

UDC 656.1

DOI <https://doi.org/10.32782/2521-6643-2023.2-66.11>

Nesterenko H. I., Candidate of Technical Sciences,
Associate Professor,
Associate Professor at the Department of Management
of Operational Work
Ukrainian State University of Science and Technologies
ORCID: 0000-0003-1629-0201

Muzykin M. I., Candidate of Technical Sciences,
Associate Professor,
Associate Professor at the Department of Transport Technologies
and International Logistics
University of Customs and Finance
ORCID: 0000-0003-2938-7061

Strelko O. H., Doctor of Historical Sciences, Professor,
Dean of the Faculty of Management of Railway Transport
University of Infrastructure and Technologies
ORCID: 0000-0003-3173-3373

Bibik S. I., Candidate of Technical Sciences, Associate Professor,
Associate Professor at the Department of Transport Technologies
and Management of Transportation Processes
University of Infrastructure and Technologies
ORCID: 0000-0002-5832-6949

Aleksieieva A. O., 4th year Student
Specialties 275 Transport Technologies
University of Customs and Finance

ANALYSIS OF POSSIBILITIES FOR INTEGRATING THE TRANSPORT SYSTEM OF UKRAINE INTO THE EUROPEAN TRANSPORT NETWORK

This article is devoted to the analysis of transport networks of such European countries as Ukraine, Hungary, and Romania. The article provides an analysis of the peculiarities in the movement organization in these countries. The transport systems of these countries were researched since during the war the issue of the interaction of the automobile transport networks exactly in these countries became particularly relevant. After all, there are incredibly long queues at the checkpoints in Poland because of strikes by Polish customs officers. And, therefore, the routes through Romania and Hungary are the most realistic both during the export of goods from Ukraine and to import humanitarian goods.

The joint use of Europe's integrated systems is a necessary component in the organization of the effective operation of road transport, as it ensures increased efficiency in the use of the motor vehicle fleet and personnel; reduction of costs for maintenance, fuel, lubricants due to optimization of routes and reduction of non-productive vehicle mileage; reduction of the need to expand the motor vehicle fleet; clearer prospective planning of work based on objective information about the real mileage of each vehicle unit and reduction of losses related to repairs and expansion of the range of services and prompt response to requests.

It is advisable to conduct further research in the direction of adapting the use of augmented reality technology in the driver's navigation systems.

Key words: traffic rules, mandatory vehicle equipment, system of fines.

© H. I. Nesterenko, M. I. Muzykin, O. H. Strelko, S. I. Bibik, A. O. Aleksieieva, 2023

Нестеренко Г. І., Музикін М. І., Стрелко О. Г., Бібік С. І., Алексєєва А. О. Аналіз можливостей інтеграції транспортної системи України в європейську транспортну мережу

Дана стаття присвячена аналізу транспортних мереж таких європейських країн, як Україна, Угорщина та Румунія. Стаття містить аналіз особливостей організації руху в цих країнах. Досліджувались транспортні системи саме цих країн через те, що під час війни набули особливої актуальності питання взаємодії автомобільних транспортних мереж саме цих країн. Адже на пунктах пропуску із Польщею неймовірно великі черги через страйки польських митників. А, отже, шляхи через Румунію та Угорщину є найбільш реальними як під час експорту товарів з України так і з метою ввезення гуманітарних вантажів.

Ефективність інтеграційних процесів під час входження транспортної системи України в європейську транспортну мережу – важливий чинник, що впливає на розвиток економіки країни, відіграє важливу роль під час воєнних дій, сприяє підвищенню культури та освіченості населення, підвищує ефективність праці, а також має велике політичне значення. Одним з основних способів підвищення ефективності роботи автомобільного транспорту України на цьому шляху є адаптація вітчизняних транспортних мереж до транспортних систем сусідніх країн.

Сумісне використання інтегрованих систем Європи є необхідною складовою в організації ефективної роботи автомобільного транспорту, адже при цьому забезпечуються підвищення ефективності використання наявного парку транспорту і персоналу; зменшення витрат на технічне обслуговування, паливо, мастильні матеріали за рахунок оптимізації маршрутів і зниження непродуктивного пробігу автотранспорту; зниження потреби в розширенні парку автотранспорту; більш чітке перспективне планування роботи на основі об'єктивної інформації про реальний пробіг кожної одиниці автотранспорту і зниження витрат, пов'язаних з ремонтом і розширення спектра послуг і оперативного реагування на запити.

Подальші дослідження доцільно проводити в напрямку адаптації використання технології доповненої реальності в навігаційних системах водія.

Ключові слова: правила дорожнього руху, обов'язкове обладнання автомобіля, система штрафів.

Formulation of the problem. The effectiveness of integration processes during the entry of the transport system of Ukraine into the European transport network is an important factor that affects the development of the country's economy, plays an important role during military operations, contributes to the improvement of culture and education of the population, increases labor efficiency, and is also of great political importance. One of the main ways to increase the efficiency of road transport of Ukraine on this path is the adaptation of domestic transport networks to the transport systems of neighboring countries, as well as the application of modern navigation systems and their development [1].

Today, owing to truck downtime at the borders with Poland, a large share of international transportation between Ukraine and European countries is carried out to Romania and Hungary. It is very important to know the peculiarities in the organization of vehicle traffic on the transport highways of these countries because it is a guarantee of traffic safety and timely delivery of goods and passengers [2]. Such transportation has become especially relevant since the beginning of full-scale military operations, which caused a decrease in the volume of maritime transport in Ukraine, and the only transport that can bring goods to the ports of European countries is by road.

In addition, ensuring safety must be a management responsibility on par with production functions. Safety must be ensured by setting achievable objectives while simultaneously planning the goal, and organizing continuous control. In line with this principle, the importance of safety is equated to the factors of transportation quality, cost, and quantity [3]. In this connection, the question arises of the need to combine the reliability factor to manage international road transport.

Analysis of recent research and publications. Ukrainian and foreign scientists such as O.P. Holykov, V.H. Shynkarenko, A.I. Abramov, A.V. Velmozyn, A.I. Vorkut, B.L. Heronimus, Ye.A. Zhukov, V.N. Ivanov, V.Ye. Kanarchuk, L.V. Kantorovych, and other devoted their research to highlighting problems and finding ways to economic issues in the development of the transport industry. Scientists comprehensively studied the issue of the development of the transport complex, gave recommendations, and proposed ways to ensure the effective functioning of this important sphere of the country's national and economic complex. At the same time, the path of European integration of Ukraine and the formation of our state as a full-fledged member of the European Community requires the development of new means and methods of traffic management in the context of cooperation with leading international transport organizations and participation in the implementation of relevant projects and programs [2]. Despite the recognition of transport as a priority sphere of activity that must be supported by the state, financed, and developed to meet international standards at the appropriate level, several problems hinder the development of road transport and the process of European integration.

