

Image recognition of water pollution based on MATLAB

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Abstract

China's water consumption ranks first in the world, a large part of which is used for irrigation. The seriousness of environmental protection of irrigation water body is not to be mentioned, and the protection of water environment is a major matter of human survival. With the social progress of our country, solving the problems of water environment has become a top priority. This paper proposes a method for water environment monitoring in China, which is to use uav to detect water quality. This method can not only save manpower and material resources, but also have high recognition and many advantages, such as: saving time, not affected by clouds, clear resolution and so on. It is hoped that this new method can play a certain role in water environment management and utilization in China.

Keywords

Water pollution; Water detection; MATLAB; Digital image.

1. Research background and existing problems

1.1. Research Background

The total amount of water resources in China is abundant, but the distribution of water resources in China is characterized by extremely uneven distribution, large temporal and spatial differences and so on. Therefore, the protection of water resources is a very important issue, it can be said that it is related to the survival of every Chinese, and the economic development of water conservancy projects is related to the national economic lifeline. But it is not very ideal, the status of the water resources in our country since reform and opening in our country, the level of national industrialization in constant improve, but at the same time of ascension also caused great damage to the environment, especially in on the aquatic environment has produced many problems, such as: water pollution, algae outbreak of the heavy metal content, water quality standard and so on. According to the investigation by the Ministry of Water Resources, some polluted rivers cannot be used for agricultural irrigation, and some polluted rivers lose their use value. The river basins located in the first and second tier cities are more seriously polluted, resulting in water pollution caused by the increase of household garbage with the advancement of economic society, and environmental pollution is becoming increasingly serious ^[1].

1.2. Solution

In the 1970 s, there is a work idea attracted everybody's attention, through the machine to test the process of crop growth, at the same time, application of image processing technology to understand their specific dynamic, compared with the language, the processing of the image processing is more difficult, because in the process need to image enhancement, image, first of all, The detailed part is further refined, followed by image segmentation. The part we need is taken out separately and a series of operations are carried out to complete image processing ^[2]. DeepLearning (DL) refers to allowing machines to identify, classify, and so on, by feeding

them genetic algorithms and then doing a lot of sample comparisons. So this kind of deep learning applied to water quality monitoring in the process of using unmanned aerial vehicle (uav) a water test can not only save manpower material resources, and high degree of recognition, and now the depth study for water quality detection, and match the unmanned aerial vehicle (uav) technology is one of the more popular means of information collection, this method has high aging, high space-time resolution, low flying under the cloud, the advantages of the high mobility, It can play an important auxiliary role in realizing continuous online water quality monitoring [3].

2. Research status at home and abroad

ShareefMA et al. proposed a method to integrate Landsat8OLI thermal infrared image and TerrasAR-X radar image data to evaluate water conductivity, salinity, temperature and other parameters, which was successfully applied to Tigris River in Baghdad city (the capital of Iraq). In 2014, RostomNG et al. used hyperspectral remote sensing data and laboratory data to rapidly evaluate and analyze the water quality parameters of Mariut Lake, including temperature, pH value, turbidity, dissolved oxygen, chlorophyll concentration and crude oil pollution. In the paper, the BP neural network based on LM algorithm is used to put forward the air quality prediction model, and the high precision prediction results of urban air quality are obtained. The BP neural network time series prediction model of precipitation established by Liu Li et al. is based on the research of MATLAB dynamic neural network in environmental pollution event prediction, and has been applied in Suqian city. Based on the data of Greek cities, KaratzasKD proposed the relationship between ozone air pollution model and atmospheric parameters using BP neural network. AKOL company has established a huge agricultural database including working habits and methods of farmers in different regions, comprehensively analyzed soil conditions, temperature and humidity data and pest index in the region, and combined with local farmers' working habits, helped farmers develop more sophisticated planting schemes.

