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TRANSACTIONAL PROCESSING SYSTEMS

Video surveillance system against anti-terrorism by Using Adaptive Linear Activity Classification (ALAC) Technique

D. Karthikeswaran[1] · N. Sengottaiyan[1] · S. Anbukaruppusamy[2]

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Abstract
Automated human activity analysis has been, and remains, a challenging problem. Security and surveillance are essential issues in today's world. Any behavior which is uncommon in occurrence and deviates from customarily understood action could be termed as suspicious. For different application regions, while identifying human exercises, fundamentally three angles are taking in worry for human movement recognition system: Segmentation, feature extraction, and activity classification. This model aims at automatic detection of abnormal behavior in surveillance videos. In this proposed work adaptive linear activity classification method and internet of things (IoT) frameworks are used to detection human activities as well as to find out who is doing unusual activities. The enhanced plan of the built environment condition will give a better observation. Such framework can be actualized in peoples in general places, for example, shopping centers, airports, and railway station or any private premises where security is the prime concern. The proposed ALAC method validated through simulation using MATLAB and VB.net software. Its ability to detect the activity of human the simulation result shows the effectiveness using ALAC method, Overall 97% efficiency achieved by using ALAC method.

Keywords Internet of things (IoT) · Adaptive linear activity classification · Video surveillance · VB.net

Introduction

Internet of Things (loT) technology is a massive development of the internet by which ordinary 'things' objects have correspondence limits which enable them to send and get information. It has required to interface frameworks, devices, sensors which can impart without the requirement for machine-to-machine correspondence. The Internet of things currently being utilized as a part of the fields of automobiles, agriculture, security surveillance, building administration, smart homes, and human services (Figs. 1, 2, 3 and 4).

The loT hopes to utilize low-cost computing devices where there are less power utilization and limited effect on nature. In this work analysis the human activity in public places from the surveillance system. The capacity of recognizing highlights on the ground from space is to an excellent extent subordinate upon the proportion of highlight size to information determination. As sensor innovations have enhanced, the possibility to use satellite symbolism for scene reviews has additionally moved forward. In September 2008, the GeoEye-1 ultra-high determination earth perception satellite was propelled by GeoEye Inc., to produce the world's most astounding resolution business earth imaging (at the season of dispatch). Generating 41 cm panchromatic and 1.65 m multispectral information, this sensor additionally extended the capability of satellite-based archeological scene studies. Notwithstanding, government controls confine open utilization of satellite information surpassing 50 cm determination. Earth-based elevated imaging advancements have additionally observed the huge change in sensor and stage innovation. Early procedures included inflatable and kite photography, which has been mostly

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✉ D. Karthikeswaran
karthikeswaranphd@gmail.com

N. Sengottaiyan
nsriram3999@gmail.com

S. Anbukaruppusamy
anbuksamy@gmail.com

[1] Department of CSE, Sri Shanmugha College of Engineering and Technology, Salem, Tamilnadu, India

[2] Department of ECE, Excel Engineering College, Namakkal, Tamilnadu, India

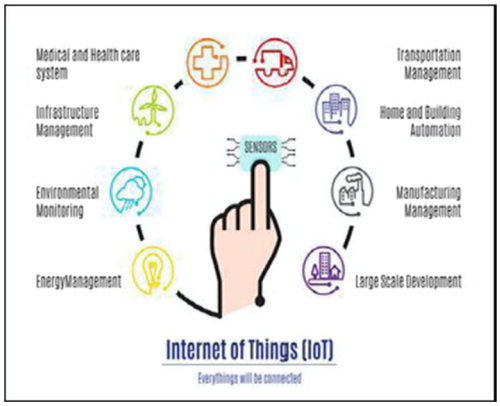

Fig. 1 Internet of Things

upgraded throughout the years to empower high-determination information gathering. However, these systems, for the most part, require a tie to the ground and either helium gas or adequate breeze conditions to empower flight, in this manner restricting the zones and situations where they can be conveyed and their portability in the field. As of late, the radio-controlled airship has been utilized in paleontology with the end goal of getting aeronautical pictures because of their focal points of portability, and huge arrangement go.

Kept an eye on an unmanned airship of a similar sort, for the most part, have conspicuously comparable physical segments. The principal individual cases are the cockpit and natural control framework or life emotionally supportive networks. Some UAVs convey payloads, (for example, a camera) that weigh significantly not as much as a grown-up human, and thus can be impressively little. Despite the fact that they convey overwhelming payloads, weapon zeds military UAVs are lighter than their kept an eye on partners with similar combat hardware. Small nonmilitary personnel UAVs have no life-basic frameworks, and would thus be able to be worked out of lighter yet less durable materials and shapes, and can utilize less heartily tried electronic control structures. For little UAVs, the quadcopter configuration has turned out to be famous. However, this format is once in a while utilized for keeping an eye on flying machine. Scaling down implies that less-capable impetus innovations can be used that are not

Fig. 2 UAV Drone

Fig. 3 Microdrone

achievable for keeping an eye on an airplane, for example, little electric engines and batteries.

