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DESIGN & DEVELOPENT OF INTELLIGENT WHEELCHAIR

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ABSTRACT

This paper describes to develop an intelligent wheelchair which is useful to physically disabled people with introducing control and navigational intelligence. Some people with severely handicapped people that affect hand movements, motor is not possible to drive a common electric wheelchair. In Powered wheelchair is not able to drive correctly with the joystick. It proposed the design of Intelligent Wheelchair using solid works and implementing the robot controller program such as ATMEGA 328 microcontroller. Using this microcontroller, the set of sensors such as Infra-red sensors and Ultrasonic sensors .The aim of this paper is to implement the intelligent wheelchair to introduce navigational intelligence.

Keywords: intelligent wheelchair, autonomous navigation, IR sensor, ATMEGA 328.

1. INTRODUCTION

Wheelchairs are important for severely handicapped and senior people. With the increase of world population carrying some form of physical incapability, affecting locomotion. Based on World Health Organization (WHO) data, it is estimated that around 15% of world population (200 million people) live with physically handicapped. The ageing of population due to life expectancy increase, environmental degradation and sub nutrition lead to the appearance of chronic disease which, together with factors like traffic and work accidents, wars and congenital deficiencies, contribute to the increase of people with mobility difficulties. Wheelchairs are useful for handicapped people who are not able to operate to use conventional wheelchairs.

2. LITERATURE REVIEW

A. Malik Mohd Ali, Razali Tomari and M. Mahadi Abdul Jamil proposed a system to control the multifinger grippers with significance on the finger tips and finger joints.[1] François Pasteau, Vishnu K. Narayanan and Marie Babel proposed a method for autonomous navigation for an electric wheelchair allows moving corridors and passing through an open door ways. [2].

Ana C. Lopes, Gabriel Pires and Urbano Nunes discussed a new scheme for an Assistive Navigation System (ANS) for a Robotic Wheelchair (RW) relying on a Brain–Computer Interface (BCI), as the Human–Machine Interface (HMI). A two-layer collaborative control approach is proposed to steer the Robotic Wheelchair, taking into account both user and machine commands [3].

N.M.A. Ghani, A.N.K. Nasir and M.A.H. Hassan proposed a method for applying PD-Fuzzy controllers to control the front and rear wheels motors to tilt an angle to ensure stability and smoothness of climbing process [4]. Yi ZHANG, Chun-jiang HE, Yuan LUO and Kai CHEN proposed an effective compression of the speech signals and make the training and recognition environments more matching, so the recognition rate can be improved in the noise environments [5].

Mohd Razali Md Tomari, Yoshinori Kobayashi and Yoshinori Kuno proposed a method for applying laser range finder and Kinect sensor for safety map of wheelchair to reach a particular place is used for an environment. [6] Celso De La Cruz, Wanderley Cardoso Celeste and Teodiano Freire Bastos proposed a method for applying radio frequency identification tag for the robotic wheelchair with the use of topological map is generated to guide users to reachthe particular place [7].

M. AL-Rousan and K. Assaleh describes a design of an automated powered wheelchair system that integrates the latest technologies to assist users with motor disability in moving around and sending help messages to four distinct destinations using SMS messages [8]. Maria Athanasiou and Jonathan Y. Clark proposed a method for applying Bayesian networks are a framework that enables probabilistic inference; therefore, they are useful for diagnostic reasoning and selection of the appropriate caring procedure in the face of uncertainty [9].

A. Gonzalez, E. Ottaviano and M. Ceccarelli describe a design of a mechanism that aims a wheel to climb obstacles, steps, or slopes with a suitable smooth path. The proposed four-bar linkage can be installed on each wheel of a vehicle, which therefore can be capable to climb stairs with suitable comfortable motion. An algorithm is formulated to design an optimum solution of the mechanism fulfilling those task requirements. A straight-line trajectory for the centre of a wheel is ensured through an easily controlled motion, and the compactness of the mechanism design makes it suitable for staircase climbing wheelchairs for aiding people with disability [10].

S.P. Parikh, V. Grassi, V. Kumar, and J. Okamato provides an integral solution to motion planning and control of robotic wheelchairs with human inputs from three sources: at the highest level, the human operator selects the destination: at the intermediate level, the user interacts with the controller to avoid obstacles: and at the lowest level, the human operator directly provides velocity commands using joystick [11].

Y. Ono, H. Uchiyama, and W. Potter proposed a method for applying Infrared sensors and multi agent control system to solve the various problems encountered during corridor navigation [12]. M Mazo, F.J Rodriguez, J.L Lázaro and J.C Garcia describe a wheelchair for physically disable people. In this wheelchair, proposed a method for the wheelchair can be driven whit oral commands and with the possibility of obstacle avoidance and downstairs or hole detection [13].