Purpose of the article: to analyze transport highways and peculiarities in the organization of road transport in Ukraine, Romania, and Hungary to find ways to integrate Ukrainian roads into the European transport network.

Statement of basic materials. International road freight transport plays an important role in the country's economy and significantly affects the development of market relations. They have many advantages compared to other modes of transport – these are the speed of delivery, relatively lower financial costs compared to other modes of transport, safety, and delivery at the exact time and point [5].

The efficient movement of goods is the basis of the functioning of any economy and company. Thanks to the possibility of fast and safe transportation of goods, production processes are possible, and consumers have access to a wide range of products [6].

Among the three standard modes of transport – sea, air, and road – road transport is the most common mode of freight transportation. An extensive network of expressways is required for its effective functioning.

There are also types of road transport depending on the type of freight being transported. They include:

- automobile transportation of maritime containers;
- oversized transport;
- transportation of heavy goods;
- transportation of medicines;
- refrigerated transport and much more.

The above-mentioned advantages and possibilities of road transport make it an ideal solution for any company that sends any freight to any part of the country or Europe [6].

Transportation of goods outside the European Union requires customs clearance. To drive through other European countries, it is necessary to observe the current traffic rules (for example, in the field of exhaust gas emissions). A license for international transportation in Europe is a type of international permission document issued by the European Road Transport Inspectorate, which gives the owner the right to carry out road transportation of goods in all countries of the European Union. It gives the right to carry out bilateral, transit transportation or transportation to third countries near EU member states [6]. Issuance of licenses for international road transport is regulated by Regulation (EC) No. 1072/2009 of the European Parliament and the Council of October 21, 2009, on general rules for access to the international road transport market ("Regulation No. 1072/2009").

First, the highway network was analyzed. The length of state highways in Ukraine is 169.5 thousand km. The network of main routes is spread throughout the country and connects all major cities of Ukraine (see Fig. 1), and also provides cross-border routes with neighboring countries. Of these, 165.8 thousand km are with hard surfaces. The State Highway Agency of Ukraine is responsible for the condition of these roads [7].

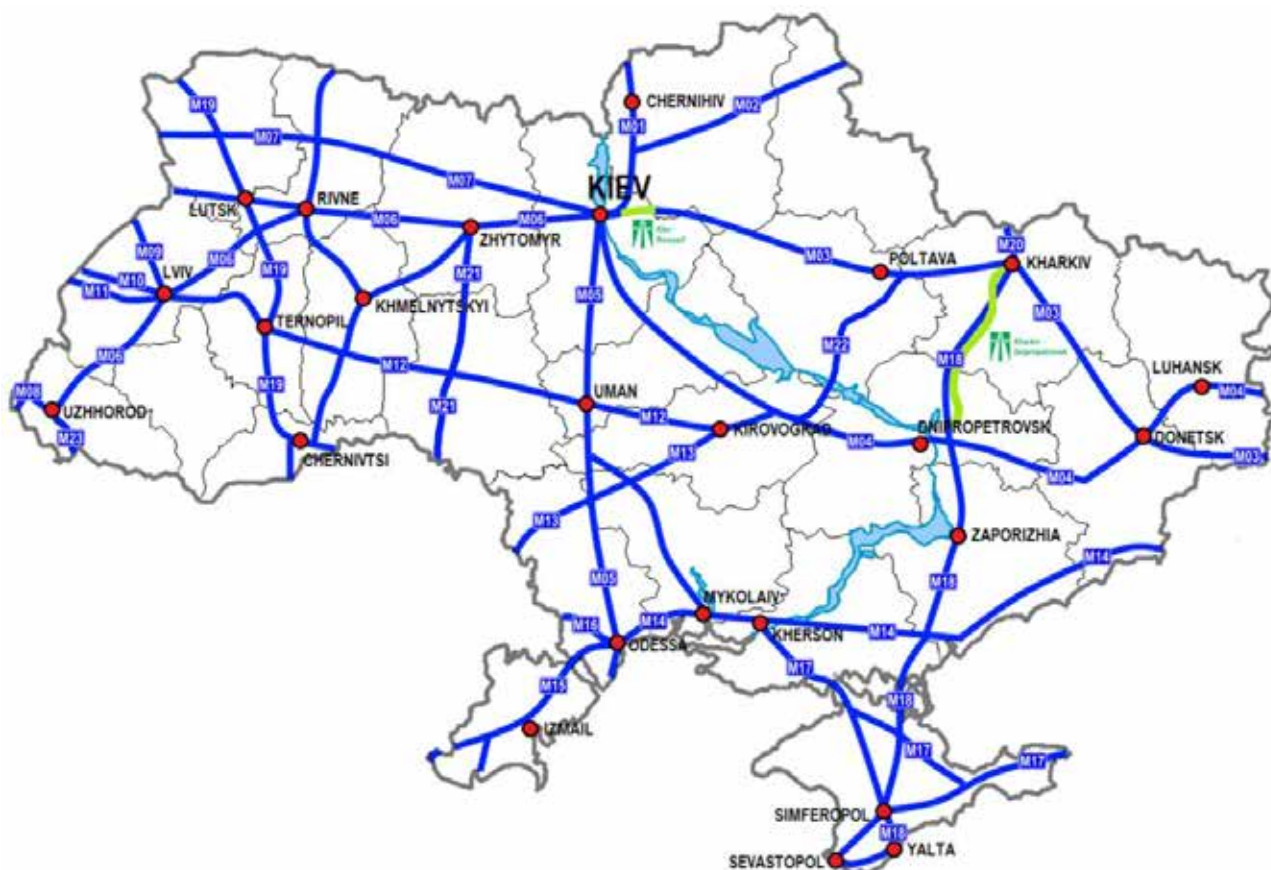


Fig. 1. Highways of Ukraine on the map of the country [8]

The basic traffic rules and speed regime in Ukraine are as follows. For example, the speed of movement outside populated areas is 90 km/h; on a road with single carriageways separated from each other by a dividing strip is 110 km/h; on the highway is 130 km/h [9]. There are fines for violating the speed limit:

- for exceeding the speed from 20 to 50 km/h – a fine is of 340 hryvnas.
- for exceeding the speed by more than 50 km/h – 1.700 hryvnias.
- For passing through a public transport lane – 680 hryvnias.
- For passing through an intersection at a "red" traffic light – 425–510 hryvnias.

