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CRUISE CONTROL IN AUTOMOBILE/CAR

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ABSTRACT

Cruise control is also known as speed control and auto cruise that is mainly used in automobiles. The increasing use of in the modern cars triggers an interesting study on the effect of cruise control in automotive industry. In this research the basic concept of cruise control is being discussed in detail. The research showed the advantages and disadvantages of cruise control in to the users and automotive industry as whole. Additionally, this research also discussed the installation of cruise control in the car. This in turn helps the readers to understand and appreciate the use of car cruise control.

Keywords
Cruise control, car, ACC, CCC, advantages or disadvantages.

1.0 INTRODUCTION

Cruise control is also known as speed control and auto cruise that is mainly used in automobiles. There are wide definitions used to define and describe cruise control. One of the simple and clear descriptions about cruise control in automobile is controlling the mechanism for keeping an automobile at a set or desired speed of the driver. The cruise control system is able to maintain the current speed of the car. Moreover, it can accelerate the car upon the request of the driver.

Conventional Cruise Control (CCC) system allows the driver to maintain the current speed without pressing on the acceleration pedal by switching on the cruise control by pressing the start cruising button controller. The cruise control will only function when the engine of the car is running, the car is in its highest gear, the speed is at least 30km/h, and the brake pedal is not depressed (Jansen, D.N., 2001). The cruise control system is not only able to maintain the current speed of the car; it can also accelerate the car upon the request of the driver.

Adaptive Cruise Control (ACC) has been introduced into the automobile market in late 1990's as a more convenient option with potential safety and throughput impacts. ACC is an advancement version of Conventional Cruise Control (CCC) where the driver has the option of selecting desired time headway in addition to the desired speed that is available in conventional systems. ACC is also known as advanced, active, or intelligent cruise control. In late 1990's where the first ACC systems were introduced to the market, it was a rather expensive option for top-of-the line vehicle models. However, today, ACC can be found in a much wider range of vehicles models (Hoedemaeker, 1999).

In addition from CCC, there is a radar system acting to detect whether slower moving vehicles are in the ACC's vehicles path which is attached to the front of the vehicle. The ACC system will slow the vehicle down and control the time gap (clearance) between the ACC vehicle and the vehicle ahead. Once the ACC system detected that there is no more forward vehicles in the ACC vehicle's path, it will accelerates the vehicle back to its set cruise control speed. This additional feature allows the ACC vehicles to autonomously slow down and speed up with traffic without intervention from the driver.

In this report, we are going to elaborate on how ACC, as an automated system works. We discuss too on the comparison between CCC and ACC. Next, we study on how to install CCC in car. Before that, the justifications of the reasons behind the selection of CCC to install in car are discussed first. The steps are shown carefully and cautiously with the aid of diagrams.

2.0 LITERATURE REVIEW

An ACC system attempts to maintain a desired speed (set by the driver) whilst keeping a minimum time-gap between the vehicles, typically measured by a radar (Tribe et al., 1995). The functionality of the systems varies (e.g. engine braking or engine and active braking) as does the control algorithm for managing the inter-vehicular separation. The driver is able to over-ride the system at any time by activating the brake or accelerator pedal and can

switch it on or o. at different stages of the journey. In common with all ACC systems, that being studied within this research is fully autonomous (not requiring any vehicle to roadside or vehicle to vehicle communication) and assumes that the driver has control of the steering of the vehicle at all times.

The first stages of deployment of ACC will be “on top of the range” vehicles, offering improved driver support with personal comfort as a prime advantage. Such ACC systems may not fully meet the requirements of a system designed to enhance the efficiency of traffic flow. For example, more gentle approaching behaviour and larger inter-vehicular distances, if selected by drivers, could reduce capacity. The systems will only operate in high-speed motorway driving conditions, which have been assumed to be more than 40 km/h for this study. Traffic characteristics below this speed are such that a separate algorithm would be required to perform a comfortable and 34 G. Marsden et al. / Transportation Research Part C 9 (2001) 33±51 acceptable distance control function (Blosseville et al., 1998) although work is on-going in this area (Hayward, 1999).

User acceptance is of fundamental importance for vehicle manufacturers to achieve rapid market penetration and widespread use of ACC in traffic networks. Understanding user acceptance and the implications of ACC use in a traffic stream is also of great importance to network operators who are charged with improving capacity and safety of the road network. A review of the state-of-art of user acceptance issues can be found in Brackstone and McDonald (2000).

The safety of ACC has been addressed in a number of studies e.g. Chira-Chavala and Yoo (1994), Najm and Burgett (1997), Nilsson (1995), Takubo (1995), DIATS (1998a), Touran et al.
(1998). These assessments examine the potential for ACC to reduce accidents in an emergency braking situation in two ways. The ®rst approach involves the development of a probabilistic model that can analyse the response of a platoon of vehicles to a variety of lead-vehicle braking manoeuvres. The second approach involves simulator investigation into the ability of drivers to take control from the ACC when entering an emergency situation. The concluding evidence is unclear. Some studies highlight the benefits to safety of an improvement in driver reaction time, brought about from the accelerator and braking feedback from the ACC system. Other studies highlight the degradation of driver performance due to a lack of involvement in this primary driving task (Brookhuis and de Waard, 1999). However, it is clear that the safety concerns have not been significant enough to delay deployment in Europe beyond 1999.
The main evidence on driver willingness to use an ACC system has come from a ®eld operational test in USA (Fancher and Baraket, 1998; Fancher et al., 1998; Hagan et al., 1997). This project evaluated the responses of over 100 drivers who used ACC for a period of two or ®ve weeks in their natural driving environment (the systems were posted to 1996 Chrysler Concorde sedan vehicles). The ACC system braked using the engine and power train only, producing a maximum deceleration capability of 0.07 g. A large data set of driver behaviour was collected, indicating when drivers will use ACC and how they use ACC in conjunction with manual driving.

