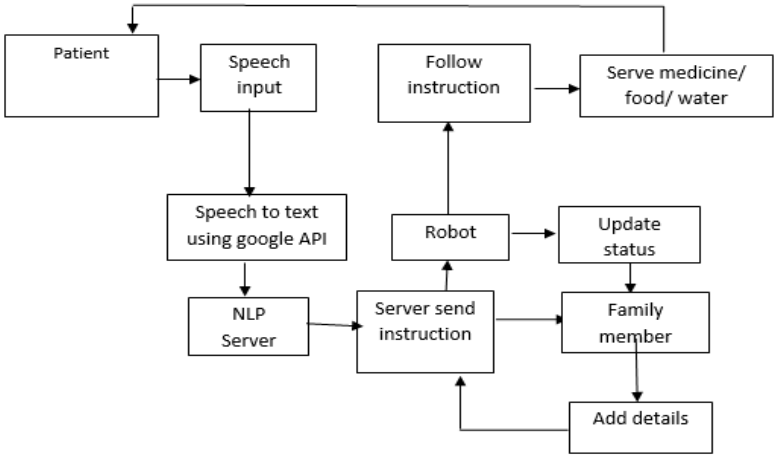


Fig 1. System Architecture of the model

The Step by step process of the system;

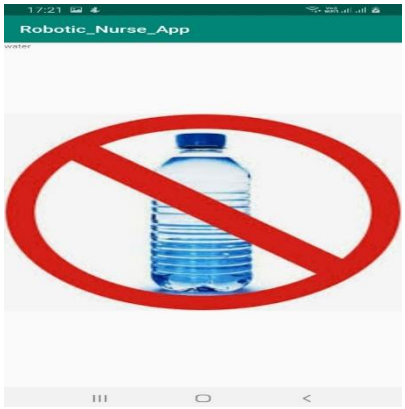
1. When the patient requests something to the robot, the message from the patient is received by the Mic which will be with the patient and that speech message is converted into the text message using the Speech to text Google API and that sentence is inputted to the NLP server.
2. NLP server detects the kind of request, it may be for the food or water. And it informs the family member about the request.
3. Robot receives the particular information about the food or water and moves near the patient and serves accordingly.
4. If the food or medicines or water is not available when requested, robot checks it and the server sends a message to the android app handled by the patient's caretaker or family member.
5. When the family member again fills the details in the server then the database will get updated.
6. The medicines will be served to the patient automatically according to the time set in the server.

V. DESIGN CONSIDERATIONS

Software Requirements

1. Operating system : Windows 7/8
2. JDK 1.8
3. Android SDK
4. IDE: NetBeans, arduino
5. Data Base: MYSQL
6. Server: Apache Tomcat Server 7.0
7. Programming Language : Java, C

Some snapshots of our android app are:



