**Erbil Polytechnic University**

**Erbil Technical Engineering College**

**Civil Engineering Technical Department**

**"Applied Engineering Project"**

# "Analysis, pros, and cons of point - to - point cameras system on Erbil-120m Street"

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# CHAPTER ONE

## Introduction

## 1.1 Abstract

The problem of road safety affects the populace and all governmental levels. Even though this is a notable decrease in casualties, the current rate of roughly one death per day still needs to be lowered. One practical method of lowering these rates is to decrease the frequency of speeding. The state of point-to-point speed camera technology is the result of advancements in speed enforcement. P2P cameras work by taking pictures of every car that crosses the beginning and finish of a given road segment. Because the photos have a time stamp, it is possible to calculate the travel time. Computer software compares the captured images with the license plates of passing cars. Since the distance between the cameras is known, the It is possible to compute average speed. Images of cars going faster than the trigger speed can be sent to the infringement division for verification. The technology, how these devices are applied in Kurdistan, and potential locations for these devices are discussed in this research report.

Fig.1 ERBIL-120m street with a point-to-point camera.

## 1.2 Background to the camera system

This study falls under the category of safety research and addresses problems pertaining to the use of point-to-point (P2P) speed cameras in Kurdistan. Since P2P devices promote compliance over several kilometers of road rather than several hundred meters, they are widely acknowledged to offer advantages over traditional spot-speed enforcement. Instead of measuring a driver's speed at a single location, P2P speed enforcement measures the driver's average speed between locations. Usually, to achieve this, two or more radar cameras are positioned at two different points along a road. These cameras typically have 3DHD radar and Automatic License Plate Recognition (ALPR) installed to record, identify, and keep an eye on a large number of license plates in a variety of lanes, in low light, and during inclement weather.

The new method measures the time it takes to travel between two points to compute the average vehicle speed. If the driver goes over the posted average speed limit, a ticket is issued. "The new system aims to control traffic, lessen fatalities and collisions, and educate drivers on safe and considerate road usage. "Although one theory suggested drivers accelerated downstream of the P2P camera zone, like observations at fixed spot speed camera sites, research on P2P speed camera enforcement revealed a high level of speed compliance within the zone.

They have two cameras that they use to take pictures of every vehicle, no matter how fast it is moving at the time. There are two cameras: one at the beginning of the road segment and one at the end. A car is seen entering the sector by the first camera, and it is later photographed by the second camera as it drives out. Automatic number plate recognition (ANPR) software compares the two images. When installing the cameras, the distance along the road between them is measured. The time that the pictures of the vehicle's entry and exit are taken is noted. The system can calculate the vehicle's

average speed across the sector using these values. An infraction occurs if the computed speed exceeds the speed of enforcement, it is possible to create notice.

## 1.3 Statement of the problem

- there shouldn't be any exit between P2P cameras, so that the cameras realize the distance and time between the two points.
- When an accident occurs, such as sickness, the P2P camera system becomes a barrier for driver to reach destination at a convenient time, but so far there is no regulation has been set for such situations.
- Sometimes drivers travel too slowly on high-speed laneways, which would be a reason for preventing other drivers to travel at standard speed.
- it should not be allowed to temporarily deviant, except for urgent situation.
- There are two very important things to take care of about driving a car which are...

  a) stay in your lane.

  b) avoid other cars.



Fig.2 Photo of Erbil-120m Street

## 1.4 Research Questions/Hypothesis

1. What makes P2P useful?

2. In what way is a point-to-point camera operated?

3. If you drive 85 mph in an 80 km/h zone while using an average speed camera, will you be fined?

4. What is the number of active speed cameras?

5. Do all of the passing cars get captured on camera?

6. Is it risky to speed?

7. What is the average speed at which individuals are detected?

8. Why is a car from outside of Kurdistan subject to a fine? Is there a policy in place, or is it difficult for P2P to enter Erbil?