Christian Buhler, Ralf Helper and Wolfram Human proposed a system to highly manoeuvrable wheelchairs for indoor use and wheelchair mounted arms are of particular importance. Due to their mobility, they are available on different locations, e.g. in different rooms of a dwelling for use in activities of daily living (ADL). This user analysis leads to further development of the human-machine interface and system integration towards an improved usability [14].

3. PROBLEM DEFINITION

Nowadays a society is more and more concerned with integration of disabled people in the community. Wheelchair patients are an example of a group that still faces segregation, mainly due to their dependence on other people for a large part of their daily routines.

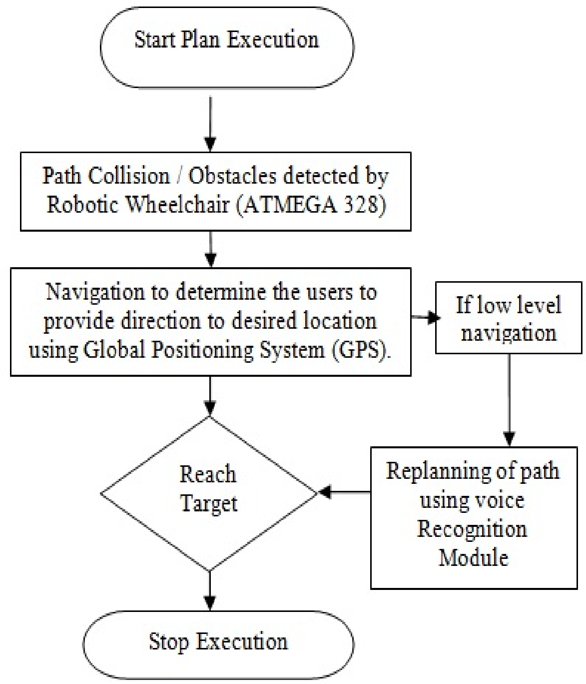
Table-1.

	Population	Percentage (%)
Total Population	1,028,610,328	100
Total disabled population	21,906,769	2.1
Types of disability		
In seeing	10,634,881	1.0
In speech	1,640,868	0.2
In movement	6,105,477	0.6
In hearing	1,261,722	0.1
In mental	2,263,821	0.2

The population of India 2001 is caused that more than 21 millions of people was suffering from seeing, hearing, speech, movement, mental retardation, mental illness and multiple disability.

4. PATH PLANNING FLOW DIAGRAM

It shows a scenario of path planning flow diagram.



The ATMEGA328 starts executing their current navigational plans and continuously senses the obstacles for next movements. The wheelchair operator will use the touch screen to select the destination. If low level navigation it appears, it goes to replanning the path of using voice recognition module. After that, it reaches the target. The Intelligent Wheelchair is an useful device for society and will be very much useful for the physically disabled persons so as to enable them to reach the required places without assistance of others.

a) Implications

LMN-Low Motor Neuron Lesions, Leprosy Patients, Paraplegic/Paraperesis

These implications caused by diseases affect several millions of people. They feel that they are always dependent to others. So, I proposed the study of automatic robotic wheelchairs which is helpful to the disabled people without depend on others. The ATMEGA328 starts executing their current navigational plans and continuously sense the obstacles for next movements. The Intelligent Wheelchair is an useful device for society and will be very much useful for the physically disabled persons so as to enable them to reach the required places without assistance of others.

5. RESULTS AND DISCUSSIONS

The experiments were performed with an Intelligent Wheelchair. It presents the prototype implementation of intelligent wheelchair. It shows the mechanical structure and the hardware implementation of Intelligent Wheelchair using solid works.

ARPN Journal of Engineering and Applied Sciences

As, we can see the prototype is a commercial electric powered wheelchair with minimum modifications. Intelligent wheelchairs extend the capabilities of traditional powered devices by introducing control and navigational intelligence. These devices can easily to operate the disabled person. The intelligent wheelchair is controlled by three ways: Navigation, Voice recognition and joystick.

6. FUTURE WORKS

The intelligent wheelchair is used for physically disabled persons. The intelligent wheelchair is controlled by three ways: Navigation, Voice recognition and joystick. Work is continuing towards the goal of an implementing the intelligent wheelchair. Intelligent Wheelchair must be able to navigate in both indoor and outdoor environments.

7. CONCLUSIONS

This paper presents the design and development of intelligent wheelchair for physically disabled people. The Intelligent wheelchair vehicle is used for many of the people who are physically disabled, low motor neuron lesions, paralysis and paraperesis patients. The Intelligent Wheelchair is useful device for society and will be very much useful for the physically disabled persons so as to enable them to reach the required places without assistance of others.

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