Control frameworks for UAVs are not the same as keeping an eye on making. For remote human control, a camera and video interface quite often supplant the cockpit windows; radio-transmitted computerized orders replace physical cockpit controls. Autopilot programming is utilized on both kept an eye on an unmanned airship, with fluctuating capabilities. One approach to accomplish self-governing authority uses various control-circle layers, as in progressive control frameworks. Starting at 2016 the low-layer circles (i.e., for flight control) tick as quick as 32,000 times each second, while more elevated amount circles may cycle once every second. The rule is to break down the air ship's conduct into sensible "pieces," or states, with known advances. Progressive control framework sorts run from essential contents to limited state machines, behavior trees, and various leveled errand organizers. The most widely recognized control instrument utilized as a part of these layers is the PID controller which can be used to accomplish float for a quadcopter by using information from the IMU to ascertain exact contributions for the electronic speed controllers and saying. We apply our technique to two high-determination aeronautical picture informational indexes. One informational collection is the flying images covering the city of Toronto, Canada, with 0.15-m longitudinal determination, an additional informational index is from the upstairs symbolism look into the informational index (UIRDS).

In the reaming part of the work, Section II describes the research background. Section III familiarizes our proposed adaptive linear activity classification method, and Section IV organizes the simulation results of the proposed system. In chapter, V presents conclusion and paths to future work.

Literature survey

At the point when entirely conveyed, the Internet of Things (IoT) will permit a tremendous assortment of new