9. A car without a license plate is what?

10. How far apart are the cameras spaced?

11. Does the camera that takes the picture of the driver have a flash alert?

12. Is the front or rear of the camera used for shooting?

13. What is the amount of the fine for hitting every camera?

14. What is taken into account in an emergency?

15. Who does the yearly salary go to?

## 1.5 Purpose of the camera system

The principal objective of deploying a point-to-point camera system on highways is to augment the transportation infrastructure by means of efficient oversight, administration, and safety protocols. The purpose of this study is to:

**Clarity of drivers:**

These cameras are positioned to make sure that drivers follow the traffic laws and speed limit signs that are posted on the streets. "At the moment, only automobile speeding is recorded. The top speed limit on the streets has been established by us. For instance, the top speed limit for cars is 110 km/h, and the top speed limit for trucks is 80 km/h," he stated. Drivers who do not go over the speed limit will not face consequences; however, those who do so will incur fines.

**The trucks:**

Currently, the system records two types of violations for trucks, the first is speeding within the limit, the second is the location of trucks on the right side of the streets If he is speeding and changed location to the left or middle side of the streets, he will be charged with two violations and all these violations will be recorded in photographs.

**Speed control:**

The spokesman of the Erbil Traffic Directorate said that the cameras will be installed on the streets of Erbil, and that the system will be installed on the highways, as well as the streets where drivers may speed traffic can be regulated and traffic accidents and the number of victims can be reduced.

**Improve Traffic Flow and Management:**

Make use of the camera system to track traffic trends, pinpoint areas of congestion, and instantly improve traffic flow.

**Strengthen Highway Security:**

Evaluate the role of the camera system in enhancing security by monitoring for unusual activities, trespassing, and unauthorized access to critical infrastructure.

**Weather and Environmental Impact Assessment:**

Assess the feasibility of integrating weather and environmental sensors with the camera system to provide comprehensive data for understanding the impact of weather conditions on highway safety.

**Support Data-Driven Research and Planning:**

Make use of the information gathered by the camera system to assist studies on urban planning, environmental impact assessments, and transportation trends.

**Enhance Communication and Information for Road Users:**

Investigate the role of the camera system in providing real-time information to drivers about road conditions, alternative routes, and potential hazards to improve overall communication between transportation authorities and the public.

## 1.6 Significance of the camera system

In today's transportation infrastructure, the installation of a point-to-point camera system on highways is of utmost importance. As technology develops further, integrating surveillance systems becomes essential to guaranteeing the effectiveness, efficiency, and general safety of highway networks. Increasing Road Safety and Emergency Response The ability of the camera system to greatly improve traffic safety is one of its main significances. These systems aid in the early detection of events like accidents or malfunctions by means of continuous monitoring. This helps to prevent and mitigate possible hazards on the highway in a proactive manner in addition to expediting the emergency services' response time.

### Optimization of Traffic Flow and Efficiency

On highways, the camera system is essential for maximizing traffic flow and minimizing congestion. Transportation authorities can enhance the overall efficiency of the road network by implementing dynamic traffic management strategies through the provision of real-time data on traffic patterns.

### Security Measures and Deterrence

Continuous surveillance through the camera system contributes to heightened security measures on highways. The presence of these systems acts as a deterrent to criminal activities, ensuring the safety of both the infrastructure and the users of the highway.

### Data-Driven Decision-Making for Transportation Authorities

The camera system's data collection provides transportation authorities with insightful information that helps them make well-informed decisions. Authorities are able to plan ahead, allocate resources effectively, and react proactively to changing conditions on the highway.

## Monitoring Weather and Environmental Impact

The camera system's range of applications extends beyond traffic control with the integration of weather and environmental sensors. The system monitors environmental factors and weather, providing vital information for determining how these variables affect highway safety.

## Contribution to Infrastructure Health and Maintenance

The camera system helps to monitor the condition of the highway infrastructure in addition to addressing immediate safety concerns. Proactive monitoring reduces the likelihood of critical failures by enabling the early detection of possible structural problems, facilitating timely maintenance.

