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Making Vehicles Remote Controlled for Special People using AT89c51

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***Abstract* – The purpose of this paper is to present a novel technique to implement remote controlled driving option in to existing cars whether they are new cars equipped with state of the art electronic control units or the good old fashioned cars relying solely on mechanical inputs and outputs. The technique used is devised in such a way that people with disabilities will benefit completely from it while the normal people will also enjoy great benefits from it. In addition to support for both new and old cars the proposed system is very cheap and anyone can afford it. The main purpose of this work is to provide a cheap and reliable system for people with disabilities to drive car on their own without any aid from anyone else.**

***Keywords* – Automation of Cars, Car For Disabled Persons, Embedded Systems In Ordinary Car, Remote Controlled Car.**

I. INTRODUCTION

With the advent of new technologies, human lives have changed considerably. The luxuries around us have made possible things once considered impossible. Air travel has made possible covering the journeys that took years in to hours. Similarly the cell phones, air conditioners and other luxuries of life are making human lives easier. A personal car is an another example, if you can afford one, travelling a great deal of distances has become easier and convenient but on the other hand it's not equally beneficial for everybody. People with disabilities, even if they can afford it, cannot benefit from it on their own. They have to rely on someone to drive them. Be the car needed in an emergency or for a drive, in an odd hour, these special people have to wait for the driver or someone else to drive them.

In this paper we are introducing a novel, cheap, easy and reliable solution for those with disabilities to drive the car on their own without relying on anybody else. This system can be installed in any car, van, jeep and even public transport vehicles. This feature is what makes it unique in its kind. It's also helpful in remote parking a. It is aided by the ultrasonic sensors, the collision detection and avoidance system, can sense consciousness and even can stay in touch with emergency services in case of any accident. The proposed solution is tested on a Toyota Corolla car, model 1976 converted to Diesel. The purpose of choosing this car is to make sure that this system can work on any type of car.

II. RELATED WORK

Liu Huan et al.[1], has worked on remote control vehicle and designed a wireless remote controlled toy car with a crash detection system. Infra-Red is used for the communication between the remote control and the toy car. Proximity sensors are used for the crash detection. Lin et al 2005, has presented a real time remote control for vehicles using mobile communication. They have integrated GPS, GIS and GPRS into their system. Communication is done via GPRS. Wang Shaokun et al [3] has also used an ARM9 to control a robot car using Wi-Fi and Linux based OS which is capable of receiving commands from the computer console and using servo motors to control the direction of motion of the car. By using the surface mount wireless camera they were able to steer the car remotely. It uses Wi-Fi meaning the car can be controlled from anywhere but again it's just a prototype and is dependent on Wi-Fi which is not everywhere available. In all this work they lack their practical implementation also they rely on totally electronically controlled vehicle which is fine with the new cars with electronic controlled units (ECU) but in most of the cases the older cars and especially the mostly used cars in subcontinent do not have ECU, also if one already have a car then to use the above mentioned systems they have to buy a new car. However, by using our system one does not have to change their car and can save money. So the biggest advantage of our work is to install the new system in any car and also at much affordable rates which is user friendly and reliable as well.

III. WORKING AND EQUIPMENT

A simple microcontroller (worth less than Rs. 80) does the whole job and makes the difference. Besides the RF transceivers each and every component used in this project is very cheap and is easily available. A couple of 12V relays, 4 Powerful DC motors and a careful placement of gears system make this project practical and possible.

A. AT89C51 Microcontroller

The basic i51 architecture based microcontroller is the core of this driverless car and its whole systems. This small electronic device is what makes and reports all the decisions. By carefully and tactfully using the Input/ Output ports and the interrupt ports of this piece of electronic hardware, a user without sitting in the car can very easily drive it.

B. Remote Controller

The remote controller, Fig. 1, has one microcontroller, an LCD, a multi-character keypad and an RF transceiver. Upon power on the LCD screen prompts for a password, Fig. 2, the system is password protected because anyone with the remote can take your car away from you. By using the multi-character keypad a password is being input and this password is being verified by the microcontroller. If the password is correct, the current status of the car is displayed on the LCD screen.

