Assistive Healthcare Robot for Patient and Disabled People

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Abstract – This project is about the caring of patients by automation like nursing behavior. This automation mainly focuses on making it possible for the elderly and disabled to remain at home, safe and comfortable. Automation becomes viable option for the elderly and disabled who would prefer to stay in the comfort of their homes rather than move to a healthcare facility. Because of automation the man power which is required to care the patient is reduced. This system helps patients to take their tablet at correct time. In this, the plate which is automatically rotatable consists of separate bowls. Each bowl has the tablets which are provided to the patients for every interval of time. If the tablet taking time attained, then automatically this system moves towards the patient and with the help of rotating plate the corresponding tablet for that particular time is given to the patient. This system makes notification to the patient for taking tablets. The notification is in the form of alarm. In case of patient sleeping at the time of taking tablet the alarm is used to wake up the patient. In addition to this, home appliances like Television, lights can be controlled by using IR blaster. GSM communication block is also introduced in this system for communicating with outside world people. With the help of GSM module automatically notification will be send to the patient's neighbor in the form of message. Because of message the patient's neighbor able to know whether the patient had taken the tablet or not. This robot movement is based on the concept of line follower. A Line follower robot is an electronic system that can detect and follow the line drawn on the floor. This robot movement is based on the Line follower concept. The LCD display is used to display the robot operations and its movements.

Index Terms – Introduction, Socially assistive robotics, Block diagram, Line Follower technique, Tablet container, RF transmitter and receiver, GSM module, Audio amplifier circuit, Output.

1. INTRODUCTION

Socially Assistive Robotics focuses on helping human users through social rather than physical interaction. This automation mainly focuses on making it possible for the elderly and disabled to remain at home, safe and comfortable. Automation becomes viable option for the elderly and disabled who would prefer to stay in the comfort of their homes rather than move to a healthcare facility. This paper describes the broad scope of socially assistive robotics, focusing on a general description of robotic technologies that have been and are currently being developed to assist people with disabilities. The paper then proposes the grand challenges of this field, and a list of milestones for achieving those in the next five to ten years.

In this section we review the principle application domains of socially assistive robotics which have so far been identified: care of the elderly, care of individuals with physical recovery/rehabilitation and training needs, and care of individuals with cognitive and social disabilities.

A health care system is defined as the organization of the people, resources and the institute to provide the health care services to the person or population. The goal of health care management system is to provide good health. For maintaining the health different organization, institutes, charities, religious and the government are planning around the world. This health care system also includes the hospitals, health care institution or clinics either these are operated by government, private for profit organization and also private not for profit organizations. All around the world, many patients suffers because of to pay medical practitioners taken by the health care system. This health care system includes the health care staff personnel that are doctors, nurse, security guards, sweepers and many more. The fee for the medical practitioners depends on the service, medicine, capitation and the salary of the personnel. And also it is very difficult to continuous monitoring of the patients. That line following robot based health care management system can be very efficient to continuous monitoring to the patients, whenever they need any help or medicine. For continuous monitoring of the patients, health care system needs many personnel. From which the fee for the medical practitioner will hike. That robot based health care management system can reduce the fee for the patients so that they can easily pay that amount of money.

2. SOCIALLY ASSISTIVE ROBOTICS

SOCIALLY intelligent robotics is the pursuit of creating robots capable of exhibiting natural-appearing social qualities.

Beyond the basic capabilities of moving and acting autonomously, the field has focused on the use of the robot's physical embodiment to communicate and interact with users in a social and engaging manner. One of its components, socially assistive robotics, focuses on helping human users through social rather than physical interaction.

The aging population is increasing the demand for healthcare services worldwide. According to recent estimation, the shortfall of nurses is already becoming an issue. The study of human-robot interaction (HRI) for socially assistive robotics applications is a new, interdisciplinary and increasingly popular research area that brings together a broad spectrum of research including robotics, medicine, social and cognitive sciences, and neuroscience, among others. Assistive robotics in general and socially assistive robotics in particular has the potential to enhance the quality of life for broad populations of users: the elderly, individuals with physical impairments and those in rehabilitation therapy, and individuals with cognitive disabilities and developmental and social disorders. As the world's population is growing older, wide arrays of new challenges are arising. It is estimated that in 2050 there will be three times more people over the age 85 than there are today. A significant portion of the ageing population is expected to need physical and cognitive assistance. Yet, space and staff shortages at nursing homes and other care facilities are already an issue today. As the elderly population continues to grow, a great deal of attention and research will be dedicated to assistive systems aimed at promoting ageing-in-place, facilitating living independently in one's own home as long as possible.

