International Journal of Electrical and Electronic Engineering & Telecommunications

ISSN 2319 – 2518 www.ijeetc.com
Vol. 4, No. 3, July 2015

Research Paper

ROBOT FOR BIO - MEDICAL APPLICATIONS CONTROLLED BY REGIONAL LANGUAGE

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This paper proposes an application of speech recognition in which a robotic module is controlled by speech technology. Here we make use of a Regional language to control the robotic module. Any Regional language can be adapted based on the region where the robotic module is being used. We are adapting languages like Kannada and Hindi as they are the prominent languages used in the region of Karnataka, India. We make use of Speech as it is significant and primarily a convenient mode of communication with the Robotic module and also with fellow humans. The Robotic module is specifically designed to serve in Medical field. As it can be a replacement for paramedical staffs and can monitor and can act according to the commands of doctors. A user interface is designed to communicate with the robotic module, speech recognition plays a vital role in the usage of any technology, as it renders the magnanimous task of usage more friendly.

Keywords: Speech recognition, Regional language, Bio-medical application, Robotic module, Zigbee serial wireless communication

INTRODUCTION

Medical fraternity requires a lot of assistance in the work environment, as activities and chores of service to handle the cases of people is vital. A simple task of picking up a scissor in an act of surgery is significant to a doctor, needless to say the paramedical staff is ever on the duty to cater the needs of medical professionals, the advent of robotics has changed the world. Robotics can be used to deal with tasks effectively, it is often an apt companion for herculean tasks, as they are functional in all environments, efficient and consistent in effect. Certain tasks require robots only, and they can be replaced instead of humans for laborious work. But, controlling these robots in real life situations poses a threat, these robots can be controlled by a voice command and even can recognize speech and respond likewise. This paper

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envisions a technology that enables the feature of speech in robotics, to help the biomedical world miles more in keeping the world healthy.

Speech is the most critical medium of communication with any subject, the power of speech has taken man to the levels he is today. Although, words can move mountains, man has often found control by his words and failure for the lack of it, the feature envisioned in this paper surely renders man to control the technology to move mountains. This paper envisages a vision of enabling speech recognition into robotics, empowering mankind with the capacity to control, operate their functions with a word from the mouth. The entry of Robotics into various fields of life is prolific, with speech recognition, robotics can be taken to different levels, robots can be controlled by talking to it, by using regular words of everyday speech, words that are used normally in our regional dialects. Zigbee successfully enforces the process of transmitting and receiving the speech command between laptop computer-robot and robot - laptop computer because of its wide range of connectivity wirelessly. Robotic module can be controlled by speech commands with the help of an external microphone or manually by using Laptop computer. The commands are being adopted in regional language Kannada. A Speech user-interface is designed for interfacing with the Robotic module.

RELATED WORK

According to the survey on Robotics the use of robotics in was up by 19% in 2002. In ûrst half of 2005, the orders for the robots for the industrial were up by 17% which was an highest level ever recorded. The forecast in the year 2003-2006 tells the use of robotic was increased by an average annual rate of about 6.97%. Over 5 Million robots are used in household in the next few years. From the UNECE issues in 2004 World Robotics survey we can easily realize that household (service) robots getting popular. This gives the researcher more interest to work with service robots to make it more user friendly to the social context. Speech Recognition technology gives the researcher the opportunity to add Natural language communication with robot in natural. So the robot that behave more similar to humans is starting to become a reality. REX is the first fully bionic human robot. It can walk, talk and even has a beating heart just like humans.

