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S.N. Yadgarov
Termez branch of Tashkent State Technical University named after Islam Karimov, sirojtdtuf@mail.ru

X.A. Qurbonov
Termez branch of Tashkent State Technical University named after Islam Karimov

Sh.M. Yugayev
Termez branch of Tashkent State Technical University named after Islam Karimov

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Available at: https://uzjournals.edu.uz/actattpu/vol9/iss4/10

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THE USE OF GEOINFORMATION SYSTEMS IN THE REGISTRATION OF ROAD TRAFFIC ACCIDENTS ON HIGHWAYS

S.N. Yadgarov, X.A. Qurbonov, Sh.M. Yugayev.

Abstract
The article presents the results of a theoretical and practical study of the use of the Geoinformation system in the registration of road traffic officers on highways. Several systems (QGIS, ArcGIS and Google Fusion) can be used when recording traffic personnel. The use of software systems in yukori in the recording of road traffic that will occur will speed up the analysis process and the work with data in the placement of road signs in road parts.

Key words: injuries, motorization, formation, accident, Effect, Fixation, Relationships.

According to statistics from the world health organization (who), about 1.25 million people die each year due to road accidents. Road traffic injuries are the leading cause of death among people aged 15 to 29 years. 90% of road deaths occur in low- and middle-income countries, although these countries account for approximately 54% of the world's vehicles. Nearly half of the people dying on the world's roads are "vulnerable road users" - pedestrians, cyclists and motorcyclists. The costs associated with road accidents in most countries account for 3% of their gross domestic product. Without appropriate and comprehensive measures, road traffic accidents are projected to rise to the seventh highest mortality rate by 2030 [1,2,3].

In developing countries, with the increase in population and the level of motorization, the relevance of preventing accidents in cities is growing every year. To date, the registration of accidents in the Republic of Uzbekistan is conducted in paper format, which in turn creates a number of difficulties for analysis and formation of such reporting. The outdated form of accounting of road accidents does not allow adequately and in due time to establish the reasons and consequences of incidents. In the Republic of Uzbekistan for the account of road accidents the uniform the card which is filled in by employees of law-enforcement bodies (the employee of UBDD).

The use of GIS. In Uzbekistan, about 2 thousand people...
die every year as a result of road accidents. At the same time, according to the Pulitzer center for crisis reporting, the Republic has the lowest rates in the field of road deaths among the countries of the region - for every 100 thousand of the population they make up 11.32 people. In Kazakhstan they reach 20.5, in Kyrgyzstan-19.2, in Russia-18.6. In Belarus, 14.4 people per 100 thousand population die on the roads every year, and in Ukraine – 13.5. Losses from Road accidents are equivalent to Uzbekistan's GDP of 2.8%, although it is also one of the lowest rates. According to experts, the losses from road accidents amount to huge sums [4,5,6].

Inventory of traffic lights using GIS. Traffic light regulation is an important element in setting traffic priorities at intersections. There is a relationship between the number of cars and traffic light regulation. At intersections with with less traffic, priority signs "Main road" and "Give way" are installed. With increasing traffic intensity, additional traffic control measures are applied, such as a circular motion. According to the normative document "Technical means of traffic management GOST 23457-86", transport and pedestrian traffic lights are installed in the presence of at least one of the following four conditions [7,8,9,10]:

Traffic light regulation reduces accidents by about 15% at T-junctions and by about 30% at X-junctions. The effect of the traffic light control device at the intersection depends on how this event affects the accident rate and capacity. According to the Norwegian analysis [11,12,13,14], based on public roads data for 1986, the ratio of benefit to cost of traffic light regulation is. At the same time, the accident rate was reduced by 20% and small changes in the time spent on travel through the intersection were provided. It should be noted that there are a number of disadvantages of traffic light regulation, such as high maintenance costs, environmental costs, and costs due to improper use of traffic light cycles. A review of the literature indicates the importance of inventory and assessment of the state of transport and pedestrian control systems [15]. Recommendations on inventory of transport and pedestrian traffic lights in Tashkent with the help of geoinformation systems (GIS) are developed. QGIS software was used to fix the location of traffic and pedestrian traffic lights (figure 1).

Visualization of the accident. Traffic accidents happen

Fig.1. Map in QGIS Tashkent
randomly in time and location. This is because the incident depends on several factors such as the driver, the car, the road and the environment. These factors can play a role in the event of an incident separately or together. The changes in driving behavior are influenced by the car and the road, in addition, to a large extent, the physiological state of the driver, age, sex, education and other factors.

