ISSN 2181-8622

Manufacturing technology problems

Scientific and Technical Journal Namangan Institute of Engineering and Technology

INDEX COPERNICUS INTERNATIONAL

Volume 8
Issue 4
2023

Google Scholar
Crossref doi
SLIB.UZ Scientific library of Uzbekistan

18. https://www.sensorsolutions.info/blog/humidity-sensors-capacitive-vs-resistive
19. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=rasulova+gulmira&oq=#d=gs_qabs&t=1699608310697&u=%23p%3DhNuhG0Ty908J
20. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=nasirdinov&btnG=#d=gs_qabs&t=1699608416794&u=%23p%3DIygwUUEHaOkJ
21. https://scholar.google.com/scholar?start=40&q=nasirdinov&hl=en&as_sdt=0,5#d=gs_qabs&t=1699608510363&u=%23p%3DHTsRuLgFU4UJ

UDK 656.052

METHODS OF DETERMINING TRANSPORT FLOWS

RASULMUHAMEDOV MUXAMADAZIZ

Associate professor of Tashkent State Transport University
E-mail.: mrasulmuxamedov@mail.ru, phone.: (+99890) 120 59-80

TASHMETOV KOMOLIDDIN

PhD researcher of Tashkent State Transport University
E-mail.: tashmetov1993@gmail.com, phone.: (+99890) 929 80-69

TASHMETOV TIMUR

Assistant of the Tashkent State Transport University
E-mail.: tima2605@gmail.com, phone.: (+99890) 069 92-92

Abstract:

Objective. The study of traffic flow and its effective management holds paramount significance in contemporary urban infrastructure. Accurate methods for assessing traffic patterns are crucial for enhancing road safety, optimizing transportation systems, and alleviating traffic congestion. This article delves into the various methodologies and technologies employed for traffic detection and control. From inductive sensors to advanced computer vision systems, these techniques offer diverse strategies for monitoring and analyzing traffic.

Methods. This article employs a comprehensive and analytical approach to explore the methods and technologies used in traffic detection and control, primarily focusing on traffic flow analysis and management.

Results. Ultimately, the outcome of the research is the provision of detailed information on different sensor types and their relevance in contemporary traffic control systems.

Conclusions. As a result of the study of the above methods, it became clear that now video camera-based sensors are widely used and with their help we can get the necessary data for analysis. Construction of new intelligent transport systems with their help. As a result, traffic jams will be reduced, ecology will be improved, exhaust gases will be reduced, fuel consumption will be saved, and it will have a positive effect on the development of the economy.

Keywords: traffic flow, traffic, dynamic parameters, sensors.

Introduction. Traffic flow research and management play an important role in modern urban infrastructure. Accurate methods of determining traffic flows are required to ensure road safety, optimize the transport system and reduce congestion. This article explores the methods and technologies used in traffic detection and control. From inductive sensors to computer vision systems, these techniques represent different approaches to traffic monitoring and analysis. This article examines the main methods and their application in urban conditions.

The constant increase in the number of cars on the roads requires finding solutions to optimize the flow of traffic, ensure safety and improve the environmental situation. As a result of the increase in the number of cars, it causes an increase in traffic jams on city roads. These traffic jams, in turn, have a negative impact on the economy, the environment, and the quality of life of the population. To solve this problem, various strategies are being considered in Uzbekistan, such as the development of public transport, the improvement of road infrastructure, the introduction of new traffic management systems, and support for the development of environmentally friendly types of transport [3].

