A SURVEY FOR REAL TIME IMAGE PROCESSING AND APPLICATIONS

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Abstract: This paper is a complete survey of different image processing techniques and large number of related application in diverse disciplines, including medical, pedestrian protection, biometrics, moving object tracking, vehicle detection and monitoring and Traffic queue detection algorithm for processing various real time image processing challenges. Techniques discussed are FPGA, Focal plane, cloud, segmentation, edge detection, A3 methodology, SURE engine, corner detection. At last we relate various techniques with application areas and also explain their future scope. We intend this paper to be useful to researchers and practitioners interested in real time image processing.

***Index Terms* - Real Time Image Processing, pedestrian protection, biometrics, SURE engine, FPGA.**

I. Introduction

Image processing, form of signal processing for which the input is an image, such as a photograph or video frame, the output may be either an image or a set of characteristics or parameters related to the image. Most image processing techniques involve treating the image as a two dimensional signal and applying standard signal-processing techniques to it. The multidisciplinary field of real-time image processing has experienced an explosion over the past several years. The purpose of real-time image processing is to improve the motion picture quality by removing the disturbance inside the series. It is designed to provide recommendations and help link the gap between the concept and the practice of picture and movie handling by providing a wide summary of proven algorithmic, components, application programs and strategies. RTIP includes many factors of application and components in order to achieve great definition feedback, low latency catch, powerful handling, and efficient display. This document presents the study of various real time image processing techniques and applications to process various challenges. This study comprises of five sections including the present one, which provide an introduction of real time image processing and objectives of this brief survey. Section II shows the study of various techniques and its related research work. Section III presents the applications of real time image processing and Section IV presents issues and challenges. Section V presents Conclusion.

II. TECHNIQUES

1. FPGA

FPGA is a programmable device in which the final logic structure can be directly configured by the end user. An FPGA consist of an array of uncommitted elements that can be programmed or interconnected accordingly to user specification. Desmouliers C. et al.[1] have developed an image and video processing platform (IVPP) for real time application on a virtex-5 FPGA. A new C-based HLS design flow is presented.

The user can design image and video processing applications in C language, convert them into hardware using symphony C compiler tool and then implemented test using IVPP. Liu Li-feng et al. [2] developed Laser Image detector. This paper presents algorithm based on Zernike moments which can be effectively recognize flying plane and again the cloud and smoke interference by calculating Zerike moment of an image by using FPGA. Rummele W. et al. [3] presents a real time multi object tracker implemented on FPGA. The system is able to track three objects simultaneously using different algorithms to get best results. By using the dynamic, partial reconfiguration capability of Xilinx FPGAs, the algorithm can be exchanged during run time without interrupting the object tracking. Acharaya A. et al. [4] outlines an efficient FPGA based hardware design for enhancement of color and gray scale images in image and video processing. The approaches used are adaptive histogram equalization which works very effectively for images captured under extremely dark environment as well as non-uniform lightening environment.

Yi-Li Lin et al. [5] presented a versatile verification/fast prototyping platform consisting of an FPGA board and the associated System Software. In this paper, FPGA board is connected to the host computer through a peripheral component interconnect interface. The System Software running on a Microsoft Windows environment is developed so that all the real-time data that were generated during the verification process can be downloaded and displayed on the host computer. Hence, the system acts like a logic analyzer with very large storage memory. Ignacio Bravo et al. [6] described an architecture based on FPGA's for real time image processing. The system is composed of a high resolution (1280×1024) CMOS sensor connected to a FPGA that will be in charge of acquiring images from the sensor and controlling it too. A PC sends certain orders and parameters, configured by the user, to the FPGA. The connection between the PC and the FPGA is made through the parallel port. The resolution of the captured image, as well as the selection of a window inside the image, is configured by the user in the PC. Jahnvi Vaidya et al. [7] implemented a video capture system on the Xilinx FPGA board using Xilinx EDK tools. It will digitize a video signal from a camera and display it on the monitor in a real-time mode. Jaun M. et al. [8] described implementation of an educational platform for real-time linear and morphological image filtering using a FPGA NexysII, Xilinx®, Spartan 3E, The system is connected to a USB port of a personal computer, which in that way form a powerful and low-cost design station for educational purposes. The FPGA-based system is accessed through a MATLAB graphical user interface, which handles the communication setup and data transfer. Divyang K et al. [9] discuss the design and implementation of a Field- Programmable Gate Array (FPGA) based stereo depth measurement system that is capable of handling a very large disparity range. The system performs rectification of the input video stream and a left-right consistency check to improve the accuracy of the results and generates subpixel disparities at 30 frames/second on 480X640 images. Batlle J. et al. [10] present a new reconfigurable parallel architecture oriented to video-rate computer vision applications. This architecture is structured with a two-dimensional (2D) array of FPGA/DSP-based reprogrammable processors Pij. These processors are interconnected by means of a systolic 2D array of FPGA-based video-addressing units. This architecture has been designed to deal with parallel/pipeline procedures, performing operations which handle various simultaneous input images, and cover a wide range of real-time computer vision applications from pre-processing operations to low-level interpretation. The exchange of information between the linked processors Pij of the 2D net lies in the transfer of complete images, pixel by pixel, at video-rate. Sorin A. et al. [11] concerned with a substantial speed up of image processing methods on 2D and 3D images making use of modern FPGA (Field Programmable Gate Array) technology. The applications of this class of methods ranges from 2D and 3D image de-noising and restoration, segmentation, morphological shape recovery and matching to vector field visualization and simulation.