The maximum permissible level of alcohol in the blood is 0.00 ‰.

The permissible level of alcohol in a driver's blood in Ukraine must not exceed 0.2 ppm (permillage).

In Ukraine, the permissible level of alcohol content in a driver's blood is 0.2 ppm. The fine for drunken driving is UAH 10,200, in addition, the violator is revoked a driver's license for a year. The same actions, committed more than twice a year, are punishable by a fine of UAH 40,800 and revocation of rights for 10 years. A dipped beam is mandatory 24 hours a day throughout the year.

The fine for not turning on the dipped beam in Ukraine ranges from 425 to 510 hryvnias. During the specified period, daytime running lights must be turned on on all mechanical vehicles outside populated areas, and in the case of their absence in the vehicle structure, dipped beam headlights.

A child car seat, also a children's car seat is a seat that is installed in a car for the safe transportation of children from the moment of birth to approximately the age of 12 years (until the child reaches a weight of 36 kg and grows taller than 1.45 meters). The official name of a child's car seat in Ukrainian legislation is "special means that make it possible to fasten a child with the help of safety belts." The fine for the first violation of the rules for transporting children will be UAH 510; for repeated violations within a year is 850 hryvnias.

In Ukraine, according to the Traffic Rules, the use of seat belts is mandatory for the driver and all passengers, including those in the back seat. The fine for violating the rules for using seat belts is 510 hryvnias.

If a police officer notices a driver talking on the phone while holding it while driving, she/he has every right to stop and prosecute him/her. If the conversation on the phone did not lead to any consequences, the driver faces a fine of UAH 510.

Average fuel prices in Ukraine as of December 1, 2023, are shown in Table 1.

Table 1

Average fuel prices in Ukraine in 2023

Type of fuel price	Price (UAH)
A-95 premium gasoline	57.57
Gasoline A-95	54.33
Gasoline A-92	51.65
Diesel fuel	54.28
Automobile gas	36.74

At the next stage of the research, the highway network of Hungary was analyzed. According to the report of Állami Autópályakezelő Zrt. ("State Highway Administration"), the total length of the Hungarian highway system is 1.400 kilometers (see Fig. 2).

The number of Hungary's border crossings with a motorway link may double by the year 2022, the national daily Magyar Hírlap said. Over the past 20 years six such facilities have been built, to be followed by another six over the next five years, the national development ministry told the paper. The government decided to build 900 kilometres of motorways and dual carriageways, and earmark a total of 2.500 billion forints (8.2 billion euros) for road construction until 2022, it said. The M4 motorway to connect Budapest with Oradea (Nagyvárad) in western Romania will be completed with the inauguration of the last 30 km section on the Hungarian side of the border by early 2020. The construction of the dual carriageway M30 between Miskolc and Kosice (Kassa) in eastern Slovakia is scheduled to start next year but its Tornyosnémeti border crossing will be inaugurated before this year is over [10].

As far as links to Austria are concerned, the border sections of M8 at Rábafüzes (in the direction of Graz) and M85 at Sopron (in the direction of Vienna) will be completed in the coming five years. The last section of motorway M6 between Bóly and the Croatian border will probably be opened in late 2020 pending environmental permits. The construction of the last section of motorway M3 between Vásárosnamény and the Ukrainian border is scheduled to start in early 2021 [10].

The basic rules of the road and the speed regime for Hungary are: in populated areas is 50 km/h; outside the populated areas is 90 km/h, a car with a trailer is 70 km/h; on the road for cars is 110 km/h, a car with a trailer is 80 km/h (follow the signs); on the highway is 130 km/h, a car with a trailer is 80 km/h; cars with installed anti-skid chains is 50 km/h.

Exceeding the speed limit of up to 15 km/h is subject to a fine of up to 30,000 forints (€100.00) or a verbal warning is imposed (at the police's discretion depending on the specific road situation). Further, every 15 km/h excess is added to this amount by 15,000 forints (€50.00), and starting from 45 km/h of excess is 30,000 forints (€100.00) fine.

