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Development of Autonomous E-Vehicle for Physically Challenged People

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ABSTRACT: The physically challenged, illness, injury or disability people are having the difficult to walk. To implement a touch-to-reach-e-vehicle is an autonomous vehicle that can drive itself from one point to another without assistance from a driver. One of the main impetuses behind the call for driverless cars is safety. An autonomous vehicle is fundamentally defined as a passenger vehicle. The proposed system is easy and efficient to solve the problem of challenged people and also it has the best functionality and it is simple. This electric vehicle provides mobility which does not depend, the ability to participate in society and earn a living. The person touch the reach location and the command sent to the microcontroller. The movement is controlled with the help of DC motors. This proposed system has battery powered. In this project we also used ultrasonic sensor, IR sensor and RFID. Ultrasonic sensor is used to detect the obstacle. IR sensor is used to track the line and the location identify by RFID reader/Tag.

KEYWORDS: e-vehicle, DC motors, IR sensor, RFID reader.

I. INTRODUCTION

The term Disability covers impairments, activity limitations, and participation restrictions. Impairment is a problem in body function or structure. An activity limitation is a difficulty encountered by an individual in executing a task or action. However participation restriction is a problem experienced by individual involvement in life situations. Disability is caused by impairments to various subsystems of the body – these can be broadly classified under the following categories. Any impairment which limits physical function of limbs or damage of limbs or organs is a physical disability. Mobility impairment is a category of disability that includes people with varying types of physical disabilities. This type of disability includes upper limb disability, lower limb disability, manual dexterity and disability in co-ordination with different organs of the body. Disability in mobility can either be a congenital or acquired with age problem. This problem could also be the consequence of some disease. Physical disability is also termed as handicap, when physically challenged people come across social cultural or physical barriers which prevent their access to different system in the day to day life which are available for other common people. Thus handicap is the loss of opportunities to take part at equal level with others. One of the areas where physically challenged people lose out is transportation. Transport disability keep out current physically challenged people from all form of transport like public, private and personal transportation. These in turn limit their ability to interact with others in the society and take up jobs or business away from their home. Access to transport will give them freedom to live independent life.

Census 2001 has revealed that over 21million people, about 2.1% of the population, in India are suffering from one or the other kind of disability. Among the total disabled in the country, 12.6million are males and 9.3million are females. Although the number of disabled is more in rural than urban areas, such proportions of the disabled males and females are 57-58% and 42-43% respectively. The disability rate(number of disabled per 100,000 populations) for the country as whole works out to 2130. This is 2,369 in the case of males and 1,874 in the case of females.The sensorial system is composed by 12 infrared sensors, 4 ultrasonic sensors, a front bumper and optical encoders on wheels. A real-time

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operating system runs on a PC based system which allows to perform basic tasks such as wheelchair control, gather sensor information and communicate with client workstation programs. Build a robust, modular and user-friendly system is very important to guarantee a good performance of the overall system. Communications and software architecture will be explained on the next subsections.

The use of powered wheelchairs with high manoeuvrability and navigational intelligence is one of the great steps towards the integration of severely physically disabled and mentally handicapped people. Driving a wheelchair in domestic environments is a difficult task even for a normal person and becomes even more difficult for people with arms or hands impairments. Tetraplegic people are completely unable to operate a joystick unless they use the tongue, which is obviously a very tedious task. Simultaneously blind and paraplegic people deal with a very uneasy situation which couples two problems: locomotion and localisation. The RobChair system is being developed to overcome the problems described above, allowing the end-user to just perform safe movements and accomplish some daily life important tasks.

II RELATED WORK

In the workstation platform a mouse and a joystick can be used to remotely control the wheelchair. In the wheelchair the main devices are: the sensorial system composed by infrareds, sonar's and a bumper; the wheels encoders which allow position estimation; and the joystick to directly manoeuvre the wheelchair. The system's tasks are modular, which means that they do not directly depend on other tasks and can run on a stand-alone basis. However, they allow communication between them. Each server task provides a service:

