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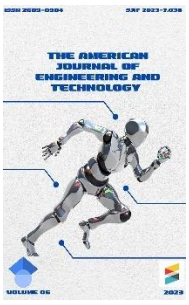

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Research Article

IMPROVING THE METHOD OF USING INNOVATIVE TECHNOLOGIES IN THE PREPARATION OF STATE CADASTRAL MAPS OF HIGHWAYS

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ABSTRACT

This article discusses the issues of displaying a special useful model "Georeferencing Roads" on satellite images by installing them on the roadsides, increasing the accuracy of geospatial linking of space photographs, vectorizing space photographs by transforming them in the geodatabase, and including information related to the state cadastre of highways in the attributive data table.

KEYWORDS

GNSS, cosmography, Georeferencing Roads, coordinate, geospatial mapping, ArcGIS, vehicle roads, geodatabase, attributive tables.

INTRODUCTION

The main tasks of the Committee for Roads of the Republic of Uzbekistan are to pursue a unified technical policy in the field of roads, in accordance with which it is necessary to determine the prospects for the development and improvement of the road network, the formation of international transit. corridors of roads, taking into account the interests of road users in the conditions of modern traffic flow, is to provide a comprehensive solution to the issues of financing, design, construction, repair and operation and the organization of effective work of the service department.

Analyzes. Field geodetic-topographical works are carried out in the preparation of state cadastral maps of highways, and they are being processed in software belonging to the family of geo-information systems. This method is considered reliable, but it has problems with increasing the volume of work. In this way, digitization is achieved by researching the objects of

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the state cadastre of highways with the help of an electronic tachymeter and a GNSS geodetic device. Works carried out in this way require an average of 2-3 hours for 1 km of highway. Based on this, it is necessary to carry out geodetic and topographical field research work for digitalization of 20-30 km of highways if 10 hours are worked in 1 day.

When conducting field research, topographical surveying is carried out using an electronic total station, and connection to the state coordinate system is carried out using GNSS. This, in turn, serves to increase the accuracy of topographic survey results.

Studies. Considerable work is being done on the digitization of the objects of the state cadastre of highways through the method of remote sensing. In this way, digitization of the state cadastre objects of highways by means of remote sensing with the help of space photographs provides an opportunity to create a geodatabase. In this regard, 3,993 km of international importance by the Highways Committee. Digitization of highways and filling of attributive data table have been carried out. It was found that a transformation error was made in the geospatial linking of space photos by downloading them in this way (Fig. 1).

Figure 1. The process of geospatial linking of cosmographs

We can see that a total of 33.48 meters of transformation error is allowed in the process of geospatial linking of cosmographs. This value is 27.15 meters on the "X" axis and 16.18 meters on the "Y" axis. In order to prevent these errors and increase the accuracy of remote sensing materials, the researcher developed a model called "GR" (GR-Georeferencing Roads) (Fig. 2).

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Figure 2. The "GR" model was created to increase the accuracy of the state cadastre of highways using remote sensing equipment.

The model named "GR" was painted in white and black colors for better visibility from a distance. The thin coating was painted in black, and a 20 cm thick white prizelet was painted in the form of a target (Fig. 3).

Figure 3. The design process for the GR model

The basis of this created model called "GR" is made of metal construction, covered with tunka material. Its radius is 1 meter. Height 40 centimeters. A 20-centimeter part of the model is inserted into the ground and fixed. Then the model stands 20 centimeters above the ground. The "GR" model was carved into the terrain of highways in a checkerboard pattern (Fig. 4).