According to the data of the Statistical Agency under the President of the Republic of Uzbekistan, as of January 1, 2022, the number of cars owned by individuals was 3 million 579 thousand 384, of which 3 million 342 thousand 49 were passenger cars, 216 1 thousand 274 trucks, 15 thousand 710 buses and minibuses, and 5 thousand 360 special vehicles [1]

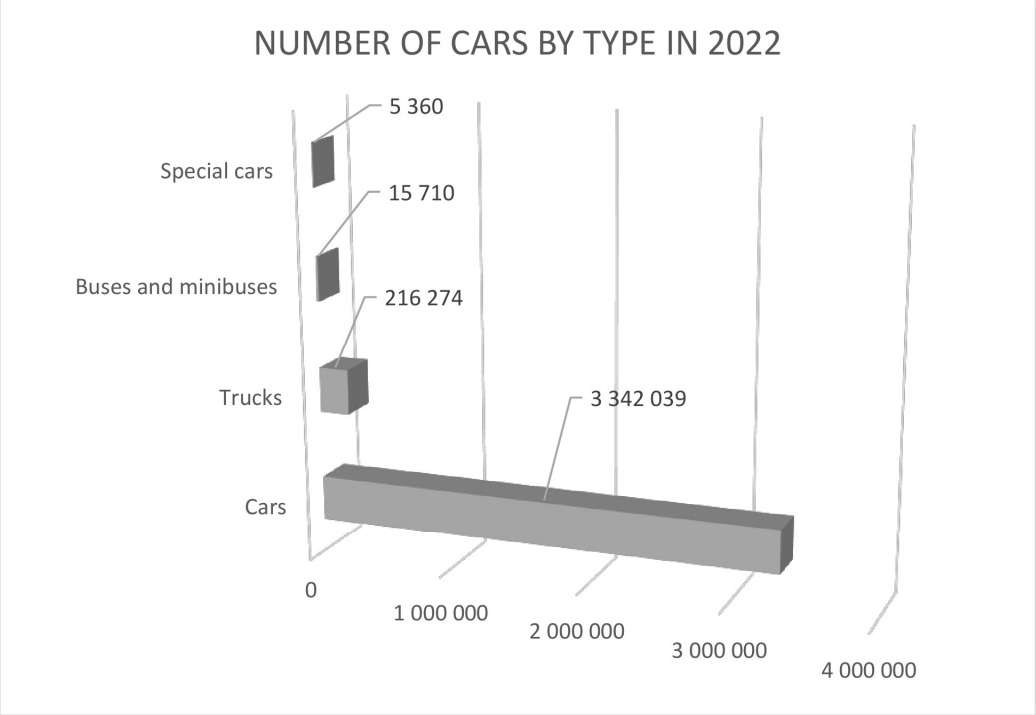

Figure 1. Distribution of machines by type

If we divide the above data by regions, we will create the graph below Fig. 2. From this graph, it can be seen that the number of cars in Tashkent and Tashkent region is on average 5 times more than in other regions, which causes traffic jams on Tashkent roads. The best way to avoid these traffic jams is to improve the current transport system and the number of roads, but this often requires large financial investments. Developing intelligent transportation systems is another approach to resolving this issue. Research related to the development and implementation of modern and promising technologies will remain relevant today and in the future. The creation of such modern intelligent systems requires information of great importance.

Data are facts about things, procedures, occurrences, and specific characteristics of the topic [1, 2]

The rapid development of information technologies has made it possible to

collect, refine, and process data from the traffic flow and perform some actions on it. Currently, there are several methods of obtaining data from the traffic flow, some of which have lost their importance today, while others have not yet been fully explored.

