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«НАУКА И ПРОСВЕЩЕНИЕ»**



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LITERATURE REVIEW FOR IMPROVEMENT AT RAILWAY LEVEL CROSSING

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Аннотация: В данной исследовательской работе поставлен вопрос, как повысить безопасность и сократить время ожидания автомобильного транспорта на железнодорожных переездах. Большинство авторов сосредоточились на безопасности и сокращении времени предупреждения на железнодорожном переезде, другие исследования показывают, что сделана аналогичная формула для не задержки автомобильного транспорта на переезде. Некоторые исследовательские университеты делают ставку на определение задержки в поездках и связанные с этим расходы. Разрабатываются системы, которые автоматически сообщают различным пользователям о событии или потенциальном событии заблокированного железнодорожного переезда. **Ключевые слова:** железнодорожные переезды, транспортное средство-транспортное средство, транспортное средство-инфраструктура, охраняемый переезд, не охраняемый переезд, авария.

ОБЗОР ЛИТЕРАТУРЫ ДЛЯ ПОВЫШЕНИЯ БЕЗОПАСНОСТИ НА ЖЕЛЕЗНОДОРОЖНЫХ ПЕРЕЕЗДАХ

Tokhirov Ezozbek Tursunaliyevich

Abstract: This paper studied how to improve safety and reduce waiting time at railway level crossings. Most authors focused on safety and reduce warning time at a level crossing. Other researchers made the for a route, the analogous delay formula at railway level crossing. Some research universities made to determine travel delays and related costs. Some authors developed a system that automatically communicates the event or potential event of a blocked railroad grade crossing to various users.

Key words: level crossings, vehicle-to-vehicle, vehicle-to-infrastructure, guarded LC, unguarded LC, accident.

Improvement Railway Level Crossing

Manabu at al. (2015) research focuses on safety and reduces warning time at level crossing. Long warning time causes inconvenience to those who want to cross the level crossing. In this development, in order to shorten level crossing warning time, they have studied two states of level crossings: normal state and failure state. For the normal state of level crossings, developed a microelectronic level crossing controller with built-in constant warning time control logic. For the failure state, developed a mechanism to avoid long warning times when a level crossing detects a failure. Specifically, it connected to level crossings in a network and control them using information of other level crossings instead of the information of the failed level crossing [1].

Computation of Automobile Transport Delay at Railway Level Crossing

The first publications on the definition of vehicle delays at the intersections of land transport routes in domestic literature appeared in the late 1940s of the last century in the works of B. D. Stange. Over time, the problem of delays escalated, and with it the interest in developing intersection theory increased. Several formulas have been proposed, but none of them has received any wide application.

Approximately the amount of delays according to the recommendations of the above authors can be found as follows. Tall (1960) has developed, if transport units are passed through the intersection in the order

in which they approach the intersection, then for one of the two intersecting routes, the total delay time will be:

$$T_1 = \frac{N_1 N_2 t_2^2}{2 * 1440} \quad \text{minutes per day} \quad (1)$$

where N_1 and N_2 are the dimensions of traffic along intersecting routes;

t_2 - the time of the intersection of one unit of the "enemy route" (in minutes);

1440 - the number of minutes in a day.

For another route, the analogous delay formula has the form:

$$T_2 = \frac{N_1 N_2 t_1^2}{2 * 1440} \quad (2)$$

If one of the routes (for example, the first one) has an advantage, i.e. the flow on it is skipped without delay, then for another route the amount of delays is determined by the formula [2]:

$$T_2 = \frac{N_1 N_2 (t_1 + t_2)^2}{2 * 1440} \quad (3)$$

As noted above, experts in road and other types of urban transport, as well as urban planners worked together with scientists and engineering and technical workers of railway transport to develop the theory of intersections and determine the delay in rolling stock in transport networks. Polyakov (1953) was invited to determine the costs caused by delays in the movement of land transport at the crossings.

$$P_0 = 365 \left[\sum N * \frac{n}{18} * \frac{\tau}{60} * \frac{\tau}{2*60} * R + S * \sum \left(\frac{1}{v_0} + \frac{1}{v} \right) N * R (P_1 + P_2) \frac{n}{18} * \frac{\tau^2}{7200} * R_1 \right] \quad (4)$$

where N is the number of transport units of each type passing through the crossing for an average day in both directions;

$\frac{n}{18}$ the average number of the closing of the move within one hour (with the omission of n trains for the period from 6 to 24 hours);

t - average duration of the closed state of relocation (min.);

R - cost of transport unit idle time, doll / hour;

S - the length of the section on the approaches to the crossing, including the moving zone and the acceleration distance to normal speed, km;

U_0 - average speed of ground transport in the moving zone, km / h;

$P_1 + P_2$ - the number of passengers and pedestrians, respectively, passing and passing for an average day through crossing in both directions;

R_1 - average cost of lost person-hour, doll.