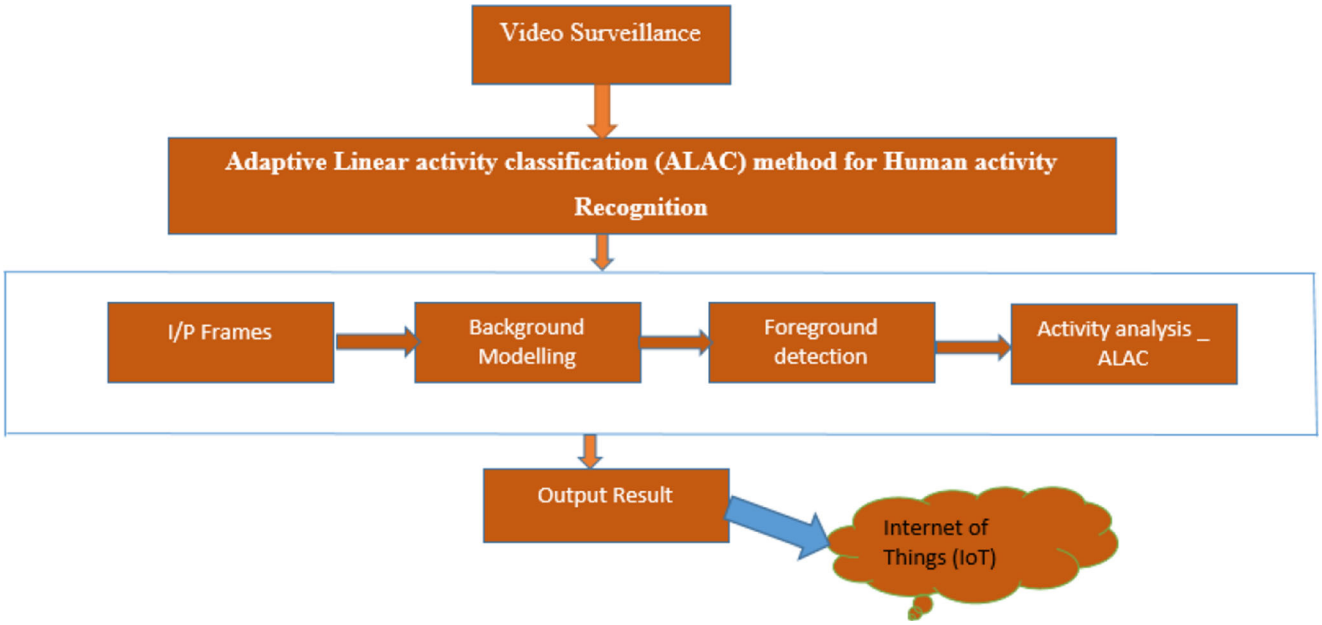

Fig. 4 Block Diagram of the Proposed ALAC Method

administrations to be accessible to our general public [2]. Making urban areas more intelligent postures numerous mechanical difficulties for IoT, enormous information, cloud among different advancements, yet additionally gives chances to new applications (verticals) [3], for example, shrewd vitality administration. In this segment, a brief about all the test papers kept an eye on for Microdrones. To elevate the unmanned aerial vehicle images by using ultra-high determination satellite imaging technique. UAVs or automatons have beaten their first military uses, ending up today a standout amongst an essential innovation in information gathering and remote detecting. This is featured by a few investigate, which records among its focal points a high determination and positional exactness. Their significance for Earth framework understanding and ecological science study has been called attention to for instance in [1]. Among the others, restriction and mapping of land ranges by methods for cutting-edge 3D imaging systems have been shown [2, 3]. Its uses for everyday purposes incorporate different utilizations of gas recognition, for example, getting gas appropriation mapping, observing outflows and gas source limitation inland zones where the ecological concern is an intriguing issue [4–8]. They have likewise been explored for crisis taking care of in indoor situations [9]. The principal problems of all the immediate execution are (i) the restricted flight self-sufficiency and (ii) the size-to-payload proportion; a couple of endeavors have been committed so far to the joint enhancement of the flight way and vitality utilization of substance sensors [10].

In the air force, without a pilot, an unmanned aerial vehicle is used for automation. UAVs are a segment of an unmanned airship framework (UAS); which incorporate a UAV, a ground-based controller, and an arrangement of interchanges between the two. The flight of UAVs may work with different degrees of self-rule: either under remote control by a human administrator or self-rulingly by locally available PCs. Contrasted with keeping an eye on flying machine, UAVs were initially utilized for missions as well "dull, messy or risky" for people [11–14]. While they started for the most part in military applications, their utilization is quickly growing to business, consistent, recreational, agrarian, and different applications, for example, policing peacekeeping, and observation, item conveyances, aerial photography, farming, carrying, and ramble dashing. Regular citizen UAVs now immensely dwarf military UAVs, with appraisals of over a million sold by 2015, so they can be viewed as an early business utilization of Autonomous Things, to be trained by the self-sufficient auto and home robots.

Airborne pictures have for entirely some time been used in archeological research to give a viewpoint that complements ground highlights, not visible, and a more noteworthy comprehension of their spatial setting [1–4] Position and development sensors give data about the flying machine state. Exteroceptive sensors manage external data like separation estimations, while proprioceptive ones associate inside and outside states. Non-agreeable sensors can recognize targets self-governing, so they are utilized for partition affirmation and impact shirking. Degrees of flexibility (DOF) allude to both the sum and nature of sensors onboard: 6 DOF suggests 3-hub spinners and accelerometers (an average inertial estimation unit – IMU), 9 DOF alludes to an IMU in addition to a compass, 10 DOF includes a gauge and 11 DOF, as a rule, consists of a GPS beneficiary. AVs ordinarily can be categorized as one of six practical classifications (in spite of the fact that multi-part airframe stages are winding up more familiar):

Target and bait – giving ground and aeronautical gunnery an objective that mimics an adversary airship or rocket and Reconnaissance – giving war zone knowledge and Combat – giving assault capacity to high-chance missions (see unmanned battle elevated vehicle) and Logistics – conveying payload and Research and advancement – enhance UAV advances and Civil and business UAVs – agribusiness, ethereal photography, information gathering.

Meager portrayal and super pixel division have gotten important consideration in PC vision [19]–[22]. Slim portrayal has been connected in many fields, including face acknowledgment, protest grouping, picture order, image de-noising, view rebuilding, visual saliency, and information pressure [23–30]. A scanty portrayal of protest recognition in remote detecting pictures and accomplished meaningful outcomes [31]. The improvement of superpixel division gives another approach to image preprocessing, photo section, highlight extraction, and question following [22, 32]. As of late, many research has concentrated on super pixel-based picture group, and many methodologies have produced. Agent approaches incorporate chart based calculations and inclination based calculations. The most recent accomplishments are straightforward, direct iterative bunching [33], edge-weighted centroid Voronoi tessellation based [34], and entropy-rate grouping [35]. Utilizing meager portrayal and super pixel division is another approach to identify vehicles from high-determination airborne pictures. Many methodologies have been produced for vehicle recognition from high-determination ethereal photos. The vast majority of the methods can be isolated into two sorts of vehicle models.

It is found that the system has an issue of smaller scale ramble ethereal imaging in all the above techniques. So another moved strategy has projected in this research. This work reveals how to discover the determination of surveillance image in various methods. In this work, we instead propose an out and out novel request strategy that consolidations are gathering correctly than past procedures.