Lidong C et al. [12] proposed FPGA implementation of pipeline structure, which uses lookup tables to replace complex calculations to guarantee high speed performance and low cost of hardware resources. Notably, a novel strategy of ldquo block prefect hingrdquo is proposed. The experimental results show that the implementation can realize real-time unrolling of 1024times1024 omnidirectional images into 3200times768 panoramic images at 24.672 ms per frame. Ching H. et al. [13] improved technology for image contrast enhancement using FPGA hardware. Based on Histogram Equalization (HE) method, this paper proposes a simple contrast enhancement scheme named Adaptively Increasing the Value of Histogram (AIVHE). It provides a convenient and effective mechanism to control the rate of contrast enhancement. AIVHE offers a gradually increment by the mean brightness of the image to modify the original probability density function (PDF). Xu G. et al. [14] designed a high speed scanning measurement system using FPGA to solve the crossing-linkable polyethylene (XLPE) insulation compound purity evaluation problem. The experimental results demonstrated that defects within 70 Â¿m~1000 Â¿m were inspected effectively by the CCD scanning defects inspection instrument, and Good agreement was shown between defects images real-time reconstructed and optical microscopic images not only in shape but also in gray.

2. Focal Plane

Focal-plane SIMD architecture is capable of supporting real-time performances with sustained operation throughputs of 500–1500 giga operations. The focal-plane architecture exploits the direct coupling between sensor and parallel-processor arrays to alleviate data bandwidth requirements, allowing computation to be performed in a stream-parallel computation model, while data arrive from the sensors. Sabrina E. et al. [15] presented an update on research activities at Columbia University in the area of focal-plane image processing. Two thrust areas have been pursued: image reorganization for image compression and image half-toning. The image reorganization processor is an integration of a 256 x 256 frame-transfer CCD imager with CCD-based circuitry for pixel data reorganization to enable difference encoding for hierarchical image compression The half-toning chip consists of a 256 x 256 frame transfer imager, a pipeline register, and comparator Circuit. Sek M. Chai et al. [16] presented an architecture that uses focal-plane optoelectronic-area I/O with a Fine-grain, low-memory, single-instruction–multiple-data (SIMD) processor array as an efficient computational solution for real-time hyper spectral image processing. Antonio G et al. [17] evaluate the effectiveness of the SIMPil design on a set of important image applications. The SIMD Pixel Processor (SIMPil) has been designed. In SIMPil, an image sensor array (focal plane) is integrated on top of a SIMD computing layer, where processing elements (PEs) are connected in a torus.

3. Cloud

Petros T et al. [18] described Cloud based image processing by extracting quantized random projections of the image features under consideration, transmit these to the cloud server, and perform matching in the space of the quantized projections.

Xiaoyan S et al. [19] propose a novel image de-noising scheme which recovers an image by exploiting the correlations between the noisy image and the images retrieved from the Cloud. Given a noisy image, we first retrieve the relevant images based on the feature-level similarity. After alignment, these images are used in our patch-level noise removal by exploiting the local correlation between a noisy patch and its external similar ones. Miao D et al. [20] proposes a low-delay cloud-based FVV rendering framework to support FVV on mobile devices with satisfactory video quality and low interaction delay. In framework, the rendering allocation scheme is proposed in which the local rendering is introduced on mobile devices during the viewpoint switching to conceal the interaction delay.

