Hindawi
Advances in Multimedia
Volume 2022, Article ID 9917770, 12 pages
https://doi.org/10.1155/2022/9917770

Research Article

Method and System for Detecting and Recognizing Floating Garbage Moving Targets on Water Surface with Big Data Based on Blockchain Technology

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Received 18 January 2022; Revised 26 February 2022; Accepted 30 March 2022; Published 12 April 2022

Academic Editor: Qiangyi Li

At present, the methods for cleaning up floating objects in small water areas such as campus artificial lakes and community sightseeing artificial lakes are mainly to use traditional tools such as hand-held nets to remove them. There are disadvantages such as unclean cleaning, long time-consuming, low efficiency, and high labor intensity. The habit and tradition of allowing the ocean to accept human waste have made almost all sea areas on the planet now full of garbage, from the poles to the equator, from coastal bays to submarine riverbeds. The accumulation of marine litter, especially plastic litter, is considered to be an urgent global environmental problem along with many important issues of our time. In this paper, three typical working environments with good vision, more reflections in the water, and strong light interference are performed to identify floating objects. Each working environment has 100 images to be tested, a total of 300 images, and read the next image after processing one image. The detection rates under the three working environments were 93%, 96%, and 74%, and the average detection rate was 84.3%.

1. Introduction

Environmental issues have never needed to be addressed as they are today. Since the mid-20th century, environmental problems have gradually evolved into a global problem. One of the most important sources of marine pollution is litter, which demonstrates the destructive impact on the marine environment caused by inappropriate human activities and economic production methods. Although the international community has been working hard to develop effective marine pollution control mechanisms in the past two decades, such as market, social management, administrative orders, and other means. However, the problem of marine litter pollution has not improved, and it is still getting worse.

Manual driving can overcome the shortcomings of manpower salvage, but the technology is not perfect, and there are still some unsolved problems. And different from large waters are small waters such as ecological landscape waters and artificial breeding waters, which have their unique distribution characteristics, usually shallow depth, small area, and not concentrated. For the needs of beautiful design, some landscape waters are specially planned into irregular shapes. In these small waters, it is difficult for large automated cleaning ships to move and steer flexibly, reducing work efficiency. Therefore, in view of the characteristics of small waters, it will become very important to study surface garbage cleaning technology. Marine environmental pollution is a global problem, and it is the main object of international environmental law regulation in recent years. One of the most important sources of marine pollution is litter, which demonstrates the destructive impact on the marine environment caused by inappropriate human activities and economic production methods.

Regarding the field of target detection, related scientists have done a lot of research. Hu et al. discussed important issues related to the balance between the quality of target monitoring and the lifespan of network sensors and introduced two target monitoring programs. One solution is to use the Objective Recognition Frequency K (TDSFK) which defines real-time detection as a small fraction of total

detection time. This means that it increases from 1 to *K*. Another solution is the Adjustable Frequency Detection Target (TDASF), which adjusts the frequency of these nodes with the residual energy. The simulation results show that the TDASF system can increase the network life by more than 17.4% and reduce the loading delay by less than 101.6% [1]. Li et al. highlighted the latest developments in PCI multimedia (also known as PCI hybrids), which provide possible solutions to these problems. In particular, target detection can be developed by creating multiple BCI models that use multiple brain types, multicellular signals, or different stimuli. It is also possible to achieve a number of changes by creating multiple modification signatures from different brain types or connection types. Here, we identify different types of BCI presentation systems by analyzing samples, cognitive methods, control, and test scores. To emphasize their importance, Li et al. cite a number of previous IMC procedures, including follow-up/detection (DOC) of patients with cognitive impairments [2]. Li et al. proposed a ship detection and recognition method based on a multilevel hybrid network and designed a noise reduction and smooth image enhancement algorithm based on a multilevel two-dimensional template filter and a three-layer pyramid structure. This work constructs an adaptive segmentation detection and ultralightweight object classification network model that combines global and local image grayscale statistics. Combining traditional image processing and deep learning methods, the demand for computing and storage resources is greatly reduced. The method can quickly detect and identify ship targets near sea level and has been verified by real flying camera data, with an accuracy rate of over 90%. Compared with the TinyYOLOV3 network, the accuracy is reduced by 5%, but the computational efficiency is increased by 50 times and the parameters are reduced by 550 times [3]. Yang and Shi developed a new visual recognition algorithm that predicts a unique amount of knowledge and the developed algorithm maintains the popularity of the television space or the level of identification resources. At the same time, constraints are used to control the pressure on the target spectral material. The last identification method was the amplification method used to test two false images and two hyperspectral real images. The test results show that the proposed algorithm is superior to other algorithms in the test data set. Even if the target is only one pixel, a planned algorithm can yield good results. Because in this case, the backbone is always smooth, but at the same time, the algorithm allows you to get sharp edges in the manufacturing industry [4]. Goudail et al. studied the properties of the objective definition of static milliliter thermal imaging, which provides stable light and analyzes the state of polarization. In the highest way, the best tetrahedron of the Poincaré sphere can be found with the best side images, and in this case, the difference between the lens and the background is simple. Then, using the common lower limit of channel contrast to fully adapt to the best image channel, the page aspect ratio is limited and always 1/9 large. In practice, This is important because it is easier to create and use images. The results show that the final difference does not require improvement [5]. Borisova et al. consider the problem of automatic target tracking in a complex natural background. By comparing with the elements of the reference image, target detection is performed in each frame of the video sequence. The method he proposed is based on representing each pixel in the direction of the nearby brightness gradient. The neighboring areas are divided into several categories according to their directions. In addition to the category of anisotropic neighborhoods, a neighborhood category with an isotropic structure is also introduced. He numbered the categories and used the numbers of nearby categories as features of points of interest, referring to the special rules of image coverage, the so-called dynamic proximity metric, to achieve stable tracking. The test results show that compared with the use of normalized correlation, the method of object tracking is more stable [6]. Objective detection is to identify ten specific targets based on specific radiological characteristics, which can be classified as binary classification in principle. Random forest is effectively used to classify HSI data. Dong et al. designed an effective matrix learning tool based on the random forest learning matrix (RFML) and semirandom forest table of the random forest and cinnamon algorithm to better distinguish the target task from the required task. Experimental results show that the proposed method is superior to the most advanced object recognition algorithms and other classic blackboard methods [7]. These methods have provided some references for our research, but due to the short time and small sample size of the relevant research, the research has not been recognized by the public.