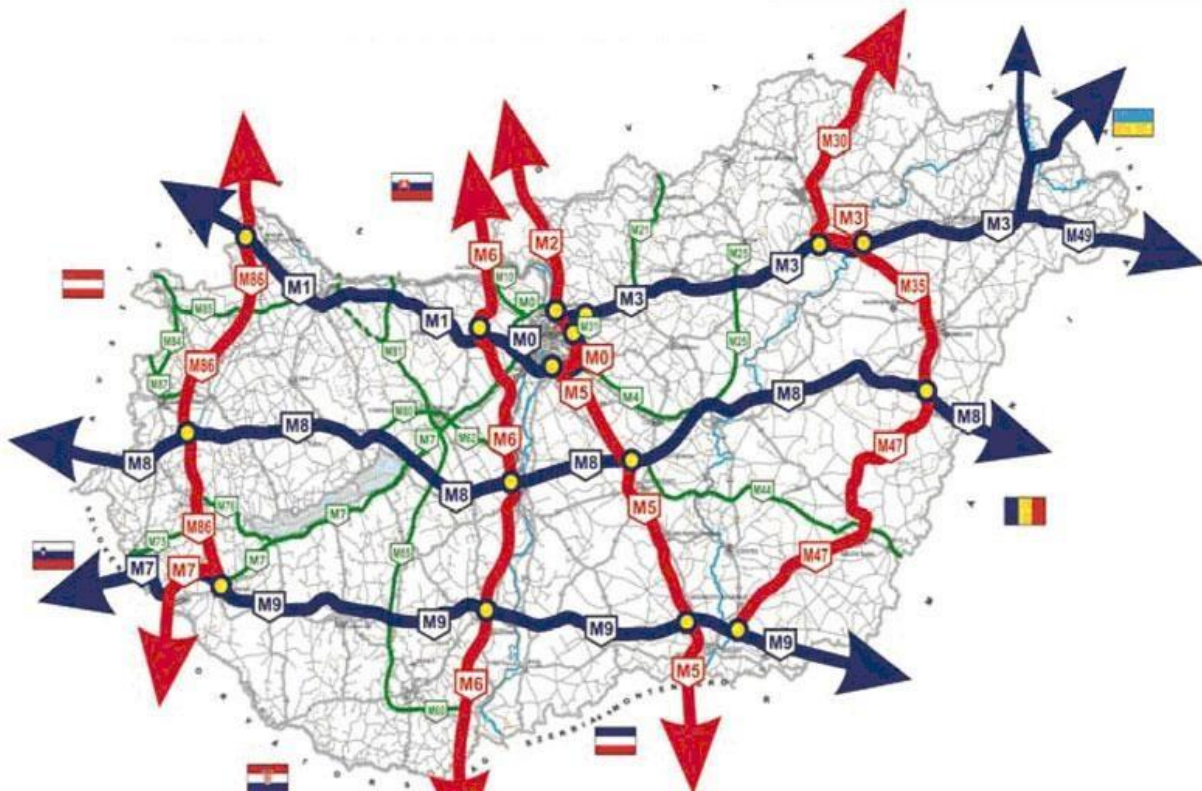


Fig. 2. Highways of Hungary on the country map [10]

The maximum amount of HUF 300.000 (€1,000.00) is charged for exceeding the permitted speed by more than 75 km/h in a populated area, outside it by 105 km/h. The maximum permissible level of alcohol in the blood is 0.00 ‰. If the level of alcohol in the blood is up to 0.5 ‰, then the fine will be 150.000 forints (€500.00). For a blood alcohol level between 0.5 ‰ and 0.8 ‰, the fine is HUF 200,000 (€750.00). If the level of alcohol in the blood exceeds 0.8 ‰, then the fine will be 300.000 forints (€1.000.00).

A dipped beam is mandatory 24 hours a day throughout the year. For non-compliance with rules is a fine of up to 10,000 forints (€33.00). For driving only with fog lights, the fine is HUF 5,000 (€17.00).

Using a telephone without a technical device that allows for hands-free conversations while driving is prohibited. Fines are from HUF 10,000 (€33.00) in the populated area and to HUF 20,000 (€66.00) on the highway.

The official price of fuel at gas stations in Hungary since November 2021 is HUF 480 per liter (about UAH 40). This year, due to the war in Ukraine, it has slightly increased. For cars and trucks, the price is HUF 661 per liter of gasoline (UAH 54.2) and HUF 679 per liter (UAH 55.7) per liter of diesel fuel.

The car must have a first-aid kit, a warning triangle, and a reflecting vest, which is mandatory for every pedestrian who is on the road or roadside outside a populated area in the dark, as well as in case of poor visibility. The fine is up to 30.000 forints (€100.00). Studded tires are prohibited. Anti-skid chains are allowed in difficult weather conditions (an appropriate international road sign is installed), and the use of a radar detector is not prohibited.

The next stage in the analysis was the research of the peculiarities of the transport network in Romania. In December 2018, Romania had 806.7 km of motorways, and another 148.6 km were under construction. In recent years, a national highway master plan has been developed, and many works have begun across the country leading to significant changes in 2022 (see Fig. 3).

To travel on roads in Romania outside the cities, you must pay a toll. In Romania, there is an electronic system for issuing vignettes (rovinieta). Vignettes can be purchased at gas stations, large shopping centers, and any post office. When paying the fee, the operator enters the license plate of the car for which the vignette is purchased, as well as the type of vehicle and the validity period of the vignette into the electronic database and issues a receipt with the above-mentioned data.

The information in the database is stored throughout the validity period of the vignette. The fee depends on the category of the vehicle and the validity period.

The cost of a vignette in Romania for trucks and vans weighing up to 3.5 tons is: for 7 days – €6.00; for 30 days – €16.00; for 90 days – €36.00; for 1 year – €96.00.



Fig. 3. Highways of Romania on the country map [11]

Control of the presence of vignettes is monitored either automatically at fixed points where the system's cameras are installed, or on the road, using mobile terminals, by police crews and employees of the National Road Company of Romania. The verification is carried out by reading the vehicle's license plate and comparing it with the database. In the absence of a vignette, a fine is charged (250–500 lei (€55.00–110.00) for a passenger car and 750–1250 (€167.00–278.00) lei for a van or minibus up to 3.5 tons), and in addition to this, compensation for road damage is (130 lei (€28.00) for a car and 430 (€95.00) for a van). Bridges (€6.00) and ferry crossings (€12.00) across the Danube both within Romania and between Romania and Bulgaria are additionally paid.

From November 1 to March 31, the use of summer tires on cars is prohibited. In case of violation, there is a fine from 2,500 to 4,000 lei (€555.00–889.00). Studded tires are prohibited.

The speed regime for cars is as follows: in the populated area is 50 km/h; outside the populated area is 100 km/h; on the highway is 130 km/h.

Cars with a trailer and motorhomes with a total weight of more than 3.5 tons are subject to the following speed regime: in a populated area is 50 km/h; outside the populated area is 90 km/h; on the highway is 120 km/h (110 for motorhomes). Even though the speed limit outside populated areas is set at 100 km/h, this applies only to those roads that have the status of national expressways or European roads (E85). A limit of 90 km/h has been set for the rest of the roads outside populated areas.

For drivers with experience of less than 1 year, the maximum speed is set at 20 km/h lower than the maximum permitted speed of vehicles of this category.

The following fines are imposed for violating the speed limit:

- 10–20 km/h – 134 lei (€30.00);
- 21–30 km/h – 201 lei (€45.00);
- 31–40 km/h – 268 lei (€60.00);
- 41–50 km/h – 402 lei (€90.00);
- over 50 km/h is 603–1340 lei (€134.00–300.00).

The maximum level of alcohol in the blood is 0.00 ‰. If the level of alcohol in the blood is less than 0.8 ‰, then the fine will be from 603 to 1340 lei (€134.00–300.00), and the driver's license revocation for up to 90 days. If the level of alcohol in the blood exceeds 0.8 ‰, then the driver faces imprisonment from 1 to 5 years.

During the movement of the vehicle, the dipped beam must be turned on regardless of the time of day throughout the year. A fine of 135 lei (€30.00) is imposed for the lack of a dipped beam or improper use of a high beam. For using fog lights in the absence of fog, there is a fine of 200 lei (€45.00).