4. Segmentation

Alexey A. et al. [21] present a novel parallel image segmentation algorithm which segments images in real-time in a non-parametric way. The algorithm finds the equilibrium states of a Potts model in the super paramagnetic phase of the system. Our method maps perfectly onto the Graphics Processing Unit (GPU) architecture and has been implemented using the framework NVIDIA Compute Unified Device Architecture (CUDA). Dillinger P. et al. [22] propose the perfectly parallelizable 3D grey-value structure code (3D-GSC) for image segmentation on a new FPGA custom machine. This 128-bit FPGA co-processing board features an up-to-date Vertex-II Pro architecture, two large independent DDR-SDRAM channels, two fast independent ZBT-SRAM channels, and PCI-X bus and Camera Link interfaces. The hardware speeds up the segmentation algorithm and allows processing of a 5123 image in about 2 sec. S. Siddharthy et al. [23] have used both region growing based background subtraction approaches for detecting the object by image segmentation algorithm using FPGA (where FPGAs are well suited for the implementation of fixed point digital signal processing algorithms). Bo Peng et al. [24] have proposed an iterative region merging based image segmentation algorithm by using graph cuts for optimization. In standard graph cuts, the extraction of foreground object in a complex background often leads to many segmentation errors and the parameter in the energy function is hard to select. In iterated graph cuts algorithm, this starts from the sub-graph that comprises the user labelled fore-ground/background regions and works iteratively to label the surrounding un-segmented regions. K. H. Zhang et al. [25] have proposed novel region-based ACM for image segmentation. It is implemented with a special processing named selective Binary and Gaussian filtering regularized little set (SBGFRLS) method. This method combines the merits of the traditional GAC and C-U models which possess the property of local and global segmentation. Yuri Y. Boykov et al. [26] have described a technique for segmentation of N-dimensional images. In this user marks certain pixels as ―object‖ or ―background‖ to provide hard constraints incorporate both boundary and region information. This segmentation method is implemented via max-flow algorithm.

5. Edge Detection

Guang-HaiLiu et al. [27] explained image feature representation method, called multi-texton histogram (MTH), for image retrieval. It can be used as a colour texture descriptor and leads to good performance. The proposed MTH method is extensively tested on the Corel dataset with 15 000 natural images. PRIYANKA S. CHIKKALI et al. [28] discussed the implementation of histogram equalization algorithm using MATLAB for a real time processing system on an FPGA. The histogram equalization algorithm was implemented and tested using array. V.ELAMARAN et al. [29] discussed a real time image processing algorithm which is implemented on FPGA. Point processes are the simplest and basic image processing operations. They operate on a pixel bases only on that pixel's value. Point processing operations such as arithmetic operations, XOR operations, Histogram with Equalization, Contrast stretching and intensity transformations. M. Chandrasekhar et al. [30] discussed about digital image to extract true image is a desired goal in several applications, such transformation is known as image enhancement. Performing the task automatically without human intervention is particularly hard in image processing. The transform is capable to perform both a nonlinear and a shape preserving stretch of the image histogram. This image enhancement results are compared to histogram equalization. PRIYANKA S. CHIKKALI et al. [28] evaluated model for edge detection and segmentation using sobel operator. Histogram is used for automatically determining the threshold for different region in image. Edge detection is used to check the sudden change in images. Bob Zhang1 et al. [27] discussed a accurate extraction of retinal blood vessels which is an important task in computer aided diagnosis of retinopathy. The Matched Filter (MF) is a simple yet effective method for vessel extraction. However, a MF will respond not only to vessels but also to non-vessel edges. It achieves competitive vessel detection results as compared with those state-of-the-art schemes but with much lower complexity. S. Munawar Ali et al. [32] evaluate that Xilinx system generator which is used in this paper is a very useful tool for developing computer vision algorithm. Image processing is used to modify the picture extract information, change their structure. The processing pixel to pixel of an image and in the modification of pixel neighbor hoods and of course the transformation can be applied to the whole image or only a partial region. Paul Bao et al. [33] discussed a technique of scale multiplication which is analyzed in the framework of canny edge detection. A scale multiplication function is defined as the product of the responses of the detection filter at two scales. Edge maps are constructed as the local maxima by thresholding the scale multiplication results. The detection and localization criteria of the scale multiplication are derived.

6. A3 (Algorithm Architecture Ad equation) methodology

The goal of this methodology is to find out an optimized implementation of an application algorithm on architecture. "Adequation" is a French word meaning an efficient matching. This methodology is based on graphs model to exhibit both the potential parallelism of the algorithm and the available parallelism of the multicomponent. Sorel y. et al. [34] described an approach based on accurate algorithm and hardware architecture models, reduces significantly the development cycle of image processing applications, by simplifying test and debugs process. It allows minimizing the hardware resources as required for embedding, whiling satisfying real-time constraints. Grandpierre T. et al. [35] presents an enhancement of our ―Algorithm Architecture Ad equation‖ (AAA) prototyping methodology which allows to rapidly develop and optimize the implementation of a reactive real-time dataflow algorithm on a embedded heterogeneous multiprocessor architecture, predict its real-time behavior and automatically generate the corresponding distributed and optimized static executive. It describes a new optimization heuristic able to support heterogeneous architectures. Ailton F. et al. [36] presented the Algorithm Architecture ―Ad equation‖ methodology for the optimized implementation of real-time image processing algorithms on field programmable gate arrays. This methodology is based on a single factorized graphs model, used from the algorithm specification down to the architecture implementation, through optimizations expressed in terms of de-factorization transformations.