Materials and method

In the proposed method IOT system for a template based human activity recognition method by using adaptive linear activity searching method. The primary purpose of this way is to recognize the activities of human in video surveillance accurately. For background subtraction, we use estimate median filter based method. This model is applied to subtract the background from the video frame to obtain the foreground. Using scale invariant contour-based posture highlights for different activities are created. (iii) Finally classifying activities of people by using adaptive linear activity classification (ALAC) algorithm. The proposed technique has four necessary steps as given below: (1) Moving object segmentation. (2) Feature Extraction (3) Classifier (4) Internet of Things.

Moving thing segmentation

The moving object segmentation has three phases in particular frame conversion, background modeling, and foreground detection.

Frame differencing

The absolute difference between two continuous frames (n-1) and n are used to obtain the frame difference for background subtraction. If the frame difference, FDn (i, j) value is less than some chosen threshold value, then FDn (i, j) is set to zero value. The frame difference framework process can be expressed by the following equation:

The coordinate frame of each pixel location (i, j) is

$$FD_n(i,j) = |f_n(i,j) - f_{n-1}(i,j)| \quad (1)$$

$$if\ FD_n(i,j) < V \quad (2)$$

$$FD_n(i,j) = 0 \quad (3)$$

Background modelling using Gaussian mixture method

Background modeling is a huge part of a video content investigation framework. At the point when static cameras are utilized, a great approach is background subtraction, which comprises of acquiring a numerical portrayal of the static foundation and contrasting it and each new frame from the video arrangement. A motion item can be identified effortlessly by recognizing parts of the picture that don't coordinate with the model. This procedure is known as background subtraction. It is the foundation for different post-preparing modules, for example, object tracking, recognition, and counting. There are two sorts of background subtraction techniques: non-versatile and versatile. The non-versatile strategy relies upon correct quantities of video outlines and does not maintain a background show in the method. Versatile techniques regularly safeguard a background model and the parameters of the background model shift over the time. A foundation display is controlled by utilizing Gaussian Mixture Models to speak to the time fluctuating background scene. The regular running methodology for the refresh of the background model Bs is portrayed as takes after

$$Bs = (1-\propto)BS-1 + \propto It \quad (4)$$

Where,

α learning rate
$Bs-1$ previous running average of the background model.
σ standards deviation,

The same learning rate is expressed as

$$\propto t = (1-\propto)\propto t-1 + \propto(It-Bs) \quad (5)$$

Foreground detection using adaptive thresholding method

In the video surveillance system, segmentation and foreground object detection is a significant task. By utilizing Euclidean standard to recognize the pixel of a Foreground

$$Hs(u,v) = \begin{cases} 1, & if\,|(u,v)-F(u,v)|s \\ 0, & otherwise \end{cases} \quad (6)$$

A versatile thresholding method has used for foreground and background classification. Thresholding is used to classify a pixel is a foreground or background pixel, and the outcomes are spoken by utilizing a double foreground view cover Fg (x, y),

$$Fg(x,y) = \begin{cases} 1 & if\,It-Bs > k\propto t \\ 0, & otherwise \end{cases} \quad (7)$$

Where

$k \rightarrow constant\,It \rightarrow pixel \quad intensity$

Features extraction

The activity representation and classification are obtained by using background signal features; the foreground image sequence is used to extract the distance signal feature. We have chosen contour-based distance signal feature extraction for different key poses as shown in Fig. 5.

At initial, the contour points A = {a1; a2… An}. For this purpose, contour extraction is applied to the border. Secondly, the Centre of mass Cm = ($\bar{x}$, $\bar{y}$) of the outline's contour points is calculated concerning the n number of points:

$$ex^{-} = \frac{\sum_{w=1}^{n} x_w}{n}, y^{-} \frac{\sum_{w=1}^{n} y_w}{n} \quad (8)$$

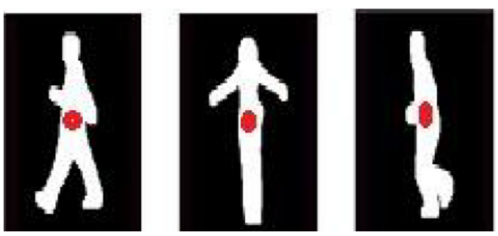

Fig. 5 Different key Process

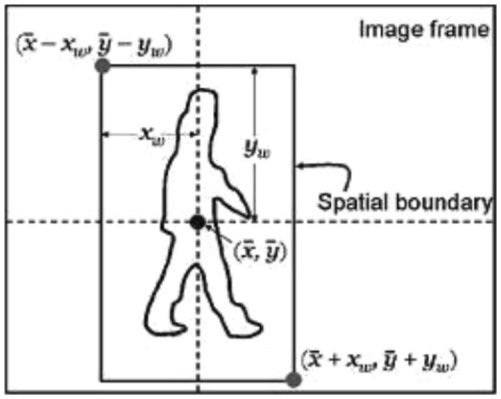

Fig. 6 Centre for mass

By using the Euclidean distance between contour point was generated using length signal D = {d1, d2, d3 ... dn} and the center of mass depicted in Fig. 6. Contour focuses ought to dependably consider in a similar request. For example, the arrangement of centers can begin and no more left point with break even with y-axis esteem as the focal point of mass, and take a clockwise request.