The innovation of this article is the introduction of blockchain technology and big data, using the frame difference method to obtain a series of video frames, then using the AND function to compare the different results between two adjacent frames and process the two adjacent frames, and using the difference that can be effectively obtained by moving objects.

2. Methods for Detection and Recognition of Floating Garbage Moving Targets on Water Surface Big Data

2.1. Blockchain Technology. Blockchain traceability includes the following components: One is the identity authentication certificate. Fabric-ca is the default certificate management component. The CA issues a root certificate for each member, a registration certificate for each authorized user, and a large number of transaction certificates for each registration certificate to confirm identity and transaction signature. The second is to establish various types of nodes in the P2P network, including ordering nodes and related participant nodes, to actually operate the blockchain [8]. Third, the SDK (client) represents the end user entity. It must connect to a peer node in order to interact with the blockchain. The client can choose to connect to any peer node. The client creates and invokes transactions. Figure 1 shows the deployment architecture diagram of the blockchain traceability system.

There are 3 types of blockchains: public chains, personal chains, and consortium chains [9]. (1) Public chain: A chain

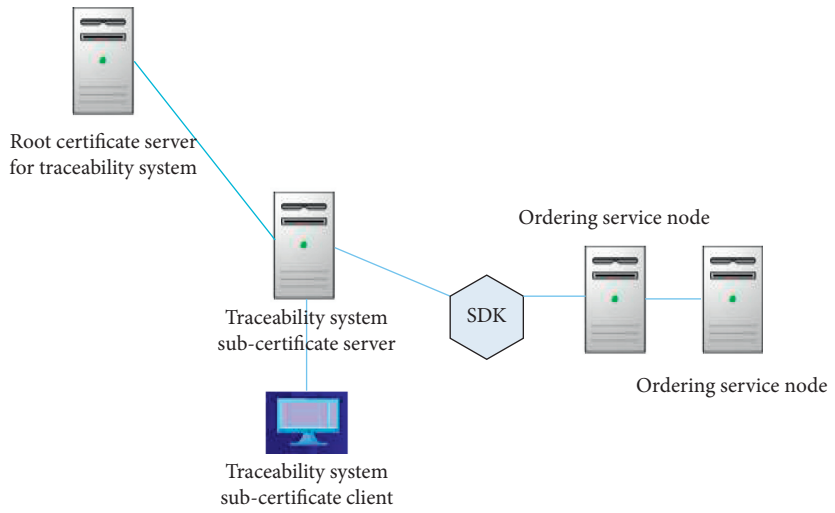

Figure 1: Blockchain traceability system deployment architecture diagram.

in which each node is free to participate in the acceptance process. It is a truly decentralized and decentralized architecture that ensures network security with full openness and encryption. (2) Personal chain: a discipline that must be approved by the organizer in order to participate. Access to data may be limited. It has a decentralized structure, but it has a central function. (3) Alliance chain: Depending on the specific characteristics of the node, the node can join and trade. The reinforcement process is controlled by the default nodes. It is a decentralized and centralized organization cosponsored by participants [10]. Table 1 shows the comparison of the above three types of blockchains.

A blockchain kernel is a decentralized distributed database based on a consensus mechanism consisting of blockchain blocks. Blockchain application that allows each node in the blockchain network to build trust relationships in an insecure network environment and store blocks in the P2P network at different times. The principle of operation of the blockchain includes the following three points:

(1) The node receiving the transaction confirms that the transaction fits, adds a timestamp, and saves it to a local block.

(2) Each node must account for the legal constraints of the will order, and the execution of the limitation usually involves the calculation of complex mathematical problems. The first block counter node may be preferred (for example, Bitcoin, Ethereum). Once the valid control is implemented, the node sends a computer block to the network.

(3) After the block is accepted, some nodes check whether it is valid. If the test is correct, place the block in the network chain, and all the nodes will start the next blocking step [11, 12].

Blockchain uses cryptography technology to ensure the security of transaction data and customer privacy. This is a necessary condition for blockchain to get everyone's attention and develop rapidly. There are many kinds of cryptographic techniques used in blockchain, such as Merkle hash tree, digital signature, ECC elliptic curve encryption, and so on. In essence, cryptography is a technology that transforms the original plaintext information into another incomprehensible ciphertext information through certain measures, and then restores the original plaintext information after decryption processing. The process is shown in Figure 2.

According to whether the keys $K1$ and $K2$ are the same, cryptography is divided into symmetric and asymmetric encryption algorithms. When $K1 \neq K2$, it is an asymmetric encryption algorithm. ECC encryption, hashing, and other algorithms are widely used to lock data in the blockchain and mathematical problems are used to increase the risk of attack and prevent data theft altogether.