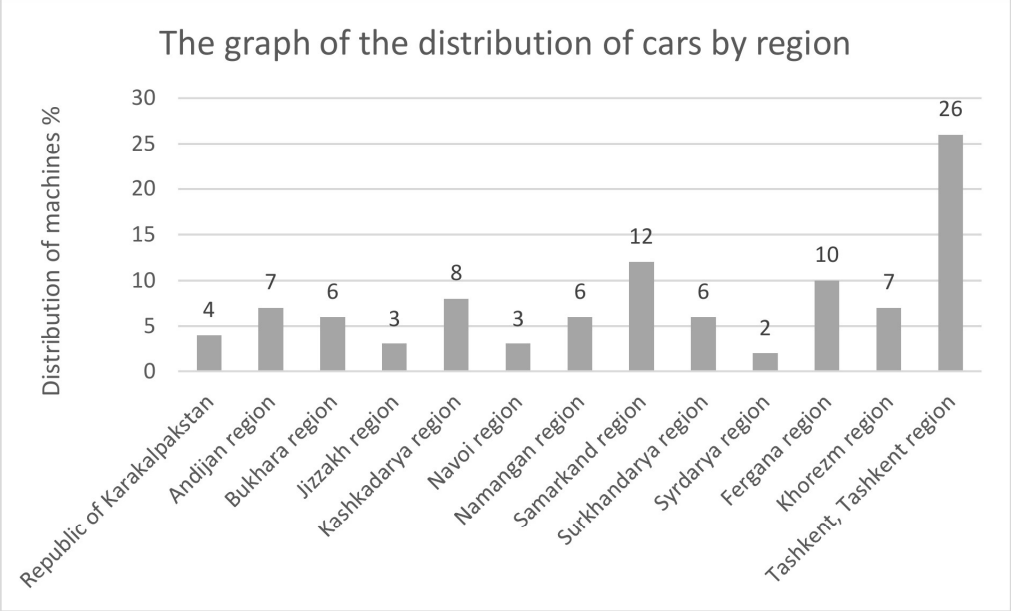

Figure 2. Distribution of cars across regions

Below we will consider what information from transport flows is important for building an intelligent transport system. Before that, we need to find an answer to the question "what is traffic flow?"

A traffic flow is a set of vehicles that participate in movement at the same time on a certain part of the road network. The following key indicators are used to describe traffic flows:

- traffic intensity $q\ (car/h)$;
- time interval $t(sec)$;
- traffic density $p\ (car/km)$;
- speed $v\ (km/h)$;

As you can see from the information given above, we need the information shown in the list when building an intelligent information system. We can get such information from sensors, cameras, GPS, GSM.

Traffic sensors are devices that detect the number, speed, and intensity of vehicles passing a certain road. These sensors can be classified according to the principles of operation and installation.

According to the operating principle, traffic sensors can be divided into three groups: contact type; radiation; measurements of parameters of electromagnetic systems.

Traffic sensors are divided into two types according to their installation: on the road and sensors installed on the road.

To the sensors installed on the road:

- Electromechanical sensors;

• Magnetic sensors;
• Pneumo-electric sensors;
• Inductive sensors;
Sensors installed on the ground:
• Acoustic sensors;
• Infrared sensors;
• Radiolocation sensors;
• Includes video detector sensors;

In general, all sensors consist of 3 parts: a sensitive element (SE), an amplifier-converter and an output device (OD).

Electromechanical sensors also consist of a sensing element, an amplifier or converter, and an output device, as mentioned above. The reason why this sensor is called electromechanical is that its sensing element generates an electrical signal due to mechanical movement under the influence of the machine. These sensors consist of two or more steel bars covered with rubber, and the sensor is installed at the same level as the road surface. When the car passes over this sensor, the contacts inside it transmit a signal to the device that is connected together, which in turn provides information that the car has passed the sidewalk where the sensor is installed. Fig. 3.

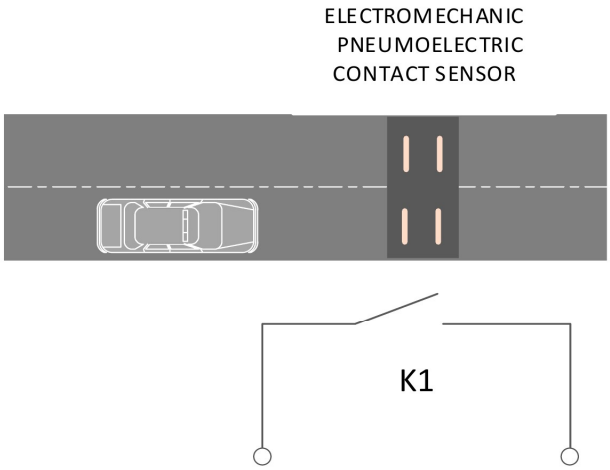

Figure 3. The principle of operation of the electromechanical sensor

Contact-based sensors (electromechanical, pneumo-electric, etc.) are rarely used in traffic control systems due to their low reliability, dependence on weather conditions, and the complexity of processing the received data. The sensors do not record the number of vehicles, but their wheel axles. In this case, it is necessary to divide the car into light and heavy vehicles depending on the number of axles. In some cases, it is impossible to know whether it is a truck or a car based on the number of bullets.

