Retraction

Retraction: Improvement of hydraulic accounting of water resources in irrigation systems using geoinformation systems (IOP Conf. Ser.: Mater. Sci. Eng. 1030 012117)

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[1] Shamshodbek B Akmalov 2018 Improvement of Hydraulic Calculation of Water Recourses in Irrigation Systems with Using GIS Thesis 2018 Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (http://library.ziyonet.uz/static/lib/reader-pdf/web/viewer.html?file=http://library.ziyonet.uz/uploads/books/251467/5b430b514db6a.pdf)

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Improvement of hydraulic accounting of water resources in irrigation systems using geoinformation systems

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Abstract. The work presented in the article directly determines the role of geoinformation systems in irrigation and land reclamation based on today's requirements. At the same time, the results of analysis and evaluation of existing experimental and theoretical researches lead to the conclusion that modern mechanisms of accounting of water distribution in irrigation systems based on the analysis programs for high resolution of satellite images are not developed from theoretical and practical points of view to GIS to the object. Therefore, studies on the use of DIO in water accounting are rare. Many studies in this area are devoted to land use and classification.

1. Introduction

Many studies and maps are limited to the creation of linear schemes using GPS (Global Position System) irrigation systems because of their small size.

Based on the foregoing, conclusions have been drawn on the use of geographic information technologies based on images from an artificial satellite for metering and control of water in irrigation systems [1]. In its initial part, the data obtained and used in the research of the research object in the Syrdarya region and the assessment of their values are analyzed. Accordingly, the following groups of data were collected for analysis: administrative, field, experimental, and data from an artificial satellite.

In the following parts, these materials were analyzed in the eCognition Developer program, based on a geographic feature (GEOBIA) and using ArcGIS program for mapping results, initial data processing and database creation.

The analysis process was carried out in 3 stages: analysis of medium-resolution images, high-resolution images, strongly-high-resolution images, for which statistical analysis and analysis algorithms were compiled. These are the following steps: image analysis [3]. MODIS, analysis of historical Landsat images, analysis of WorldView2 satellite images.

In accordance with this, analytical algorithms were compiled in the above order (Fig. 1).
Figure 1. Landsat Image Classification Algorithm[3].
Information DIO in the form of images to obtain the necessary information needed to be converted into digital form. Currently, two analysis methods are used. The first one is based on pixels; the second is an object-oriented method. Irrigation systems are small objects, so highly resolution images are required for analysis. The research used the object-oriented method and GEOBIA programs. Based on this program, the images are analyzed by the segmentation and classification stage. Comparison of field data with GIS data was evaluated. According to the analysis, the correlation coefficient was 0.95.

Based on MODIS images, analysis of meteorological and hydrological data, and analysis of the assessment of plant water requirements, the following conclusions are drawn: the development of plants in the Syrdarya region is strongly associated with air temperature and changes in the water flow of the Syrdarya river. Water scarcity during the growing season leads to the death of plants on agricultural lands in the central regions. Water consumption in the river decreases every year, which is confirmed by the analysis of literature and data obtained from the main department of Hydrometeorology of Uzbekistan.

The analysis showed that the eCognition Developer 9 program is the most efficient MODIS image segmentation program because, through this program, 154 images are segmented in 10 minutes, this minimum takes up to several hours in the Erdas program [4].

In conclusion, based on the studies, a diagram of plant development types has been developed for the Syrdarya region, which makes it possible to take into account the area by plant species and the correct choice of water supply rates.

The results of segmentation and classification of images 1972-2014. Landsat’s historical satellites showed that the region’s lands were intensively developed for agriculture and population housing until 2000. As a result, one can see that the areas of irrigation systems were expanding, this, in turn, led to an increase in water demand and an increase in water consumption in the region. The development of desert lands for agricultural land led to large losses of water during irrigation, because the desert soil is unsuitable for irrigation, and the climate is dry and hot, these desert areas are marked in red on the map (Fig. 3).

Using the analysis, a model for the development of different systems and increasing water demand has been created. To this change, an action was developed for the conformity of water accounting and its distribution [5].

Using segmentation and classification of images of the WorldView2 satellite, the technical and operational status of water systems and objects is determined. For several years, data change has been evaluated.
Figure 2. Classification Results Map.