In Japan, a GPS-based analysis system has been developed to reduce traffic accidents. The system has the following information: road conditions, road equipment and weather. The system is used to analyze the frequency of accidents, frequency of accidents and mortality. In Pakistan, the analysis of traffic accidents to identify the causes of their occurrence in the period of time by hour, by day, by month, and by year. In the US, some researchers have proposed using machine learning paradigms in traffic accident analysis. They found that among several machine learning paradigms, the hybrid tree-neural network approach outperforms the individual approaches. In Saudi Arabia, researchers looked at traffic accidents from 1971 to 1994 to determine their causes and consequences. They found that the reason is the rapid development of infrastructure, the influx of immigrants with different bases and driving habits, most of the traffic accidents are related to speeding and driver error.

In India, studies have been conducted on the relationships between road types, total number of casualties, accidents, fatalities, vehicle types, driver awareness and accidents, highway types and the number of accidents, people killed or injured. In Uzbekistan, scientific publications were published, which covered the new electronic system for collecting traffic accidents, and visualization in QGIS (Fig. 2).

![Fig.2. In QGIS attributes table](image)

For the analysis and visualization of traffic accidents in the city of Tashkent, the data were used for the period from 2016 to 2019, with a total of 2,053 observations. In Table 1 shows variables such as ID, date, time, number of accidents, number of dead and injured, type of accident and location. The purpose of data analysis is to extract useful data from the database and then use it for visualization and analysis.

<table>
<thead>
<tr>
<th>ID</th>
<th>Date</th>
<th>Time</th>
<th>Quantity accidents</th>
<th>Quantity dead</th>
<th>Quantity victim</th>
<th>Type accidents</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20.06.2016</td>
<td>14:00</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>The U. Yusupov St. Tashkent</td>
</tr>
<tr>
<td>2</td>
<td>13.09.2016</td>
<td>15:05</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>Tashkent A. Kodiriy street</td>
</tr>
<tr>
<td>3</td>
<td>18.08.2016</td>
<td>23:10</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>Tashkent building Conservatories'</td>
</tr>
<tr>
<td>4</td>
<td>01.07.2016</td>
<td>01:30</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>Tashkent Navoi street</td>
</tr>
<tr>
<td>5</td>
<td>08.08.2016</td>
<td>09:35</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>Tashkent Navoi street</td>
</tr>
<tr>
<td>6</td>
<td>06.11.2016</td>
<td>10:15</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>Tashkent Navoi street</td>
</tr>
<tr>
<td>7</td>
<td>15.11.2016</td>
<td>11:10</td>
<td>1</td>
<td>0</td>
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<td>1</td>
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<tr>
<td>8</td>
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<td>12:05</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>Tashkent building Conservatories'</td>
</tr>
<tr>
<td>9</td>
<td>18.08.2016</td>
<td>13:25</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>Tashkent restaurant Эсдиер</td>
</tr>
</tbody>
</table>

The analysis was updated to remove information about the missing data. From the data on road accidents analyzed from 2013 to 2016, using the variable "date", the dissertation extracted the day of the week, month and year. The analysis of the data showed that two types of traffic accidents often occur: a collision (type 1) and a collision with a pedestrian (type 5) in the number of 874 and 960 cases, respectively. The main purpose of the analysis is to investigate traffic accident data over time during the day, day of the week, month and year.
mainly from 07:00 to 23:00 with maximum values at 18:00 and 16:00. The graph shows that type 5 occurs during the morning commute at 08:00 (frequency = 40) and from 16:00 to 20:00 in the evening. On the other hand, type 1 (collision) occurs relatively frequently, unlike type 5, which had a low frequency from 00:00 to 07:00. Type 1 accident from 07:00 to 23:00 occurred more than 20 times.

In the second graph (see Fig. 3, b) shows the change in the number of accidents by day. It is established that the majority of type 5 accidents occurred on Friday (frequency-160), on Tuesday (frequency-153) and Wednesday (frequency-148). The smallest number is observed on Sunday (frequency = 98). Type 1 accidents occurred on Saturday (frequency = 131), then on Friday (frequency-123) and Sunday (frequency = 122).

The third graph (see Fig. 3, C) shows the distribution of accident data by month. It is established that in March (frequency – 94) and in September (frequency-94) the highest frequency for type 5 accidents, the lowest was observed in July (frequency – 63). In February the frequency was-52, in May-53, in August-56 and in November-50. Type 1 accidents are approximately evenly distributed between months.

The fourth graph (see Fig. 3, d) shows the annual distribution in 2013, the frequency of type 5 accidents was 225,