$$d_i = ||C_m - a_i|| \quad (9)$$

$$\forall_i \in [1.....n] \quad (10)$$

At last, scale-invariance is accomplished by settling the measure of the separation signal D, sub-inspecting the component size to a steady length L and normalizing its esteems to unit total.

$$D[i] = D\left[i^* \frac{n}{L}\right] \quad (11)$$

$$\forall_i \in [1.....L] \quad (12)$$

$$D^{-}[i] = \frac{D[i]}{\sum_{i=1}^{L} D[i]} \quad (13)$$

$$\forall_i \in [1.....L] \quad (14)$$

Adaptive linear activity classification (ALAC) method for human activity recognition

After having registered highlights from a video, the classifier is prepared and executed with this video. To show and classify the activities, versatile straight movement classifiers have utilized. To start with preparing of classifier has performed. The got preparing marks are provided by the classifier then after testing is performed. The exercises in the testing video had performed with the assistance of preparing labels. At long last, extraordinary test names have gotten for the test video of human exercises. Consider the recognition issue of preparing

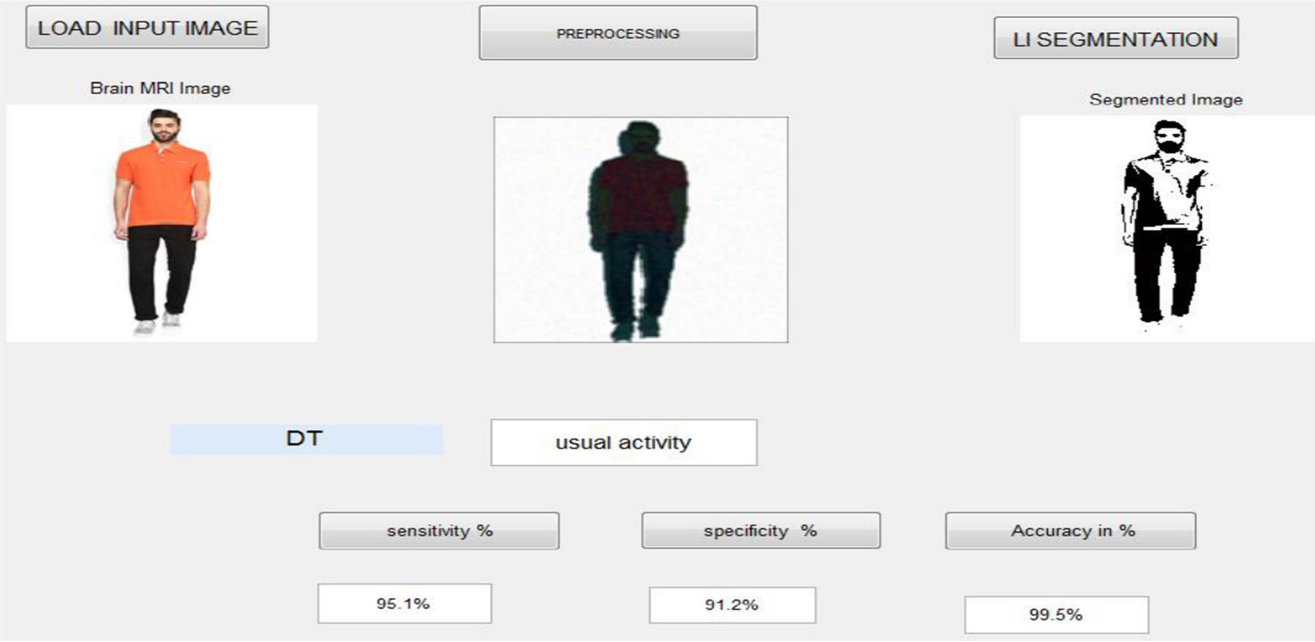

Fig. 7 GUI screen forMatlab Simulation Result

tests (×1, y1), (×2, y2),… ..,(xl, yl), where xi, I = 1, 2,….,l is a vector and yi∈ {1, 2… ….,k} speaks to the class of tests. To overcome the optimization problem to use adaptive linear activity classification method is proposed in this work.

$$\varnothing(\omega,\varepsilon)=\frac{1}{2}\sum_{m=1}^{k}\omega_m\cdot\omega_m+C\sum_{i=l}^{l}\sum_{m\#y}\in^m \tag{15}$$

With constraints

$$\left(\omega_{yi}\ldots x_i\right)+b_{yi}\geq(\omega_m\cdot x_i)+b_m+2-\in^m \tag{16}$$

$$i=\{1,2,\ldots,l\}m\in\{1,2,\ldots..,k\}\backslash yi \tag{17}$$

Where.