The ECC Elliptic Curve Equation is a figure, a flat line, commonly referred to as the letter Q.

$$y^2 + \alpha_1 xy + \alpha_3 y = x^3 + \alpha_2 x^2 + \alpha_4 x + \alpha_6,$$

$$Y = \sum_{j=1}^{N} X_j = d - d_1, \tag{1}$$

$$Q\{Y = d_2 | Y_1 = d_1\} = M_{N-d_1}^{d_2} \left(\frac{1}{m}\right)^{d_2} \left(\frac{m-1}{m}\right)^{N-d_1-d_2}.$$

The encryption process of the elliptic curve uses a special equation, which is a curve defined on the finite field Ep. $\alpha, m, x, y \in Ep$ and $\alpha < p$, $m < p$.

$$y^2 = x^3 + \alpha x + m \,(\mathrm{mod}\, p),$$

$$4\alpha^3 + 27m^2 \,(\mathrm{mod}\, p) \neq 0,$$

$$Y_1 = \sum_{j=1}^{N} P_j = d_1, \tag{2}$$

$$Y_1 \sim B\left(N, \frac{1}{m}\right).$$

p-prime number, α, m-non-negative integer

Table 1: Comparison of the characteristics of the three forms of blockchain.

Comparison item	Public chain	Private chain	Alliance chain
Degree of centralization	Decentralized	Centralization	Polycentric
Participant	Everyone	Central controller designated member	Preset members with specified characteristics
Bookkeeper	All participants	Customize	Negotiated
Trust mechanism	Proof of work	Self-endorsement	Consensus mechanism
Advantage	Easy application deployment, any user can access, the application is easy to deploy	Low network energy consumption, the rules are easy to modify, the transaction volume and transaction speed are unlimited	Easy to set control authority, has a very high scalability
Insufficient	Most restricted transactions	Limited access node, can't solve the trust problem	Does not fully solve the trust problem

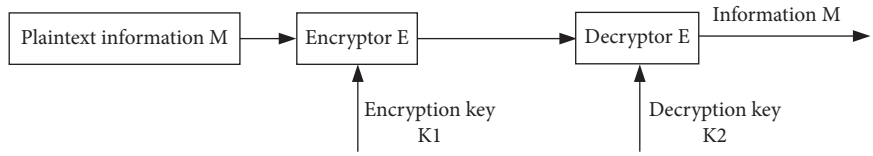

Figure 2: Cryptography encryption and decryption process.

Define set $S = \{n_1, n_2, n_{31}, \ldots n_{N-1}, n_N,\}$, where each element n_i in the set is a random variable. For any element n_j in set S, $0 < j \le N$ of them. Because each element satisfies a uniform distribution, then,

$$\begin{aligned} Q\{n_j = i\} &= \frac{1}{\omega}, 0 \le i \le \omega - 1, \\ Q\{n_j \ne i\} &= 1 - \frac{1}{\omega}, 0 \le i \le \omega - 1, \\ P(X_i|C) &= \frac{P(X_i|C)}{P(C)} \\ &= \frac{P(X_i)P(C|X_i)}{\sum_{i=1}^{n} P(X_i|C)P(C)}, \end{aligned} \tag{3}$$

It can be assumed that

$$\begin{aligned} P_j &= \left\{ \begin{array}{l} 1, n_j = i \\ 0, n_j \ne i \end{array} \right\}, 1 \le j \le N, \\ P(x_1, x_2, \ldots x_n|c_j) &= \prod_{i=1}^{n} P(x_i|c_j). \end{aligned} \tag{4}$$

The core capabilities of blockchain technology: (1) The ability to store data: The data in the block is continuously accumulated and stored (for example, the Fabric platform has its own level database). With the accumulation of time, the size of the blockchain continues to increase. It is possible to store a large amount of the same data among multiple subjects at the same time; (2) The ability to share data: each subject participating in the blockchain automatically reaches a consensus through the agreed decision-making mechanism and can share the same trusted data ledger. (3) Ability to prevent tampering and protect privacy: Due to the use of identity authentication and cryptography, the privacy of each subject's identity and the security of shared information are protected through cryptographic tools such as public and private keys and hash algorithms. Blockchain has the following properties:

(1) Autonomy: The blockchain is based on a P2P network. The nodes on the chain are all peer-to-peer, and the data is stored in each participating node in a distributed manner. The chain can be called to run and synchronize data. It is a decentralized (or weakly centralized) and autonomous trading system.

(2) Reliability: The blockchain system is that all participants share a chain on the P2P network, and all transactions are confirmed through a consensus mechanism. Except for 51% of attacks, it can effectively prevent system failures and ensure the reliability of the system;

(3) Information transparency: any participant on the network can (or within the specified authorization scope) view the information on the ledger with high transparency;

(4) Immutability: After each transaction is completed, the information is recorded in the block header, and the subsequent blocks are accumulated on the previous block to form a data chain. Once formed, the data cannot be tampered with.

2.2. Big Data. Information security refers to the use of technical and management security protection methods to protect software, hardware, and data from damage, modification, and exposure due to some reasons (such as accidental or malicious). In the era of big data, there have been huge breakthroughs and extensions in the connotation and extension of traditional private data. The results

caused by the leakage of private data are not entirely borne by individuals or groups, and the protection of private data faces greater challenges [13]. With the in-depth understanding and research on big data, the main challenges facing big data security are as follows: (1) Security in the era of big data has become more complicated: massive data collections, such as records about personal privacy and behavioral details, etc., if these massive amounts of data are stored centrally, the risk of data leakage will be greatly increased; the integrity, availability, and secrecy of data all pose great challenges to big data analysis. (2) The use and analysis of big data face more challenges: when using data mining technology and data analysis technology to obtain the commercial value of big data, hackers can collect valuable data to the greatest extent so as to use big data analysis technology to launch attacks on enterprises. For areas that require high big data analysis, such as e-commerce, finance, and complex network computing, malicious attacks can cause quite serious consequences. (3) Major challenges based on the characteristics of big data: Big data has the characteristics of diverse data types and dynamic data changes. In the process of analyzing and processing big data, it will face real-time dynamic changes and the integration of multiple types of data. This requires new methods and technologies to make the protection of big data face major challenges [14].