It is forbidden to use a telephone communication device that is not equipped with a technical device that allows for hands-free conversations while the vehicle is in motion. The fine is 134 lei (€30.00).

As a rule, in Romania (as well as in Ukraine), the parking fee is charged by employees of companies that service parking lots. Parking costs range from 2.5 lei (€0.50) to 12 lei (€1.50) per hour. A receipt is issued upon payment. Violation of parking rules is 201 lei (€45.00).

The use of a video recorder is allowed in Romania.

At the final stage of the research, the main criteria taken into account in the process of integrating the transport system of Ukraine into the European transport network were compared. The results are shown in Tables and Figures.

Table 2

Comparing the length of the highway network, km

	Ukraine	Hungary	Romania
Length of roads	170000	203601	198930
Length of roads with hard surface	165800	77087	49873
Length of highways	169500	281	8067

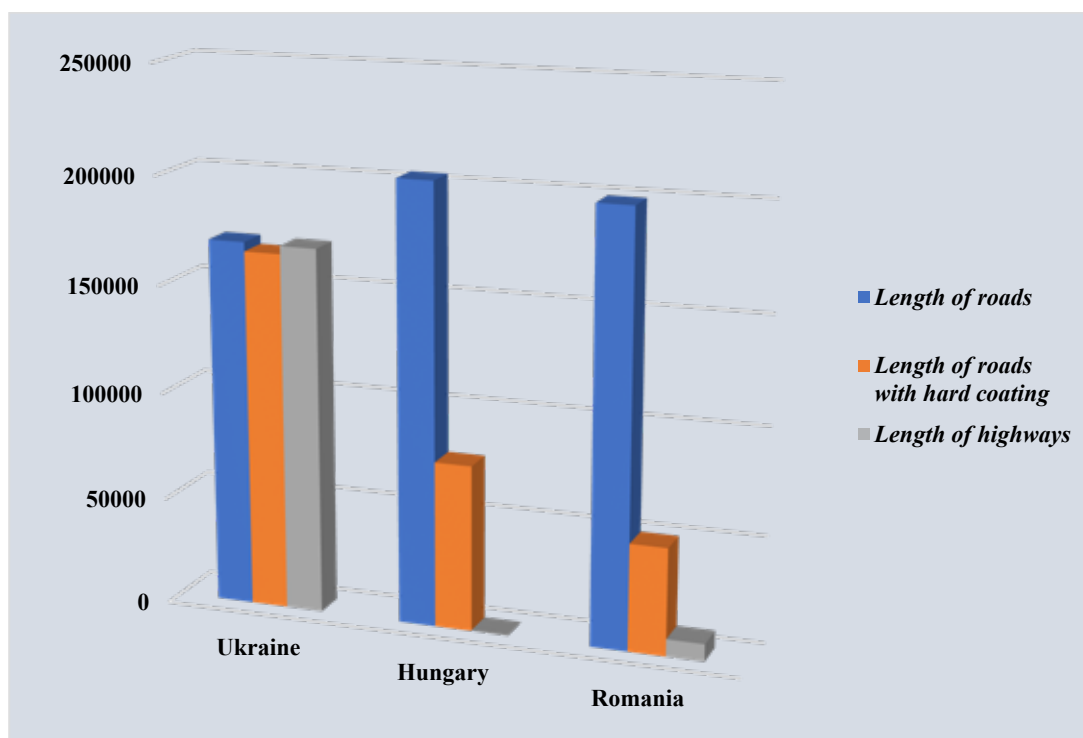


Fig. 4. Comparing the length of the highway network, km

Table 3

Comparing the standard speed limits in Ukraine, Hungary and Romania, km/h

	Ukraine	Hungary	Romania
In the city	50	50	50
Out of the city	90	70	100
On the highway	130	130	130

From the comparison Table, it can be concluded that the speed limits in the city and on the highway are the same. Restrictions outside the city vary considerably.

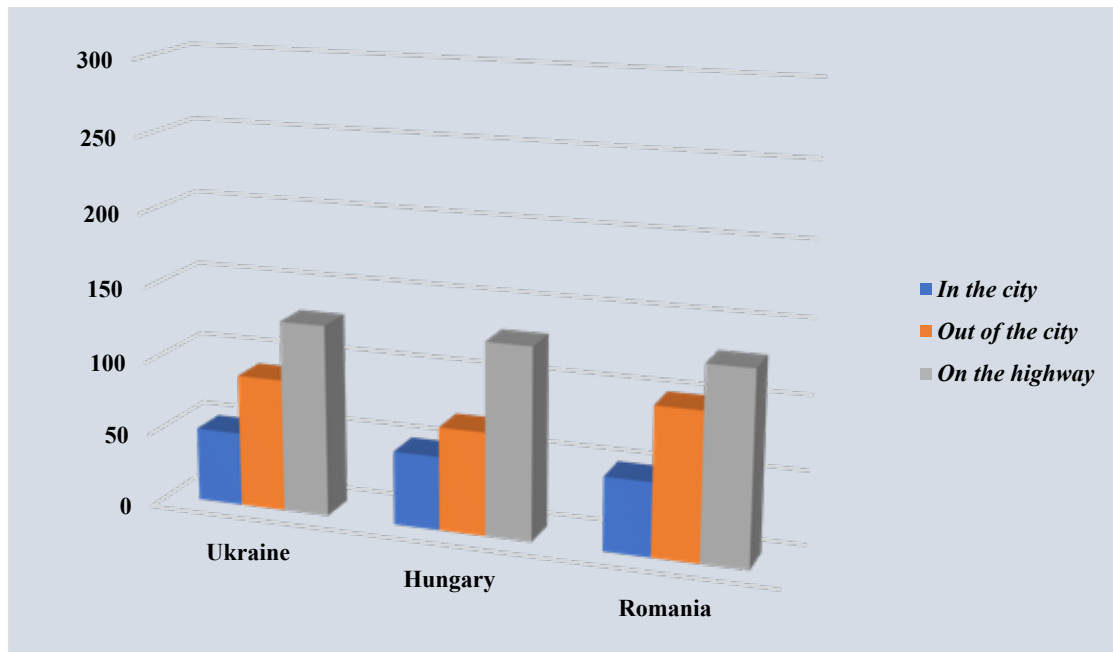


Fig. 5. Comparing the standard speed limits in Ukraine, Hungary, and Romania, km/h

Table 4

Comparing the standard speed limits in Ukraine, Hungary and Romania, km/h

	Ukraine	Hungary	Romania
A95(liter)	€1.33	€1.67	€1.69
A98(liter)	€1.61	€1.70	€1.81
Diesel (liter)	€1.32€	€1.71	€1.81
Gas	€0.92€	€0.98	€1.34

The comparative Table shows that the lowest price for all types of fuel is in Ukraine/Poland, and the most expensive fuel is in Romania.