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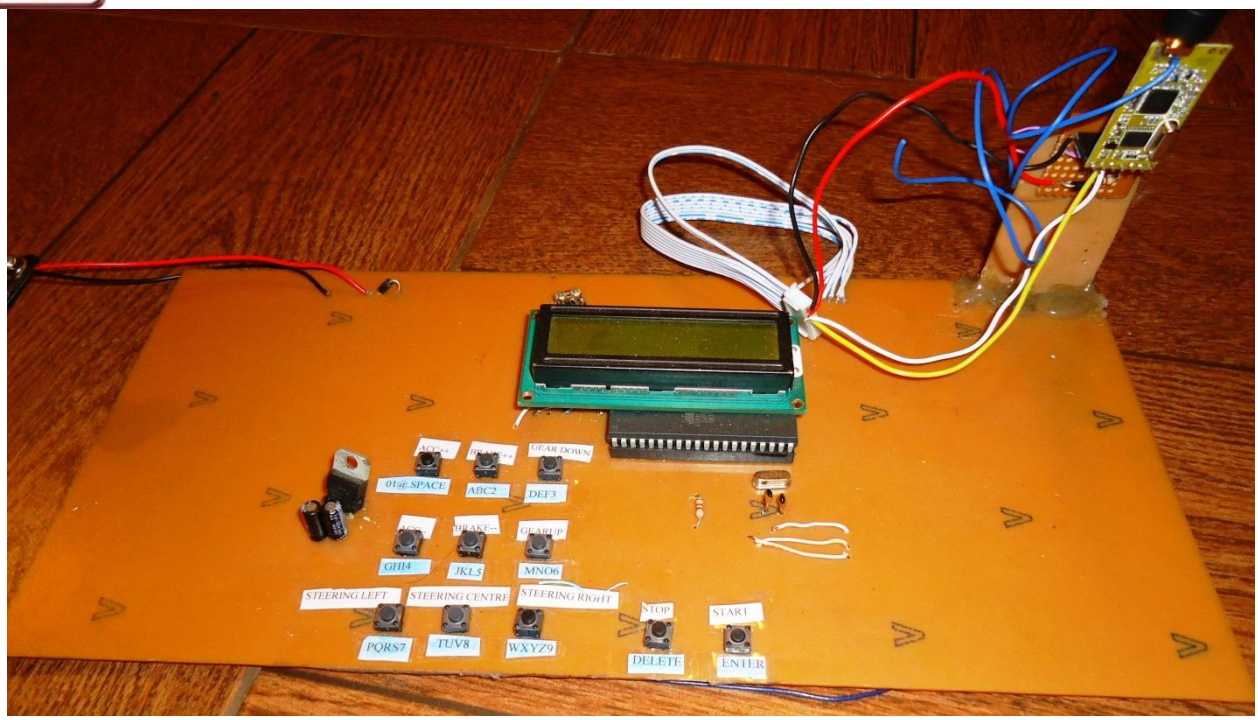

Fig.1. Car Remote Control Unit

This current status will be updated and displayed all the time to let the user know about certain activities going on in the car. Any change requested by the user is input through the multi-character keypad is being received by the microcontroller this change is then converted in to the required format of the RF Transceiver and is sent to the car on board control circuit.

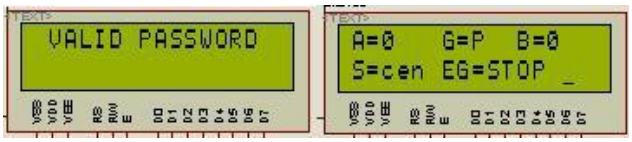

Fig.2. Remote Control LCD showing Password and Car Initial Status

For the system to efficiently work the changed pattern received by the car on board controller is sent back to the remote unit for acknowledgement, if it matches the pattern sent by the remote control it is confirmed and implemented.

C. Car On Board controller

The job of the car on board controller is to receive commands from the remote control unit, report them back and make the car follow whatever is sent to it. The RF Transceiver receives commands sent to it, which is then fed in to the microcontroller on board fitted inside the car, Fig 3.