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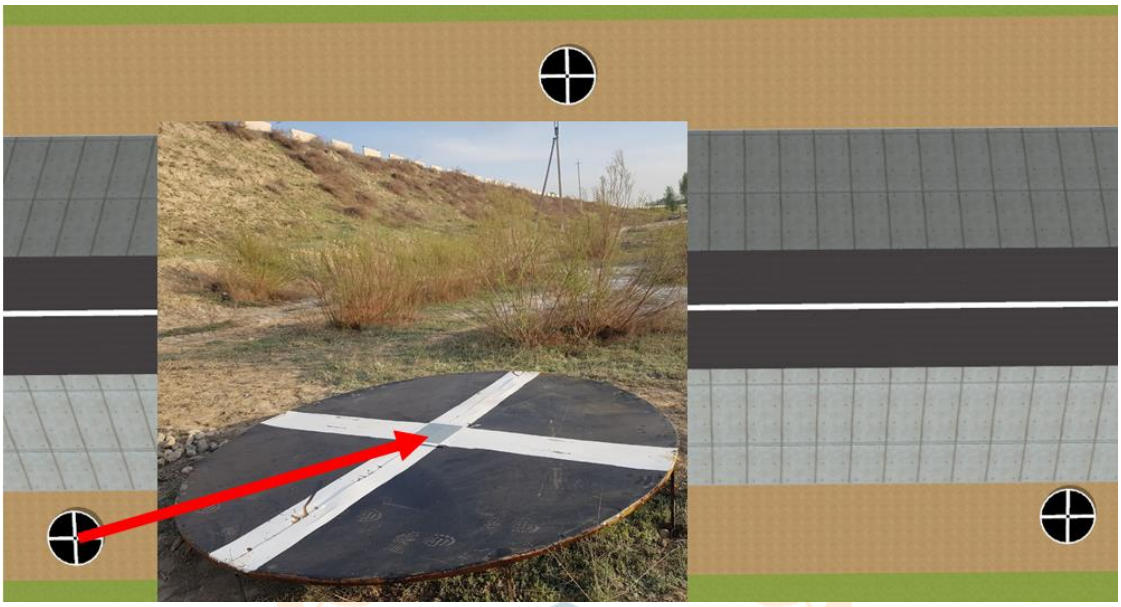

Figure 4. Schematic of placement of the "GR" model in the shamat method

This model named "GR" (hereafter model) was installed 6 units for the 45 km section of the 4R-113 state highway in the study area. The model fitting algorithm was implemented taking into account the curvature and length of the road. This algorithm was implemented based on the following formula.

$$FM = \frac{YL}{YE} = \frac{45}{8} = 5{,}62 \qquad (1)$$

Here, an FM-enabled model,

YL-the total length of the road,

YE- the number of curves in the road.

According to the value determined by the formula, at least 6 models are required to be installed in the study area. Therefore, 6 models were installed in the research area. In the process of installation, the models were installed in places where there are road curves and at the beginning and end of the road (Fig. 5).

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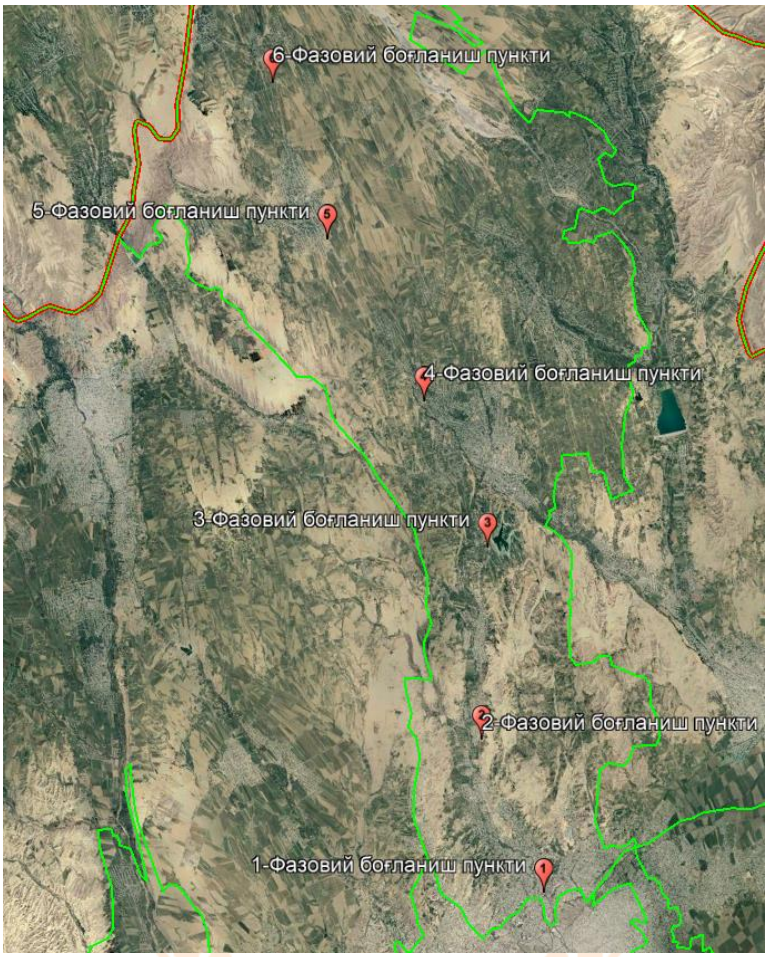