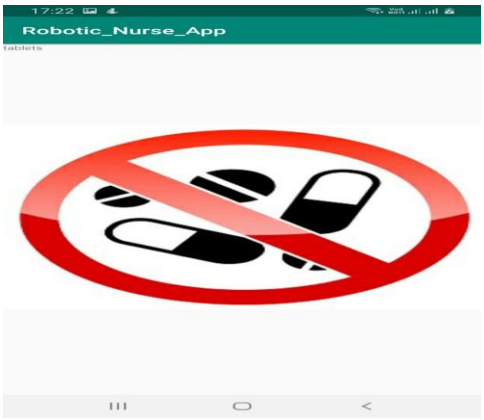
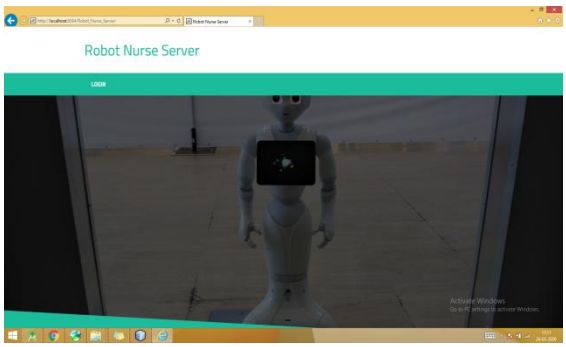
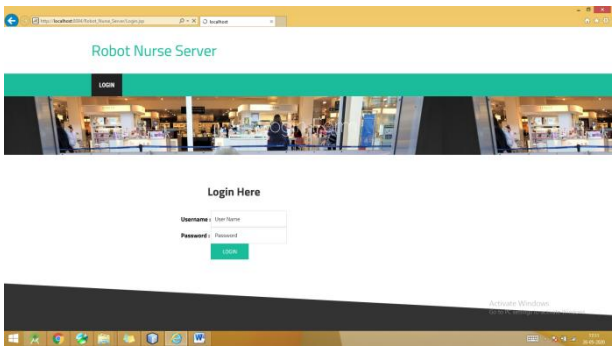
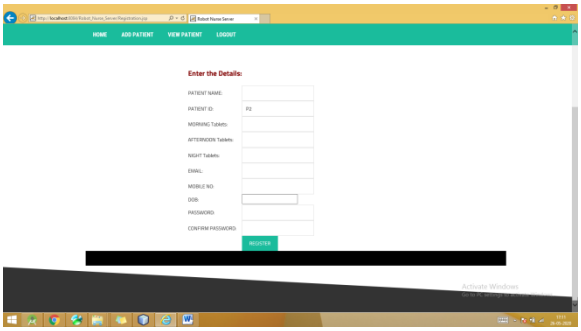


Fig 2 Android Application UI Fig 3. Water Alert in the Android App Fig 4. Medicines Alert in the Android App

Some snapshots of our Web Application are:







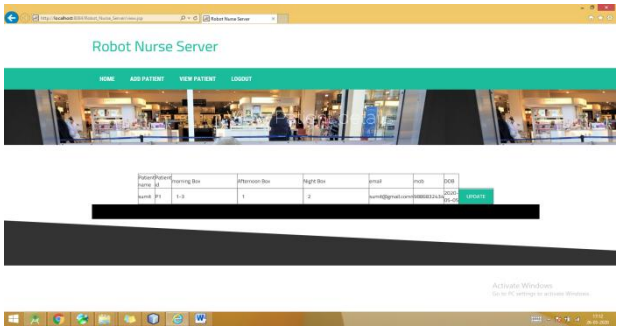


Fig 6. Service Pages in the Website for the care taker to add details about the medicines and the time

Hardware Requirements

Processor : Any Processor above 500 MHz, RAM : 4 GB, Hard Disk : 80 GB, Android Phone, Arduino Uno, Water pump, DC Motor, Relay, Power Supply, Servo motor, NodeMCU.

Power Supply: Control supply is a reference to a wellspring of electrical compel. A contraption or system that provisions electrical or diverse sorts of essentialness to a yield load or assembling of weights is known as constrain supply unit or PSU. The term is most generally associated with electrical essentialness supplies, less much of the time to mechanical ones, and once in a while to others. This power supply segment is required to change over AC flag to DC flag furthermore to decrease the plenitude of the flag. The available voltage motion from the mains is 230V/50Hz which is an AC voltage, yet the required is DC voltage (no repeat) with the sufficiency of +5V and +12V for various applications.