C	penalty parameter
l	number of training data
k	number of classes
Yi	class of training data
ω	hyper plane
b	offset parameter
ξ	degree of misclassification

The decision function is expressed as

$$f(x)=\text{argmax}[w_m\cdot x+b_m] \tag{18}$$

The execution of the classification has assessed concerning precision, recall and fault measure from the perplexity matrix of characterization. The estimations have processed by utilizing the conditions depicted below with the accompanying conventions.

Precision: It is the proportion of number of positive samples accurately arranged to the total number of samples in a class

$$precision=\frac{Tp\ (True\ Positive)}{Tp\ (True\ Positive)+Fp\ (false\ positive)}$$

Recall: It is the proportion of some positive specimens accurately classified to the total number of samples named positive.

$$Recall=\frac{Tp\ (true\ positive)}{Tp\ (true\ positive\ )+Fn(false\ negative)}$$

Table 1 Comparison of Evaluation metrics

Methods	Classification Sensitivity (%)	Classification Specificity (%)	Classification Accuracy (%)	Positive Predictive Value	Negative Predictive Value	FDR
MCSVM	100	94.02	97.72	98.1	81.3	10.2
Sparse Representation	100	93.02	96.91	89.3	67.12	20.23

Fig. 8 Comparison of time complexity of different methods

Fig. 9 Computation Speed

F-measure: The fault measure is a harmonics error of precision and recallthe equation was expressed as

$$F_{measure} = \frac{2*precision*recall}{precison + recall}$$

Accuracy: It is the total number of tests accurately classified to the total number of tests classified as given by the condition underneath

$$Accuracy = (TP + TN)/(Tp + Tn + Fp + fn)$$

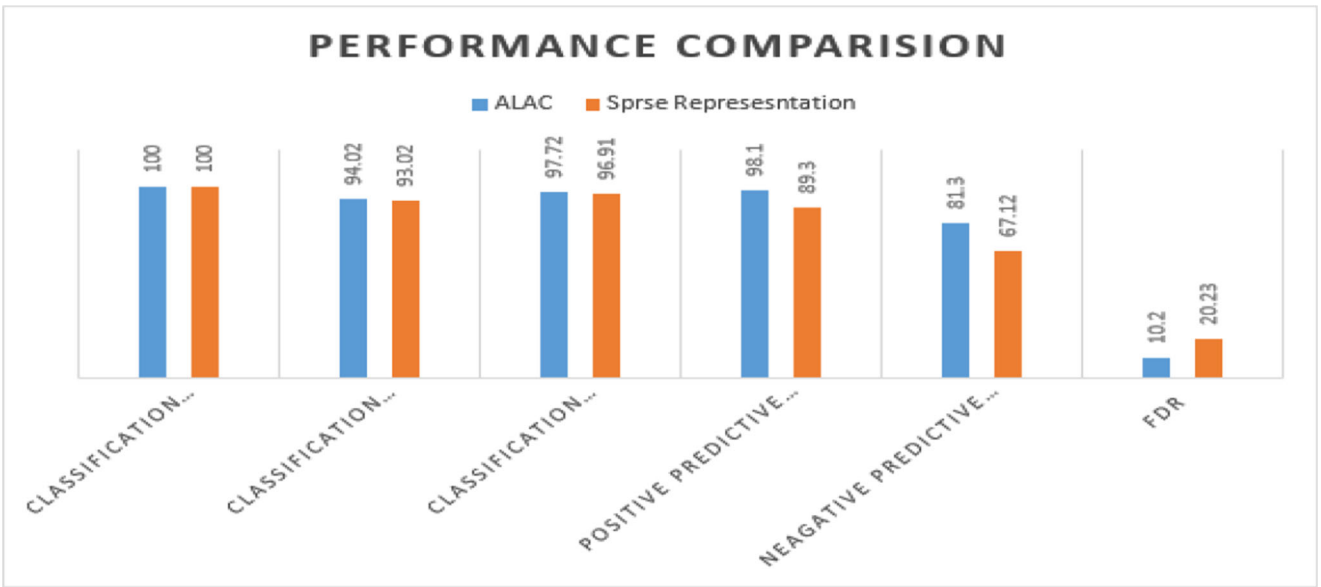

Fig. 10 Graphical representation of different evaluation metrics for proposed and existing methods