The Kalman filtering algorithm uses recursion to filter, recursively derive the current state based on the current state and the previous state, and usually remove redundant information in a dynamic environment to achieve data fusion. In the Kalman filter algorithm, the discrete control process system and measured values are first introduced:

$$\begin{aligned} M_k &= \alpha M_{k-1} + \beta Y_k + W_k, \\ P_k &= HM_k + V_k, \\ c(x) &= \operatorname{argmax} P\left(x_1, x_2, \ldots x_n | c_j\right) P\left(c_j\right). \end{aligned} \tag{5}$$

α, β-System parameters. M_k, Y_k-It is the state variable and control quantity of the system at k moment.

The time update formula of the Kalman filter can be derived, and the time recursive state variable and the error covariance of the previous moment can be calculated separately [15].

$$\begin{aligned} \widehat{M}_{k,k-1} &= \alpha \widehat{M}_{k-1} + \beta Y_k, \\ P_{k,k-1} &= \alpha P_{k-1} a' + Q, \\ c_{NB} &= \operatorname{argmax} \left\{ P\left(c_j\right) \prod_{i=1}^{n} P\left(x_i | c_j\right) \right\} \end{aligned} \tag{6}$$

Using the measured value at the current moment and the estimated value at the previous moment, the state equation of the Kalman filter can be derived, including the updated estimated observations, the Kalman gain, and the new error covariance [16].

$$\begin{aligned} \widehat{M}_k &= \widehat{M}_{k,k-1} + Kg_k\left(Z_k - H\widehat{M}_{k,k-1}\right), \\ Kg_k &= \frac{P_{k,k-1}H'}{\left(HP_{k,k-1}H' + R\right)}, \\ P_k &= \left(1 - Kg_k H\right) P_{k,k-1}. \end{aligned} \tag{7}$$

$\widehat{M}_{k,k-1}$: The predicted value of state one step forward, $\widehat{M}_k$: The best estimate of the state at the last moment, $\widehat{P}_{k,k-1}$: Covariance of the state one step forward

Sorting the data and calculating the parameters of the distribution diagram method. Among them, β is a coefficient, which can be set as a constant.

$$\begin{aligned} A_M &= \left\{ \begin{array}{c} A_{N+1}, N \text{isodd} \\ \\ \dfrac{A_{N/2+1} + A_{N/2}}{2}, N \text{iseven} \end{array} \right\}, \\ W &= \frac{(\text{Max} - \text{Min})}{t}. \end{aligned} \tag{8}$$

A_M: The median of the data series. N: Number of data series.

The above formula is used to calculate the ω_1 and ω_2 parameters of the judgment interval. If the data in the data sequence is outside this interval, the data is regarded as abnormal data and excluded from the data sequence.

$$\begin{aligned} \omega_1 &= F_L - \frac{\beta}{2} dF, \\ \omega_2 &= F_U - \frac{\beta}{2} dF. \end{aligned} \tag{9}$$

When the abnormal data is eliminated, the dimensionality of the data will change. In order to keep the data dimension unchanged, the estimated value calculated in Table 2 is used to replace the abnormal data [17].

The original definition of big data: large-scale data collection beyond the capabilities of traditional database software tools in terms of collection, storage, management, and analysis. There are four features: large data volume, fast data flow, different data types, and low density [18].

2.3. Moving Target Detection. The essence of moving object detection is the process of segmenting the moving objects of interest in the video image. In digital video image processing, techniques such as moving target segmentation, tracking, and behavior understanding are all aimed at the target moving area of interest in the image, so the detection of this area is the basis for realizing the above technology. Because natural scenes are dynamic and changeable, they often interfere with target detection, which brings certain difficulties to moving target detection and therefore arouses the interest of more researchers. Moving target detection can be divided into two types of detection methods, static

Table 2: The mean value of the intermediate data.

Features of data number N	Estimated value of abnormal data
N is divisible by 4	Estimated value is the mean of $N/2$ data in the series
N is divisible by 2 but not divisible by 4	Estimated value is the mean of $N/2$–1 data in the series
N is not divisible by 2 and $N+1$ can be divisible by 4	The estimated value is the mean of $(N-1)/2$ data in the sequence
N is not divisible by 2 and $N+1$ is not divisible by 4	Estimated value is the mean of $(N-1)/2-1$ data in the series

background, and dynamic background, according to the fixed situation of the camera. Because most cameras in real life are fixed, the detection based on the static background is more favored by researchers [19].

Moving target detection based on the frame difference method is a commonly used static background detection method. Its basic principle is to detect the changes in the pixel intensity of adjacent frames of video images and use the pixel time domain difference method to extract the moving area of interest in the image. In a fixed scene, it is determined whether the point belongs to the background pixel or the foreground pixel by judging the threshold value of the pixel characteristic value of the adjacent frame image so as to realize the detection of the moving target.

The advantage of the frame difference method is that the algorithm is low in complexity, simple to implement, and has good real-time performance. Because the time interval between two adjacent frames of images is very small, the background changes little, and the error caused by the background changes can be avoided under the difference cancellation, so it has better adaptability to dynamic scenes. The most typical application is in the VSAM (Visula Surveillance and Monitoring) system. Researchers propose a method based on the combination of frame difference method and background difference method to achieve fast and effective moving target detection [20].

The disadvantage of the frame difference method is that it is more sensitive to environmental noise, and the choice of the threshold is also critical. Choosing a threshold that is too low will not be able to suppress the noise in the image while choosing too high a threshold will easily ignore the change of the target in the image. In addition, when the moving object moves slowly, a hole phenomenon will occur, which will affect the subsequent processing, such as the analysis and recognition of the target image, and miss the detection of the slowly moving or stopping target.