- **Vehicle control and position monitoring** - this task sends drive commands to the wheelchair motor controller and "requests" udometric information.
- **Infrared, sonar and bumper readings** - this task takes charge of gathering sensor measurements.
- **User Interface** - this task gives the user the means to perform pre-defined "actions/tasks" by using a mouse or a keyboard and allows the user to communicate with other people sending and receiving messages.
- **Obstacle avoidance algorithms** - this task uses sensor measures information to avoid obstacles.
- **Communications** - this task handles the communication between the wheelchair and remote operators

Wheelchair Motion: The wheelchair performs two kinds of movements: straight and pure rotational movements. These two movements executed at a given speed allow to accomplish the tasks we proposed to do. The wheelchair position relies on dead reckoning from wheels encoder readings. Wheelchair displacement and heading angle are obtained from the well known kinematics equations given in [1]. Nevertheless these equations give an accurate method to calculate the position, it is well known in practice that mobile robotics deal with very poor dead-reckoning. Problems such as wheel slippage and variable surface characteristics contribute to a poor dead-reckoning. David Bell say in [2] about wheelchairs: "Even in straight travel, variations in wheel diameter due to load shifts cause angular accuracy to be an order of magnitude worse than in most mobile robots". This statement has indeed been confirmed.

IR Sensor:

Infrared radiation is the portion of electromagnetic spectrum having wavelengths longer than visible light wave lengths, but smaller than microwaves, i.e., the region roughly from 0.75µm to 1000µm is the infrared region. Infrared waves are invisible to human eyes. The wavelength region of 0.75µm to3µm is called near infrared, the region from 3µm to6µm is called mid infrared and the region higher than 6µm is called far infrared.(The demarcations are not rigid; regions are defined differently by many).

RFID:

Radio-frequency identification (RFID) is the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. Some tags are powered by electromagnetic induction from magnetic fields produced near the reader. Some types collect energy from the interrogating radio waves and act as a passive transponder. Other types have a local power source such as a battery and may operate a thundreds of meters from the reader. Unlike a barcode ,the tag

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doesnot necessarily need to be within line of sight of the reader and may beem bedded in the tracked object. RFID is one method for Automatic Identification and Data Capture (AIDC).

ATMEGA328:

ATMEGA328 microcontroller, which acts as a processor for the Adriano board. Nearly it consists of 28 pins. From these28pins, the inputs can be controlled by transmitting and receiving the inputs to the external device. It also consists of pulse width modulation (PWM). These PWM are used to transmit the entire signal in a pulse modulation. Input power supply such as Vcc and Gnd are used. These IC mainly consists of analog and digital inputs. These analog and digital inputs are used for the process of certain applications.

Feature:

- High Performance, Low Power Design
- 8-Bit Microcontroller Atmel AVR advanced RISC architecture
- 131 Instructions most of which are executed in a single clock cycle
- Upto 20MIPS through put at 20MHz
- 32x8 working registers
- 2 cycle multiplier

III. SYSTEM IMPLEMENTATION

Power supply to the all the components. In this project to design touch to reach e-vehicle by using wireless sensors. In this system consists of IR sensor, ultrasonic sensor, RFID reader and tag, controller and motor driver unit. In this project we use Atmega328 controller, it has 28 pins, it has inbuilt ADC. The IR sensor is used to track the line to move the vehicle. Ultrasonic sensor is used to detect the obstacle in front of the vehicle. Touch pad is used to select the location. RFID tags are place dispatch department. RFID reader attached in Vehicle. When you select the location the vehicle is moving start. The reader read the tag for the corresponding location the vehicle is stop otherwise vehicle search correct location. Vehicle moving is controlled by using driver unit. Driver is used to control the vehicle motor through relay. LCD display used to display the short messages.