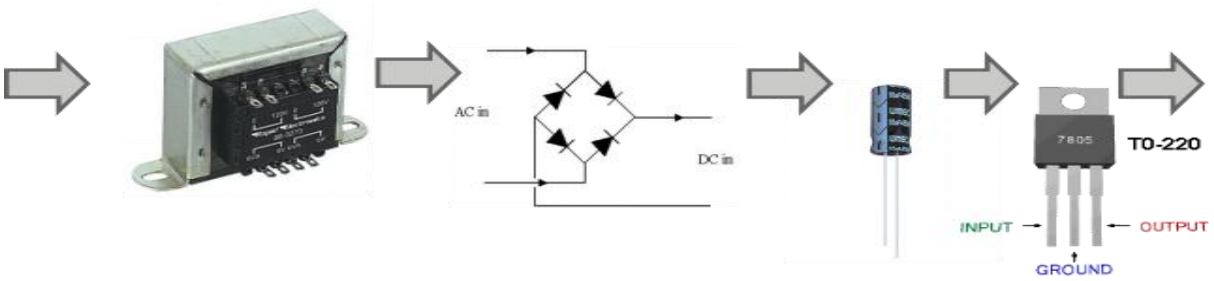


Fig 7. Power Supply and transistors

DC Motor: The **DC Motor** or **Direct Current Motor** to give it its full title, is the most commonly used actuator for producing continuous movement and whose speed of rotation can easily be controlled, making them ideal for use in applications were speed control, servo type control, and/or positioning is required. A DC motor consists of two parts, a "Stator" which is the stationary part and a "Rotor" which isthe rotating part. The result is that there are basically three types of DC Motor available.

Servo Motor:A **servo motor** is an electrical device which can push or rotate an object with great precision. If you want to rotate and object at some specific angles or distance, then you use servo motor. It is just made up of simple motor which run through **servo mechanism**. If motor is used is DC powered then it is called DC servo motor, and if it is AC powered motor then it is called AC servo motor. We can get a very high torque servo motor in a small and light weight packages. Doe to these features they are being used in many applications like toy car, RC helicopters and planes, Robotics, Machine etc.

Fig 8. Servo Motor

Fig 9. DC Motor

Arduino Concepts: An Arduino is an open-source microcontroller development board. In plain English, you can use the Arduino to read sensors and control things like motors and lights. This allows you to upload programs to this board which can then interact with things in the real world. With this, you can make devices which respond and react to the world at large. An Arduino board is a one type of **microcontroller based** kit. The first Arduino technology was developed in the year 2005 by David Cuartielles and Massimo Banzi. The designers thought to provide easy and low cost board for students, hobbyists and professionals to build devices. Arduino board can be purchased from the seller or directly we can make at home using various basic components. The best examples of Arduino for beginners and hobbyists includes motor detectors and thermostats, and simple robots. In the year 2011, Adafruit industries expected that over 3lakhs Arduino boards had been produced. But, 7lakhs boards were in user's hands in the year 2013. Arduino technology is used in many operating devices like communication or controlling.

The pin configuration of the Arduino Uno board is shown in the above. It consists of 14-digital i/o pins. Wherein 6 pins are used as pulse width modulation o/ps and 6 analog i/ps, a USB connection, a power jack, a 16MHz crystal oscillator, a reset button and an ICSP header. Arduino board can be powered either from the personal computer through a USB or external source like a battery or an adaptor. This board can operate with an external supply of 7-12V by giving voltage reference through the IORef pin or through the pin Vin.

Fig 10. Arduino UNO

VI. RESULTS

The result of this project mainly focuses on the robot helping the disabled or paralyzed person with their medicines on time and when they are thirsty, when they are hungry. And here the device comes to the patient from its resting place with 5 cm and 1degree precision using AMCL. And also it pumps the required amount of water and when the patients says stop the robot stops and goes back to its position again. And whenever the tablets or water or medicine are over in the containers then the robot detects it and sends a message from the server to the android app which is handled by the patients care taker. When the water quantity is below 250 ml only the robot sends the alert to the caretaker about water level.

Fig 11. Final Model of the Personal Assistant Robot System using Node MCU

VII. CONCLUSION AND FUTURE WORK

The Health IoT thus helps the hospital / home authorities to have continuous monitoring on the patients as well as it reminds the patient to have the medicines in time. With the increase in the use of family friendly robots this voice based personal assistant robot finds useful applications in modern homes. The robot presented in this paper creates an interactive environment for the user and assists him virtually. This justifies its cause of a personal assistance. A sample instance of the interaction environment of the system. We will be using raspberry pi camera in future enhancement. This camera will capture images of patient and find the particular patient from database, after that process will be starting.

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