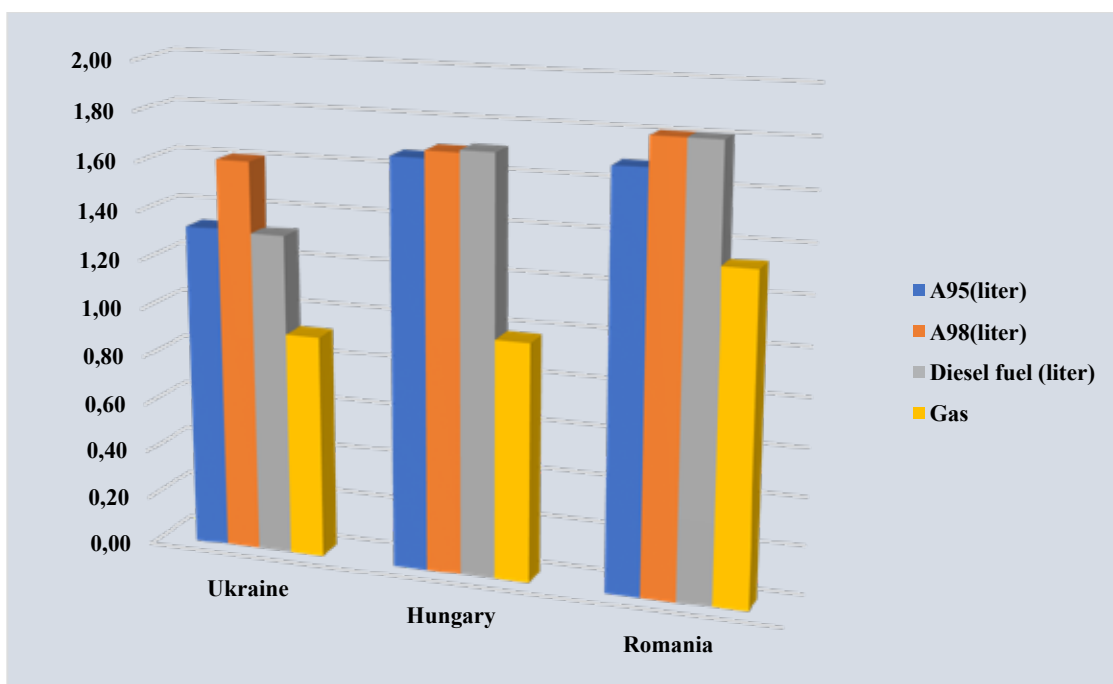


Fig. 6. Comparison of fuel costs in Ukraine, Hungary and Romania, €

Table 5

Comparing the validity period of the electronic vignette

Validity of electronic vignette	Ukraine	Hungary	Romania
10 days	€0.00	€11.00	€23.00
1 month	€0.00	€14.00	€7.00
1 year	€0.00	€130.00	€28.00

