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OVERVIEW OF A HOME MULTI-TASKING ROBOT SYSTEM FOR THE ELDERLY AND DISABLED

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ABSTRACT:

Robotics is developed very rapidly in the last two decades. Robotics has found wide range of applications in today's world. The development of technology has opened the new doors for the replacement of human by the machines. The robotics development is not only limited to the military applications but it has found several applications in domestic purposes also. The research was started with the basic robot model in 1961 from the metal pieces connected together; today it results in the replacement of the human by robot. The robots have optimized many industrial applications and have provided the better efficiency by reducing the errors and the time requirements. In this manuscript, authors have presented the overview of the research carried out on the robot systems utilised for the elderly and disabled human beings.

KEYWORDS: Robotics, indoor robots, Home based system, assistive robots etc.

INTRODUCTION:

The researchers of today's world have to face the challenges to address the problems of economical robot development for the commercial applications. The feasibility of the robots for the domestic applications found to be very vital from the end user points of view. Developing the robots with the compatibility of present home systems is another problem to address [1]. The development of the smart chairs helped a lot for the 3D motion from the point of view of differently able people. It will provide the assistance for the movement of the differently able people [2]. Another developed technology human gesture reorganisation systems. Cluster of research has been carried out for development of this technology. The gesture identification technique is very useful for development of several applications related to the disabled people. The wide applications of the gesture reorganisation include several smart systems [3].

The future developments in the robotics are human robot interaction. The robots should be developed to work in household by providing the proper programming [4].Internet of things terminology has developed over last few years, this technology has proven the great potential to connect the processes and machines to internet and operate it remotely. The introduction of Raspberry Pi has supported IoT technology [5].Various wireless protocols have been developed to develop an independent robot with better accuracy of performing the tasks. Authors have carried out the survey to study the present technologies for development of robotics from the perspective of applications to the old age and disabled people. There are ample of opportunities to for extension of the robotics technology for betterment of society. Now a day, robots are not just the machines to be tested in laboratories but the machines supporting the day to day activities by performing the various tasks accurately. For the application of the repetitive tasks, the robots are found more efficient and accurate than the human beings. Continuous developments are going on in the field of robotics for bridging the gap between human and machines. Authors have presented the overview of the recently developed technologies in this field. A number of different sensors (Temperature, Heartbeat, Sweating, etc) are interfaced with this system to achieve/monitor various assistive applications and biomedical applications. An integration of both Assistive and Biomedical Applications in a robot system will provide

real-time monitoring of vital parameter of Patient and support in Assistive applications for elderly and disabled. Below Table lists software packages available in the Robot Operating System and the ROS characteristics.

Table 1: lists software packages available in the Robot Operating System

Experimentation	Software	Additional Information
Speech recognition	pocketsphinx ros kinect	ROS Pocketsphinx, Tutorial , Pi Robot Tutorial
Processing depth images	ROS Opencv2	OpenCV API
Processing depth point clouds	pcl-ros	PCL API
Optical character recognition	Open Source OCR Engine Tesseract	Tesseract API
Voice Synthesizer	eSpeak	eSpeak API
Scientific Computing in Python	Scipy Stack:numpy, scipy,matplotlib, pandas	SciPy API

BASIC ROS SYSTEM TO BE IMPLEMENTED:

The basic system is the implemented by the application of Raspberry Pi and Zigbee. The Motion sensitive Cameras along with IR sensors are interfaced with Raspberry Pi micro computer, the Multiple Parameter Biomedical sensors and the Door control unit along with the RFId that will be mounted on robot arm and the RFID decoder that will be mounted on Door control Unit (DCU) for the opening and closing operation of door. The output of the sensors and DCU are interfaced with the assistive robot. The whole system is interfaced with the PC or smart phone for giving command to the robot based on the data collected by it from the sensors and other elements of ROS.

LITERATURE REVIEW:

Benavidez, Patrick, et al. have proposed the robotics system for the applicable for domestic use. The several improvements in the present systems have been suggested. The various designs of the robots are used for performing different tasks in the household. The open source software is proposed to control the robot operations remotely. The combination of various robots by means of the software is possible and with the wireless technology or the gesture preconisation it will be operated even by a differently able person [1].

Bae, Ju-Hwan, and Inhyuk Moon et al. have proposed the lifting chair car (electric) for the standing and seating as per the requirement of differently able person. This product may help many people in making their life self dependent even with the disability. Authors have proposed, designed and analysed the lifting chair in this paper. After the experiment, it was concluded that, the angle of 15 degree is most suitable for the hip- up function [2].

Nejat, Goldie, and Maurizio Ficocelli et.al have addressed about the problems faced during the design of social assistive robot. The gesture identification and software and hardware design required for the performance of the social tasks are the areas to be challenged. The development of the task driven robotic system is discussed in detail. The decision making is one of the important things to control [3].

Werner, Katharina, Johannes Oberzaucher, and Franz Werner et al. have discussed about the humanoid robots development and the various aspects to be considered during the design of such robots. The survey is carried out over 16 senior citizens to understand their views on handling the robot and their experiences in using the robot. The recommendations given by those people are taken in to consideration for the future developments. The system is checked and the scope for the future developments is checked [4].

Maksimović, Mirjana, et al. have proposed the application of Internet of Things (IoT) which is one of the greatest emergent platform. In this smart word, the things are getting smarter every day and hence it is necessary to implement this technology for robotics also. This will develop the robots those can interact with each other and the cost of the hardware is even cheaper than the other platforms for IoT. Interfacing is possible by means of Raspberry Pi, which is one of the popular and extensively used boards now days. Raspberry Pi has made it possible to provide the wide applications connected to internet and one can control and access them from the remote places too [5].

Lee, Jin-Shyan, Yu-Wei Su, and Chung-Chou Shen et.al has discussed about the low power consumption options of the wireless communication domain. The effective wireless communication is need of today's word to control different processes and devices remotely. Authors have discussed about the features of the present wireless communication standards. Also the available technology is compared to identify the effective one from the wide range [6].

CONCLUSION:

Robotics technology has developed in recent years after the first invention in 1961. The robots have found plenty of applications to support the various systems. The implementation of the robotics for the enhancement of human being is the need of time. Reducing the human efforts along with the design of new robotics applications is possible. Authors have presented the overview of the available systems in robotics and their applications. Various software platforms are available to

support the robotics system. Authors have tried presenting the robot operated systems application for the elderly and disabled human beings. The interfacing of robot with different softwares has opened the new doors of opportunities for development of robotics.

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