This microcontroller manipulates the meaning of the incoming signals. The Input/ Output ports of this microcontroller are connected through relays to the Brake, Gear, Steering wheel, Accelerator and ignition switch. Upon receiving an ignition command it is made sure that the car is in parking gear then the engine heater is activated (the car in test is Diesel) for a pre-set time delay which is determined using a digital thermometer installed in the engine compartment. If the temperature is low, the number of the heating cycles will be increased up to three times, if it's hotter, it may not even apply heating. When this phase is over the self-starter is given signal and the engine is started, the engine status is then reported back to the remote control unit. After starting the car depending on the user requirement the car gear change is sent to the car on board controller from the remote control, to change the gear, first of all brake is pressed the gear is changed by powering up the dual polarity 12V DC motor using a combination of gears and levers. This change is once again sent to the remote control unit and displayed on the LCD screen. When in gear, the brake is kept pressed until the ACC+, the accelerator plus, is pushed. When acceleration is increased the brake is released and the car starts moving, the status of the car is once again reported back to the user.

The Steering is also controlled using two different signals i.e. one for Clock wise motion and other for counter clock wise motion. When the steering is rotated it is recorded in a register and then with a single key press the steering can be centered. Fig 4 shows the complete schematic diagram of the car remote control unit.

D. Eyes of the Car (Cameras)

One wireless RF-Camera is installed on the bonnet and another on the trunk of the car. These cameras are helpful when the height of the driver is less or when the driver is sitting in the back seat or the driver wishes to park in or park out his car without actually sitting in it. The signal from these two wireless cameras is fed in to the colour LCD screen that is inside the car and can also be mounted on the remote control unit. The user/driver can switch the camera views by selecting the rear view or the front view camera.

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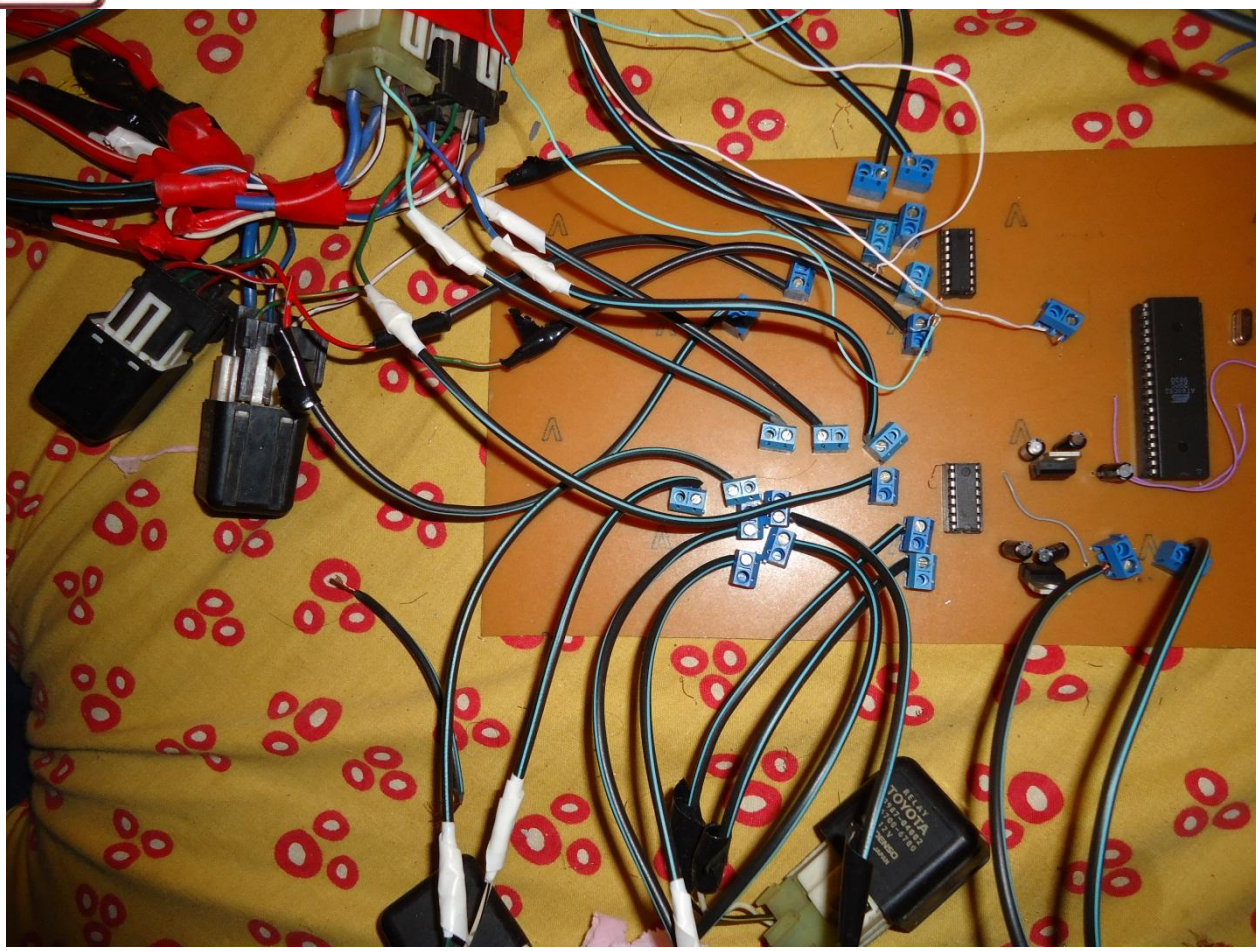