## Integration with Smart City Initiatives

The camera system's seamless integration with smart city initiatives is what gives it its greater significance. Within the context of intelligent transportation systems, this integration supports thorough urban planning, effective transportation management, and improved connectivity.
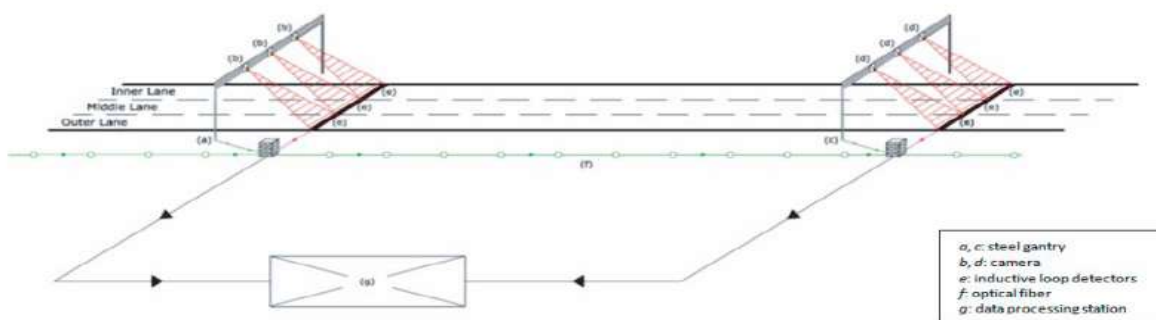


Fig.3 Camera P2P description and how it's work

# CHAPTER TWO

## Review of Related Literature

## 2.1 Insert other relevant sub-headings.

**Traffic cameras**

These motion-activated camera devices are frequently seen at traffic lights at busy intersections, and their purpose is to deter drivers from speeding through red lights. In addition to fines and points being added to your driving record, you will be charged if they catch your car running a red light.

As a result, it's critical to understand red light cameras, their typical locations, and how they contribute to road safety. Red-light cameras serve to enforce that drivers follow traffic laws, and stopping at a red light is essential for your safety and the safety of other drivers.

**Q) How does the technology behind the red-light cameras work?**

Using electronic detectors buried in the road's surface or a tracking radar, traffic light cameras measure and record the speed of moving cars. Vehicle speed is precisely measured by these detectors. A picture is taken whenever a car crosses the line when the light is red or goes faster than the posted speed limit.

**Q) Do Red-light cameras record speed?**

Radar technology is used by red-light cameras, commonly referred to as "Gatso cameras," which can record both speeding and red-light violations.

## 2-2 Literature Appraisal

**Optical markings**

Optic marking treatments create the impression that the driver is moving too quickly. After that, speed ought to be decreased.

**Speed humps and raised platforms.**

To reduce speed, use the speed hump.

**Roundabouts**

Roundabouts make intersection traffic slower and increase the safety of a vehicle's potential impact angle in the event of a collision. They are also self-regulating, which functions well because there is clarity regarding who has the right-of-way, speeds are reduced, and the field of vision is clearly wider.



Fig.4 Photo of Erbil-120m Street

# CHAPTER THREE

## Methodology

## 3.1 Research design

We will learn about point-to-point cameras, including their functionality, where to fix issues, and the extent of their research. In order to discuss the outcome and make recommendations for the future, we will first gather data and analyze it.

## 3.2 Population of study

The proposition of redirecting traffic camera revenue from private companies to government entities represents a pragmatic approach to addressing concerns related to revenue distribution in traffic management systems. By prioritizing the public interest over commercial incentives, this approach has the potential to enhance transparency, accountability, and the overall effectiveness of traffic enforcement efforts. However, successful implementation would require careful consideration of legal, logistical, and financial implications, as well as robust mechanisms for stakeholder engagement and oversight. Nonetheless, the benefits of government-controlled revenue allocation in promoting road safety and advancing public welfare justify further exploration and consideration by policymakers and stakeholders involved in traffic management initiatives. Although drivers accepted the system, he advised the traffic director to give the government the camera revenue rather than a private company.

سڵاوتان لێبێت شۆفێران.
توێژینەوەیەکمان کردوە لەسەر کامێرایی خاڵ
خاڵ، پێویستمان بەم ڕاپرسیەیە،هیوادارام ئێوەش بە
بۆچوونی خۆتان وەڵام بدەنەوە.
زۆر سوپاس.
پێتوایە کامێرایی خاڵ خاڵ ئاسودەیی شۆفێری بۆ
شۆفێران دابین کردوە لەو شەقامانەی کە سیستەمەکەی
بۆ داندراوە؟

○ هیچ ئاسودە نیم
Added by you
🏍 👤 😊 840 votes

○ زۆر ئاسودەم
Added by you
🌆 🏞 🖼 194 votes

○ تا ڕادەیەک ئاسودەم
Added by you
🏞 🌆 😊 90 votes

Fig.5 Referendum about P2P cameras

**Ahmad A. Hussain** Top contributor
کامێرا هەقە لەناو کۆڵانەکانیشا داینێن
16 h   Like   Reply                5 👍

**Mabast Naef**
Hêmin Mustefa Reşîd
هەولێر بۆ کەرکوک کامێرای خاڵ بۆ
خاڵ لە نێوانەکان لە سورعەتی
110ئەرۆیشتمو لە کامێراکانیش
103-105ئەرۆیشتم یەک کامیرەش
غامە نەکردوم سورعەتی ڕێگە
پێدراویش100ە
6 h   Like   Reply                1 👍

Fig.6,7 comment about P2P cameras.