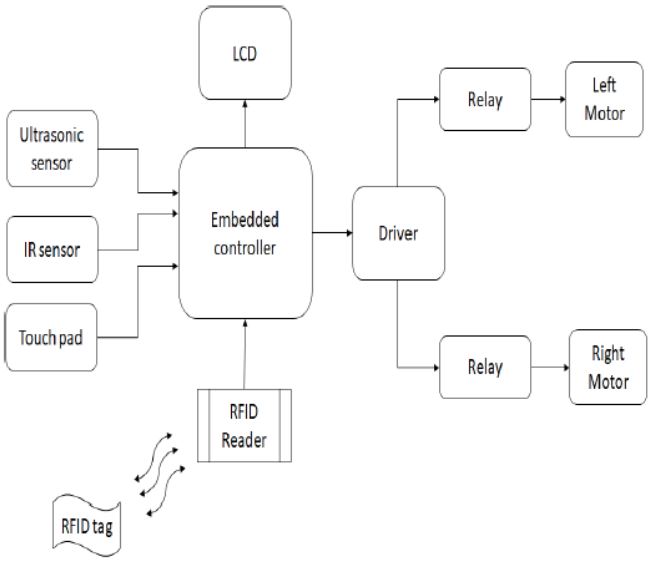

Fig 1. Block Diagram of Autonomous E-vehicle

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IV. EXPERIMENTAL RESULTS

It was performed during the experimentation course three different tasks: simple obstacle avoidance, wall following and passage through a door. The philosophy employed relies on the architecture described in section IV. Two different behaviours were used to accomplish these tasks. The end-user drives the wheelchair with a joystick (goal-driven behaviour) and a collision avoidance algorithm (collision avoidance behaviour) provides safe manoeuvres. A passage through a door is faced like the only way between two obstacles (the side walls), and following a wall is like avoid and round a rectilinear obstacle. These tasks were showed on a TV video system during the conference and have proved the effectiveness of this philosophy.

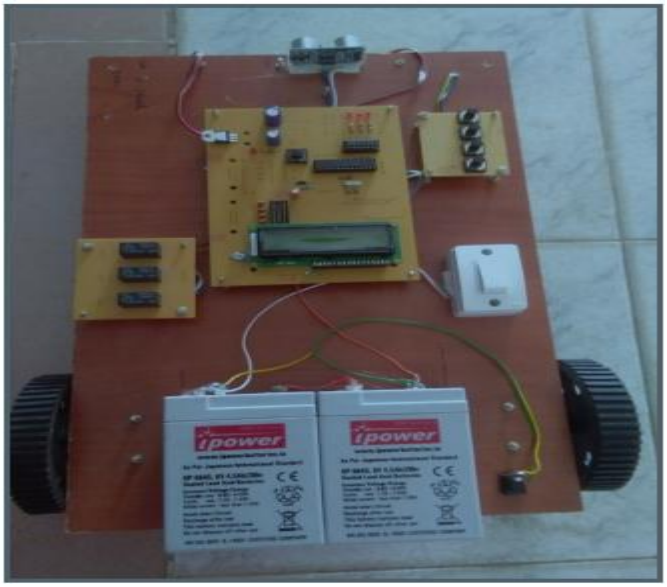
Electrical characteristics:

- Forward Current (IF) :15mA
- Operating Temperature (Topr) :-40to+85
- Storage Temperature (Tstg) :-40to+100
- Soldering Temperature (Tsol) :260±5
- Power Dissipation (Pd) :45mW
- Peak Forward Current (IFPeak) :50mA
- Reverse Voltage (VR) :5V

ADVANTAGES:

Without the need for a driver, cars could become mini-leisure rooms. There would be more space and no need for everyone to face forwards. Entertainment technology, such as video screens, could be used lighten long journeys without the concern of distracting the driver.

Over 80% of car crashes in the USA are caused by driver error. There would be no bad drivers and less mistakes on the roads, if all vehicles became driverless. Drunk and drugged drivers would also be a thing of the past.



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V. CONCLUSION

In this project the movement controlled car driving system using a Microcontroller for physically challenged people is implemented. The programming and interfacing of microcontroller has been mastered during the implementation. This device is designed to provide a greater advantage to physically challenged. Despite the inherent benefits, autonomous vehicle technology must overcome many social barriers. Much like the issues faced by the first automobiles, the influence of mental models can impede the advancement of technology. However, new legislation is creating opportunities for these cars to prove their viability. The ongoing research and testing done by organizations such as Google and Stanford will only prove to advance the acceptance of autonomous cars. As more states
legalize driverless cars, the social obstructions will give way, allowing for the largest revolution in personal transportation since the introduction of automobiles.
General Motors predicts, "The industry will experience a dramatic leap in active safety systems "and plans to release a fully autonomous vehicleby2020. The Institute of Electrical and Electronics Engineers "selected autonomous vehicles as the most promising form of intelligent transportation, anticipating that they will account for upto75percentof cars on the road by the year 2040."

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