Fig.3. Car onboard Controller

IV. Details of the Car on Board Controls

A. *Car Self Starter Module*

The self-starter module is composed of two systems one the self-starter itself the other one is the heating mechanism. The heating mechanism is composed of an LM 35 heat sensor interfaced with the heating coils of the diesel engine. When the ignition key is pressed the temperature is being read from the heat sensor through the microcontroller if the engine temperature is above 50 degree Celsius the ignition takes place right away otherwise first of all the heating elements are activated for one cycle or more depending on the temperature and these heating cycles can reach to a maximum of three. When the heating cycle is complete the self-starter is activated, upon a successful start the status is reported back to the remote control unit.

B. *Brake Control Module*

The brake control module is composed of a dual polarity DC motor, input control from the microcontroller and lever control. Whenever the ignition process is started, the brake is pressed along with it and then afterwards with every first gear change i.e. from parking to any gear shift the brakes is applied and every time the brakes are pressed its status is reported back to the remote control unit.

C. *Steering Control Module*

The steering of the car is also controlled by dual control dc motor. In the remote control module there are three keys for this module one key is used for left turn, other for right turn and another one is to center the car. You can steer the car by pressing the respective key and then you can press the opposite key to center the car or press the center key to straight the steering.

D. *Speed Control Module*

The acceleration of the car is also controlled by the same style motors and levers assembly. With a single press of a key the car can be accelerated and with the other one it can be decelerated.

V. Programming Logic

The programming is done in Assembly language. Its very simple programming, the logic is to use all the ports of microcontroller as efficiently as possible. In most of the cases two pins are used for each operation. Any operation performed is reported back to the remote control unit so that if there is any mistake that should be promptly corrected.