2.4. Marine Litter. Marine Litter is the direct or indirect, intentional or unintentional disposal of persistent solid matter by humans into the marine environment. Marine debris is one of the marine pollutants, and it is one of the marine environmental pollution problems that most troubles people's production and development. The adverse effects of marine debris on humans, natural organisms, and the marine ecological environment are great, mainly in the following aspects: (1) It causes visual pollution to the marine landscape, affects the aesthetic value of the coastal landscape, and causes tourism damage. Decrease in income; (2) Damage to marine animals, plants, and marine ecological environment, entanglement, and suffocation caused by garbage being eaten by marine animals, and direct or indirect damage to marine life caused by garbage transporting alien species. According to the findings of "Greenpeace," at least 267 species of marine animals suffer from eating or being entangled in marine debris, and cause death. For example, birds sometimes mistakenly eat plastic waste as food, which hinders the digestive system and eats plastic waste by mistake. Of these, birds end up starving to death, and large numbers of seals, sea lions, and dolphins are entangled in discarded fishing nets every year.

3. Experiment on Detection and Recognition of Floating Garbage Moving Targets on Water Surface with Big Data

The performance of the consensus mechanism of the blockchain is tested. The nodes in the system complete the consensus and storage operations of 100 data as a test round. In each test round, the time it takes for the system to complete the corresponding operation is recorded. Figure 3 shows the test results.

Based on the blockchain platform's node architecture, combined with BcRCACDAM, the topology of the CBcP network node is designed. The nodes and functions of CBcP used in this model are described in detail below: (1) Client: The RCA of each trust domain is responsible. As a client of CBcP, submit and query transactions to nonverified nodes; (2) Nonverification node: it is assumed by the server provided by each trust domain. The unverified node receives the transaction sent by the client, verifies the signature of the transaction sent by the client, and sends the transaction, sorted by timestamp, to the verification node for further processing. Unverified sites synchronize registry data to help you find clients faster. (3) Verification node: considers the server assigned to each trusted domain. The verification node compliance algorithm is included in the authorization process. The verification node is divided into master and child nodes. The master node collects transaction blocks that are passed to the nonverification node, initiates a block proposal, and shares common block transactions through the EDA consensus algorithm. Reach a consensus. Connect the other authentication nodes and the new blockchain to the blockchain.

The node collaboration of the CBcP network of this model is divided into 3 steps, which are specifically introduced as follows: (1) After joining CBcP, the root CA initiates a trust-authorized transaction about BcRCert and sends it to nonverified nodes; (2) The nonverification node verifies the transaction signature received from the client, classifies the transaction according to the transaction timestamp, and in turn transmits it to the verification node. (3) The verification node leads to consensus in the block based on the consensus algorithm and connects the block to

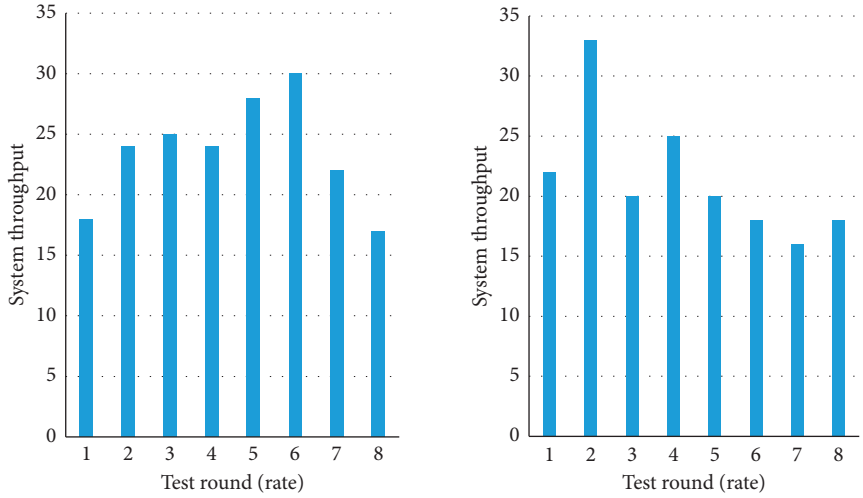

Figure 3: Performance test chart.

the chain. Figure 4 shows the topology of the blockchain platform node.

The incentive system of the blockchain is that the random notary node suspends the block generation work during the term of office and thus loses the opportunity to successfully generate the block and obtain work remuneration. If it wants to quantify the loss during the tenure of a random notary node, it can share the work rewards obtained after a single successful block generation according to the probability of successfully generating a block. Since all working nodes on the blockchain network are free to come and go, it is difficult for us to accurately count the total computing power of the real-time blockchain system, and even the number of real-time working nodes on the network is difficult to count. Therefore, in order to facilitate the calculation, we need to find a reference value for the number of working nodes of the blockchain in the network, which is defined as the benchmark value in this article. The first benchmark value is set according to the initial scale of the blockchain system, and the subsequent benchmark values can be calculated. Figure 5 is a comparison chart of benchmark values.

Based on the analysis of the shadow detection algorithm, this paper proposes an improved algorithm for shadow removal based on the Gaussian mixture model. The algorithm divides moving target detection into two parts: foreground detection and shadow removal. Firstly, according to the Gaussian mixture model algorithm, it is judged whether the pixel of the current video frame belongs to the background point or the premovement scenic spot. If the pixel is the former scenic spot, the shadow removal algorithm is used to remove the shadow, and finally, the moving foreground target is obtained. The specific process is shown in Figure 6.

According to the proposed algorithm, the contour of the moving target is extracted. This article selects three video sequences indoors, outdoors and under different lighting for experiments. Quantitative analysis of a moving object's detection speed includes the pixel level and the object level. In this work, the object level is used to determine the detection rate of a moving target and the error detection rate. The test results are shown in Table 3.

