

Computer and mechanically assisted driving support devices for the ‘Differently-abled’ persons – a brief survey

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ABSTRACT

In the latest scenario, computer science and mechanical engineering joint research work proving a tremendous improvement in physical disability section. Researchers are focusing on finding modern computer controlled equipments. Persons with locomotor disability facing new challenges every day, but with the joint efforts and the latest innovations are equipping them for using much improved mechanical devices.

Applying the artificial intelligence on various devices and using the gesture control for the various equipments, the differently-abled persons will not find themselves dependent. Many of these are exceptionally good. In this research paper the study has been performed on to the disable friendly, computer controlled and mechanical device which enable the locomotor or multi organ failure persons with disability to operate the four wheeler vehicle very safely and comfortably.

In our study the working system is very easy to use and provides the self controlled (using programmed computer chip) clutch mechanism. This working device is fully safe for the safety measures for the multi organ failure persons with disability. Using this clutch operating system the driver needs to focus only on the road traffic and doesn't needs to focus and involve frequent operating of the clutch pedal, this provides the relief for the person and he just needs to draw his attention over steering control and break and speed control.

Keywords: Computer controlled mechanical devices, Aids for disabled, automatic vehicle

INTRODUCTION

In the process of providing the confidence of movement on daily basis to the differently-abled¹ persons the combined efforts of the mechanical engineering and the computer science is to be utilized. The following study provides an insight of how to use them. The computer controlled chip is needed to be programmed and collaborated with the artificial shaft that operates the clutch mechanically. This is very interesting that in order to achieve this the parallel rotator mechanism needs to be installed that will operate the shaft actually.

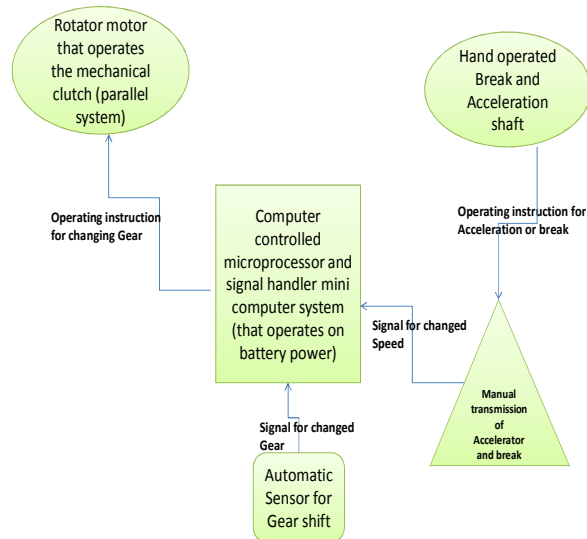
MODEL DESCRIPTION

The approach or the working model used in this study is as follows

Data Acquisition: It is necessary to measure the capabilities and needs of the individual, his/her environment and to describe the task in quantitative terms in order to generate the specifications for the design problem. For example, the custom design of a hand controlled four wheeler automatic transmission system, the differently-abled person if capable of pressing the clutch by one of his leg then only the working shaft will needs to be applied and appropriate movement in the vehicle can be

obtained. The data acquisition will need to be captured if the person is having both legs as a locomotor disability.^{2,3} In this case he needs to be assisted with the

Figure 1 Model for automatic computer controlled driving transmission system.⁴



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gear sensors and the required data of the signals has to be stored in the memory of the computer controlled system (which is installed and connected with the hand operated shaft and the automatic transmission system).

Similar measurements may also be required for the feeding task (for example, if the person is not affected by the disability much, he will operate the clutch and the data

acquisition is not a problem in this case.) And the short measurement will give the perfect result for the vehicle transmission manually.

Vehicle transmission

Vehicle is to be adjusted in order to send the signal to the operating shaft, This will enable the clutch shaft to be in motion, as a result of what the vehicle will be moved towards the accelerator pressure applied.⁴

LITERATURE SURVEY

As suggested by Neogi et.al.⁵ a working model has been demonstrated and released to the general public for use about the prosthetic arm using the gear motor control technique.⁵ There are so many assistive devices are available today[4]. These provides the physically disabled persons a means to live with a healthy and independent life.⁷ Some researchers are in to the search that provide them best out of available resources with extra comfort and safety.⁶ Similarly, Steve C. Hsiung,⁷ "The Use of PIC Microcontrollers in Multiple DC Motors Control Applications", Journal of Industrial Technology, in this research paper Steve described the various aspects of the artificial devices.⁷ Lewis an initiator of the 'Freedom in the air' A working and running not for profit organization working towards developing and manufacturing the kits for aviation also for the **people with disabilities**. 'The purpose of Freedom in the Air is to make flying more accessible for young people with disabilities who would otherwise not have had the opportunity'- Freedom in the air.⁸