3. LINE FOLLOWER TECHNIQUE

This paper report describes the techniques for analyzing, designing, controlling and improving the health care management system. A line following robot carrying medicine has been designed for providing the medicine to the patient whenever they need it. A Line follower robot is an electronic system that can detect and follow the line drawn on the floor. Generally, the line is specified a predefined path that can be either visible like a black line on a white surface with a high contrasted color. Light dependent resistor sensor has been attached with the robot whose resistance varies with light intensity. When the LDR receives maximum amount of light then its resistance goes to its minimum value, ideally zero and when no light falling on the LDR then its resistance goes to its maximum value, ideally infinitive. A switch with IR sensor has been fitted near the patient, which connection has been made by the robot too. If the patient presses the switch then a flag bit set in the microcontroller, from which line following robot follows the line and got reached near the patient and provide the medicine to the patient with the help of dc motor. A proximity sensor also has been attached with the robot so that robot can detect any obstacle on their ways and can alarm. The ability to get someone around the clock is the best thing that this system can do. This technology focused on the delivery of safe, timely, efficient, effective, patient-centered and equitable health care.

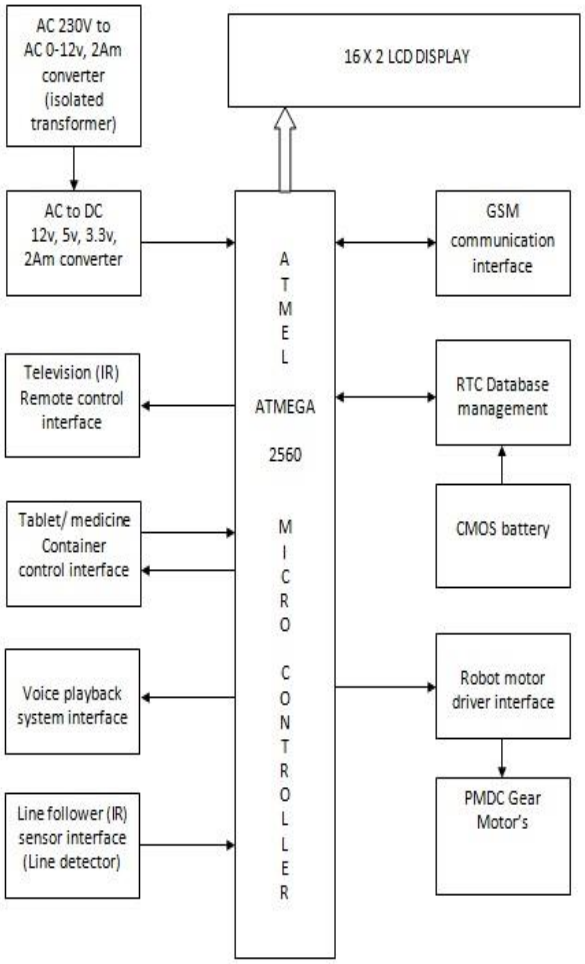

Figure 1 Block Diagram

4. SENSOR

This system has used two type of sensors circuit. One is LDR based another is IR proximity sensor. LDR is a light dependent resistor which works by incident light on it. Its resistance varies according to change in the intensity of light. As the light falls on the LDR then it shows very high resistance ideally infinite and when there is not any light beam incident on it then it shows very less resistance ideally zero.