## 3.3 Method of data analysis.

Our goal in this research project is to conduct a thorough examination of the spatial arrangement of traffic surveillance infrastructure, with a special emphasis on the implementation of point-to-point (P2P) camera systems. Our approach entails the methodical computation of distances between individual camera installations, which will then be compared to standard distances that have been established through extensive empirical data and theoretical models. This careful investigation seeks to identify any discrepancies or inconsistencies between the P2P camera placement as it occurs, and the ideal location as defined by accepted practices. We aim to determine the effectiveness and efficiency of the placement of these surveillance nodes to facilitate effective traffic monitoring and enforcement protocols by carefully evaluating the spatial relationships that are present in their distribution. Using this critical perspective, we seek to extract knowledge about possible improvements or adjustments to the present P2P camera system deployment tactics to maximize their efficiency in fostering traffic safety and legal observance in the urban transportation system. To determine the P2P camera result, we will measure the distance between each camera and compare it to the standard distance.

## How point to point camera works:

The yellow car travels at 80 km/h in 3:45 (225 seconds) minutes, but the red car travels the same distance in 124 seconds, so its speed is 145 km/hr. which is an infraction.
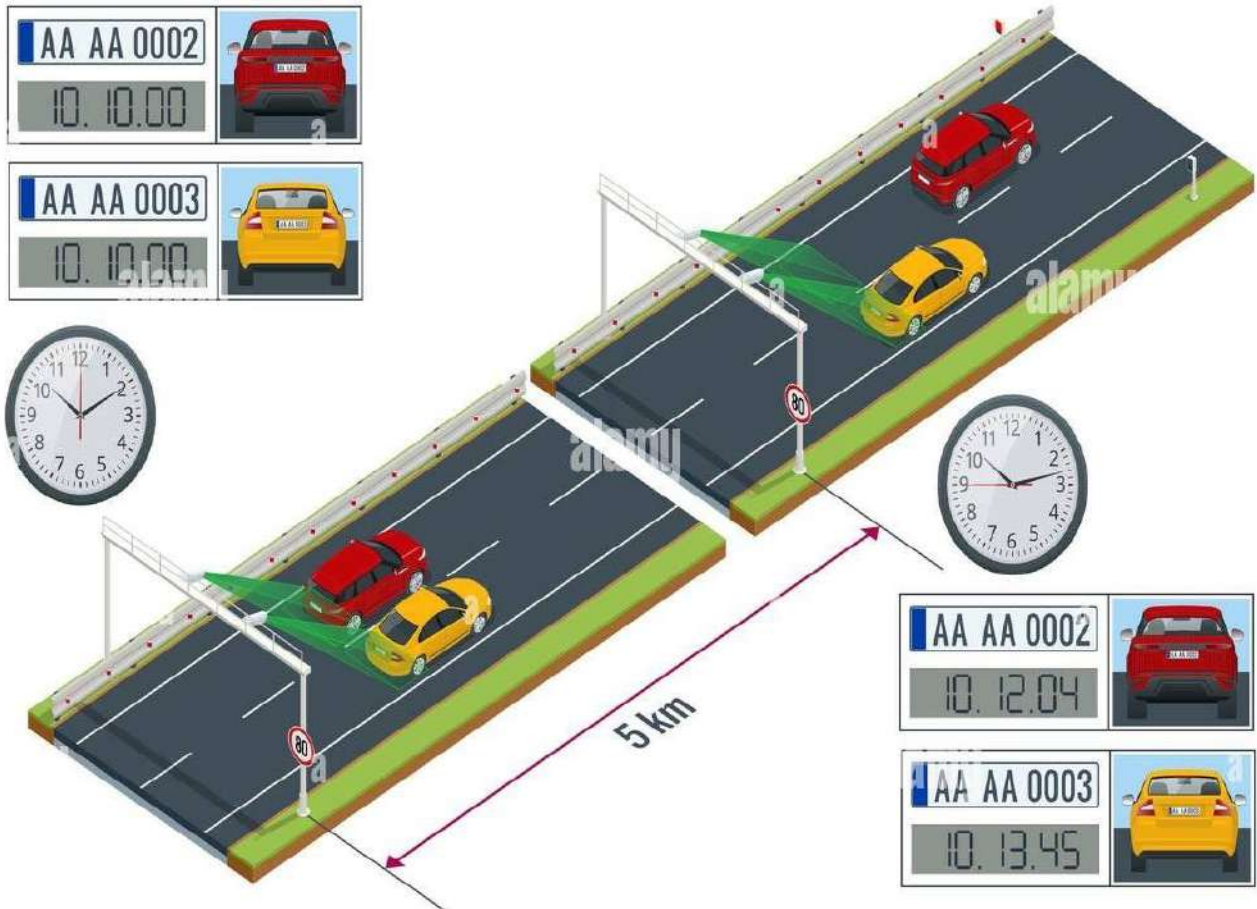
Fig. 8: P2P Camera Location on ERBIL-120M Street Plan