The above formula allows you to determine the travel delays and related costs not only for rolling stock, but also take into account the economic damage caused by the delay of passengers and pedestrians, as well as from the decrease in the speeds of ground transportation in the moving zone [3]. Taggard (1987) explored some formulas for calculating the travel delay experienced by each vehicle when crossing a level. These equations are based on the average annual turnover, vehicle traffic and closing time, which is calculated from the average length of the train and the average train speed at the transition [4].

Hakkert and Gitelman (1997) developed a simplified tool for assessing level crossings in Israel. From the field data collected in the 31 most problematic locations, they calculated the cost of security problems and travel delays and used them to compare the crossing characteristics of the levels [5]. Okitsu et al. (2010). had undertaken a 24-hour video record at 33 level crossings in Los Angeles County's San Gabriel Valley. From the recordings, they determined several parameters such as upstream traffic signal phasing and downstream signal green-to-cycle ratios and applied them to Webster's intersection delay model. Thus, delay caused by blockages at level crossings in every individual event throughout the day could be identified.

$$D = [AR * Q * (B + LT)]/2 \quad (5)$$

Where:

D = Total delay in vehicle-hours;

B = Duration of blockage event in hours

AR = Vehicle arrival rate in vehicles per hour;

LT = Lost time in hours

Q = Queue Duration in hours[6].

Schroder and Hoffpauer (2001) developed a methodology for prioritizing the potential locations of highway and railroad separation in Central Arkansas. In this method, the time delay at the intersection of level crossing is one of the seven factors included in their analysis, and is estimated using the formulas developed by Taggart et al. (1987) [7]. Haque et al. (2012) has analyzed three different scenarios for econometric analysis. First scenario is without the proposed relocation and no improvement of the existing road-rail junctions. Secondly, without relocation but with grade-separated level crossings at 9 major locations is analyzed. Lastly, it considers the with relocation strategy. An equation to determine rail delay was derived from one of the underlying equations of traffic flow theory- the Webster equation. Details about how this equation was changed are presented in a memorandum Access Duwamish Grade Delay Analysis (Heffron Transportation, 1997). The resulting equation determines the total delay in vehicle-hours for a single roadway approach during one hour. Delay for each hour for each direction was found from equation:

$$D = \frac{\lambda n \mu r^2}{2(\mu - \lambda)} \quad (6)$$

These values are then combined for the whole day and the total level crossing. Where, D = Total delay in vehicle-hours, λ = Arrival rate of vehicles (Vehicles per hour), μ = Queue dissipation rate (Vehicles per hour), r = Average blockage time at crossing (hours), n = Number of blockages per hour (similar in magnitude) [8]. Peter et al. (2014) were analyzed on the basis of a geographic information system: a service area analysis showing how the fire service responders' service area is changing with and without the class transition blocking; and network analysis To assess the impact of grade crossing monitoring system on the response time of firefighters with or without blocking. Both analyzes are quantitative, and both can visually display the results. Results avoiding the rounds made on assumption that the road is blocked, avoiding the route being blocked, and then Bypass and select wait on the transition to lock to clear when grade crossing monitoring system indicates that this is more efficient than the bypass route [9]. Rempel et al. (2015) had created and got a patent a system that automatically communicates the event or potential event of a blocked railroad grade crossing to various users, including but not limited to emergency dispatchers and drivers, news media, traffic management system, and the general public, specifically the location, time, and duration of the event or potential event. The system applies multiple technologies to detect the presence of activity on a rail line, transmits this detection data a database, performs various analyses on the data, and communicates the status of grade crossing (blocked, potentially blocked, upcoming blocked, or clear) to assist various users with information to make more informed decisions [10].

Driver Behavior in Level Crossing

U.S. Department of Transportation Federal Railroad Administration (2008), the review of articles and researched studies focused on those that addressed human behavior at grade crossings. The research focused on the factors influencing driver behavior, influence to driving skills and those that influence driving style, respect, driving skills age, experience, internal or external distractions, and driver impairment. Because negotiating a grade crossing is only one aspect of the driving task, research addressing general driving behavior was included when relevant to the grade crossing problem. The document includes literature addressing the effectiveness of countermeasures on driver compliance [11]. Steven et al (2018) from the paper describes driver behavior at simulated rail crossings modeled after real-world crossings included in the Naturalistic Driving Study dataset. Results suggest that drivers may not react properly to cross bucks and active warnings in the off position. Participants performed the safest behaviors in reaction to STOP signs. The majority of participants also reported an increase in vigilance and compliant behaviors after repeated exposure to railroad crossings, which was supported by the results of a linear regression analysis [12].