A multipurpose human assistance robotic dog is designed to guide the visually impaired and elderly people to some predefined destination avoiding obstacles and traffic. It is also designed to act as an advanced multipurpose human assistance. A robot is designed in order to recognize the words spoken by the user, talk to them and take action according to the spoken voice command. The Voice commands are recognized by an android Smartphone and the information is transferred to the main MCU using a Bluetooth serial port that runs Bluetooth SPP protocol stack (Joshuva Regan and Barkunan, 2014). We designed a walking frame incorporating both robotic technology and speech recognition, which enables the user control the walker's navigation and speed using speech commands. The materials used were wood, EZ-B v3 Bluetooth Robot Controller, continuous rotation servos, 6 AA batteries and

peripheral cables for connections. The EZ-B v3 Bluetooth Robot Controller was configured with different speech commands using the EZ-Builder Robot Control Software. Speech recognition tests were carried out on the robotic walker in both quiet and noisy environments (Danquah-Amoah *et al.*, 2013). A walking frame or walker is a tool for disabled or elderly people who need additional support to maintain balance or stability while walking (Pedretti, 2001).

PROPOSED SYSTEM

The proposed system basically has three modules. One is speech recognition unit and the other is communication unit the final module is of control unit of robot. The entire module setup is as shown in Figure 1.

Voice command is given speech recogniser through microphone, once speech is recognised it is transmitted through zigbee protocol to controller unit for further action. Controller will decode the input once it is received from zigbee receiver and generate Unicode to do particular action.

Module 1: Speech Recognition Unit

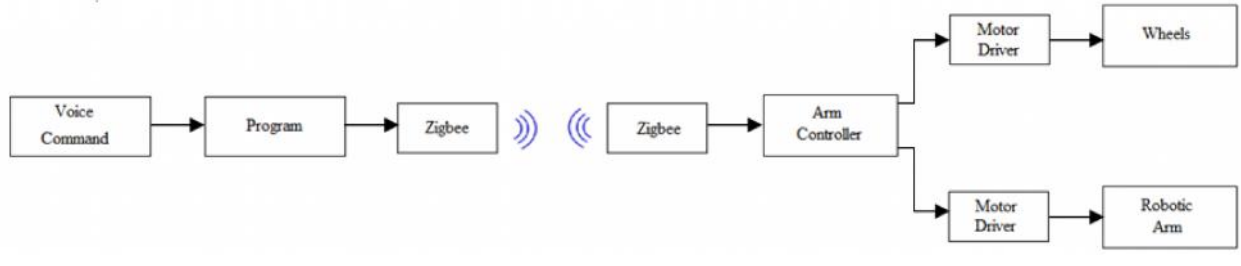
The Speech commands are given to the robotic module through external microphone. The Input Speech command is searched and is compared with the data present within the program

Module 2: Communication Unit

ZigBee is a high-level communication protocol used to create personal area networks built from small, low-power digital radios. ZigBee is based on an IEEE 802.15.4 standard. It has a low power consumption and limits transmission distances to 10-100 meters. ZigBee devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones. ZigBee is best suited for intermittent data transmissions from a sensor or input device. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that requires short-range low-rate wireless data transfer.

Once the input speech is recognised the speech from speech database, a signal is transmitted to the robotic module from recognition unit. For the process of transmission and receiving, a new communication technology is used, i.e., Zigbee. This technology is used because of its high range of connectivity wirelessly. Another Zigbee is present within the module for receiving.

Figure 1: Block Diagram of Robot Control System Using Voice Commands



Module 3: Robot Control Unit

The received signal is given to the microcontroller for controlling the robot to do particular action. Once the recognised signal matches with database the controller will generate a Unicode to do particular action.

The commands are as follows: Mundhae (Front), Hindae (Back), Eda (Left), Bala (Right), Mhele (Up), Kelage (Down), Hedee (Grip), Bedu (Release), and Nillu (Stop).

Table 1: Robot Commands

Commands	Response
Mundhae	Moves Front
Hindae	Moves Back
Eda	Arm Moves Left
Bala	Arm Moves Right
Mhele	Arm Moves Up
Kelage	Arm Moves Down
Hedee	Arm Grips The Object Like Knife or Scissor
Bedu	Arm Releases The Object
Nillu	Robot Stops

Algorithm Flow

Speech command is given to Module 1, speech recognition unit through microphone. The voice command is compared with predefined set of database stored in memory and check whether it matches the list present in database. If the speech matches the dataset based on the recognised command further action is taken by controller unit to move the robotic module. Otherwise the voice command is given again by the user for next speech command. This process is as shown in Figure 2.

