**WIRELESS REAR CAMERA FOR AUTOMOBILE**

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**(ST/CS/ND/20/363)**

**A SEMINAR REPRESENTED TO THE DEPARTMENT OF COMPUTER SCIENCE, SCHOOL OF SCIENCE AND TECHNOLOGY, FEDERAL POLYTECHNIC MUBI, ADAMAWA STATE, NIGERIA**

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**Abstract**

*This paper on wireless rear camera for automobile, the effectiveness of rearview cameras, rear parking, and both systems combined in preventing police-reported backing crashes. Rearview cameras are effective in preventing police-reported backing crashes. The paper also examines the importance/benefits of wireless rear cameras, the advantages and disadvantages and made necessary recommendations. The paper review shows that the rear camera was the only technology that was effective for preventing collisions with the stationary object. The variation in collision outcomes between the stationary- and moving-object conditions illustrates how the effectiveness of these technologies is dependent on the backing situation.*

**Keywords**: Wearless, Rear, Camera, Technology.

**Introduction**

Camera-based systems for indirect vision around vehicles have been anticipated and discussed for many years (Kelley & Prosin, 2016). Recently, such systems have come into reasonably common use for low-speed maneuvers, particularly backing. It seems likely that camera-based systems will soon also be used for other, more perceptually demanding driving tasks, such as high-speed lane changes and merges. In those tasks, drivers’ judgments about the distances to other vehicles can be important. That has been the main reason for concern about the possible effects of convex and aspheric rearview mirrors (Matsui & Oikawa, 2019). In several recent studies, we have tried to outline the factors that may affect distance judgments in camera-based systems. Those studies have primarily used procedures in which the observer’s vehicle is stationary and only a stimulus vehicle is moving. The present study was designed to test some of the conditions from the earlier studies in more realistic conditions; it was performed on a public road with both the observer’s vehicle and the stimulus vehicle moving.

The Rear-View Camera (RVC) Makabe (2012), is a new robust and smart video driver assistance system for automotive applications. This camera system should be able to transmit the video signal within a distance of around 20 m (the length of a long vehicle) wirelessly and reliably. It is an embedded system based on a very-low-latency video encoder and designed to be extremely fast, cheap in production, reliable, and safe against attacks and interferences.

This is an advanced type of reversing camera that does not require the use of cables between the camera itself and the display. It functions remotely. Wireless rear-view cameras usually have separate sources of power from the display. The cameras are usually powered by the same power source as the brake and thus switches on automatically when one engages the reverse gear. Majority of these rear cameras usually come with a transmitter (near the camera) and a receiver (near the display) for relaying the signals and live images. Some models such as the Pearl Rear Vision camera, which is made by [Pearl Automation](https://en.wikipedia.org/wiki/Pearl_Automation), use solar energy for power (Lehtonen et al., 2018). The display for these types of rear camera can be powered from the cigarette socket on the car's dashboard. Some of the displays are also integrated on the rear-view mirror thereby giving it a multipurpose function. Some models also sync directly with one's phone using an app which then acts as the display. The main advantage of this type of rear camera is that it is extremely easy to install and rarely requires the help of professional when doing it. The installation of these cameras also do not interfere with a car's look as minimal to no drilling or laying of wires is required. However, this comes at a cost as some of these wireless cameras are quite expensive.

**Literature Review**

In the fast growing and optimized world where maximum no. of peoples having their own vehicle, but don’t have time to maintain it for a long time and they pay attention when they have been needed not when a vehicle needed. But there are lots of unavoidable problems are arising such as pollution, crowd of vehicles on the road, less place for parking etc. which are commonly being ignored by the user. For an example, in trucks it needs periodic maintenance such as after every job which is assigned needs to be checked that 'everything is alright' and if not, then it may create the problems like reduction in efficiency which will indirectly lead to increase pollution. Even, if a minor part is damaged, it may turn to a bad accident etc. For many people, internet and telecommunications have redefined the ability to track the vehicle.