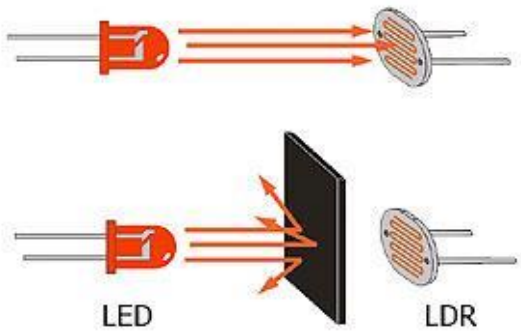

Figure 2 Light Dependent Sensor

5. TABLET CONTAINER

This system helps patients to take their tablet at correct time. In this, the plate which is automatically rotatable consists of separate bowls. Each bowl has the tablets which are provided to the patients for every interval of time. If the tablet taking time attained, then automatically this system moves towards the patient and with the help of rotating plate the corresponding tablet bowl for that particular time is given to the patient. The axis of the plate is rotated towards the patient for providing corresponding tablet for particular time. This system makes notification to the patient for taking tablets. The notification is in the form of alarm, in case of patient sleeping at the time of having medicine.

6. RF TRANSMITTER AND RECEIVER

A wireless radio frequency (RF) transmitter and receiver can be easily made using HT12D Decoder, HT12E encoder and ASK RF module. Wireless transmission can be done using 434Mhz ASK RF transmitter and receiver. In these modules digital data is represented by different amplitudes of the carrier wave, hence this modulation is known as amplitude shift keying(ASK).

RF transmission is more strong and reliable than IR transmission due to following reasons:

- Radio frequency signals can travel over longer distances than IR.
- Only line of sight communication is possible through IR while the RF signals can be transmitted even when there is obstacles.

Infrared signals will get interfeared by other IR source but signals on one frequency band in RF will not interfeared by other frequency signals.

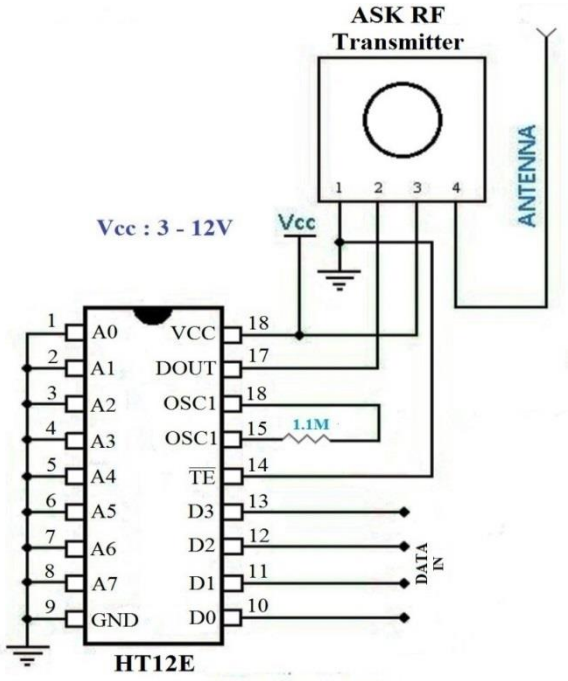

Figure 3 RF Transmitter

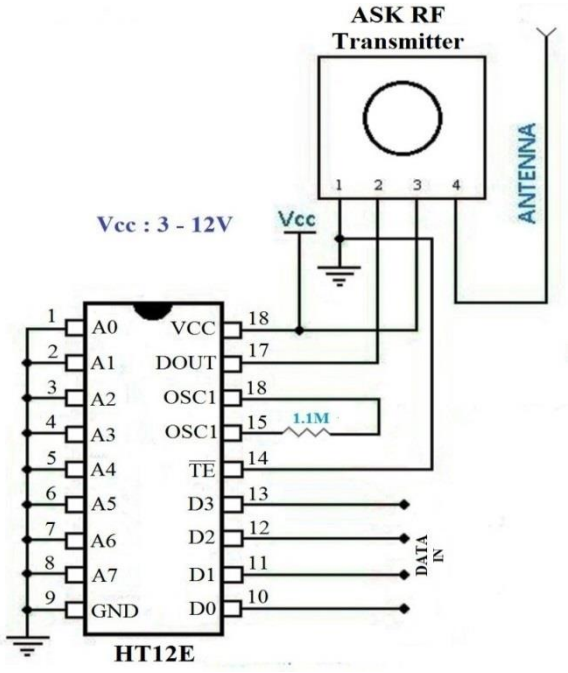

Figure 4 RF Receiver

7. GSM MODULE

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile

operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phones.