Figure 3. The results of the remote study of the operational status of the channel K-3-5 (PK116).
According to the results of the analyzes, it was found that a decrease in the efficiency of systems and a
change in design decisions led to a decrease in channel capacity (Fig. 4).

The analysis revealed that the design depth of the channel K-3-5 (PC-116) at 0.75 m it is filled
with silty sediments, which led to a decrease in the canal throughput by 28% (Fig. 5.). At the same
time, its throughput and hydraulic parameters changed (Table 1.).

This situation was also observed in the reservoirs. Siltation of the design depth of the GPC
collector (PK-130) was revealed by an average of 0.9 m. In the central parts of the course, the
presence of algae was revealed, which led to a decrease in reservoir capacity by 32% (Fig. 6.).

Table 1. Calculation of the water throughput of the channel K-3-5 (PK-116) YangiabadWUA.

| №  | Hydraulic parameters          | Designvalues | The values determined in the experiments (at silting) |
|----|-----------------------------|--------------|----------------------------------------------------|
| 1  | Channel width along the bottom (b, m) | 3            | 5,25                                               |
| 2  | Depth of water in the channel (h, m) | 3            | 2,25                                               |
| 3  | Difference in depth (h’, m)      |              | 0,75                                               |
| 4  | Slope ratio (m)                | 1,5          | 1,5                                                |
| 5  | Bottom roughness (n)           | 0,02         | 0,02                                               |
| 6  | Slope (i)                      | 0,0001       | 0,0001                                             |
| 7  | Cross-sectional area (ω, m²)    | 22,5         | 19,41                                              |
| 8  | Humidification perimeter (χ, m) | 13,82        | 13,36                                              |
| 9  | Hydraulic radius (R, m)         | 1,63         | 1,45                                               |
| 10 | Shezy coefficient (C)           | 54,23        | 53,21                                              |
| 11 | Throughput (Q, m³ / s)          | 15,57        | 12,44                                              |

Figure 4. The results of a remote study of the operational status of the collector of the gas processing
plant (PK-130).
Figure 5. Results of a remote study of the operational status of the VS-13 collector (PK-116).

During field verification of the results obtained using this model, the accuracy of the obtained data was confirmed. Based on the above calculations, a model was created and recommendations for remote monitoring of channel parameters were developed.

2. Conclusions
1. The possibility of estimating water consumption in irrigation systems using the eCognition and ArcMap programs has been substantiated. As a result, an innovative approach to hydraulic calculations of water resources in irrigation systems was achieved. This made it possible to introduce new technologies in the field of water resources management.
2. On the object of research, methods and algorithms for image processing WorldView-2, Landsat, MODIS collected in GIS, a database is compiled, maps are created. This database can serve as an important material for remote management of water resources calculations. As a result, it became possible to create a system for water management.
3. Based on GIS and eCognition Developer software, new programs and methods for implementing water accounting based on the data of the artificial Earth satellite have been developed. Analysis of images based on the object has a higher accuracy compared to other methods. As a result, it became possible to increase the correlation coefficient according to statistical data to 0.95.
4. Based on Landsat images, a model for changing the costs of irrigation systems was developed and a forecast was made of the prospective use of water until 2025. As a result, under the conditions of climate change, this model makes it possible to foresee the necessary measures for adaptation to climate change.
5. Methods and algorithms for calculating the hydraulic parameters of irrigation systems using GIS-based WorldView2 and Landsat images have been developed. As a result, it became possible to develop effective measures for remote operational analysis of irrigation systems and water accounting.
6. A database and a map of data have been developed for analyzing an accurate estimate of the throughput and flow rate of water of irrigation systems, the water demand of agricultural plants using...
MODIS images. As a result, the possibility of accurate remote assessment of water flow in irrigation systems has been increased.

7. Based on the studies, it became possible to record water in irrigation systems based on innovative technologies. The application in practice of programs based on GIS technology and technology will become a new direction in the efficient and accurate implementation of the distribution of water resources and the effective monitoring of water resource savings. As a result, it became possible to achieve water saving.

8. Some research results are presented for implementation in WUAs and farms of the Syrdarya region, which makes it possible to increase the annual economic efficiency of the proposed recommendation

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