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Mitigating collisions between pedestrians and vehicles

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Abstract - Traffic safety studies deal with systems that change in substance and hierarchy depending on their goals. An aggregation of road accidents, sorted by any given aspect, could serve as a barometer for how the system interacts with its surroundings. This study examines the findings of professional road accident evaluations and investigations, as well as data that characterize the current state of the street and road network and point to the primary causes of road accidents. We present findings from street and road network field investigations, which include driver and pedestrian feedback, and discuss current traffic patterns. We also examine the most frequent points of conflict that arise when pedestrians go along the side of the road or the edge of the carriageways, as well as locations of conflict that arise in intersection areas. In addition to discussing how a person's employment may affect traffic safety, this essay also examines how a driver's and a pedestrian's behavior may be affected by their mental and physical health.

Keywords*:* road accidents, intersection; pedestrians; vehicles; street and road network.

1. INTRODUCTION

Traffic safety assurance is a top priority since accidents on the road can have serious effects. More concerted efforts are needed to improve traffic safety and lessen the harm caused by accidents in order to solve this problem. The issue is made even worse by the fact that there are a lot of people on the roads and by how difficult it is to coordinate all of the pertinent organizations, businesses, and bodies involved in the transportation process. In the context of the "People-Vehicle-Road-Traffic Environment" (P-V-R-TE) system, this research seeks to assess pedestrian-vehicle conflicts. The order of the entities in the name of our system is intentional. In terms of methodology, the concept of a system indicates that it is both distinct from and contiguous with its surroundings. In addition to defining the bonds and relationships between the components of a system, systemic analysis also focuses on the relationships and connections between the system and its environment. In our case, the term "Traffic Environment" refers to the following: the actual accident that was caused by the drivers of the vehicles; the tools used to manage and regulate the visitors; and the climatic conditions (humidity, rain) and astronomical (daylight hours, overnight) conditions affecting the other components of the system at the time in question. An aggregated collection of traffic accidents that have been categorized by any given feature can be used as an indicator of how the environment and the P-V-R-TE system interact. The driver must immediately activate the car's active safety features, and the pedestrian must get out of the area of conflict as soon as feasible. Underestimating the human aspect in this situation poses a serious risk to the security of all the subsystems. As a result, the conflict escalates into an accident that causes harm or death if the persons involved fail to take the precautions listed above, or if their measures are insufficient or inappropriate for the circumstance.

2. OBJECTIVE:

The severity of road accident outcomes depends on a variety of factors, as we found out when we examined more than 400 papers from 200 to the present day that contained expert evaluations and investigations of road accidents. This necessitates a thorough examination of the process of a vehicle-pedestrian collision. A technical component (the pedestrians' movements, the vehicle's speed, and the damage it sustained), a medical factor (the pedestrians' injuries), etc., should be included among the aforementioned considerations. According to a study of collisions between various vehicles and pedestrians between the ages of 20 and 50, which we consider to be the most active age group, around 55% of crashes were caused by passenger cars, 20% by trucks, and 4% by buses. 600 pedestrians suffered various forms of injuries as a result of these crashes. In the course of crashes, we have data on the patterns of velocity distribution among passenger cars. Our research shows that vehicle speed is constantly rising. In contrast, over the more recent years, the velocity range has reached 20-40 km/h, and in extreme cases, as much as 50-70 km/h. Between 2000 and 2015, the approximate vehicle velocity at the moment of collision with a pedestrian was 20-30 km/h (data recorded in populated regions only). Modern automobiles have better dynamic parameters, which readily explains this. There is, however, a psychological component as well. Many owners of costly automobiles have a tendency to feel superior to the general populace, which they demonstrate by making full use of their vehicles' amazing speed and dynamics in the midst of the street and road network. Since 2015, the majority of people have begun to view vehicles as more than simply practical tools but also as a form of self-expression.

The analysis of vehicle-pedestrian collisions in traffic accidents led to the following overall trends in Samara (numbers are supplied as percentages):

• Percentage of vehicle-pedestrian collisions resulting from infractions of traffic safety:

- **by pedestrians** (between 50 and 60)
- **by drivers** 20–27
- **Bad traffic conditions (including maintenance of traffic management equipment)** 4–18

• Examples of pedestrian-committed traffic infractions include:

- use a crosswalk that is not in a recognized area 50-60
- sneaking up behind a stopped car without signaling 15-26
- strolling along the lane of traffic 4-18

• Examples of driving infractions involving traffic safety

- speed 54 to 67 mph
- 10–13 Left-side driving;
- breaking the overtaking regulations 10-15
- people using drugs or alcohol 12–24