Among the sensors installed directly on the road surface, inductive sensors are one of the most common ones, which differ from other types of sensors due to their simplicity of construction, reliability and low cost.

An inductive sensor (Fig. 4) is a coil of wire located on the road surface, and it can have one or more different forms. For ease of control during operation, the wire is connected to the controller, which transmits the sensor signal to the motion control system through the installation well. An

alternating electric current with a frequency of 10...200 kHz is transmitted to the ring, which creates an electromagnetic field.

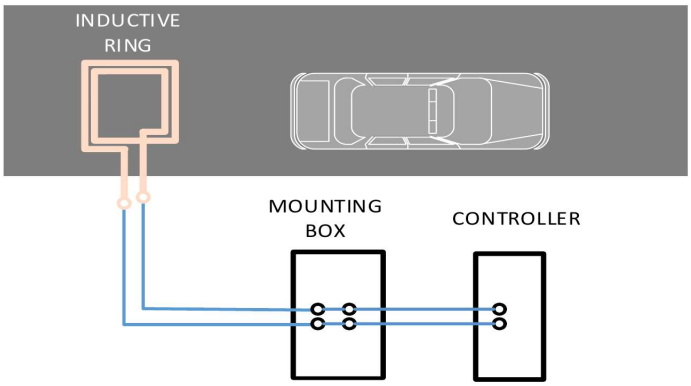

Figure 4. Inductive sensor circuit

The principle of operation of the inductive ring sensor is based on the resonant frequency change, and when the vehicle crosses this inductive ring, the frequency changes and the presence of the car is detected.

The following traffic control operations can be carried out with the support of inductive sensors:

• determining the time of passage of a vehicle on a certain part of the road;

• determining the intensity of the traffic flow in any period of time;

• determining the average spatial flow speed in a certain part of the road;

• detection of traffic on a certain part of the road;

• determination of flow density in a certain part of the road;

• determining the length of the queue of cars at the intersection of the route.

On-road sensors are characterized by ease of installation, but are more expensive than inductive sensors and their accuracy is more dependent on weather conditions. Often, acoustic and infrared sensors are used to detect the presence of vehicles in this group of sensors.

Radioactive sensors can be used in flexible traffic management systems. The principle of operation of the sensor checks high-frequency signals along the way. This sensor can detect several road sections. The sensor can be installed on communication network poles and walls Fig. 5.

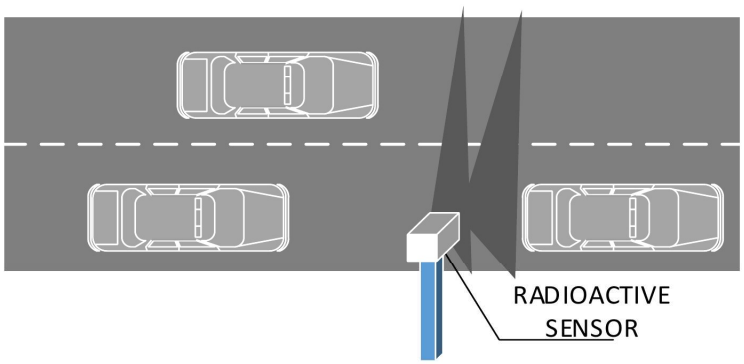

Figure 5. Radioactive sensor

Radioactive sensors perform two main functions:

• Determines the presence of vehicles in controlled zones.

• Determines the dynamic parameters of the transport flow [2].

Similar to radio-location sensors, infrared sensors are used in adaptive traffic management systems. Sensors are widely used to determine the presence of a vehicle, its intensity and speed.

The working principle of this sensor is to detect infrared radiation.

The sensor is protected against changes in light, changes in air currents, changes in temperature, voltage pulses, electrostatic discharges, and electromagnetic currents in the source circuit.