Figure 5. Scheme of installation of the model named "GR".

The geographic coordinates of the installed model named "GR" were determined using the GNSS geodetic device. Each identified coordinates were monitored for 20 minutes. The GNSS geodetic device was connected to an average of 32 satellites during monitoring.

The coordinate values obtained on the GNSS geodetic device were equalized by linking each installed model to the differential (permanent) geodetic grid.

Results. After leveling was completed in TBC, the values were exported to the *.shape format unit for transfer to ArcGIS. The exported values were downloaded into ArcGIS software and assigned conditional symbols. It is possible to know latitude and longitude coordinate values with the help of attributes of coordinate values formed in the vector form, and this information has been widely used. In the process of geospatial linking of space photos, based on the results obtained by the model called "GR" (GR-Georeferencing Roads), we can see that a 20 cm transformation error of space photos is allowed.

Therefore, in order to expand the scope of use, coordinate values of the models were created based on the WGS-84 system.

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It was studied whether the installed model named "GR" appears in space images. Models installed in March 2021 appeared in space photos in March 2022. Geospatial linking of models that are not visible in space photographs is carried out on the basis of coordinates, which serves to increase the accuracy of digital data on highways (Table 1).

Geovisualization of the installed model named "GR".

1- table

№	Name	Geovisualization
1	1-FB(MOST)	
2	2-FB(MAX)	
3	3-FB(SUV)	

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4	4-FB(COL)	
5	5-FB(TRANS)	
6	6-FB(POST)	

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A high (1:2000 scale) electronic digital map of highways was created as a result of downloaded space photo vectorization using 6 built-in models.

The scope of use of the space image has been expanded through the geospatial link transformation command based on the coordinates of the space image downloaded to the ArcGIS program. Then, based on the information received from the highway department, the attributive data table of highways was filled (Fig. 6).