When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS message.

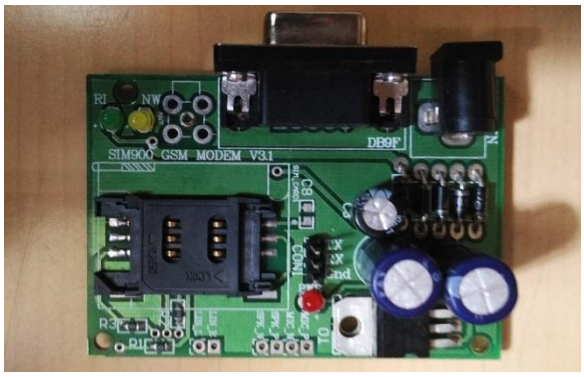

Figure 5 GSM Module

8. AUDIO AMPLIFIER CIRCUIT

An audio amplifier is an electronic circuit which convert low power audio signal into high power audio signal. Audio amplifier circuit is shown below. While the input signal to an audio power amplifier may measure only a few hundred microwatts, its output may be tens or hundreds of watts.

Audio amplifier increases the strength (amplitude) of the audio signal that pass through it. An audio amplifier amplifies low power audio signals to a level which is suitable for driving loudspeakers.

Figure 6 Audio Amplifier Circuit

9. OUTPUT

The output display which is used in this project is used to indicate the operation performed. The various indications of output display of this project are show below.

Figure 7 LCD Display

Figure 8 Output I

Figure 1 Output II

10. CONCLUSION

In this paper, we have presented the assistive healthcare robot for helping patient and disabled people to take their medicine (tablet) at correct time without man power. This automation mainly focuses on making it possible for the elderly and disabled to remain at home, safe and comfortable.

REFERENCES

[1] Adriana Tapus, Maja J Matari´c and Brian Scassellati, "The Grand Challenges in Socially Assistive Robotics" in *Proc. IEEE International Conference on* robotics and automation magazine special issue on grand challenges in robotics, pp. 465–468.,2006.

[2] Suk-Joong Kim, Dong-Ho Kim and Jin-Young Park," Implementation of assistive robotic vehicle for the elderly", in *Proc.* 10th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI), October 31-November 2, 2013 / Ramada Plaza Jeju Hotel, Jeju, Korea, pp. 725–727.

[3] Juan Fasola and Maja J Mataric," Using Socially Assistive Human–Robot Interaction to Motivate Physical Exercise for Older Adults", in *Proc.IEEE international conference on* Using Socially Assistive Human–Robot Interaction to Motivate Physical Exercise for Older Adults, Vol. 100,No. 8, August 2012, pp. 2512-2526.

[4] Mehran Pakdaman and M. Mehdi Sanaatiyan," Design and Implementation of Line Follower Robot", in *Proc* Second International Conference on Computer and Electrical Engineering, 2009, pp. 585–590.

[5] A. Tapus and M. J. Matari´c, "Towards socially assistive robotics", *International journal of the Robotics Society of Japan (JRSJ)*, vol. 24,no. 5, pp. 14–16, 2006.

[6] T. Fong, I. Nourbakhsh, and K. Dautenhahn, "A survey of socially interactive robots," *Robotics and Autonomous Systems*, pp. 143–166, 2003.

[7] D. Feil-Seifer and M. J. Matari´c, "Defining socially assistive robotics", in *Proc. IEEE International Conference on Rehabilitation Robotics(ICORR'05)*, Chicago, Il, USA, June 2005, pp. 465–468.

[8] Resul Das, Gurkan Tuna, Ayse Tuna, "Design and Implementation of a Smart Home for the Elderly and Disabled", International Journal of Computer Networks and Applications (IJCNA), 2(6), PP: 242-246, 2015.

[9] Gurkan Tuna, Resul Das, Ayse Tuna, "Wireless Sensor Network-Based Health Monitoring System for the Elderly and Disabled", International Journal of Computer Networks and Applications (IJCNA), 2(6), PP:247-253, 2015.