A COMMUNICATING ROBOT WITH HUMAN

Vineet Kumar Disodia[1], Ashish Tanwar[2], Rajat Aggarwal[3], Amrita Kumari[4]

[1,2,3,4] Computer & Science Engineering Department, Dronacharya Group Of Institutions, Greater Noida, Uttar Pradesh, (India)

ABSTRACT

Several new remote control of machinery on robot platforms are introduced in recent years, as this technology has the potential to increase bond between those people who work away from their team. The main aim is that each and every person with disabilities may find similar benefits while remaining connected with their family & friends. Here we discuss our design of a remote control machinerysystem which is used by such type ofpeople.In this we describe new machinery in which people with their needs will operate that remote control machinery at their families & also about their potential of these robots.

Keyword- "PEBBLE S" (Providing Education By Bringing Learning Environments To Students), "LIRC" (Linux Infrared Remote Control).

I. INTRODUCTION

A person's quality of life may be impacted when he/she is no longer able to participate in everyday activities with family & friends. This can lead to desperation which could affect our health. Researchers have investigated robots as social companions such as PARO the baby harp seal. This remote control machinery can be controlled independently by an operator, means a driving person can look around as he/she wants. We also found that people who used to be collocated with their teammates and then became remote workers had the best experiences recreating the closeness with their team usingremote control machinery. We try to give such type of benefits, which can be gained by people with their needs who wish to make social interaction but cannot physically present with their families & friends. Thus, the recent numbers of remote control machinery robot platforms are:-

- Giraff Technology's Giraff
- RoboDynamics' TiLR
- Anybots' QB
- VGoCommunications'VGo
- WillowGarage'sTexai
- Gostai's Jazz

Our believe is that people with needs will adopt this type of new technology. The outline of this research is the need of people which take the active role of operatingremote control machinery. Firstly we have to find out what type of robotic behaviour is in need or necessary, then how these behaviours should bedesigned to function in social situations & how a user interface to control it. In this paper, we discuss overall System design &the experimental design which will run from the middleof May 2011 through theend of July 2011. There are two techniques in whichremotecontrol machinery can be used with people with their needs.

In the first scenario shown in;

Fig. 1

Remote control machinerycan be located in the residence of a person having some health problem, family members can then call in and operate theremote control machinery to check on the person. The In-Touch Health RP robots have been used in hospitals by doctors to conduct their patient rounds. In the above figure family member visits a person ,who is passivelyinteractingwiththerobot.

Fig. 2 A Robot Used From June Through August 2010.

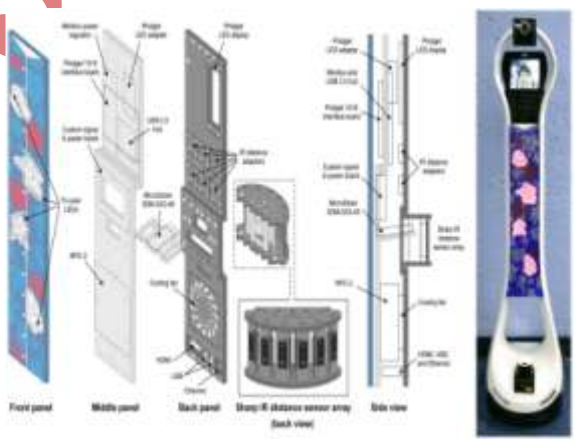

Fig.3 Front And Back Views Of Robot.

Family members could check or anything that he/she wants when necessary. Beer and Taka-yama conducted a user needs assessment of seniors (n=12; ages 63-88) with a V-G robot. The participants were visited by a person who operated the V-G. The participants also assumed the role of operator and controlled the V-G to interact with a person, the researchers found that in post-experiment inter- views, the participants discussed significantly more concerns when visited by a person through the remote control robot than the condition when they operated the V-G remote controlrobot which implies that seniors are willing to operateremote control robot systems with respect to where the participants wanted to use theremote control robots, Beer and Taka-yama reported that 6 of 12 participants wanted to use the robot outside, 5 wanted to attend a concert or sporting event through the robot, and 4 wanted to use the robot to visit a museum or a theatre. There are few examples, however, of people with special needs using such type of robots in the real world. “PEBBLESTM” was developed by Telebotics, the University of Toronto, and Ryerson University as a means for hospitalized children to continue attending their regular schools. “PEBBLES” has been used across the US since 2001 including at UCSF Children’s Hospital, Yale-New Haven’s Children’s Hospital, and Cleveland’s Rainbow Babies and Children’s Hospital. A “PEBBLES” robot is placed at the child’s school, and the child uses a computer station or another “PEBBLES” robot to look around the classroom and “raise its hand” to participate and ask questions. However, the “PEBBLES” robot is a passive mobile system and the robot operator is unable to change the robot’ slocationin dependently. More recently in the media has been used of the V-Go Communications’