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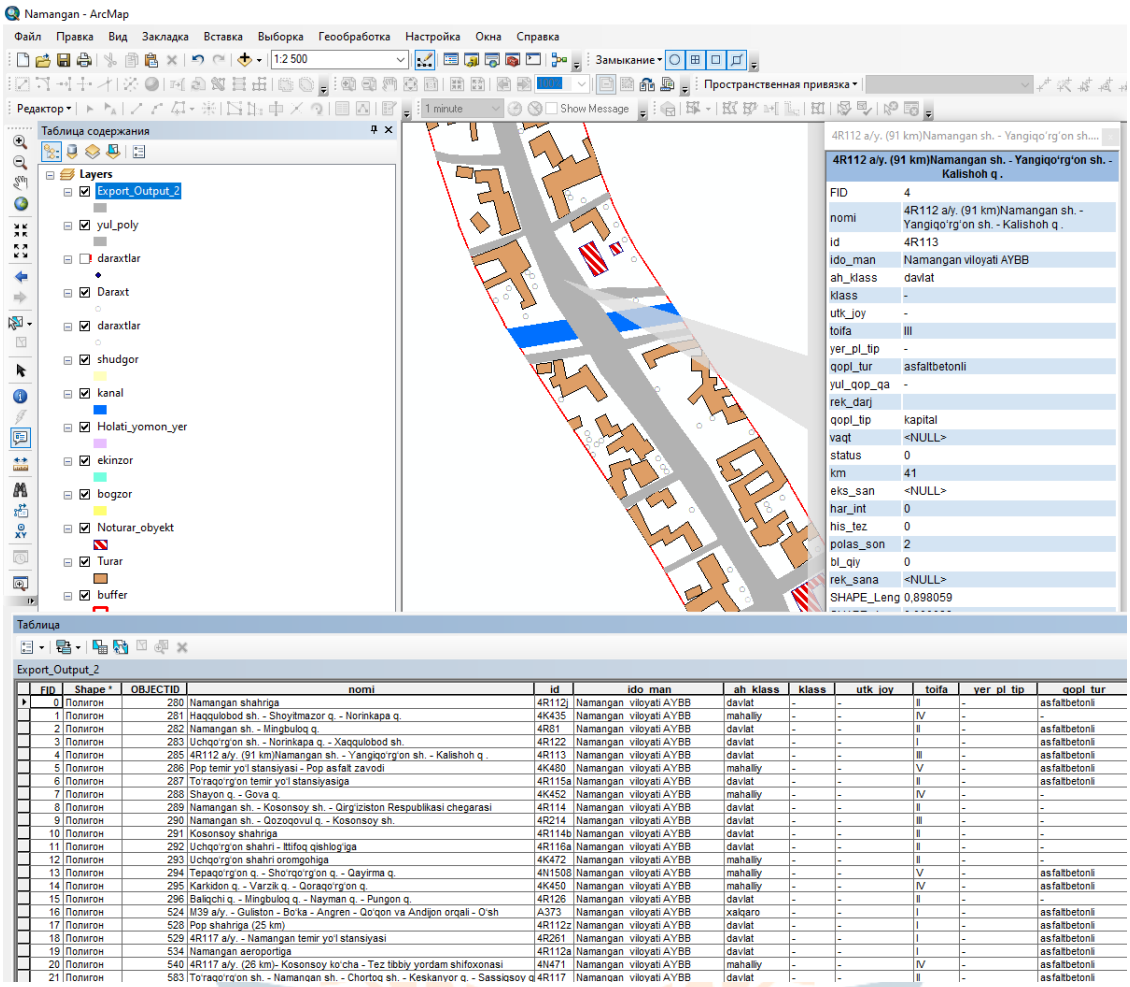