Figure 2 Block diagram of the device^{2,5}

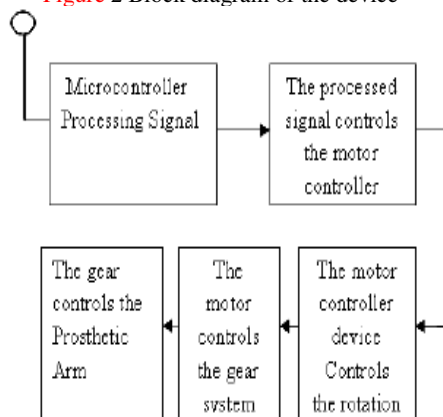


Figure 3 Working procedure of the device^{2,5}

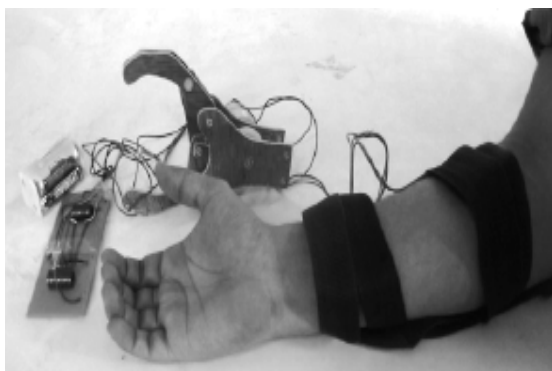
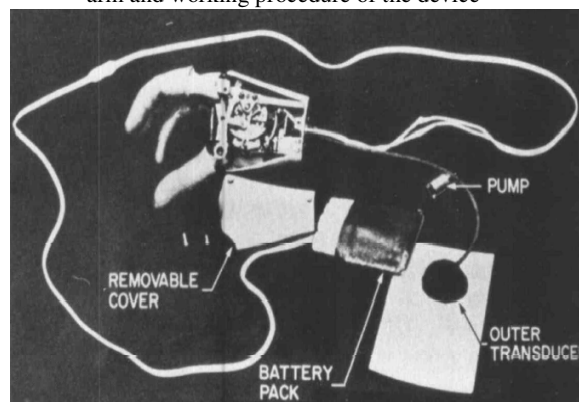


Fig. 4: Working procedure of the device⁵



Figure 5: View of complete Vaduz system for artificial arm and working procedure of the device^{2,7}



EXPERIMENTAL SETUP

Steps in operating the device

- Step 1. Start ignition
- Step 2. Press thumb on sensor
- Step 3. Change gear to one
- Step 4. Apply some pressure on the hand accelerator assembly
- Step 5. Use the normal procedure of controlling the steering
- Step 6. Use the same procedure again & again to run the vehicle smoothly.

Steps when the system turns on

- Step 1. When engine starts the computer controlled system resets
- Step 2. When Pressed thumb on sensor it sends the signal to the computer controlled system for pressing the clutch.
- Step 3. When clutch pressed, change gear to first.
- Step 4. Apply some pressure on the hand accelerator assembly that moves the vehicle to its initial state.
- Step 5. Use the normal procedure of controlling the steering.
- Step 6. Use the same procedure again & again to run the vehicle smoothly.

Figure 6: Automate India vehicle automatization kit⁴



PROCEDURE

For illustration we consider the sensor connected with the gear shaft and the thumb is to be used for the sensor initialization. After the sensitivity of the sensor to be initialized, the rotator motor connected with the shaft will be initialized and the approximated pressure will then be

applied to the clutch shaft. In this manner the gear can be changed by putting the thumb on to the gear sensor.

When the gear senses the object it sends the message to the computer controlled chip enabled computer system that will send the operating instruction to the operating shaft. As a result of what the clutch is pressed and the driving person (in our case the disabled person), can change the gear.

After this process the accelerator shaft and the brake shaft can be used to accelerate the vehicle and to stop the vehicle.

This system is very safe as it operates the clutch using computer controlled kit, and the motor attached to clutch picks up the accurate instruction in order to press or release it.

Figure 7: Working procedure of the device⁵



Figure 8: Connected assembly for the Accelerator and Break of the device⁵



Figure 9: Reverse assembly of the break & accelerator of the device⁵



Figure 10: Safety for assemble in terms of opposite mechanism in working device by Auto Mate India Pvt. Ltd⁴

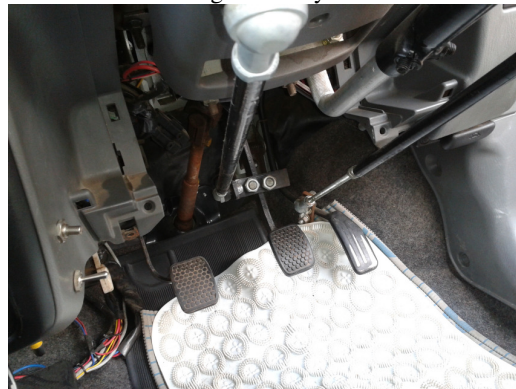


Figure 11: Working Module of the device by Auto mate India Pvt. ltd⁴



Figure 12: Working procedure of the device⁵



Figure 13: Simple Working of the device by Auto mate india Pvt. ltd⁴



Figure 14: More close view of working module of the device by Auto mate india Pvt. ltd⁴



Figure 15: Computer controlled chip based computer system of the device by Auto mate India Pvt. ltd⁴



Figure 16: Working procedure of the device⁵



Fig. 17: Vehicle snapshot, still with device, vehicle looking same⁴



CONCLUSIONS & FUTURE ASPECTS

This study based on the feature and the ability to control the vehicle without any extra efforts. After practicing this installation is very easy to operate and control.

The attached accelerator and break mechanism is opposite to each other, this provide the extraordinary security constraint in order to prevent the vehicle from any type of damage or malfunctioning.

The automatic computer controlled kit is very accurately measure the pressure to be applied on the clutch. This is a very interesting feature. It can be used in the variations of the vehicles, and provides the full support to control vehicle of any type. For example it can be used in the Mercedes, Toyota, Tata, Hyundai or even in the Farari. The people suffered with the disabilities will not face any kind of boundary that stops them to drive any kind of vehicle.

The future of the automobile industry for the assistive vehicle is very bright. Various kind of vehicles can be operated and driven with the help of this for the disabled persons. This entails great future possibilities in addition to this research work.

Figure 18: Automate India vehicle automatization kit assembly for the disabled vehicles.⁴



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