Algorithm steps:

1. Read the segmentation images
2. Check for base cases For each quality
3. find the standardized data pick up from the part on a picture
4. Let take best be the property with the most noteworthy standardized data pick up
5. Apply the ALAC step
6. Create a decision to split the best result
7. Finally get a comparison result image

8. Algorithm
9. Input: surveillance video
10. Output: Class C.
11. Start
12. Region R= Perform video surveillance Estimation.
13. Image img = segmented Image(human Image)
14. GSDF = Perform unusual activity
15. If GSDF<Th1> then
16. Class A
17. Else GSDF <Th2> then
18. Class B
19. Else if GSDF <Thn> then
20. Class N.
21. End
22. Stop.

The above-discussed algorithm performs human activity classification in video surveillance system given using adaptive linear activity classification method.

Internet of things for adaptive linear activity classification method

In this section discuss how the local information's are loaded into IOT using ALAC method. As compared to the existing conventional systems like sparse representation the proposed ALAC algorithm access the many nodes at the same time, data collection speed is high and provide the practical result. To accomplish the checking of human activity in video surveillance system, an IOT server and PC program have created in vb.net. In this area, the information got at the controller and is exchanged to the cloud server in PC. A consistent checking of human behavior from anyplace on to the real working spot with the assistance of web of things (IoT) technique. If the customer at whatever point needs to see the deformity range of the surveillance, a flag will be given from the web server at the beneficiary end. This framework screens the operation of photovoltaic as well as shields it from the extreme faults that regularly happen.

Algorithm 1 Initialization phase of the proposed ALAC

Parameters ← {Pixel Depth, Color Space, Alpha Channel}

Resolution ← {pixels/inch}

Color Type ← {True Color, Grayscale}

If Length > 2 then

Bit depth ← {Mate Data/Image Size}

If Bit depth ≠8 then

Alpha Channel ← Ø

PRINT "ERROR: while opening bit depth encoder.'

Else

If Bit depth ≠8 then

Alpha Channel ← Ø

PRINT "ERROR: while opening bit-depth encoder."

If Color Type < 12 then

PRINT "ERROR: Color space is not supported."

End

PRINT "Bit Depth and color space are supported."

PRINT "Image accepted for BPG compression."

End

By comparing existing prediction with neighbor prediction units, the temporal redundancy was reduced by using motion estimation method. In videos, the Inter-picture is performed to influence forecasts in which to movement vectors determine the development of the proposed picture toward the path existing model. The proposed figure is chosen from the interpreted image buffer to perform Intra prediction on a block basis, which indicates the displacement location according to the selected picture and its prediction block.

Result and discussion

MATLAB is the best language for specific enlisting and inventive condition for calculation change. It facilitates calculation, portrayal, and programming in an unadulterated to-use condition where issues and courses of action have conveyed in the first numerical documentation. One of the upsides of working in MATLAB is that limits chip away at entire assortments of data, not only on single scalar qualities. MATLAB store most pictures as two-dimensional clusters, i.e., cross sections, in which each part of the network identifies with an individual pixel in the shower display. Pixel normally demonstrates a solitary touch on a COMPUTER appear. MATLAB can store pictures as uint8, uint16, or double array (Fig. 7).

To assess the execution of our proposed strategy, we have broken down various assessment measurements accuracy, sensitivity, and specificity. As compared to previous research algorithms the proposed ALAC produce a significant result. The Table 1 gave below demonstrates the assessment