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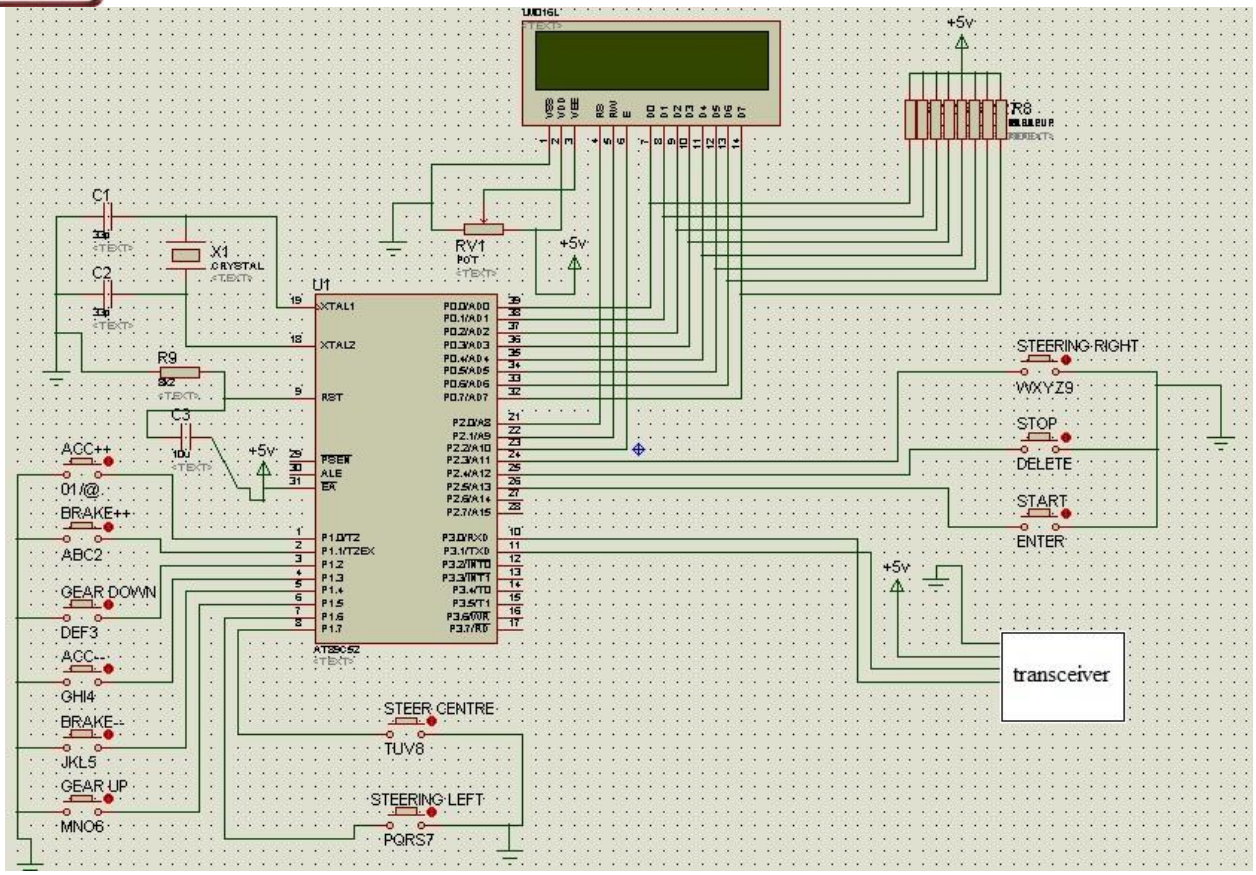

Fig 4. Remote Control Unit Schematic Diagram

VI. Conclusion

We were successful in implementing the project on a real car. The car was then very extensively tested, its starting mechanism was a complete success at a very long range of temperatures, it was able to shift the gears as per the requirements of the driver and that of the automated transmission, the brake response time was extremely accurate, the car was able to steer in very narrow street and we were able to park it along with other cars, the remote park in and park out system i.e. using the bonnet mount camera, was also very good. After the testing phase the car was given for a test drive to a real handicapped person who had unfortunately lost his one hand and one leg in the recent suicide bombing. After a few attempts he was able to drive the car on a very congested road.

Future Work/Enhancements

The project can further be extended to a more secure and user friendly level by adding collision detection and avoidance system. This way if the driver in any circumstances loses control of the car of if he/she is not giving attention to certain critical details the car may apply automatic brakes and hence will be able to secure more human lives and financial losses.

Presently the car is being controlled using RF remote unit, we can in future control the car using GSM/GPRS signaling, increasing the efficiency and range of the car. By installing motion sensors in the remote control unit we can convert the remote in to a real steering control system tilt it in the direction in which you want to turn the car and it will follow you.