**Difference between P2P camera system and Speed Camera**

the operation for this type of camera is different from P2P camera system, which the camera only recorded speed violation when the car passed the camera at a speed exceeding the standard speed limit, on that occasion, the camera recorded the violation speed for driver by making the violation speed data for the cameras. according to the information of Erbil traffic management, every 10 days these data was collected by a person who visited the cameras practically with a flash and transmitted the data's to the Erbil traffic management, where they were placed in the fine knowledge system for drivers, so that drivers know where and how much they violated, this information was being updated every 10 days in the system. However, the P2P camera is directly connected to the system at the same time of speed violation it will be sent by massage to the driver's number to find out what type of violation he committed.

# CHAPTER FOUR

## Data Analysis, Interpretation and Discussion of Finding

## 4.1 Data Analysis, Interpretation and Discussion of Findings

P2P cameras will take pictures at points A and B. They will then divide the distance between the two points over time to determine the average speed of the vehicle. Since there should be no stops or exits between A and B, the distance between them must be greater than 3.4 km.

The distance between two cameras was displayed in Table 1.

| point1 | point2 | Distance (km) | point1 | point2 | Distance (km) |
|--------|--------|---------------|--------|--------|---------------|
| A1 | B1 | 2.5 | A2 | B2 | 2.7 |
| B1 | C1 | 1.5 | B2 | C2 | 2.7 |
| C1 | D1 | 2.9 | C2 | D2 | 2.7 |
| D1 | E1 | 1.4 | D2 | E2 | 1.6 |
| E1 | F1 | 2.2 | E2 | F2 | 2.4 |
| F1 | G1 | 2.4 | F2 | G2 | 1.9 |
| G1 | H1 | 2.3 | G2 | H2 | 2.3 |
| H1 | J1 | 1.4 | H2 | J2 | 1.6 |
| J1 | K1 | 1.6 | J2 | K2 | 1.5 |
| K1 | L1 | 2.2 | K2 | L2 | 1.9 |
| L1 | M1 | 1.9 | L2 | M2 | 2.2 |
| M1 | N1 | 1.4 | M2 | N2 | 1.4 |
| N1 | O1 | 1.9 | N2 | O2 | 1.8 |
| O1 | P1 | 2 | O2 | P2 | 2.1 |
| P1 | Q1 | 2.6 | P2 | Q2 | 2.4 |
| Q1 | R1 | 2.5 | Q2 | R2 | 2.6 |
| R1 | S1 | 1.9 | R2 | S2 | 1.8 |
| S1 | A1 | 2 | S2 | A2 | 2.1 |

Table 1: P2P camera spacing on Erbi-120m street.

As we shown in table 1, distance between two points is difference, Minimum distance is 1.4 KM, and we also have all distance less than 3.4 KM.

It's because of the street design, we have many exits from the street.