John et al. (2014), studied the various histories and development in the field of transportation, examined the problems being faced in travel patterns and telecommunications. There also performed a survey in two countries pertaining to dispatchers and commercial vehicle operators to determine characteristics that would determine the likely acceptance of advanced traveler information systems (ATIS) technologies, including route guidance, navigation, road and traffic information, roadside services and personal communication.

# Vehicular Sensing & Recording and Video Data Sharing

A rear camera is a novel technology that supports advanced sensing and video recording in vehicles (including basic event data recording, or EDR). Recent dashcams even support advanced driver-assistance systems (ADAS) features such as lane departure warning, obstacle detection, and wireless communications (e.g., WiFi and Bluetooth connection to smartphones, or cellular communications like 4G and 5G), which help to provide context-aware video data recording. Autonomous vehicles can easily support advanced sensing and recording as evidenced by Telsa’s recent software updates (V9) for rear camera support. Video recording has been widely used for property monitoring (e.g., smart security and surveillance cameras for home) and lifelogging purposes (e.g., wearable cameras). When compared with such devices, rear camera as continuous mobile sensing and recording devices capture diverse scenes due to vehicle mobility (e.g., nearby cars and pedestrians, residents, and people in parking lots), and thus have much greater spatial temporal coverage with a variety of sensor data annotation (e.g., location, driving events) (James, 2019).

# Information Sharing

Researchers have studied motivations for sharing various types of information such as knowledge, photos, location data, and life-long data. However, less attention has been paid to nations differences in sharing motives. Hosokawa & Oikawa (2019), investigated cultural differences in social question asking behaviors across four countries (i.e., United States, United Kingdom, China, and India) using a survey. They found that culture was a more prominent factor compared to other demographic factors (i.e., gender and age) in explaining differences of question types and question topics in social media-based Q&A across users of the four countries. Altruism and feeling good were the most common motivations for all countries, where Asians, especially Chinese, were motivated by the expectation of social reciprocity. John et al. (2014), showed that cultural preferences of employees should be considered in knowledge management systems. `

## Information Privacy Concerns

Our work considers privacy concerns in the context of rear camera video sharing. Recent privacy studies investigated users’ privacy concerns on various video recording devices, including mobile and wearable cameras. Researchers found that privacy concerns are highly contextualized (e.g., people, objects, activities, and locations) and people generally lack the tools, motivation, power, or knowledge to control and access the recording environments (Oikawa & Ando, 2013).

In the case of mobile video sharing with wearable cameras, wearers were willing to share images if there were any good reasons to do so, as long as contextualized privacy concerns were not present. Our work extends prior studies by studying privacy concerns related to dashcam video sharing across three different countries. It has been shown that various dimensions affect individuals’ privacy and that culture which could be considered at many levels, such as socio-cultural, political, or the individual level can explain differences in privacy attitudes. Our research is based on vehicle dashcams, which have mobility and wider coverage in the real world and supports the generation of various data types (e.g., video, sound, and location), and hence motives and concerns will be different from existing research (Mizuno et al., 2012).

## Traffic safety and risk perception

As dashcams are used mainly on the road in a driving environment, it is important to understand unique backgrounds regarding traffic safety and risk perception across multiple cultures. It is well known that there are substantial differences between countries in driving styles and skills (Mizuno et al., 2012).

Shibata (2009), studied cultural differences in perception and attitudes towards traffic safety and risk in the Norwegian and the Ghanaian cultures and observed major differences. The authors focused on making a comparison between developing counties (i.e., Ghana) and developed countries (i.e., Norway), arguing that people would likely have different perception towards safety or risk depending on their cultural background. The results showed that Ghanaians perceived a greater probability of being involved in traffic accidents and also judged the consequences to be more severe than Norwegians, as supported by the more hazardous traffic environment. James (2019), studied not only the cultural differences in environmental factors (i.e., traffic safety cultures) but also how people use related technology tools (i.e., advisory traffic information systems).

**Variations of wireless rear camera**

Rear cameras are produced in different varieties depending on the application (Lehtonen *et al.,* 2018).