The sensor is installed on lighting poles, walls, bridges, overpasses or other artificial structures.

Among the types of sensors that are common these days are video detectors Figure 6. These systems include one or more video cameras, whose data is processed by high-performance special software. This program provides the following set of functions to the system:

• Determines the number of cars on each road section.
• Determines the intensity of machines.
• Determined the density of machines.
• Divides machines into groups.
• Allows you to determine the speed of cars.

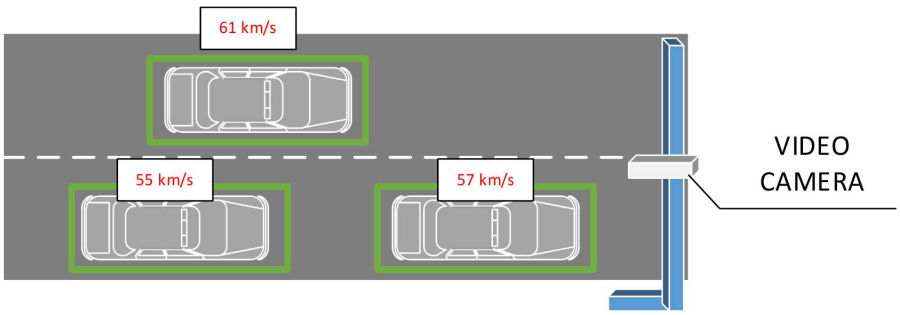

Figure 6. Video camera-based sensor

The advantage of the video camera-based sensor is that it can detect vehicles on up to 4 roads using one video camera and can determine all dynamic parameters of the traffic flow.

The above-mentioned sensors are now widely used in determining the flow of cars. But among these sensors, contact sensors are hardly used nowadays. The reason for this is that it is impossible to determine all the dynamic parameters of the traffic flow with the help of these sensors, contact sensors are not adapted to weather conditions and have low reliability.

One of the developing methods for determining the parameters of the traffic flow is to determine the density, length, and intensity of the traffic flow using the geolocation of mobile phones. This method arose as a result of the development of information technologies, and it is widely used by Google and Yandex to determine and analyze traffic jams on their maps. Figure 7.

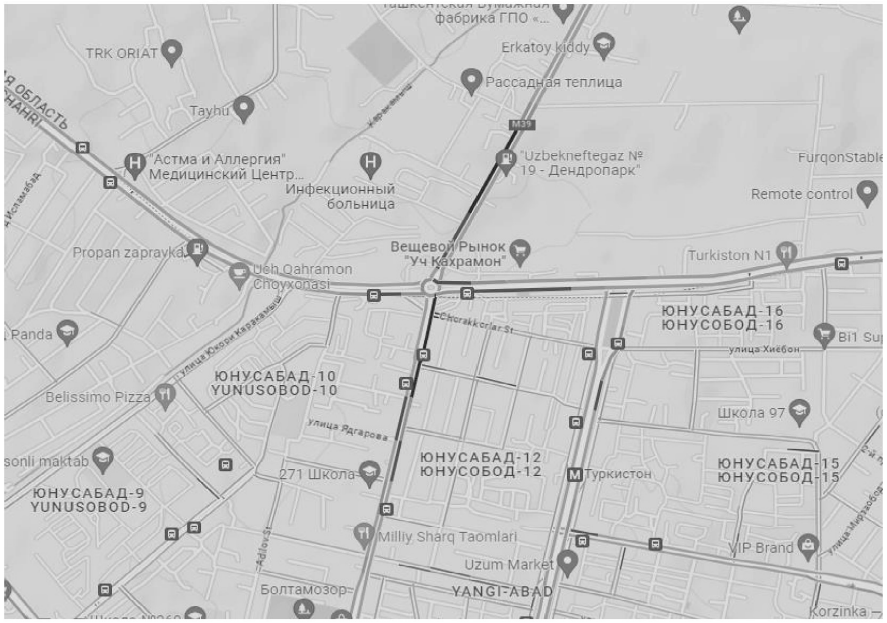

Figure 7. Traffic analysis on Google Maps

Results. The study analyzed various aspects of traffic flow in urban areas. Our results show that traffic flow is influenced by several key characteristics:

- traffic intensity
- transport interval
- traffic density
- transport speed

Our research also examined the technologies and sensors used to monitor traffic flows. The following key conclusions were drawn:

Inductive sensors. Inductive sensors are widely used due to their simplicity, reliability and cost-effectiveness. They accurately measure the presence of vehicles and are the main tool for traffic control and management.