After P2P camera all cars reduced speed down, and we notice that the street is noisier than before P2P camera as shown in figure 5.
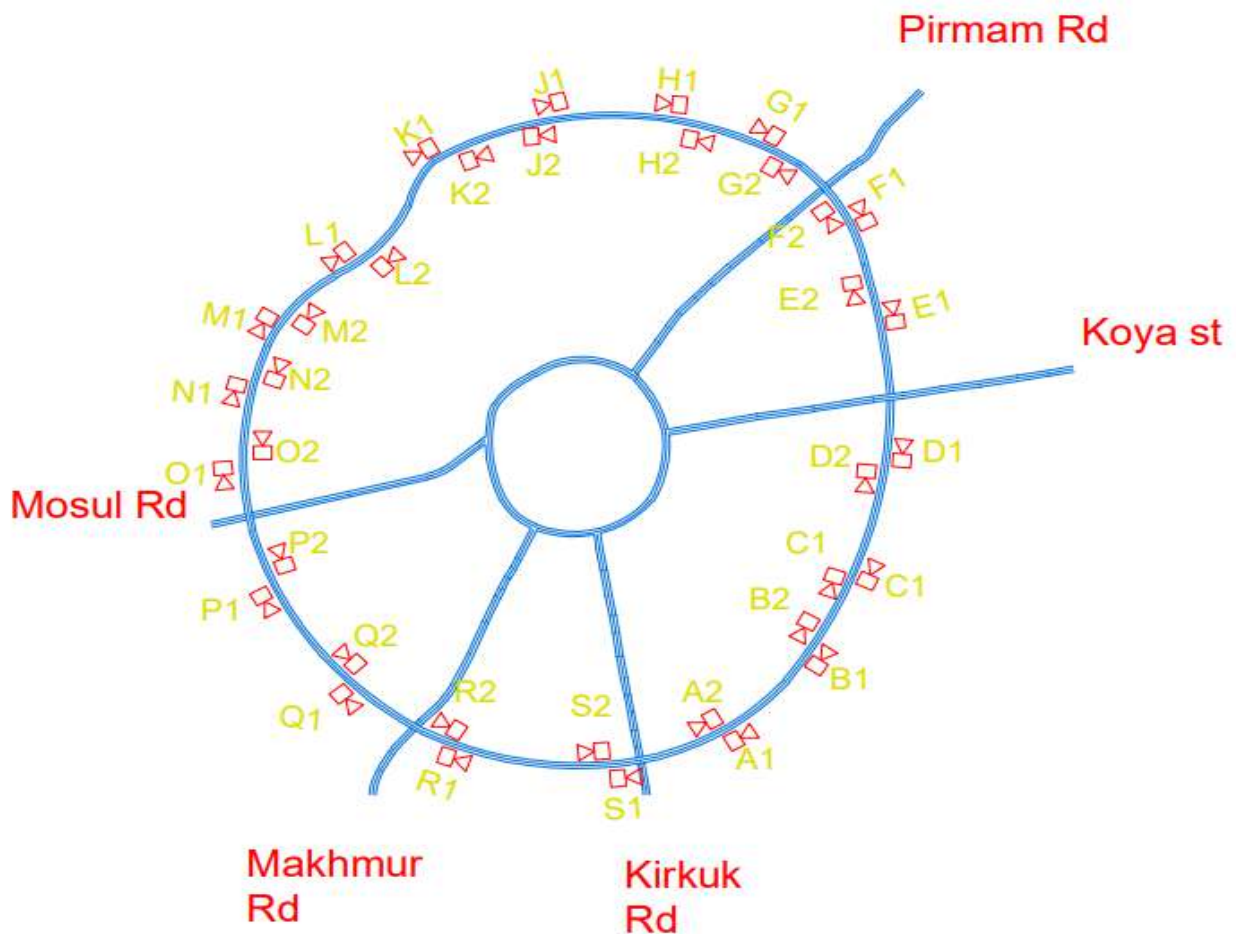


Fig. 9: P2P Camera Location on ERBIL-120M street Plan

Since Kurdistan's drivers lacked knowledge of the system and the highway, they drove at a high speed before the P2P camera was fixed. As a result, after the P2P camera was fixed, more people drove less than 100 km and stayed on the left, as shown in figure 1. This is dangerous because, for safety, if you drive 100 km, you should be more than 65 meters away from a car in front of you. Humans are not robots; for instance, a driver may occasionally reach a speed of 120 km/h; however, to maintain the distance between cameras, they must then slow down to less than 100 km. Additionally, it made the highway noisier and decreased its speed. Most of the time, speeding is the cause of traffic problems, but this is not always the case. All drivers in Kurdistan need to be taught safe driving practices through social media, TV shows, traffic directors, on the roads, in schools, and through driver education organizations.