1. Rear or Reversing Cameras can be added as aftermarket additions to vehicles that do not come with factory-fitted systems. They are available in both wired and wireless versions.
2. For large vehicles such as [motorhomes](https://en.wikipedia.org/wiki/Motorhome), camera systems with built-in [servomechanisms](https://en.wikipedia.org/wiki/Servomechanism) allow the driver to remotely pan and tilt the camera.
3. Wireless Rear Cameras come with a wireless camera and receiver, which make it easier and cheaper to install them.
4. Built-in audio intercoms (one-way or two-way) are used in addition to the camera system for communicating with a spotter outside the vehicle - common when backing large trailers or launching boats.
5. [Night vision](https://en.wikipedia.org/wiki/Night_vision) cameras use a series of infrared lights for backing in the dark, when the positioning or the intensity of the vehicle's white reverse lights are insufficient for this purpose.
6. Portable or semi-permanent all-in-one camera systems (also known as dashboard cameras or [dashcams](https://en.wikipedia.org/wiki/Dashcams)) are sold typically for vehicles that don't have displays permanently installed in the dash. Such systems consist of a small portable screen that can be affixed on the dashboard or on [rearview mirror](https://en.wikipedia.org/wiki/Rearview_mirror), and a length of wire to reach the cameras, including a rear camera.
7. Some backup and rear cameras are connected to displays on the [rearview mirror](https://en.wikipedia.org/wiki/Rearview_mirror) and are used in vehicles to detect activity behind the car to "avoid the tooling, software, hardware, and testing costs associated with integrating the display/feature in other areas of the vehicle."
8. [License-plate-frame](https://en.wikipedia.org/wiki/Registration_plate) versions permit permanent installation without any permanent vehicle modifications.
9. Custom cameras: [brake light](https://en.wikipedia.org/wiki/Brake_light) cameras are combination devices that contain a camera, while still illuminating as a brake light. Some rear cameras also use a combination of LEDs surrounding the camera lens to illuminate the surroundings while in use.

## Benefits of a wireless rear camera for automobile

## It Helps in Reversing your Vehicle

When I was learning how to drive, I was nervous. I am sure that many of you can relate to this anxiety that I experienced. Holding the steering wheel for the first time and being in control of the car can be overwhelming. One of the things that I dreaded the most is reversing, basically because I do not have a clear vision of what is at the back of my vehicle (Matsui, 2013).

This is where a wireless rear camera enters the picture. As the name implies, the main function of the latter is to help you when backing up. In most cases, we would rely on a friend or a good Samaritan to help us when backing up, especially when parking. The rear camera eliminates the need for the latter. You can be an instant expert in parking if you have this camera!

If you have a [rear camera installed](https://www.youtube.com/watch?v=DWZ6s_BBXwA), you will be able to clearly see what is behind you. The first thing that most of us do when reversing is to turn our head around and look out of the window. This can help, but still, it does not give you a full view of what you can possibly hit. There can be a dog or a small child that is blocked by your car’s rear.

Still with regards to how a rear camera helps in reversing, consider a situation wherein you are stuck in a dense road. If you have to reverse and if you cannot do it easily, you will be a cause of traffic. For sure, you do not want to be the person that everybody blames as the culprit for the vehicle pile-up. If you have a rear camera, this will most likely not be a problem.

## It Prevents Collision

Being involved in a collision is one thing that we do not want to happen. Unfortunately, [especially for beginners in driving](https://drivinglife.net/essential-driving-tips-for-new-drivers/), this is one thing that is almost inevitable. Regardless of how careful you are when you are holding the steering wheel, you can still be confronted with an unfortunate situation. This gives you another good reason to have a wireless rear camera. One of the reasons why the possibility of collision is minimized is because the blind zone is eliminated. It is like having a conventional rearview mirror, with the only difference being the fact that the camera is more intelligent (Matsui, 2013).

## It Saves you Money

The price tag of a rearview camera is one of the things that discourage many from owning one. With the tight competition, however, they are being more affordable, leaving you with no reason to not have one. The initial costs of such an equipment may be high, but the benefits will make it a worthy investment. In the long-term, it can help you to save a lot of money (Matsui, 2013).