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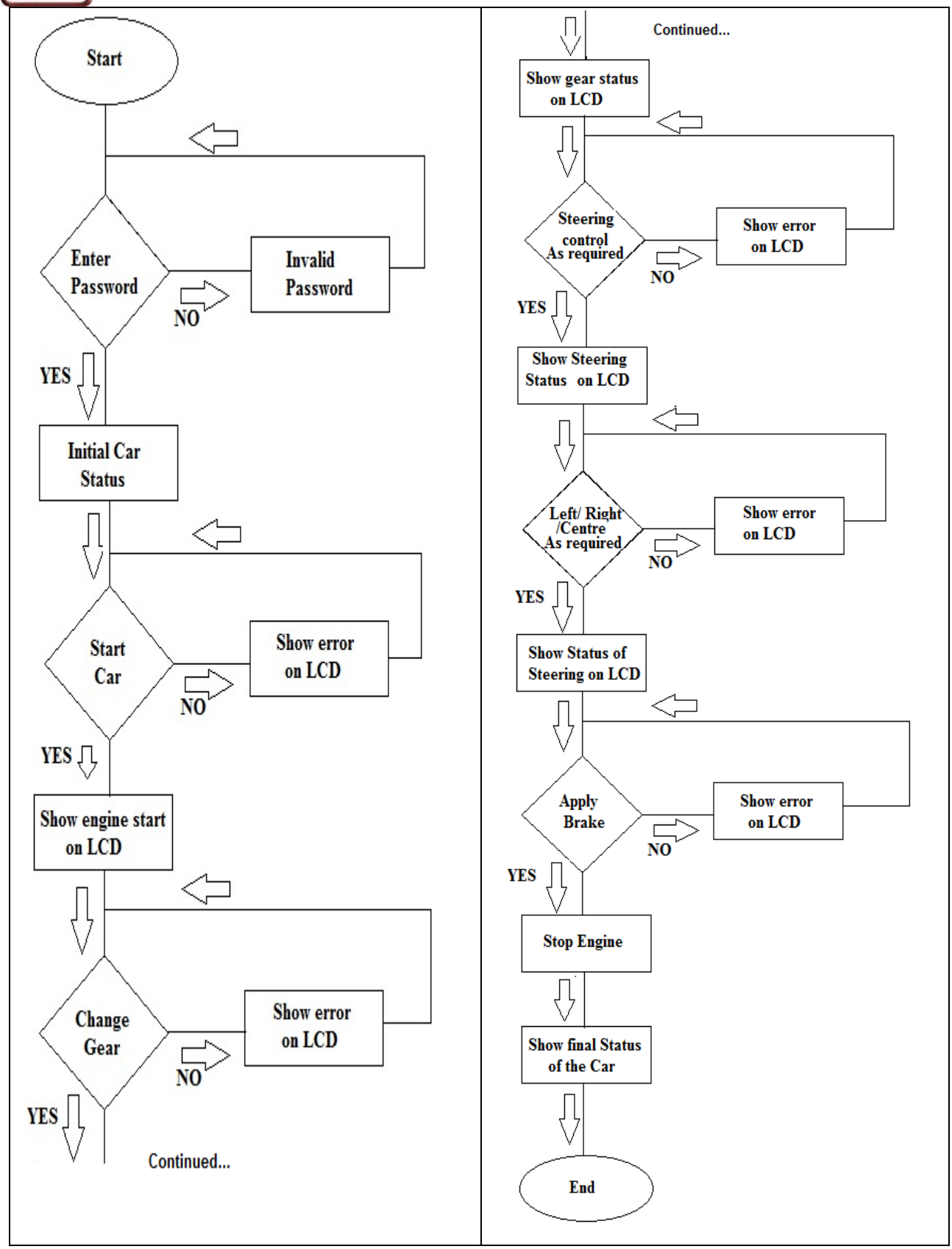

Fig 6. Flow chart

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AUTHOR'S PROFILE

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