Video Detectors: Video sensors equipped with advanced software offer a complete solution. They determine the number of vehicles, groups of vehicles and dynamic parameters, providing detailed information about traffic patterns.

Geolocation of mobile phones. New methods using mobile phone geolocation data are being explored as potential tools for traffic flow analysis. Companies such as Google and Yandex use this approach to monitor and analyze traffic conditions.

Conclusions. As a result of the study of the above methods, it became clear that now video camera-based sensors are widely used and with their help we can get the necessary data for analysis. Construction of new intelligent transport systems with their help. As a result, traffic jams will be reduced, ecology will be improved, exhaust gases will be reduced, fuel consumption will be saved, and it will have a positive effect on the development of the economy.

References

1. Yasnitsky L.N. Intelligent systems: textbook M.: Laboratory of Knowledge 2016.-221.

2. Organization and safety of road traffic: a textbook for students. higher textbook establishments / I.N. Pugachev, A.E. Gorev, E.M. Oleshchenko. - M.: Publishing Center "Academy", 2009. - 272 pp.

3. Mahut, M., Florian, M., Tremblay, N., Campbell, M., Patman, D., McDaniel, Z., 2004. Calibration and application of a simulation-based dynamic traffic assignment

model. Transportation Research Record: Journal of the Transportation Research Board, 101–111.

4. Treiber, M., Kesting, A., 2013. Elementary car-following models, in: Traffic Flow Dynamics. Springer Berlin Heidelberg, pp. 157–180. doi:10.1007/978-3-642-32460-4{_}10.

5. Introduction to mathematical modeling of traffic flows: textbook. manual / Gasnikov A.V., Klenov S.L., Nurminsky E.A., Kholodov Ya.A., Shamray N.B.; Applications: Blank M.L., Gasnikova E.V., Zamyatin A.A., Malyshev V.A., Kolesnikov A.V., Raigorodsky A.M.; Ed. A.V. Gasnikova - M.: MIPT, 2010. - 360 p.

6. Inose H., Hamada T. Traffic control / Ed. Ed. M.Ya. Blinkina: Trans. from English M.: Transport, 1983. – 248 p.

7.https://stat.uz/uz/matbuot-markazi/qo-mita-yangiliklar/30220-o-zbekistonda-jismoniy-shaxslarga-tegishli-avtomobillar-soni-3-579-383-tani-tashkil-etdi.

8. Stevanovic A., Kergaye C., Haigwood J. Assessment of surrogate safety benefits of an adaptive traffic control system //3rd international conference on road safety and simulation. – 2011. – С. 14-16.

9. Yau K. L. A. et al. A survey on reinforcement learning models and algorithms for traffic signal control //ACM Computing Surveys (CSUR). – 2017. – Т. 50. – №. 3. – С. 1-38.

10. Sims A. G., Dobinson K. W. The Sydney coordinated adaptive traffic (SCAT) system philosophy and benefits //IEEE Transactions on vehicular technology. – 1980. – Т. 29. – №. 2. – С. 130-137.

11. Sims A. G. Scat the sydney co-ordinated adaptive traffic system //Symposium on computer control of transport 1981: Preprints of papers. – Barton, ACT : Institution of Engineers, Australia, 1981. – С. 22-26.

12. Hamilton A. et al. The evolution of urban traffic control: changing policy and technology //Transportation planning and technology. – 2013. – Т. 36. – №. 1. – С. 24-43.