II. DESIGN

Robot we selected the V-Go Communications robot as our base platform. The V-Go robot retails for $6,000 USD. It uses two wheels and two rear casters to drive; its maximum speed is 3.0 mph. The V-Go robot is four feet tall (48 inches) and weighs approximately 18 lbs with a 6-hour lead acid battery; a 12-hour battery is available. It has a six inch display with two pairs of front and rear microphones and red and green status LEDs on either side of the display. On top of the display, there is a forward facing camera on a servo motor that can tilt up and down 180 degrees. There are two speakers on the robot with the woofer in the base of the robot and the tweeter in the “head.” The robot driver uses the V-Go Communications’ video application on Windows7/Vista/XPto drive the robot using arrow keys to move the robot forward, back, left, or right. The robot driver can also use a mouse to indicate a “Click and Go” velocity based on the the angle and magnitude of the distance from the center point at the bottom of the video window. We have augmented the V-Go robot with additional pro-cessing and sensors based on guidelines that we developed forremote control machineryBeagleboard xM-B with an ARM RC-ortexTM -A8 1GHz processor and 512 MB RAM runs Ubuntu 10.10. The BeagleBoard receives and logs latched TCP robot movement commands; these commands are then sent to the V-Go base using serial communication. An Iguana works IR transceiver sends camera commands to the V-Go head using the (LIRC) package. The BeagleBoard also sends a UDP Streamer video stream from a Logitech Webcam Pro 9000, which provides a downward facing view of the base of the robot. TheBeagleBoardinterfaceswithtwoPhi-dgetsensorsboards and logs the sensor values. The first is a Phi-dgetSpatial 3/3/3 board which has a three axis compass, a three axis gyroscope, and a three axis accelerometer. The second is a Phi-dgetInterfaceKit 8/8/8 board which has eight digital input ports, eight digital output ports, and eight analog input ports. ThePhi-dgetInterfaceKitsignalMiniBoxpower converter to turn on when the robot leaves its charging station; the converter powers draws 5V directly from the robot's battery and connects the USB peripherals to the BeagleBoard through a 4 port hub. The Phi-dgetInterfaceKit also illuminates four blue LEDs in a clear Plexiglas necktie on the front of the robot to let the user and interacts when the BeagleBoard is powered on. Additional sensors will be added to Hugo in the second phase of this research to implement the autonomous robot behaviours described in the following section. We are considering a Ho-ku-yolaser which will be used for moving safely in a person's home and localizing itself in a known environment. Other options for localization may be to use an additional webcam for identifying QR codes or AR-Tags placed throughout a person's home identifying a specific room or "ground truth" locations; a similar approach could be to use RFID tags read with a Phi-dgetRFID board. The Hu-ku-yo laser in conjunction with an array of IR Phi-dgetTemperatureSensors can also be used to identify people near theremote control robot. B. Alternative User Interface we have designed an alternative user interface prototype for operating the V-Gorobot. Our alternative interface was designed for Safari (MacOS and Windows) and is programmed using HTML, Javascript, and PHP. The V-Go video is displayed in a separate window to the left of our alternative interface. When the status bar at the top of the screen shows the left segment as green and "Control Hugo" is bolded, the operator can provide input to the robot. The light gray bar below shows the operator's request, which is an <h1> HTML heading tag (24 point boldfaced type). To the right of the request are three buttons: go, stop, and clear. The operator presses the "go" button when he/she wants Hugo to execute the current command. If the command is valid, a "ding" sounds and the status bar shows the right segment as a red scrolling marquee. While the command is being executed, the operator can pause the robot's actions by pressing the "stop" button; the right segment of the status barchanges to a light gray colour. Pressing "go" will resume the robot's action. If the operator wants to cancel the robot's current actions, he/she can press the "clear" button; the displayed request will empty, and the status bar turns back to a ready state with the left segment coloured green. The request is generated from three modes of robot control shown on the left side of the interface as dark gray buttons. Whenamodeisselected, thebuttonturnsdarkblueanditstext turns white for contrast. The shape of the button changes from a rounded rectangle to a rectangle with right-side arrow edge. The robot control on the right side of the interface changes according to the mode, which we describe below. Tele-operation. As with the original V-Go interface, a person can tele-operate the robot to move forward, backward, left, and right and to tilt the camera up and down. The operator can use a mouse to depress the arrows, use the arrow keys on the keyboard, or a custom jelly bean switch array which emulatesarrow key presses. When an arrow is pressed by any one of thesethreemethods,theuserinterfaces how thepressedarrow in a dark blue colour and the text of the arrow inverted to white for contrast. When the arrow is released, the arrow returns to the unpressed white image and the drive command is posted to the gray bar. TheoriginalV-Gointerfaceprovidescontinuousrobotmovement which means that the robot would move in the desired direction when the arrow key was pressed and stop when the key was released. However, in a preliminary evaluation, we found that continuous robot movement was an issue with our target population's mental model of the robot due to the latency between issuing the commands, the robot receiving the commands, the robot executing the command, and the video updating to show the robot moving. This issue is consistent with our previous work where we found that able- bodied novice users had difficulty drivingremote robots straight down a corridor; the latency often caused the robot to turn greater than the desired angle and thus zigzag down the hallway. The interface for the participant at CMRC will be the standard V-Go Communications video chat window on the left side of the screen and our previously described alternative user interface on the right. He/she will use our alternative user interface to control the robot. In the laptop condition, the remote person will use the V-Go video conferencing software which is similar to Skype. The laptop provided for this study is the Dell Mini 9 netbook running Windows 7. The screen size is comparable to the V-Go's screen and the integrated webcam is in a similar position above the screen. The Windows 7 interface has been replaced with a custom LiteStep interface which allows the remote participant to access the V-Go software, view any shareddata from the V-Gointerface, andshutdownthenetbook. The interface for the participant at CMRC will be the V-Go Communications video chat window only. In robotic devices have been listed under the categories of environmental controls and self- care devices. Asrobots prove their value in this use case, we may findrobots explicitly listed in students' IEPs in the near future. For adults with disabilities, robotscould be used to engage in telecommuting or remote work. According to the Americans with Disabilities Act, employees and potential employees with disabilities1 can request reasonable accommodations to the work environment or processes related to their job. Employers are not required to accommodate requests that incur a large expense or are difficult to implement. However, companies have already begun to investigaterobots for ad-hoc conversations beyond the conference room for remote employees to be better connected. Asrobots become part of the corporate culture; it will become feasible for more adults with disabilities to telecommute from their residence. 1The Americans with Disabilities Act (ADA) Amendment Act of 2008 provided a broader definition of "disability". These changes have been implemented by the Equal Employment Opportunity Commission (EEOC) and active as of March 25, 2011.