The results suggest that drivers will not use the systems in dense traffic conditions. Results showed that drivers chose to engage the ACC in about half of all miles travelled above 35 mph and for 39% of the time it was available. The above results are supported by a stated preference study,
DIATS (1998b) in which drivers expressed a willingness to use the system in low-density traffic.

3.0 FINDINGS

Throughout the research, we have identified the mechanism of Cruise Control in detail. Moreover, the pros and cons of implementing CC in vehicles are also discussed. The ways of how ACC works are identified and discussed in detail. The procedures of how to install CCC manually in car are discussed. Steps are shown with the aid of visual for easier understanding**.**

The advantages include reduce the tense on the driver. ACC reduces over fatigue on the driver especially on the highways and long distance driving. Drivers relieve from the task of careful acceleration, deceleration and braking with the help of the radar which automatically control the vehicles. There is less need of close control on the brake pedal or accelerating pedal too. Hence, the driving is much more relaxed, with reduced symptoms of fatigue.

Besides, ACC avoid the chances of involving in road accidents. The radar system in ACC which detects the vehicles ahead of the ACC’s vehicle maintains a safe distance or gap from the vehicle ahead. Therefore, the chances of involving in a collision with the front vehicle are decreased.

Next, avoid unconsciously violating speed limits. By setting the desired speed using the cruise control system, driver will stick to the speed without accelerating the vehicle. ACC can be set at the speed limit and avoid the potential to exceed the speed limit. This will in turn reducing the likelihood of being issued a speeding ticket.

Finally, ACC minimize the fuel consumption level and emissions. The radar system in ACC detects the vehicles ahead of the ACC’s vehicle maintains a safe distance or gap from the vehicle ahead. Drivers do not need to brake unnecessarily. Fuel can also said to be very efficient because drivers only brake when it is needed or to

disengage from the cruise control system (Van Arem, 2006).

On the other hand, the disadvantages include problems in cruise control module. Since ACC system is built up in the car engine, drivers might not able to detect the problems that occur in the cruise control system. This is risky because drivers might not realise that the system does not function well until they involve in an accident.

Risks involving in road accident. ACC enables the drivers to rely on the system to control the movement of the vehicle. Hence, it encourages drivers to pay less attention to driving, which in turn increasing the risk to involve in a road accident. Moreover, ACC does not test whether the current or desired speed is safe. The system will only follow the set speed to move. ACC does not change gears even when this would be appropriate, for example when driving uphill or downhill. Automating speed control means that it takes longer for a driver to respond to changing road conditions. Cruise control systems have contributed in the past to drivers losing control on turns or curves in the road (G. Marsden et al, 2001).

4.0 DISCUSSION

As the result of the study, we are mindful of the benefits or pros of using ACC in the vehicles. It is quite ironic however, that the pros and cons of such systems are not completely understood yet. Hence, we further discuss the pros and cons of ACC in the following section. Upon the completion of study of ACC system, we have come out with some new ideas and suggestions that could possibly be implemented in the future by taking into account the limitations.

The limitations of CCC systems are endured by the ACC systems. ACC uses many of the same parts as CCC, with the addition of the radar system to the front part of the vehicles will however add some challenges when repairing vehicles with front end damage. ACC systems can be advantageous especially on road safety when used on roads with non-congested traffic. Under these situations, ACC has a moderating effect on the driving speed. Moreover, an additional positive effect is the reduction in fuel consumption. On the other hand, the negative side of ACC need to be considered too, like the increase chances to involve in accidents in busy traffic, rural and urban roads other than the main roads. Another important issue is driver's behaviour. However, new developments are likely to improve the effects on safety, traffic efficiency and the environment.

5.0 SUGGESTION

Development can be seen at everywhere especially technology. In automobile perspective, safety features during driving experience always a hot topic among the designers, manufacturers and end users. It can be clearly seen from the evolution from CCC to ACC, a large improvement proven. As a consequence, many drivers are looking forward to the new generation of ACC that will beyond their imagination.

Those modern vehicles nowadays having the system of drive-by-wire integrated with the control centre named as Electrical Control Unit (ECU). In others word, the main authority in controlling the car still remain on the drivers while the ECU just perform the instruction given by drivers. Hence, the fancy innovation about the implementation of intelligent system into the automobile created.

The integration of intelligent system corporate with the Global Position System (GPS) and the combination of ACC will enhance the driving experience from safety, convenience, comfortable and others. By utilize the intelligent system; it will analyze the road condition with the help of GPS to predict the most appropriate speed should be applied. The system can dissection the road condition accurately no matter is uphill or curves while ACC controlling the speed. Furthermore, alert system of pre-collision will be activated with the warning beep. If the collision is imminent, the brake system will be activated immediately and the seat beat retract automatically.

The ultimate intelligent systems will have the same concept vehicle in the movie of 'Knight Rider'; it will have conversation with the driver and control the vehicle automatically without intervention of human even for the steering control. Although it is an unreachable conception rather than reality, but technology make all possible, thus look forward for the new automobile with the advance technology.

6.0 CONCLUSION

Although the ACC is the advanced version of CCC, CCC still has its competitive advantage in those conventional vehicles. Initially cruise control invented for controlling the speed of the vehicles on the road, especially for the highway to reduce the fatigue of drivers. Hence, if the driver's requirement and demand towards the cruise control is not high, CCC is sufficient. Furthermore, CCC will be another option for those incapable for having an installed ACC vehicle. In addition, CCC can be installed manually easily like demonstration before. Therefore, CCC will be the best choice for you with the low requirement for the cruise control.

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