Figure 2: Flowchart of Robot Control

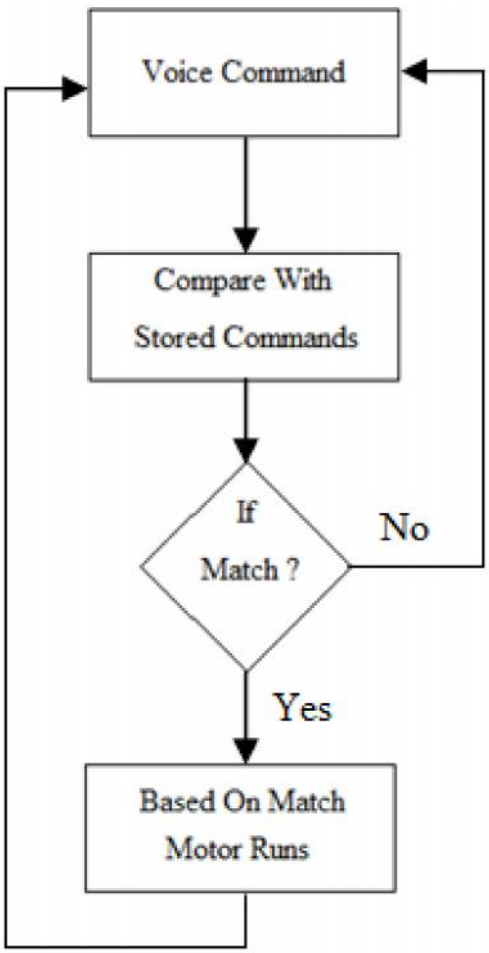


Table 2: Performance Analysis

Commands	Itteration	Result	Efficiency (%)
Bala	1	Moves	80
	2	Moves	
	3	Moves	
	4	Doesnot Moves	
	5	Moves	
Heede	1	Hold	100
	2	Hold	
	3	Hold	
	4	Hold	
	5	Hold	

Figure 3: Speech Recognition Panel

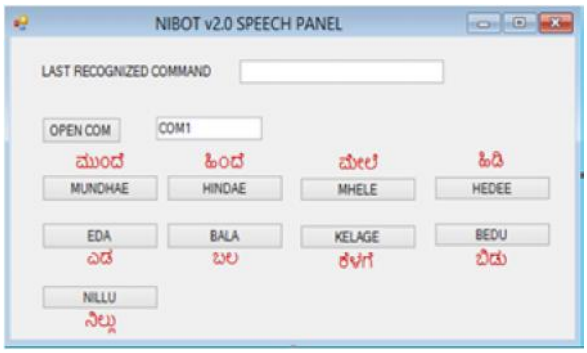


Figure 4: Robot

CONCLUSION

In this project a multipurpose assistance robot is designed which is very much helpful in the future Medical field. The robotic module was constructed and tested successfully by using speech command of different regional languages. Also, the incorporation of robotic and speech technology has made the Doctors easier to communicate with the robot in their regional language during operations and surgeries. This is, hopefully, will be an major development in the field of Medicine.

REFERENCES

1. Danquah-Amoah, Daniel Amiteye, Bassey Eno Basiono and Akyampon-Sakyi Yaw (2013), "Robotic Wheeled Walker for the Aged Using Speech Recognition Archibald", Department of Biomedical Engineering, All Nations University, Koforidua Ghana.
2. Joshuva Regan M and Barkunan S R (2014), "Voice Recognition Robot for Visually Impaired People".
3. Pedretti L (2001), "Occupational Therapy: Practice Skills for Physical Dysfunction", Mosb, St Louis.
4. Yamasaki N and Anzai Y (1995), "Active Interface for Human-Robot Interaction", Proceedings of the 1995 IEEE International Conference on Robotics and Automation, pp. 3103-3109, Nagoya, Japan.