Based on the result of the moving target lifting image based on the color image, the threshold value is changed for experiment. Compared with the reference image, based on the dynamic image target that the gray image is often discarded, the reference image and the pixels in the image are counted. Figure 7 shows the reference image change diagram of the moving target image.

It can be seen from Figure 7 that in different pixel percentages, the processing results based on the grayscale image are different from the reference image, and it can be seen that the two are the closest when the threshold Te = 21, and only about 1% of the pixels are different.

Among the many moving target detection algorithms, the interframe difference method is easy to optimize due to its simple method, small amount of calculation, fast speed, and easy optimization. At the same time, it is suitable for the advantages of DSP implementation, and is currently widely used in the detection and monitoring of moving targets in video image sequences, and its detection effect is significant. The core idea of the interframe difference method is to subtract two frames of the image, subtract the part of the image whose gray information is unchanged or whose amplitude is less than a certain threshold, and find the part where the gray level information changes greatly, so as to determine whether there is a moving target in the video.

The interframe difference method uses a series of video images instead of affecting two adjacent frames so that moving objects can be effectively used and is usually best for viewing scenes with clear motion. The frame difference technology has many advantages. The algorithm is simple, requires a lot of computer resources, and is easy to implement. In response to the above problems, the frame difference method is improved, and the three-frame difference method is adopted, which increases the number of difference functions between two proposed adjacent frames.

The specific implementation steps of the improved three-frame difference method are as follows:

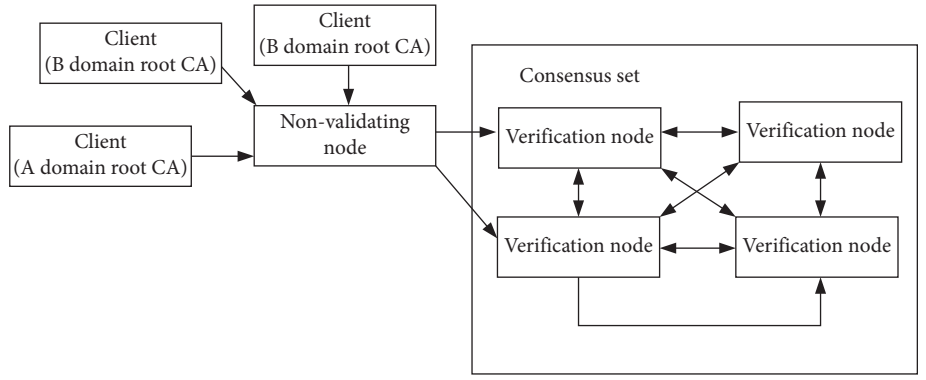

Figure 4: Topological structure of blockchain platform nodes.

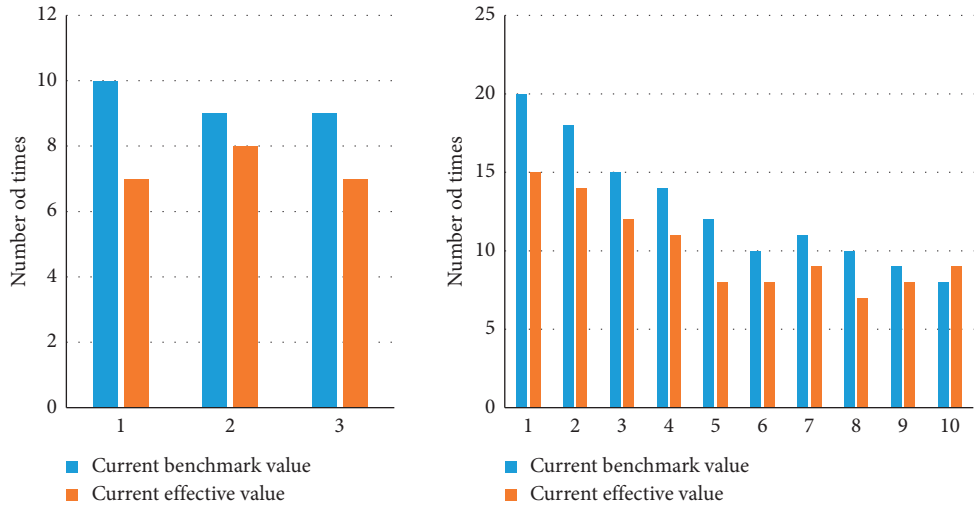

Figure 5: Benchmark value comparison chart.

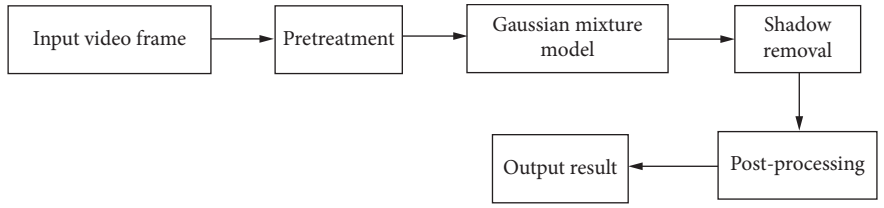

Figure 6: Flow chart of shadow removal algorithm based on Gaussian mixture model.

Table 3: Object level detection rate.

Video sequence	Number of goals	Number of detections	Number of false detections	Detection rate (%)	False detection rate (%)
Sequence 1	80	78	2	97.5	2.5
Sequence 2	500	493	7	98.6	1.4
Sequence 3	360	355	5	98.61	1.39

(1) First obtain three consecutive frames: Image1, Image2, Image3.

(2) Perform bilateral filtering, median filtering, and grayscale processing on the image, take out the motion area, use three-frame difference, and perform AND operation.

