Security analysis of vehicle violation alarm based on intelligent monitoring platform

Lanlan Zheng\textsuperscript{1,a}, Jiagen Niu\textsuperscript{1,b}, Xianghong Li\textsuperscript{1,c*}, Huiying Song\textsuperscript{1,d}

\textsuperscript{1}School of Energy Science and Engineering, Henan Polytechnic University, Jiaozuo, Henan, China
\textsuperscript{a}e-mail: 809647579@qq.com, \textsuperscript{b}e-mail: 2425873654@qq.com, \textsuperscript{c*}Corresponding author: lixianghong001@126.com, \textsuperscript{d}e-mail: hu1230@163.com

Abstract. With the development and progress of the society, travel modes are constantly diversified. Passenger transport is deeply loved by people for its advantages of efficiency, convenience and comfort. Traffic accidents caused by overspeed driving and fatigue driving are still a big problem to be solved. This paper will be combined with intelligent monitoring platform to provide vehicle violation alarm record, through the analysis of the statistical data analysis and interview method driver speeding, fatigue driving, and combined with the enterprise management department, to improve the relevant management regulations and put forward new measures, effectively reduce the occurrence of vehicle violations, so as to reduce the occurrence of traffic accidents.

1. INTRODUCTION
The way of passenger transport is favored by people for its efficiency and convenience, but the traffic safety problem caused by vehicle violation is becoming more and more obvious, which has become an important research object of many scholars. Luo Chengjian \cite{1} studied and analyzed the influence of overspeed on traffic safety based on the relationship between human, vehicle, road and other traffic factors in the road traffic system and speed, and put forward the traffic safety countermeasures to limit overspeed and reduce the occurrence of traffic accidents. Chen Gang \cite{2} proposed an intelligent detection model for mobile law enforcement of expressway traffic vehicle violations. The system model algorithm has been used to test the vehicle violation behavior, lane line detection, vehicle target and tracking in the actual highway environment to represent its detection ability of vehicle violation behavior. Xu Jianxiang \cite{3} puts forward suggestions on reducing traffic safety from the perspective of drivers’ behavior characteristics. The above studies have effectively reduced vehicle violations and traffic accident incidence. However, there is a lack of dynamic research on vehicle driving and no analysis from the perspective of enterprise management. Therefore, this paper proposes the research and analysis of intelligent monitoring management platform.

Intelligent monitoring management platform is one of the most advanced network management platform systems, It can monitor the actual conditions of drivers, passengers, and roads in real time, and can cause alarms and feedback on violations generated by drivers through corresponding systems and algorithms. To the monitoring platform, through the corresponding management means to achieve the standard role of drivers, thereby reducing the incidence of traffic safety accidents. Based on the vehicle violation alarm data provided by the Jiaozuo city transportation intelligent monitoring platform, this paper analyzes the data of five transportation companies from the perspective of enterprise management, and finally proposes an optimization plan.
2. RESEARCH METHODS

2.1. Data analysis:
Data analysis refers to the analysis of a large number of collected data with appropriate statistical analysis methods. This paper USES relevant knowledge of statistics to analyze and mine the data of overspeed and fatigue violation of enterprises provided by the intelligent monitoring platform, and finds out the problems of enterprise management measures and conducts in-depth research.

2.2. Interview method
Interview is a research-based conversation in which objective and unbiased factual materials are collected orally based on the answers of the interviewees. In this paper, through interviews with enterprises and enterprise managers, the reasons for drivers' violations are understood. In the research, problems are analyzed in combination with enterprise management, and finally improvement plans are proposed.

3. ANALYSIS OF THE STATUS QUO OF VIOLATION ALARM ON THE INTELLIGENT MONITORING PLATFORM
Intelligent monitoring platform using GPS monitoring road information and driver driving condition, the condition of passengers, the driver, the vehicle on the road when the violations of violations, alarm, alarm types have mainly hardware failure type and area road type, operation type, route alarm type, type of advanced driving assistance systems, etc. The number of overspeed alarm and fatigue driving alarm takes up a large proportion. Therefore, this paper analyzes and studies these two factors of the platform. Through the data provided by the platform and the interview with the enterprise and its managers, the following analysis can be obtained:

3.1. Analysis of overspeed alarm:

3.1.1. Analysis of overspeed alarm data

|          | The first month | The second month | The third month | The fourth month | Total number |
|----------|-----------------|------------------|-----------------|------------------|--------------|
| A company| 2898            | 2401             | 1496            | 4849             | 11644        |
| B company| 546             | 66               | 4               | 319              | 935          |
| C company| 26              | 97               | 18              | 286              | 427          |
| D company| 94              | 243              | 72              | 233              | 642          |
| E company| 19              | 16               | 5               | 19               | 59           |

It can be seen from Table 1 that company A has the most alarms and Company E has the least alarms. Among them, the alarms of Company A are much more frequent than those of the other four companies. The five companies have A downward trend in the first three months, but the alarms increase in the fourth month. In order to further understand the law of data change and the correlation between data change and enterprise management, this paper has sorted out the speeding alarm data of drivers with a large proportion of alarm times in the five companies. The specific data are shown in Table 2 below:
Table 2: Driver Alarm Data With A Large Proportion In The Number Of Overspeed Alarms

| Company | First Month | Second Month | Third Month | Fourth Month |
|---------|-------------|--------------|-------------|--------------|
| A       | DriverA1:354 | DriverA2:158 | DriverA3:135 | DriverA4:330 | DriverA5:172 |
|         | DriverA1:291 | DriverA3:197 | Driver A4:173 | Driver A5:224 | DriverA1:268 |
|         | DriverA1:202 | DriverA3:209 | Driver A4:189 | Driver A5:573 | DriverA6:491 |
| B       | DriverB1:258 | /            | /            | DriverB2:127 |
| C       | /            | /            | /            | DriverC1:103 |
| D       | DriverD1:49  | DriverD1:93  | DriverD1:197 | DriverD1:63  |
|         | DriverD2:62  | /            | /            | DriverD3:134 |
| E       | /            | /            | /            | /            |

3.1.2. Correlation analysis between overspeed alarm data and enterprise management

Table 3: Handling Methods Of Alarm For Violation

| Disposal measures | Company treatment | Processing result |
|-------------------|-------------------|-------------------|
| A company         | Send text messages| Criticize, educate, write and check | Has the rectification |
| B company         | No detail         | No detail         | No detail |
| C company         | Send text messages| Send text messages and carry out safety education | Has the rectification |
| D company         | Voice notification| Warn, circulate a notice of criticism | Has the rectification |
| E company         | Send text messages| Send text messages | Has the rectification |

It can be seen from the data that A1, A3, A4 and A5 in Company A have a large number of overspeed alarms, which are frequently reported in many months, indicating that the company's handling measures and methods do not have a great constraint effect on drivers' illegal behaviors. In the fourth month, company B and C reported an obvious increase in the number of alarms, but there was no continuous violation alarm by drivers, indicating that the training management system of such enterprises is not perfect and the punishment for violation is not strong enough. Company D driver D1 in four consecutive months are overspeed alarm, and alarm times larger proportion, in the submitted data is not the business of illegal closed loop process data, to the violations processing strength slightly larger than the other four companies, suggests that the lack of perfect training management system, the company is also a lack of pilots for the relevant management measures, leading to the same driver for violations.

3.2. Fatigue alarm analysis

3.2.1. Analysis of fatigue alarm data

Table 4: Total Number Of Fatigue Alarms

| Company | The first month | The second month | The third month | The fourth month | Total number |
|---------|-----------------|------------------|-----------------|------------------|--------------|
| A       | 1253            | 372              | 576             | 1050             | 3251         |
| B       | 560             | 9                | 9               | 23               | 601          |
| C       | 40              | 16               | 16              | 26               | 98           |
| D       | 29              | 55               | 215             | 168              | 467          |
| E       | 864             | 15               | 183             | 192              | 1254         |
As can be seen from Table 4, the fatigue alarm frequency of Company A and Company E decreases to increase, while that of Company B decreases and that of Company D increases. In order to further understand the law of data change and the correlation between data change and enterprise management, this paper has sorted out the fatigue alarm data of drivers with a large proportion of alarm times in the fatigue alarms of five companies. The specific data are shown in Table 5:

Table 5: Drivers' Alarm Data With A Large Proportion Of Fatigue Alarms

| Company | Month         | Driver 1 | Driver 2 | Driver 3 | Driver 4 | Driver 5 |
|---------|---------------|----------|----------|----------|----------|----------|
| A       | The first month | A7:905   | /        | /        | /        | /        |
|         | The second month | /        | /        | /        | /        | /        |
|         | The third month  | /        | /        | /        | /        | /        |
|         | The fourth month | /        | /        | /        | /        | /        |
| B       | /              | /        | /        | /        | /        | /        |
| C       | /              | /        | /        | /        | /        | /        |
| D       | /              | Driver D4:46 | /        | Driver D1:197 | /        | Driver D5:102 |
| E       | /              | Driver E1:849 | /        | Driver E2:131 | /        | Driver E4:60 |

3.2.2. Correlation analysis between fatigue alarm data and enterprise management

Table 6: Handling Methods Of Alarm For Violation

| Disposal measures | Company treatment | Processing result |
|-------------------|-------------------|-------------------|
| A company         | Send text messages | Criticize, educate, write and check | Has the rectification |
| B company         | No detail         | No detail         | No detail |
| C company         | Send text messages | Send text messages and carry out safety education | Has the rectification |
| D company         | Voice notification | Warm, circulate a notice of criticism | Has the rectification |
| E company         | Send text messages | Send text messages | Has the rectification |

According to the data collated, A7, the driver of Company A, accounts for the largest proportion of fatigue violation alarm in the first and fourth months of the month, and the company's handling method is not sufficiently restrictive. The number of fatigue alarms of Company B showed a downward trend, but the company's handling methods for violations were not found in the materials. The fatigue alarm frequency of Company C is relatively stable, indicating that the relevant system of the company is perfect. The number of fatigue alarms of Company D is on the rise. The number of fatigue alarms of driver D1 in the third month is 197, and that of driver D5 in the fourth month is 102, indicating new violations. Company E made more alarms in the first month, mainly because the company's driver E1 made more alarms in the first month, 849 times. However, there was no violation later, indicating that the company's control had a certain effect, but the management system was not perfect.

4. ANALYZE THE IMPROVEMENT OF OVERSPEED FATIGUE FROM THE PERSPECTIVE OF ENTERPRISE MANAGEMENT

For enterprises with incomplete closed-loop treatment, relevant policies should be standardized to ensure the effectiveness and feasibility of treatment. A sound management system should be established for enterprises with imperfect management system. To do a good job of driver screening, screening more suitable drivers; Enterprises should regularly carry out safety education and training for drivers to enhance their safety awareness; In addition, the characteristics of drivers must also be considered and included in the relevant management regulations. [4] For now, the enterprise by way of management for traffic management competition, namely through the corresponding correct knowledge, modern competition to improve the driver's driving knowledge and the experience of driving skills and know
five companies by data processing driving competition activity rate is respectively: 0%, 33.3%, 66.7%, 0%, 0%, therefore the enterprise to carry out the driving competition's action is not well implemented, driving to conduct can improve the driver's driving ability of the competition, can develop the driver's responsibility consciousness, is necessary, therefore, enterprises should promptly implement the activities.

5. CONCLUSION
Intelligent monitoring platform can restrict the behavior of drivers to a certain extent, thus reducing the occurrence of violations. Based on intelligent alarm monitoring platform provided by the vehicle violation records, by speeding, fatigue driving is statistical data analysis and interview method to carry on the analysis, combined with the enterprise management, to improve the related management and put forward the new measures, in order to reduce accidents and ensure safety, make enterprise system more perfect.

ACKNOWLEDGMENTS
1. Science and Technology Public Relations/Social Development field of Henan Province (Project No.: 182102310719);
2. Basic scientific research business expense of henan polytechnic university: NSFRF180420
3. Installation and Application of Intelligent Monitoring and Alarm Technology for Operating Vehicles in Jiaozuo City (Project No.: 19-473)

REFERENCES
[1] Luo C.J. (2019) A brief analysis of the impact of speed on traffic safety and control countermeasures based on the factors of people, vehicles and roads. Road Traffic Management, (09):48-49.
[2] Chen G., Chen B., Qian J.D. (2008) Research on Intelligent Detection of Illegal Vehicles in Vehicle-mounted Mobile Law Enforcement. Journal of University of Electronic Science and Technology of China, 47(03):350-355.
[3] Xu J.X. (2020) Analysis on human Factors of Automobile Drivers and Traffic Safety [J]. Times Automobile, (15):185-186.
[4] Huang J.C., Li S.L., Ye X.F. (2017) Management. Teaching Materials for the 13th Five-Year Plan for Economic Management Majors in Colleges and Universities. ChongQing.