III. SCOPE IN FUTURE

In this paper our 1st step towards developing aremote control robot system for people with needs to operate. We have designed the study to assess if theremote controlrobot is perceived as valuable. The current design is largely visual with large buttons and high contrast colour to accommodate low-vision users. As the primary task of the remote control robot is communication, audio status indicators have been minimally used. Based on the feedback from the study participants, we will iterate on the alternative user interface and input methods. We believe that our system design will be useful for both a home and a corporate environment.At the end of the 2012-13 school year, more than 40 students were using a VGo to attend school remotely.

REFERENCES

[1] Jump up^ Children's Hospital Boston is sending home some of their patients with a VGo for remote patient monitoring.

[2] Jump up^ Palomar Hospital is using AV-Go to allow distant family members to visit with patients, and be part of care planning discussions.

[3] http://www.nytimes.com/2013/06/08/education/for-homebound-students-a-robot-proxy-in-the-classroom.html?pagewanted=all&_r=0

[4] http://www.boston.com/business/technology/articles/2011/12/12/the_robot_that_makes_house_calls/

[5] http://www.palomarhealth.org/ContentPage.aspx?nd=907

[6] Defleur, M.L. & Dennis, E.E. (2005). *Understanding mass communication: A liberal perspective* (7th ed.). Boston: Houghton Mifflin.

[7] Katz, W.A. (2002). *Introduction to reference work: Basic information services* (8th ed.). New York: McGraw-Hill

[8] Kemoni, H.N. (2004). Melvin DeFleur's information communication model: Its application to archives administration. *African Journal of Library, Archives & Information Science*, 14(2), 167-175

[9] Lin, T. (1997). *Inferiority complex: Prevention in children and relief from it in adults*. Retrieved 26 May, 2010 fromwww.bsmi.org/download/lin/inferioritycomplex.pdf

[10] McKay, M., Davis, M., & Fanning, P. (2003). *Communication skills* (2nd ed.). New Delhi: Kuldeep Jain.

[11] Nwalo, K.I.N. (2003). *Reference sources and services*. Ibadan: Centre for External Studies, Univesity of IbadanOdini, C. (1999). Training and development of skills in changing information environment. *Library Management*. 1 (2), 100-104

[12] Ojomo, O.W. (2004). Communication: theory and practice. In E. Adegbija (Ed.), *Language, Communication and Study Skills*, (pp. 77-95). Ota: Covenant University.

[13] Rothwell, J.D. (2004). *In the company of others: An introduction to communication.* (2nd ed.). New York: McGraw-Hill

[14] Tubbs, S.L. & Moss, S. (2003). *Human communication: Principles and contexts.* (9th ed.). New York: McGraw-Hill.