3. Research Methods

3.1. Traditional monitoring

The traditional way of monitoring is to use human vision for artificial identification of river water quality (color, smell, whether there are floating objects, whether there are piles of garbage on the shore, etc.). However, even manual identification has many disadvantages, such as limitations, no persistence and so on, which will greatly reduce the efficiency of identification and can not be accurately prevented. In addition, some places where rivers exist have inconvenient transportation, so the problems of rivers cannot be discovered at the first time. They can only be discovered when the problems occur or break out. This tends to delay the optimal control time [9].

3.2. Uav remote sensing monitoring

By comparing UAV remote sensing with traditional space remote sensing based on satellite platform, it is not difficult to conclude that UAV remote sensing has the following advantages: 1. Uav remote sensing is not affected by clouds; 2. The precision of UAV remote sensing technology is high enough, even reaching the centimeter level; 3. Uav itself integrates flexibility, low consumption, low cost and time saving [10]. In addition. The UAV remote sensing platform can also be equipped with different sensor devices to meet more application requirements. At present, uav remote sensing is widely used, such as agricultural growth state monitoring, forest fire monitoring, post-disaster search and rescue, urban garden layout planning and so on. Unmanned aerial vehicle (uav) composed of nozzle, motor, storage, bluetooth receiver,

camera, processor and so on, works by unmanned aerial vehicle (uav) via long distance wireless connection technology to connect to the staff of smart phones, smart tablet or laptop, the staff of unmanned aerial vehicle (uav) ordered through smart devices, and can be real-time monitoring of water quality.

4. Research Principles

The identification and prediction of water quality problems mainly include surface garbage image identification, water color identification, shore garbage stacking and algae outbreak prediction, etc. The results of the study are of great significance to solve the problems of water quality research. Digital image processing refers to the process of digital processing of the image collected by computer. Its purpose is to improve the visual effect of the image and reduce the unnecessary interference of subsequent feature extraction. The main research content of digital image processing includes image digitization, image enhancement, image restoration and image target segmentation. After the above series of preprocessing, feature extraction of the image target is started, and finally the designated target recognition is carried out [4].

When uav shoots, it may encounter various problems, such as the influence of air flow, visibility and weather, etc., so there may be problems in the pictures taken by UAV. Therefore, we need to carry out image processing to reduce the bad results caused by these influences and avoid errors. Have different solutions for different problems, such as when the picture is not clear, have a foldover, we usually way is to use image restoration technology, through a time iterative processing by, in addition to the picture is not clear, the received image usually exist different levels of noise, such as gaussian noise, salt and pepper noise, etc. The influence of noise will be carried through the whole process of image processing [5]. The way we carry out noise reduction is: mainly through a variety of filters for noise reduction, such as mean filter, maximum filter and median filter.

5. Image processing

Image preprocessing is a process to enhance the visual quality of the image because the image acquisition may not be ideal. In this process, image edge enhancement, noise filtering, sharpening and other techniques are used to make the enhanced image more suitable for specific applications than the original image. The input colors for image processing are the three primary colors, namely red, green and blue. Due to their grayscale range from 0 to 255, the input grayscale image only contains a color channel information, so RGB can not be used to load the application. Therefore, RGB is converted to grayscale images using the following color conversion formula.

$$F(x) = 0.2989 * R + 0.5870 * G + 0.1140 * B \quad (1)$$

Where, $F(x)$ represents the gray value of the image, 0.2989, 0.5870 and 0.1140 represent the weights corresponding to R component, G component and B component of pixel point respectively.

5.1. Image acquisition

The first stage of any visual system is the stage of image acquisition. After the computer obtains the image, various processing methods can be applied to the image to perform the required different visual tasks. If satisfactory images are not obtained, the desired task may not be accomplished, even with the help of some form of image enhancement technology. The images captured in this study were in RGB form (red, green and blue). For the convenience of the study, the images were converted from one color space to another. MATLAB contains all the tools required for image processing, which cover all color space conversion [6].