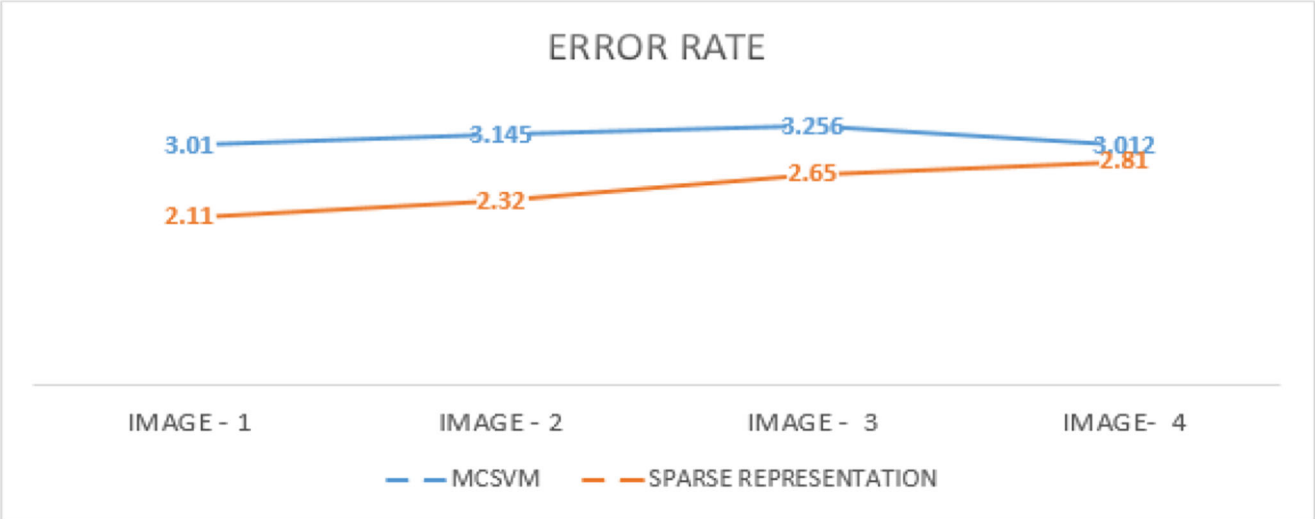

Fig. 11 Error Rate

parameters got utilizing our proposed strategy and existing technique.

Figure 8 shows the comparison of various methods on time complexity, and it depicts that the proposed plan has less time complexity than others.

The above Fig. 9 shows the comparison of various methods on computation speed, and it depicts that the proposed plan has less time computation than others.

From the above examination played out, the proposed strategy has been assessed with different parameters and has delivered valuable outcomes with all components of optical properties and classification.

The figure mentioned above Fig. 10 demonstrates the graphical portrayal for assessment measurements like sensitivity, specificity, and accuracy acquired for our proposed and existing technique. From the chart, obviously, our proposed design conveys better exactness in regard to the acknowledgment of activity from the pictures when compared with existing methods.

The Fig. 11, demonstrates the examination consequence of error classification rate delivered by various techniques and it indicates plainly that the proposed design has created less wrong proportion than another way.

Figure 12, presents the examination of cloud security execution by various techniques and it indicates plainly that the proposed ALAC strategy has created higher exactness than others. From the above all analysis most importantly investigation played out, the proposed design has been assessed with different parameters and has given valuable outcomes all variables of optical properties and characterization.

Conclusion

In this work recommended IOT system for an adaptive liner activity classification technique based human activity recognition in video surveillance system. The input image is preprocessed and extracts the features like gray value and mean gray distribution. The projected ALAC method has produced higher segmentation quality and produced less false classification ration and less time complexity. The segmented

Fig. 12 Comparison of Cloud Security

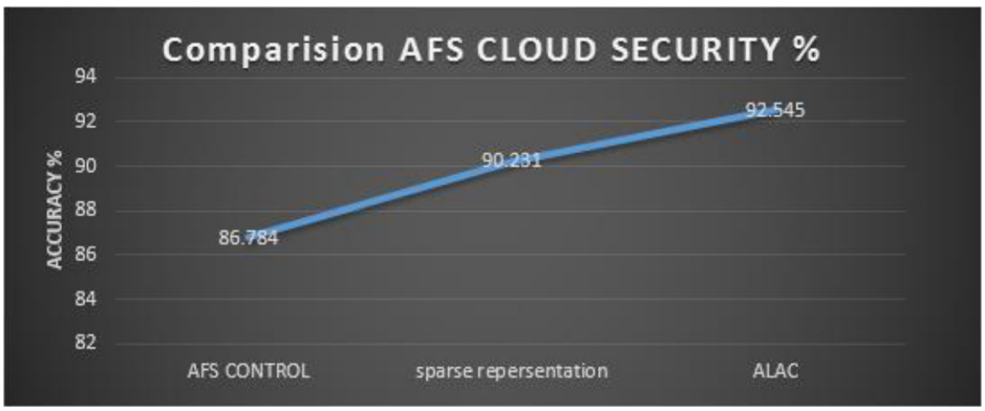

image is used for ALAC classification. Finally based on the segmentation factor and the estimated area value the proposed method classifies the human activity under a different class of video surveillance system. The proposed plan has produced useful results in human activity classification and improved the accuracy and reduces the false classification ratio also to view through IOT. Our proposed method gives good accuracy and sensitivity. As Compared to another conventional classifier, our proposed ALAC method performance by achieving an efficiency of 97.72%, a sensitivity of 100%, and a specificity of 94.02%.

Compliance with ethical standards

Conflict of interest This paper has not communicated anywhere till this moment, now only it is communicated to your esteemed journal for the publication with the knowledge of all co-authors.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

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