13. Dinopoulou V., Diakaki C., Papageorgiou M. Applications of the urban traffic control strategy TUC //European Journal of Operational Research. – 2006. – Т. 175. – №. 3. – С. 1652-1665.

14. Luk J. Y. K. Two traffic-responsive area traffic control methods: SCAT and SCOOT //Traffic engineering & control. – 1984. – Т. 25. – №. 1.

15. Boukerche A., Tao Y., Sun P. Artificial intelligence-based vehicular traffic flow prediction methods for supporting intelligent transportation systems //Computer networks. – 2020. – Т. 182. – С. 107484.

16. Расулмухамедов М. М. и др. Автономные автоматизированные пешеходные переходы //Universum: технические науки. – 2023. – №. 5-4 (110). – С. 38-41.

17. Abdullaev E., Zakirov V., Shukurov F. Assessment of the distance learning server's operation strategies and service capacity in advance //E3S Web of Conferences. – EDP Sciences, 2023. – Т. 420. – С. 06016. https://doi.org/10.1051/e3sconf/202342006016

18. Vakhid Z., Eldor A., Farrukh S. System's load reduction by using asynchronous and synchronous service methods //Universum: технические науки. – 2023. – №. 4-6 (109). – С. 65-70.

19.https://www.researchgate.net/figure/SCATS-physical-architecture-We-proposed-3LOM-architecture-as-distributed-system_fig4_266353695

20. Tashmetov K. et al. Expert system for diagnosing faults railroad switch of automation and telemechanic systems //AIP Conference Proceedings. – AIP Publishing, 2022. – Т. 2432. – №. 1.

PROSPECTS FOR THE APPLICATION OF VERTICAL AXIS WIND TURBINES IN THE JIZZAKH REGION

IZZATILLAEV JURABEK

Ph.D of Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (TIIAME) National Research University
Phone.: (+99897) 720 01-36

KHUDOYBERDIEV UMID

P.h.D student of Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (TIIAME) National Research University
E-mail.: umidkhudoyberdiev1994@gmail.com, phone.: (+99899) 354 86-56

MAMADIEV XUMOYUN

Teacher of Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (TIIAME) National Research University
Phone.: (+99899) 709 54-96

Abstract:

Objective. Foreign and local researchers analyzed the wind energy potential, technical and economic indicators of Bukhara, Navoi, Karakalpakstan, Kashkadarya and Tashkent regions. However, the information obtained as a result of the study about the potential of wind energy in the Jizzakh region, its direction and technical indicators is insufficient. In this article, analyzing the potential of wind energy in the Jizzakh region, the prospects for the use of small vertical wind energy devices are explored. Wind speed and its energy potential are the main factors in the production of electricity using wind energy devices. When using a wind energy device, it is necessary to find a point in this area with high wind speed and potential.

Methods. Data from NASA Power, Global Wind Atlas, and Windy international climate platforms were used to estimate the potential of wind energy.

Results. As a result of the research, average annual wind speeds were determined for each district of the Jizzakh region and areas with the highest wind speeds within the areas. At the same time, the coordinates of points with high wind energy potential were found in areas with high wind speeds. A brief description of small-power vertical type wind turbines that can operate at low wind speeds produced by various companies is given. An optimal wind power device has been selected that can operate at low wind speeds.

Conslusion. When analyzing the wind energy potential of the Jizzakh region using international climate platforms, the wind speed in the Farish, Gallaral and Sh. Rashidov districts among the districts located in the Jizzakh region is higher compared to other regions. In the above districts, the use of small wind power plants is more efficient compared to other districts.

Keywords: Wind power device, wind speed, wind energy, Weibull distribution function, small-power vertical wind turbines.

Introduction. The population of the Earth is increasing from year to year, and the amount of electricity consumed by them is also increasing. To meet the ever-increasing energy consumption, extensive use of renewable energy sources in addition to existing fuels is the need of the hour. The source of energy of the world since 1970 and its trained until 2040 is shown in Fig. 1. It can be observed that oil, gas, and coal were the main source of energy for the last five decades and similar trend is projected for the coming decades.

CONTENTS