5.2. Noise reduction

Image denoising is a technical term in image processing. Its meaning is to reduce or reduce the impact of noise on the image process, sometimes also known as image denoising. Gaussian noise and salt and pepper noise are denoised by MATLAB, usually using mean filter, maximum filter and median filter.

5.3. Image Segmentation

MATLAB algorithm for image segmentation and feature area extraction, image segmentation and its components (processing object), can be divided into the need to be processed part and do not need to be processed part. This study includes: edge detection, thresholding, boundary extraction, region growth, segmentation and merger [11].

5.4. Feature extraction and numerical calculation

After the region we are interested in is obtained through image segmentation, image feature extraction is carried out, image counting is carried out, and a relatively compact feature vector is used to represent the color, texture, entropy and mean deviation of the segmented image part by dimensionality reduction. Input the parameters into the MATLAB program. After feature extraction is completed, the obtained values are compared with the normal water quality, and the differences between the obtained values are compared to classify the problems.

6. The conclusion

In this study, by using MATLAB image processing technology to monitor the image of water quality with problems, problems can be found in the latent period or preliminary stage of water quality problems in time, and drone monitoring is adopted to monitor, so as to achieve the purpose of water quality protection. The process of image processing is based on MATLAB algorithm, including image acquisition, image preprocessing, image segmentation, feature extraction and numerical calculation.

In a word, with the continuous development of the national economy and the continuous improvement of people's living standards, the contradiction between economic construction and water pollution is also becoming increasingly serious. We should have a clear understanding of this and resolutely not to develop the economy at the expense of the environment. As the local government, in the process of water pollution control, it should uphold various measures, take diversified measures, carry out comprehensive treatment activities, ensure the development of economy and ecology, resolutely do a good job in various water pollution control measures, and commit itself to the construction of a harmonious society [8].

References

- [1] Wang Guangyan, Yao Jian, Li Dengfu. Surveying, mapping and spatial geographic information technology, 2016,39 (5) : 113 -- 115.
- [2] WANG W. Research on application of low-altitude UAV remote sensing in water conservancy project mapping [J]. China High-tech, 2019 (8) : 99-101.
- [3] Zhong Cheng, Shen Tao, Zhang Jingyi, Ma Qianli. Research on crop diseases and insect pests based on deep learning aerial image recognition [J]. Artificial Intelligence Recognition and Technology, 2020 (3) : 104-105, 108.
- [4] WANG Y M. Application research of low-altitude UAV remote sensing in water conservancy project mapping [J]. Jiangxi Building Materials, 2018 (11) : 89 -- 90.
- [5] Tian Yuhan, Yang Sen, Jia Xuzhen. Science & technology economic guide, 2018,26 (6) : 28.]

- [6] Liu Hui, WEI Li. Research on Spray Robot and Insect Pest Identification Based on MATLAB [J]. Journal of Anhui Radio and TV University,2020, 4 :92-96.
- [7] WANG S S. Selection of feature vector of fresh peach pest detection based on hyperspectral imaging [J]. Journal of xinyang agriculture and forestry college, 2015,25(4) : 119-123.
- [8] Huang Linsheng, ZHANG Qing, Zhang Dongyan et al. Infrared and laser engineering, 2018,47 (5) : 219 -- 226. (in Chinese)
- [9] WANG J D. RaspberryPi introduction and robot Actual Combat [M]. Beijing: Peking University Press,2018:17-18
- [10] HODGE J, LONGSTAFF B, STEVEN A, et al. Rapid underway profiling of water quality in Queens- land estuaries[J]. Marine Pollution Bulletin,2005,51 (1 /2 /3 / 4) : 113-118.
- [11] KAREN A, KEVIN J G. Lightweight unmanned aerial vehicles will revolutionize spatial ecology [J]. Frontiers in Ecology and the Environment,2013,11(3) : 138-146.