Active Control Level Crossing

Adam Sidebottom (2016), Active Control Level Crossing - a road pedestrian level crossing where warning equipment warns road users and pedestrians about approaching rail traffic by devices such as flashing light or barriers. An Active Control Level Crossing Protection monitoring device will start to operate if it is detected that the railway traffic reaches a predetermined warning distance from the rail level crossing. This varies to provide an adequate warning period corresponding to the maximum track speed. The activation point can

be a fixed position determined by design calculations or may be determined dynamically by the level crossing prediction system if it is installed [13].

Railway level crossing and connected vehicle technology

- a grade-crossing warning system was developed to warn drivers of the presence of a train approaching the level crossing, either gated or ungated.

- a system was a low-cost supplement that uses wireless communications at the level crossing to deliver in-vehicle warning messages for equipped vehicles.

Communication Protocols in a connected vehicle and Grade-Crossing Technology

1. Vehicle-to-infrastructure (V2I) technology offers the potential for bi-directional exchange of data between vehicles and roadway infrastructure;

2. It aims to coordinate vehicle group behaviors based on collected information about traffic and road conditions.

- includes velocities and accelerations of vehicles based on traffic congestion;

- includes information about the status of a level crossing;

- controls infrastructure to improve road safety;

- includes broadcasting messages via road displays or adjusting traffic signals;

- alerts motorists when it is unsafe to enter intersections and level crossings;

Autonomous vehicle technology development.

- development of autonomous vehicles in real-world operational test environments are limited to a subset of operational scenarios that occur in roadway operations, including level crossings.

- future development of autonomous vehicle platforms should consider all operational scenarios, particularly grade crossings.

- integrating existing connected vehicle technology at grade crossings into autonomous vehicles builds upon the functional the ability of autonomous vehicles ensuring safe and efficient level crossing interaction. Engaging original equipment manufacturers and Tier 1 suppliers will help to define the state of autonomous vehicle technology and the readiness of these systems as they relate to safe navigation of level crossings [14].

References

1. Manabu Teramoto, Naoki Miyaguchi, Kazuhiko Kumasaka, Reiji Ishima, Yamato Fukuta (2015). Development of a Smart Level Crossing System For Traffic Convenience. JR EAST Technical Review-No.33(p.43-48).
2. Таль К.К. О методике расчётов пропускной способности станций. // Ж.-д. транспорт, 1960, №12, с. 47-51.
3. Поляков А.А. Городское движение и планировка улиц. М., 1953, с.207
4. Taggart, R.C., Lauria, P., Groat, G., Rees, C., Brick-Turin, A., 1987. NCHRP Report 288: Evaluating Grade-Separated Rail and Highway Crossing Alternatives. Transportation Research Board, NRC, Washington, D.C
5. Hakkert, A.S., Gitelman, V., 1997. Development of evaluation tools for road-rail crossing consideration for grade separation. Transp. Res. Rec. 1605 (1), 96–105.
6. Okitsu, W., Lo, K., 2010. Simulation-free railroad grade crossing delay calculations. Western ITE Annual Meeting. San Francisco.
7. Schrader, M.H., Hoffpauer, J.R., 2001. Methodology for evaluating highway–Railway grade separations. Transp. Res. Rec. J. Transp. Res. Board 1754, 77–80.
8. K. Haque, M.R. Fatmi, S. Tanvir, 2012. Effects and Feasibility of Relocation of Kamalapur Railway Station: An Econometric Approach. Internet: <https://www.researchgate.net/publication/264758593> . (May 17, 2015).
9. Peter et al. (2014) First responders' response area and response time analysis with/without a grade crossing monitoring system.

10. Rempel et al. (2015): System to Provide Real-Time Railroad Grade Crossing Information To Support Traffic Management Decision-Making, U.S. Patent Pending, (Application Number: 15/146,391, Filing Date: May 7, 2015).
11. U.S. Department of Transportation Federal Railroad Administration (2008), Driver Behavior at HighwayRailroad Grade Crossings: A Literature Review from 1990–2006.
12. Steven Landry, Yuguang Wang, Pasi Lautala, David Nelson, and Myounghoon Jeon(2018). Digital Human Modeling. Applications in Health, Safety, Ergonomics, and Risk Management, pp.599-609.
13. Adam Sidebottom (2015), Active control level crossing management, Version 1.01, 01 October 2016.
14. Bud Zaouk., & Kelly Ozdemir (August 15, 2017). Implementing Connected Vehicle and Autonomous Vehicle Technologies at Highway-Rail Grade Crossings.