FID	Shape *	OBJECTID	nomi	id	ido_man	ah_klass	klass	utk_joy	toifa	yer_pl_tip	qopl_tur
0	Полигон	280	Namangan shahriga	4R112j	Namangan viloyati AYBB	davlat	-	-	II	-	asfaltbetonli
1	Полигон	281	Haqqulobod sh. - Shoyitmazor q. - Norinkapa q.	4K435	Namangan viloyati AYBB	mahalliy	-	-	IV	-	-
2	Полигон	282	Namangan sh. - Mingbuloq q.	4R81	Namangan viloyati AYBB	davlat	-	-	II	-	asfaltbetonli
3	Полигон	283	Uchqo'rg'on sh. - Norinkapa q. - Xaqqulobod sh.	4R122	Namangan viloyati AYBB	davlat	-	-	I	-	asfaltbetonli
4	Полигон	285	4R112 a/y. (91 km)Namangan sh. - Yangiqo'rg'on sh. - Kalishoh q .	4R113	Namangan viloyati AYBB	davlat	-	-	III	-	asfaltbetonli
5	Полигон	286	Pop temir yo'l stansiyasi - Pop asfalt zavodi	4K480	Namangan viloyati AYBB	mahalliy	-	-	V	-	asfaltbetonli
6	Полигон	287	To'raqo'rg'on temir yo'l stansiyasiga	4R115a	Namangan viloyati AYBB	davlat	-	-	II	-	asfaltbetonli
7	Полигон	288	Shayon q. - Gova q.	4K452	Namangan viloyati AYBB	mahalliy	-	-	IV	-	-
8	Полигон	289	Namangan sh. - Kosonsoy sh. - Qirg'iziston Respublikasi chegarasi	4R114	Namangan viloyati AYBB	davlat	-	-	II	-	-
9	Полигон	290	Namangan sh. - Qozoqovul q. - Kosonsoy sh.	4R214	Namangan viloyati AYBB	davlat	-	-	III	-	-
10	Полигон	291	Kosonsoy shahriga	4R114b	Namangan viloyati AYBB	davlat	-	-	II	-	-
11	Полигон	292	Uchqo'rg'on shahri - Ittifoq qishlog'iga	4R116a	Namangan viloyati AYBB	davlat	-	-	II	-	-
12	Полигон	293	Uchqo'rg'on shahri oromgohiga	4K472	Namangan viloyati AYBB	mahalliy	-	-	II	-	-
13	Полигон	294	Tepaqo'rg'on q. - Sho'rqo'rg'on q. - Qayirma q.	4N1508	Namangan viloyati AYBB	mahalliy	-	-	V	-	asfaltbetonli
14	Полигон	295	Karkidon q. - Varzik q. - Qoraqo'rg'on q.	4K450	Namangan viloyati AYBB	mahalliy	-	-	IV	-	asfaltbetonli
15	Полигон	296	Baliqchi q. - Mingbuloq q. - Nayman q. - Pungon q.	4R126	Namangan viloyati AYBB	davlat	-	-	II	-	-
16	Полигон	524	M39 a/y. - Guliston - Bo'ka - Angren - Qo'qon va Andijon orqali - O'sh	A373	Namangan viloyati AYBB	xalqaro	-	-	I	-	asfaltbetonli
17	Полигон	528	Pop shahriga (25 km)	4R112z	Namangan viloyati AYBB	davlat	-	-	I	-	asfaltbetonli
18	Полигон	529	4R117 a/y. - Namangan temir yo'l stansiyasi	4R261	Namangan viloyati AYBB	davlat	-	-	I	-	asfaltbetonli
19	Полигон	534	Namangan aeroportiga	4R112a	Namangan viloyati AYBB	davlat	-	-	I	-	asfaltbetonli
20	Полигон	540	4R117 a/y. (26 km)- Kosonsoy ko'cha - Tez tibbiy yordam shifoxonasi	4N471	Namangan viloyati AYBB	mahalliy	-	-	IV	-	asfaltbetonli
21	Полигон	583	To'raqo'rg'on sh. - Namangan sh. - Chortoq sh. - Keskanyor q. - Sassiqsoy q	4R117	Namangan viloyati AYBB	davlat	-	-	II	-	asfaltbetonli

Figure 6. Table of attributive data on highways and their geodatabase

With the help of the model "GR" created by the researcher, it serves to provide high-accuracy data using the state cadastre of highways and creating its map. The methods of making road maps were improved and introduced to the highway department of Namangan region.

CONCLUSIONS

Based on the request of the Highways Committee to create a geodatabase in order to maintain cadastral data in a systematic manner, recommendations were developed for the creation of a geodatabase of the state cadastre of existing highways. A geodatabase was formed using GAT software (ArcGIS) and a method of creating and forming a geodatabase using ArcGIS software was developed.

A 1:10,000 scale road map of Namangan region was created based on the geodatabase. A table for simplifying the formation, identification and attributes of AYDK with special abbreviations was developed. In these works, a method of forming the geodatabase and sub-layers based on the requirements of the Regulation was developed, according to which the

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geodatabase was formed using special terms and an identification system.

In the process of geospatial linking of space photos, a total of 6 models named "GR" (GR-Georeferencing Roads) were created with a transformation error of 20 cm and installed in the protection zones of the 4R-113 state highway in Namangan region.

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