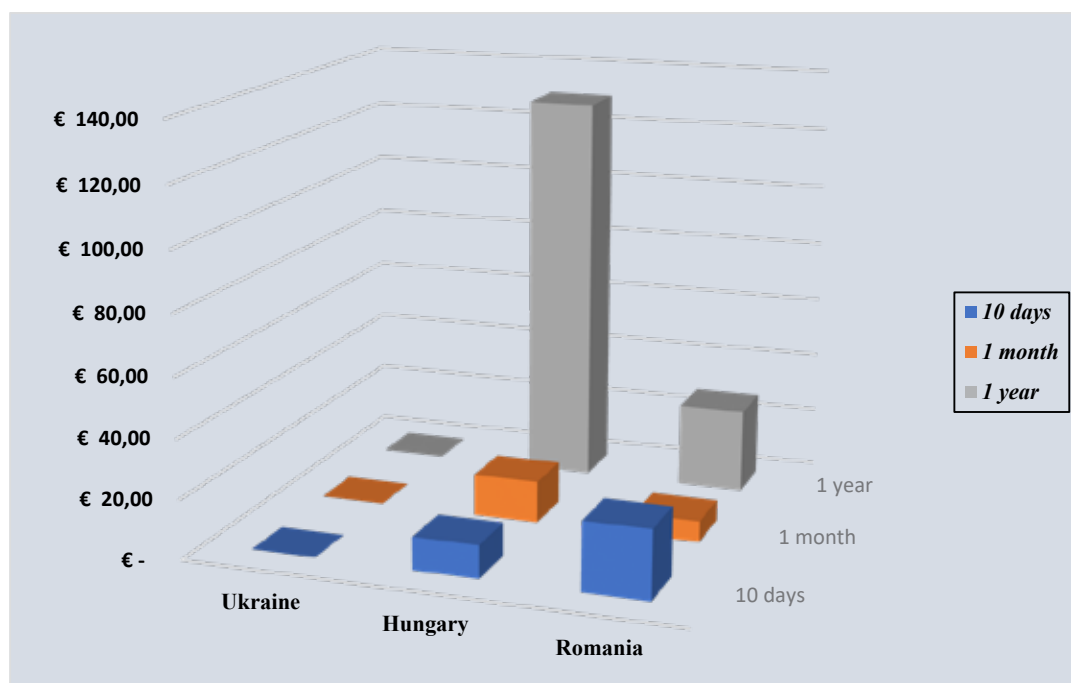


Fig. 7. Comparing the validity period of the electronic vignette

Table 6

Comparing the car parking costs in the researched countries

	Ukraine	Hungary	Romania
Parking cost of 1 hour	€0.55	€1.60	€1.50

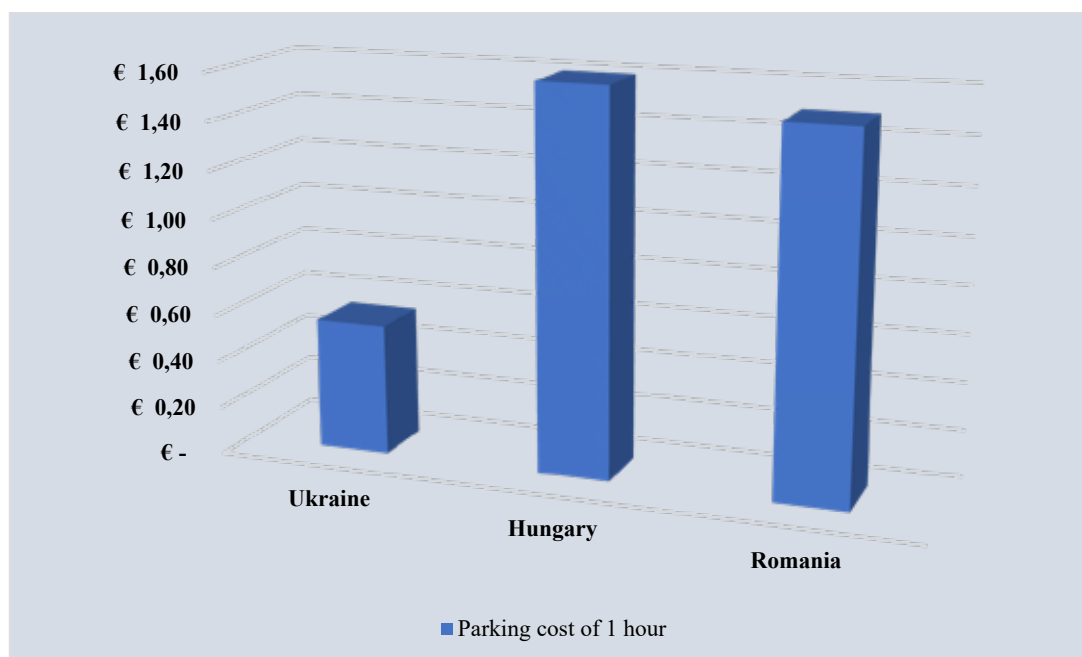


Fig. 8. Comparing the car parking costs in the researched countries

Table 7

Comparing the standard fines in Ukraine, Hungary and Romania

	Ukraine	Hungary	Romania
Overspeeding (on average)	€25.60	€408.30	€109.80
Alcohol in the blood (on average)	€851.60	€750.00	€217.00
Dipped beam headlights turned off outside the city (on average)	€11.70	€25.00	€37.50
Unbuckled seat belt	€12.80	€92.50	€30.00
Talking on the phone while driving	€12.80	€50.00	€30.00
Improper children transportation	€13.50	€150.00	€217.00
Average value of fines	€154.7	€246.0	€106.9

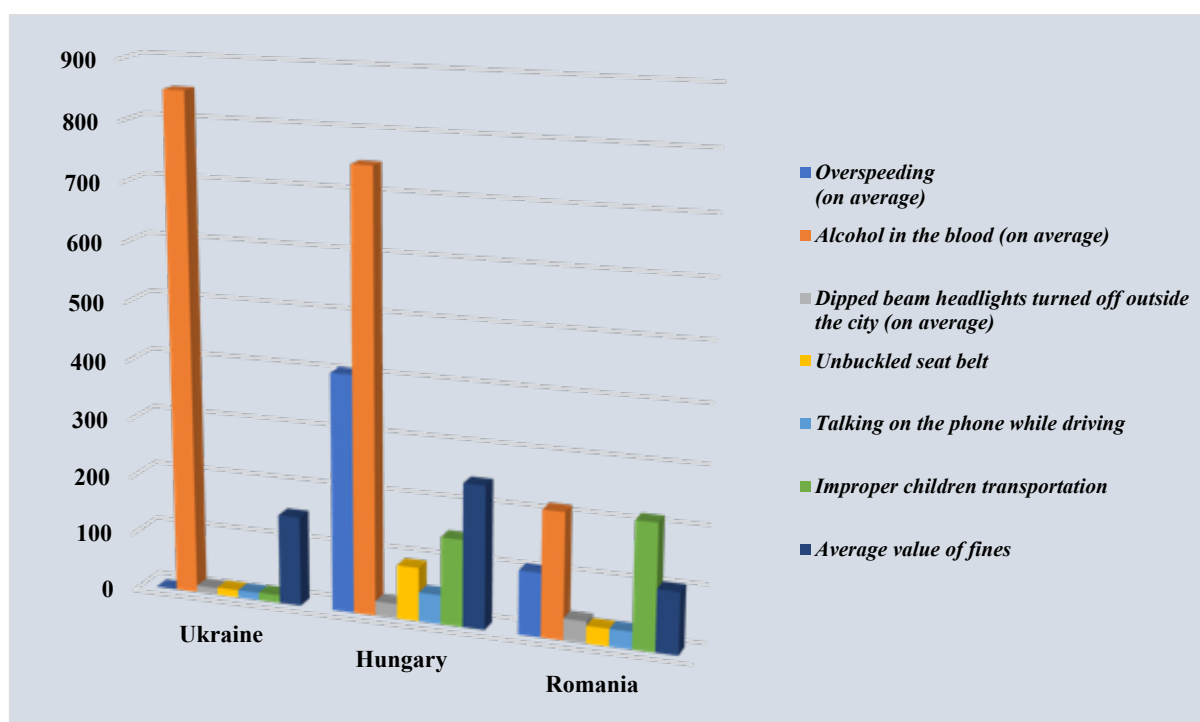


Fig. 9. Comparing the standard fines in Ukraine, Hungary, and Romania, €

Conclusions from this research and prospects for further surveys in this direction. After analyzing the data of the comparative charts constructed in the course of the research, it can be concluded that the speed limits in cities and on highways of all countries that were accepted for comparison are almost the same. Restrictions outside the city vary considerably.

The lowest price for all types of fuel, despite the war, is in Ukraine; the most expensive fuel is in Romania. Hungary has the highest fines, followed by Ukraine, and Romania has the smallest fines.

Thus, it can be said that the conditions in the transport networks of the analyzed countries are favorable for the integration of the transport system of Ukraine into the European transport network.

Bibliography:

1. Музикін М., Нестренко Г., Стрелко О., Клочкова Н. Роль навігаційних систем в організації ефективної роботи автомобільного транспорту. *2022 International Conference on Innovative Solutions in Software Engineering (ICISSE)*, Vasyl Stefanyk Precarpathian National University, Ivano-Frankivsk, Ukraine, Nov. 29–30, 2022, pp. 82–85.