P2P cameras were installed on Shaqlawa-Erbil Street prior to and following the Pirmam Tunnel. The tunnel is 2.47 km long, with a distance of more than 3.4 km between each camera. This is a better distance for P2P cameras because we can control over 2.4 km with just two cameras, but on 120 metric streets, we are unable to do so due to the numerous exits. The tunnel's speed is 70 km/h for increased safety.



Fig.10 Pirmam Tunnel

# CHAPTER FIVE

## Data Summary, Conclusion, and recommendations.

## 5.1 Summary of Findings

1. This new system is used for driver safety, compliance with traffic rules and driving.

2. Records the driver's speed between two cameras, and records your picture on both cameras, the first camera records all the vehicle information and sends it for the second camera, the second camera records a violation.

3. No, no violation will be registered if your speed is close to the speed limit

4. 18 cameras for operating system from 120m road.

5. Violators will be notified first, and your photo will be recorded through the camera flash

6. Yes, speeding not only increases the likelihood of accidents but also exacerbates their severity. The force of impact significantly intensifies with higher speeds, leading to more extensive property damage, a greater risk of injury, and higher probability of fatalities, if an unexpected danger appears, you may not have enough. time to react.

7. Speed occurs during adverse conditions.

8. Yes, foreign vehicles are also registered for violations

9. vehicles without license plates have two penalties

10. The distance between the cameras (location calculation) is set according to the location

11. You will be notified by the flash that you have committed a traffic violation

12. From back, A photograph of the vehicle's violation is recorded on the back

13. Fines are according to the violation

14. There are no significant facilities for this purpose

15. 70% of the revenue from the penalties will go to the company 30% will be for the

Kurdistan Regional Government



Fig 11,12 P2P cameras in Erbil-120m Street

## 5.2 Conclusion

According to our research, this system works well for speed control and minimizing unexpected bad things from happening. The method can track speed continuously and without any pauses. There is evidence to suggest that this speed control technique works very well at incentivizing drivers to adhere to the posted speed limit when traveling on the enforced portion of the road.

## 5.3 Recommendations

According to the results of point-to-point speed camera experiments, full access control roads (such as toll roads, motorways, or major roads with frontage) are the best places for this technology to be used. The cameras should be positioned on high-average-speed roads to prevent the sudden braking that is frequently observed at spot speed camera checkpoints and to incentivize drivers to maintain a steady speed throughout. This will force drivers to slow down for a certain amount of time. Vehicles should be able to move forward at a steady speed for the proper length of the speed control area. For a comprehensive view of every lane, the cameras ought to be mounted atop overhead structures. However, there was a small issue with this study that a setup like that. Because the experiment was carried out on an elevated toll road, there were moments when the cameras shook in response to movements of the cars below. This occasionally caused fuzzy images to be captured, which had an impact on the detection results.

**license suspension.**

a way to reduce traffic violation is license suspension, some traffic violation is dangerous and traffic director can block the license for 3,6,12 month or primary, so its duty of traffic director they can select the traffic violation that the driver will get license suspension and reteach the drivers.

**license point.**

add point to the license and the traffic violation, after any breaking of the rules of the road the traffic director reduces the point of license, for example the point will be 0, the traffic director blocks the license until the driver get the education of traffic rules. The points and selection of the rules is the duty of the traffic director.

**Retch the drivers.**

some drivers break the rule of the road but he/she doesn't have idea about the rule, the traffic director will get many courses and presentation for the driver until the driver can learn the rules and drive safely.

## 5.4 Suggestions for Further Research

We recommend that the traffic director disseminate additional information regarding traffic and highway driving, as many Kurdish drivers lack knowledge of the highway and are unable to drive safely. We also need traffic programs on TV, radio, social media, etc. Thus, a great deal of research is needed to determine the best ways to teach and train drivers.

# Reference

1. [Point-to-point cameras reduce traffic accidents (gov.krd)](#)
2. [New speed cameras shot up by upset Kurdish drivers in Iraq (newarab.com)](#)
3. [36 point-to-point speed cameras to begin operation in Erbil: Traffic spox (kurdistan24.net)](#)
4. [Speed Safety Camera Program Planning and Operations Guide (dot.gov)](#)
5. [Point-to-point road safety cameras | vic.gov.au (www.vic.gov.au)](#)