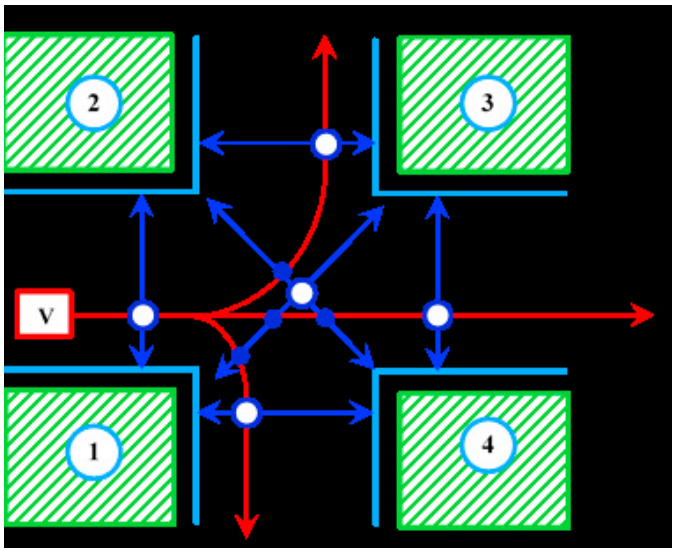


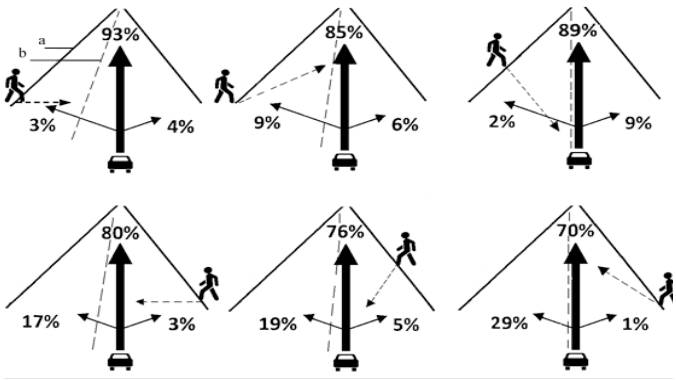
Fig. 1.

The overall total value (100 percent) of all traffic accidents is made up exclusively of the vehicle-pedestrian incidents that are the subject of this research. In light of the foregoing, we will examine the major events that result in vehicle-pedestrian crashes within the usual rectangular street and road network layouts, which are typical not just of Srinagar cities but also of Chanapora. The usual at-grade crossing crash points are depicted in Fig. 1.

The locations of the collisions between cars and pedestrians are indicated by the circles in Fig. 1. 54 percent of the collisions at the road crossing happened when a vehicle (V) entered the crossing. In this case, people were using the sidewalk to cross the street from point 1 to point 2 and vice versa. In 11% of incidents, a driver was turning to the right when the crash happened. People were using the sidewalk to cross the street from point 1 to point 4 and from point 4 to point 1. Approximately 50 km/h was the maximum speed that the vehicle could go at when travelling ahead, 30–35 km/h when moving left, and 25–30 km/h when moving right. The collision took place in the middle of the road in 21% of cases.

In this case, pedestrians were gravely violating the traffic code by strolling from point 1 to point 3, point 2 to point 4, and point 4 to position 1. There were 45 percent of conflicts at crossings with signal control and 52 percent at crossings without signal control, as shown by the conflict points C1 to C4. In the remaining 3 percent of cases, we would also want to note that it was hard to tell which pedestrians were moving because their movements went beyond the graphs that were shown in 1 percent of the cases and 2 percent of the cases, the pedestrians were people the age of 70.

According to additional research, 74% of all vehicle-pedestrian collisions included walkers who were walking alongside traffic. This leads to the conclusion that travelling against the flow of traffic is roughly three times as safe as doing so. The movement vectors of a car and a pedestrian during a collision are depicted in Fig. 2.



Person and vehicle movement during crashes when the pedestrian was jogging beside the road when the collision first occurred are shown in Fig. 2: Road markings 1.2.1 in (a) and 1.5 in (b).

Focusing ability, response time, intelligence level, personality, awareness of driver and passenger conduct, ability to recognize danger, and many other attributes should be assessed in more depth while taking into account a variety of real-life variables, in our opinion.

3. Conclusions

In order to properly structure the material gathered and draw accurate conclusions that would enable investigators to reconstruct the traffic accident, it is crucial to comprehend the structural connections between the questions stated below. If the problems with the qualitative assessment of driver-pedestrian conflicts are to be remedied, highway patrol officers and accident surveyors need the proper focused training. The vehicle is a possible high danger source within the "People - Vehicle - Road - Traffic Environment" system.

The following must be taken into account at the initial stage of a road accident investigation:

- What was the distance between the collision spot and the vehicle that was travelling at a specific speed, if the pedestrian had covered that distance at that speed?
- If the collision happened within a specific area of the braking track (assuming we know the complete length of the braking track), what was the vehicle velocity at the time of the impact?
- Is it technically possible for the events detailed in the parties' statements?
- What internal dynamics led to the traffic accident?
- From the driver's seat, how high was the vision level and how big was the field of view? How well could the driver assess the state of the roads and the surrounding environment? • In accordance with the technical requirements of the Traffic Code, how should the driver have responded to prevent a collision?
- • At the crossroads, who had the right-of-way?
- • Would an experienced and skilled driver have acted in accordance with the Traffic Code in this circumstance? Or was the scenario straightforward enough for the driver to decide without having a lot of knowledge and expertise?
- • Given the state of the roads, did forceful braking cause the collision?
- • Were the tires on the car in decent condition and the steering controls?

If it turns out that these questions are unanswerable, the case will need to be thoroughly assessed by a team of experts. This will provide a clearer, more thorough picture of the conflict situations that lead to traffic accidents.

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