2. Нестренко, Г. І., Музикін, М. І., Бібік, С. І., & Швайко, А. Ю. (2023). Аналіз транспортних мереж та організації автомобільних перевезень в країнах Європи. *Системи та технології*, 63(1), 88–99. <https://doi.org/10.32782/2521-6643-2022.1-63.7>

3. Нестеренко Г. І., Музикін М. І., Бібік С. І Аналіз впливу людського фактору на виникнення транспортних ризиків. *Збірник доповідей Міжнародної науково-методичної конференції «Інжиніринг криз та ризиків транспортних послуг»*. Маріуполь: ПДТУ, 2021, стор. 299–303.
4. Науменко А. П., Макаревич Д. О. Розвиток міжнародних автомобільних перевезень в рамках транспортних коридорів Європи та України. URL: <https://jrnل.nau.edu.ua/index.php/PPEI/article/view/468/456>
5. Нестеренко Г. І., Музикін М. І., Сакаль О. М., Жабокрик В. В., Цьомка Р. О. Дослідження економічної доцільності автомобільних перевезень. *Збірник наукових праць науково-практичної конференції «Логістичне управління та безпека руху на транспорті»*. Северодонецьк: СЧУ ім. В. Даля, 2020, стор. 126–129.
6. Особливості автомобільних вантажних перевезень у Європі. URL: <https://www.cargosupport.com.ua/ua/osoblivosti-avtomobilnih-vantazhnih-perevezen-u-evropi/>
7. Автомобільні шляхи України. URL: https://tsdea.archives.gov.ua/usefond/f_23/153-05/stoj/uk.wikipedia.org/wiki/%D0%90%D0%B2%D1%82%D0%BE%D0%BC%D0%BE%D0%B1%D1%96%D0%BB%D1%8C%D0%BD%D1%96_%D1%88%D0%BB%D1%8F%D1%85%D0%B8_%D0%A3%D0%BA%D1%80%D0%B0%D1%97%D0%BD%D0%B8.html
8. Roads in Ukraine. URL: https://en.wikipedia.org/wiki/Roads_in_Ukraine#/media/File:Ukraine_Major_Roads.png
9. Що потрібно знати про швидкісний режим в Україні. URL: <https://thepage.ua/ua/news/shvidkisnij-rezhim-ukrayina-2021-sho-potribno-znati-pro-dozvolenu-shvidkisti>
10. Highway To Anywhere – Number Of Hungary’s Highway Border Crossings May Double By 2022. URL: <https://hungarytoday.hu/wp-content/uploads/2017/08/6.jpg>
11. Romania – Road Map. URL: <https://markthepretender.tripod.com/id37.html>

References:

1. Muzikin M., Nestrenko H., Strelko O., Klochkova N. (2022). Rol navihatsiinykh system v orhanizatsii efektyvnoi roboty avtomobilnogo transportu [The role of navigation systems in the organization of efficient operation of road transport]. *International Conference on Innovative Solutions in Software Engineering (ICISSE)*, Vasyl Stefanyk Precarpathian National University, Ivano-Frankivsk, Ukraine, Nov. 29–30, 2022, pp. 82–85. [in Ukrainian]
2. Nesterenko H. I., Muzykin M. I., Bibik S. I., Shvaiko A. Yu. (2023). Analiz transportnykh merezh ta orhanizatsii avtomobilnykh perevezen v krainakh Yevropy [Analysis of transport networks and road transport organization in European countries]. *Systems and Technologies*. 63(1). 2023. P. 88–99. <https://doi.org/10.32782/2521-6643-2022.1-63.7>. [in Ukrainian]
3. Nesterenko H. I., Muzikin M. I., Bibik S. I. (2021) Analiz vplyvu liudskoho fактору na vynyknennia transportnykh ryzykiv [Analysis of the influence of the human factor on the occurrence of transport risks]. *Collection of reports of the International scientific and methodical conference "Engineering of crises and risks of transport services"*. Mariupol: PNTU, 2021. P. 299–303. [in Ukrainian]
4. Naumenko A. P., Makarevich D. O. Rozvytok mizhnarodnykh avtomobilnykh perevezen v ramkakh transportnykh korydoriv Yevropy ta Ukrainy [The development of international road transportation within the framework of the transport corridors of Europe and Ukraine]. URL: <https://jrnл.nau.edu.ua/index.php/PPEI/article/view/468/456> [in Ukrainian]
5. Nesterenko H. I., Muzikin M. I., Sakal O. M., Zhabokrik V. V., Tsomka R. O. (2020) Doslidzhennia ekonomichnoi dotsilnosti avtomobilnykh perevezen [Study of the economic feasibility of automobile transportation]. *Collection of scientific works of the scientific and practical conference "Logistics management and traffic safety in transport"*. Severodonetsk: ENU named after V. Dallya, 2020. P. 126–129. [in Ukrainian]
6. Osoblyvosti avtomobilnykh vantazhnykh perevezen u Yevropi [Peculiarities of road freight transportation in Europe]. URL: <https://www.cargosupport.com.ua/ua/osoblivosti-avtomobilnih-vantazhnih-perevezen-u-evropi/> [in Ukrainian]
7. Avtomobilni shliakhy Ukrainy [Automobile roads of Ukraine]. URL: https://tsdea.archives.gov.ua/usefond/f_23/153-05/stoj/uk.wikipedia.org/wiki/%D0%90%D0%B2%D1%82%D0%BE%D0%BC%D0%BE%D0%B1%D1%96%D0%BB%D1%8C%D0%BD%D1%96_%D1%88%D0%BB%D1%8F%D1%85%D0%B8_%D0%A3%D0%BA%D1%80%D0%B0%D1%97%D0%BD%D0%B8.html [in Ukrainian]
8. Roads in Ukraine. URL: https://en.wikipedia.org/wiki/Roads_in_Ukraine#/media/File:Ukraine_Major_Roads.png
9. Shcho potribno znaty pro shvydkisnyi rezhym v Ukraini [What you need to know about the speed mode in Ukraine]. URL: <https://thepage.ua/ua/news/shvidkisnij-rezhim-ukrayina-2021-sho-potribno-znati-pro-dozvolenu-shvidkisti> [in Ukrainian]
10. Highway To Anywhere – Number Of Hungary’s Highway Border Crossings May Double By 2022. URL: <https://hungarytoday.hu/wp-content/uploads/2017/08/6.jpg>
11. Romania – Road Map. URL: <https://markthepretender.tripod.com/id37.html>