(3) In the selected motion area, find the smallest rectangular area that can contain the motion area (lx, ly, width, height). lx represents the x coordinate of the upper left corner of the rectangular area, ly represents the y coordinate of the upper left corner of the rectangular area, width is the width of the

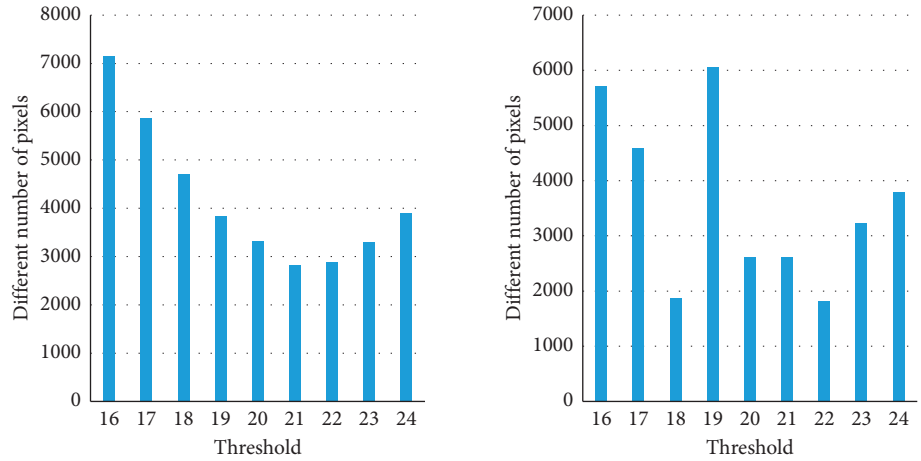

Figure 7: Moving target image reference image change.

rectangular area, and height is the height of the rectangular area.

(4) Canny edge extraction is performed on Image2 to obtain Image2_canny image, and a morphological closing operation is performed. For the obtained Image2_canny image, take out a small rectangular frame according to the rectangular area in the previous step. Then extract the closed contour formed by the inner edges of the rectangular area and fill it with white.

(5) Median filter the image to get the final result image.

Figure 8 shows the flow chart of the three-frame differential method.

The reason why the three-frame difference method can solve the problem of the unclear target contour detected by the two-frame difference method is that it compares the different results of two adjacent frames of images with an AND operation. Figure 9 can clearly understand the reason why the target contour extracted by the three-frame difference method is relatively clear.

As shown in Figure 9, A, B, and C represent images of different frames in the video image sequence, B represents the current frame image at time k, A represents the frame image at time $k-1$, and C represents the frame image at time $k+1$. Differential operations are performed on adjacent frame images, where D is the difference result of A and B, and E is the difference result of B and C. It can be seen that D and E are the results obtained according to the two-frame difference method, respectively. The contour of the central part of the target image is not extracted, so the problem of unclear contour will occur. According to the steps of the three-frame difference method, D and E are then logically ANDed, and the obtained F is the same part between D and E. It can be seen that the target extracted in the detection result F contains all the target contour information, which is the principle that the three-frame difference method can extract the target contour more completely than the two-frame difference method.

The experimental materials are two different views, as shown in Figure 10, one is the floating garbage view in the ocean, and the other is the experimental result.

Recognizing floating objects in three typical working environments: good vision, more reflections in the water, and strong light interference. Each working environment has 100 images to be tested, a total of 300 images, and read the next image after processing one image. In order to facilitate the viewing of the recognition results, the images after the recognition processing are stored in the designated folder. In actual use, there is no need to store them in order to save resources. The recognition results are shown in Table 4.

4. Discussion

The consensus mechanism of the blockchain is a mechanism that enables the entire network to reach a consensus on the generated block data information. Among them, the research and development of the workload certification mechanism, the equity certification mechanism, the authorized share certification mechanism, and the Raft mechanism started early and currently occupy a dominant position and become the basis of a variety of derivative mechanisms. The following is a brief introduction to the above consensus mechanism: (1) The workload proof mechanism requires all nodes to participate in the computing power game of finding a random number, and the one who calculates first can get the right to this bookkeeping and a certain reward. (2) The equity certification mechanism is similar to the shareholder mechanism. Whoever invests more capital will have greater equity and a greater possibility of obtaining the right to bookkeeping. This mechanism converges fast and saves resources, but its security needs to be studied in depth. (3) The authorized share certification mechanism is a professionalization of the role of the bookkeeper. It requires participants to choose their own trusted nodes and authorize them. This mechanism consumes less resources, reaches consensus quickly, and has high throughput, but there is a risk of agents cheating. (4) Raft is a mechanism in which nodes jointly elect to determine the accounting node. If the accounting node fails, a new accounting node can be reelected. This mechanism has good fault tolerance and high system operation efficiency.