When you do not have a rear camera, there is a higher likelihood that you will be hitting a child or a pet. You will be legally liable for your action, especially when it results in death or serious injury. More than the case that will be filed against you, there are also financial concerns. You might need to settle the medical bills and spend money for one thing that could have been avoided, only if you have installed a wireless rear camera (Matsui, 2013).

## ****Advantages of a rear camera for automobile****

**Evidence**: Having a dash cam in your car means supporting evidence at your fingertips – should you be involved in a car accident or witness one. The devices are conveniently placed to observe the whole of the road ahead, therefore any accident which you happen to see or be involved in is going to be recorded. They can therefore be used to prevent future accidents by reporting reckless and dangerous drivers (Matsui & Oikawa, 2019).

Road rage, drink driving and other dangerous behaviour behind the wheel are prevalent. However, a dashboard camera can help police and other law enforcement punish offenders before the worst-case scenario happens.

**Reduced insurance premiums:** On a more positive note, a dash cam can have cost-effective benefits for you as a driver. For example, lower insurance premiums. Some insurers are recognising the preventative nature they have and offer a discount if you state that you have one fitted in your car. Aviva pioneered this by including a free dashboard camera for drivers who take out its discounted black box insurance. AXA and Swiftcover do too. Both offer ‘dash cam insurance discount’ when you get a quote and prove that you have one installed on your car (Swiftcover specify that you must have a Nextbase make) (Matsui & Tanahashi, 2014).

**Encourage safe driving:** The power a dash cam has to reward safe driving and punish dangerous habits behind the wheel naturally encourages drivers using one to make better decisions. Going back to the Aviva example, the technology it uses for its car camera provides you with a score after each journey. The higher score is given to those drivers who show that they’re responsible when they take to road. In turn, premiums can be reduced by the insurance company the more times this happens

**Technologically Advanced:** Wireless systems are more technologically advanced compared to standard wired systems. If you’re looking for high-tech gadgets, wireless is definitely the way to go. Systems that utilize wireless technology have the ability to use rear cameras integrated into the a navigation system. Only time will tell how far technology will propel wireless rear cameras into the future.

## ****Disadvantages of rear camera for automobile****

When you consider the above, it’s hard to point to any disadvantages of having a dash cam fitted to your car. However, here are a few to consider.

**Distraction**: While a dashboard camera can be a reliable and handy device for capturing evidence of road accidents, they can also be a method of distraction while you’re driving. It would be rather ironic for a device which is intended to document accidents to cause one, but it isn’t unheard of. Because they are positioned on either the windscreen or dashboard, their presence can create a blind spot while driving. Especially as most of them are rather hefty in size. It can be much like having phone or tablet in your car, minus the endless notifications.

**Can Encourage Theft**: If you have a rear visible from the outside of your vehicle, it may encourage thieves to target your car.  In some cases, thieves have been known to break into cars to steal the dashcam. To avoid this, it’s best to use a dashcam that’s hidden from view.

**Potential to invade privacy:** Finally, there’s a danger with dash cams that you may invade a person’s privacy. This is particularly a risk with devices which have Wi-Fi, because the ability to upload footage to social media is at your fingertips. This is something to consider, especially if your footage contains vital evidence which should only be used in court proceedings.

### Can only pick up video from your point of view: One of the limitations of dashcams is that they can only pick up footage from your point of view. This means that if something happens out of your field of view, you may not have any footage of it.

## Conclusion

The paper has described wireless rear camera technology for automobile review literatures on the technology. The paper has also showed the various benefits of this technology in minimize accidents, also the advantages and disadvantages. The paper review shows that the rear camera was the only technology that was effective for preventing collisions with the stationary object. The variation in collision outcomes between the stationary- and moving-object conditions illustrates how the effectiveness of these technologies is dependent on the backing situation.

**Recommendations**

1. The paper recommends that they should be a development of a vehicle camera system that combines the left- and right-side mirror cameras and the rear camera into one screen.
2. Also, it is recommended that with the benefits of a wireless rear camera that have been mentioned above, it should be obvious by now that it is a great investment. Its price should not be a concern since it can be useful in more ways than one.
3. To make the most out of its uses, be sure to exert effort in narrowing down the possibilities and choosing the right one.

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