

Implementation of Radar Gun to Know the Speed of Vehicles in Ethiopia

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Abstract: As the population is increasing day by day the utilization of technology is also increasing rapidly. So the people want to run the luxurious life by using the technology. So there is a competition between companies to release the high end technology products, competition between the users also. Humans to run their life smoothly and to run with this fast conditions they are using their own vehicles, and some people to run their life's and some for the commercial purpose. So the utilization of vehicles has enhanced rapidly. So to run their life's comfortable they are moving fast and some people for the enjoyment. So it is creating some problems to the environment. So to control them we have traffic system and traffic police. So here were introducing a new technology which should be useful know the speed of a vehicle. It should be implemented in any places where we want to know the speed of the moving vehicle. This instrument name is given as RADAR GUN.

Introduction:

As vehicles have become faster, speed limit signs have naturally kept up. The first speed limit signs were posted at city and town limits. Early signs were not reflective. By the middle to late 20's however, many cities required that speed limit signs be illuminated. The early requirement was for a famous GE style of light, called a "MAZDA" lamp. The New York State legislature, in 1925, passed a law that "each city shall have placed conspicuously each main highway, where the rate of speed changes adequately illuminated between sunset and sunrise". After that digital meters are implemented to show the speed limit. The speeders are not following those limits and they are violated those speed limits. So government authorities thought to know the speed of the moving vehicle, those vehicles has violated speed limits have to be punished.

In generally the cities like Addis Ababa, Adama, Mekelle, is developing cities their population is also increasing day by day. So roads become busy with the traffic. In many places like school, hospitals, and in rural areas they will keep the speed limits but speeders will violate. In order to catch those we are implementing Radar Guns.

A radar speed gun (also radar gun and speed gun) is a device used to measure the speed of moving objects. It is used in law-enforcement to measure the speed of moving vehicles and is often used in professional spectator sport, for such things as the measurement of the speed of pitched baseballs, runners and tennis serves. A radar speed gun is a Doppler radar unit that may be hand-held, vehicle-mounted or static. It measures the speed of the objects at which it is pointed by detecting a change in frequency of the returned radar signal caused by the Doppler effect, whereby the frequency of the returned signal is increased in proportion to the object's speed of approach if the object is approaching, and lowered if the object is receding. Such devices are frequently used for speed limit enforcement, although more modern LIDAR speed gun instruments, which use pulsed laser light instead of radar, have begun to replace radar guns in the past decade, because of limitations associated with small radar systems.

Methodology:

This Radar gun works on the principle of Doppler radar to perform speed measurements. Radar speed guns, like other types of radar, consist of a radio transmitter and receiver. They send out a radio signal in a narrow beam, then receive the same signal back after it bounces off the target object. Due to a phenomenon called the Doppler effect, if the object is moving toward or away from the gun, the frequency of the reflected

radio waves when they come back is different from the transmitted waves. From that difference, the radar speed gun can calculate the speed of the object from which the waves have been bounced. This speed is given by the following equation

$$v = \frac{\Delta f}{f} c$$

Where c is the speed of light, f is the emitted frequency of the radio waves and Δf is the difference in frequency between the radio waves that are emitted and those received back by the gun. This equation holds precisely only when object speeds are low compared to that of light, but in everyday situations, the velocity of an object is directly proportional to this difference in frequency.

By rearranging terms we can see that Δf is proportional to the absolute frequency as well as the object velocity. Any change in f , the operating frequency in a radar gun, will produce a change in the calibrated relation between Δf and v .

$$\Delta f = \frac{fv}{c}$$

After the returning waves are received, a signal with a frequency equal to this difference is created by mixing the received radio signal with a little of the transmitted signal. Just as two different musical notes played together create a beat note at the difference in frequency between them, so these two radio signals are mixed to create a "beat" signal (called a heterodyne) and an electrical circuit then measures this frequency using a digital counter and displays the number on a digital display as the object's speed. Since a speed gun measures the difference in speed between a target and the gun itself, the gun must be stationary in order to give a correct reading. If a measurement is made from a moving car, it will give the difference in speed between the two vehicles, not the speed of the target relative to the road, so a different system has been designed to work from moving vehicles.

List of some Equipments used in manufacturing

S.No	Apparatus	Details
1	Camera manufacturer	NIKON CORPORATION
2	Camera model	NIKON D1H
3	Software used	Adobe Photoshop 7.0
4	Maximum land aperture	Pattern
5	Sensing method	One-chip color area sensor

Applications:

Traffic radar comes in many models. Hand-held units are mostly battery powered, and for the most part are used as stationary speed enforcement tools. Stationary radar can be mounted in police vehicles and may have one or two antennae. Moving radar is employed, as the name implies, when a police vehicle is in motion and can be very sophisticated, able to track vehicles approaching and receding, both in front of and behind the patrol vehicle. It can also track the fastest vehicle in the selected radar beam, front or rear.

The latest technology instrument using is Laser devices, such as a LIDAR speed gun, are capable of producing reliable range and speed measurements in typical urban and suburban traffic environments without the site survey limitation and cameras. This is reliable in city traffic because LIDAR has directionality similar to a typical firearm because the beam is shaped more like a pencil that produces measurement only from the object it has been aimed at.

Literature review:

Due to the over speed of the vehicles moving in the traffic zones it lead to major problems. In order to control the speed of the moving vehicle, first thing is to find the speed of the moving vehicle. If any vehicle is crossed those speed limits then we will catch those vehicles, take corrective action on them. To find the speed of vehicle we are using Radar Gun.

In the well developed countries like Germany, Brazil they are using these Radar Guns to know the speed of a moving vehicle. In many papers and patents they proposed to solve the problems of traffic system, but they didn't consider the measurement of speed of the vehicles. They generally keep the speed limit. It may be

followed or violated it depends on drivers. To control the speed generally, we keep speed breakers. In this proposal, the Radar Gun proposed to detect the speed of the vehicle. If any vehicle is violated the speed limit it detects. By incorporating the networking to the Radar Gun it might be monitored in the traffic head stations. The vehicles which are violating the limits those can be identified and they can be captured and the sent to punishment.

Conclusion:

In this proposal we are implementing the Radar Gun to come across the speed of the vehicle. By implementing this Radar Gun in the streets, it is possible to catch the vehicles that are violating the speed limits. By taking the corrective action on the speeders we can reduce the accidents. We can implement these Radar guns in every high ways where major of the accidents are occurring and it is networked with the nearest police station it can be monitored over there it self. These Radar Guns are fixed in the streets or it can be fixed in front or backside of the police vehicles (Patrol vehicles).

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