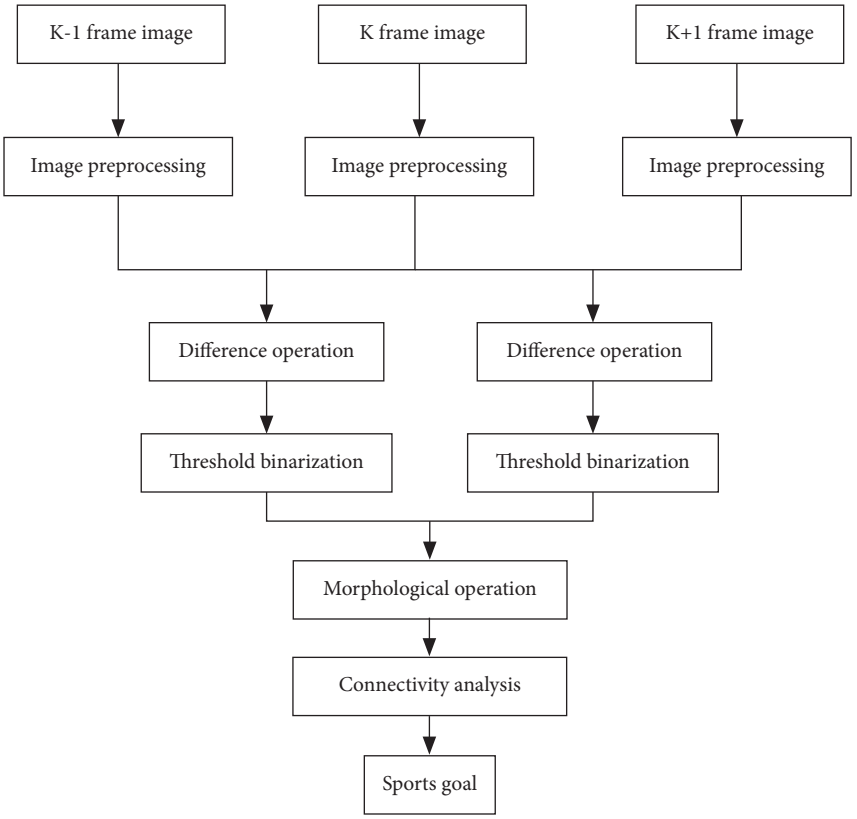

Figure 8: Three-frame difference method flowchart.

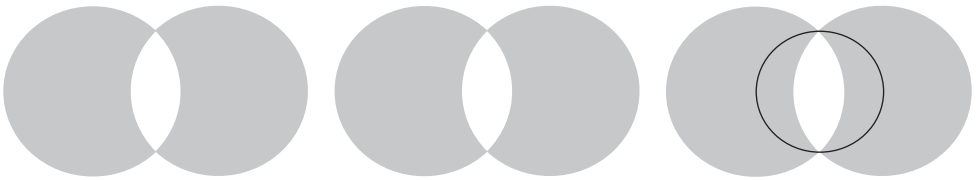

Figure 9: Schematic diagram of three-frame difference method. (a) D = A + B. (b) E = B + C. (c) F = D + E.

Figure 10: Experimental comparison chart.

Table 4: Recognition result.

Working environment	Number of inspections	Number of successful detections	Recognition rate (%)	Average recognition time
Better vision	100	93	93	5.26
More reflections in the water	100	86	86	5.3
Glare interference	100	74	74	5.26
Total	300	253	84.3	5.29

However, this algorithm can only guarantee the activity of the bookkeeper, and there is a security risk of the bookkeeper's deception.

Surface garbage is also known as floating garbage. Water surface garbage refers to various wastes floating in the upper layer of various water bodies (lakes, rivers, landscape waters, etc.), which deteriorate the water quality of the water bodies and cause a visual impact on the public. It mainly includes the wastes that are caused by people's weak environmental protection awareness. Discarded various household items, such as food packaging bags, plastic bags, plastic bottles, etc.; various on-board supplies discarded by ships sailing on the water, such as fishing nets, buoys, etc.; surface vegetation that has been washed into the water body due to rain or wind; pollution of dead fish and shrimp, rotten fruits and vegetables, etc.

For different application scenarios, the processing requirements and purposes of shadows in video frames are also different. Such as some target tracking or target shape extraction, the processing requirements for shadows are relatively high, which requires accurate identification of target shadow components in motion and separation and extraction of targets. In the fields of remote sensing imaging and photogrammetry, in order to improve the visibility and quality of images, it is necessary to detect shadows and deal with the influence of shadows, reduce or eliminate their influence as much as possible, and restore the objects in the shadows original appearance. Therefore, the accuracy of shadow detection directly affects the subsequent shadow processing.

5. Conclusion

With the rapid development of urban construction in our country, people's needs for a better life are increasing, and improving the urban ecological environment has become the primary task. In recent years, garbage pollution in small water areas such as urban ponds, artificial lakes, and water parks has gone from bad to worse. The cleanup of surface garbage has become an important environmental governance issue, which is directly related to the entire urban ecosystem. This paper proposes an improved algorithm for shadow removal based on the Gaussian mixture model, which divides the motion garbage detection into two parts: foreground detection and shadow removal. Firstly, according to the Gaussian mixture model algorithm, it is judged whether the pixel of the current video frame belongs to the background point or the premovement scenic spot. If the pixel is the former scenic spot, the shadow removal algorithm is used to remove the shadow, and finally, the moving foreground target is obtained. This paper mainly studies and analyzes the moving target detection algorithm. Although the research work has made some progress, the results still have many shortcomings. In this paper, the improved algorithm of mixed Gaussian model and color features improves the accuracy of moving target detection algorithm in complex scenes, but the accuracy of background modeling is relatively high, the algorithm is relatively complex, and the amount of calculation is large, so the real-time application is limited to a certain extent. How to improve the algorithm operation speed on the basis of ensuring the detection effect will become a practical topic for moving target detection.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

Acknowledgments

This work was supported by the 2020 Youth Innovative Talents Project of colleges and universities in Guangdong Province, "Design and implementation of water surface floating garbage collection system based on deep learning" (Project No: 2020KQNCX244) from Guangzhou Nanyang Polytechnic College, Innovation and strong school research team project "Big Data and Intelligent Computing Innovation Research Team (NY-2019CQTD-02)" from Guangzhou Nanyang Polytechnic College, and Key Natural Science Research Projects of New Generation of Information Technology in Focus Areas in 2020 Of General Universities in Guangdong Province "Research and Application of Traffic Safety Early Warning System Based on 5G Internet of Vehicles" (Project No: 2020ZDZX3096) from Guangzhou Nanyang Polytechnic College.

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