7. SURE engine

SURE engine is a new high speed real time image processing system designed to provide higher image quality by taking direct conversion FPD which gives high sensitivity and resolution. SURE engine system was designed to improve the S/N ratio, contrast and time resolution. Kazuhiro M et al. [37] developed the SURE engine to provide higher image quality. This engine continuously isolates noise elements from signal elements in each image of dynamic image as it moves. In this paper the developed engine is capable to provide maximum performance under a wide array of clinical conditions. Miura Y. et al. [38] describes the operating principal of SURE engine PRO (Pattern Reorganization Optimizer). PRO higher image quality. The SURE engine works on concept of pattern recognition.

8. Corner Detection

Corner detection in an image plays an important role in computer vision because corners in images include useful information and are invariant to geometric deformation. Corners are used as feature points in many applications, such as image registration, moving object tracking, object recognition, and so on. Mokhtarian F. et al. [39] describes a method for image corner detection based on the curvature scale-space (CSS) representation. The first step is to extract edges from the original image using a canny detector. The corner points of an image are defined as points where image edges have their maxima of absolute curvature. The corner points are detected at a high scale of the CSS and tracked through multiple lower scales to improve localization.

Gupta A. et al. [40] presents a new developed Matlab Simulink model to compute traffic load for real time traffic signal control. Signal processing Block set and video and image processing Block set have been used for traffic load computation. The approach used is corner detection operation, wherein, corners are extracted to count the number of vehicles. This block finds the location of the corners, the number of corners, and the corner metric values. Phull R. et al. [41] proposes the implementation of low complexity corner detector algorithm on a parallel computing architecture, namely a GPU using Compute Unified Device Architecture (CUDA) which shows the low complexity corner detector is 2-3 times faster than the Harris corner detector algorithm on the same GPU platform.

III. APPLICATIONS

1. Medical

Masaru Fukumoto et al. [42] have discussed about SLOT Radiography which is a new application i.e. useful in the field of orthopaedics. Slot radiology is a technique used to obtain long images. With the X-ray tube and FPD acting as a pair, the X-ray beam is narrowed to a region with a width of a few cm (the slot width) running perpendicular to the axis of the body, and images are continuously taken while the imaging chain is moved over the body at a constant speed. Information about the position of the imaging chain relative to the R/F table is used to combine the acquired images into single long image. With an FDP, a wide dynamic range with no distortion is available, and by performing dynamic range compression or by adjusting the gradation, it is po2ssible to obtain an even image of the entire region containing the cervical spine, thoracic spine, and lumbar spine. Slot radiology offers various advantages like projection from infinity, Low dose, and improved operability. Santarelli MF et al. [43] proposed multimodal dynamic three dimensional (3-D) visualization in real time that supports medical specialists in the diagnosis of moving organs, such as the heart during the cardiac cycle, allowing them to compare information on perfusion/contraction match as a basis for diagnosis of important cardiovascular diseases. The 3-D volume-rendering algorithm runs on a SIMD machine because of the great amount of data to be manipulated by always using the same operations. One of the features of the algorithm is the possibility to change, interactively, image processing and visualization parameters at any step, and to perform simple and effective image manipulations. Performance studies have demonstrated a very high global efficiency in practical situations by using typical data-volume dimensions. The system has been tested in the medical environment, by using magnetic resonance (MR) and single-photon emission-computed tomographic (SPECT) images.

Kohji Ohbayashi et al. [44] discussed the real-time 3D OCT imaging system by using optical coherence tomography (OCT) and a 320-channel data acquisition system combining NI Flex RIO field-programmable gate array (FPGA) hardware and GPU processing.

Victor Murray et al. [45] have discussed about AM-FM methods used for carotid artery ultrasound, pneumoconiosis, diabetic retinopathy, and age-related macular degeneration. Its ability to represent different frequencies is highly valuable when analysing structures with spatial and spectral variability. In retinal images, structures such as drusen and microa-neurysms have a well-defined shape that gets captured by the higher-frequency scale AM-FM filters, while vessels and haemorrhages are better represented in the lower frequencies. In chest radiographs, nodules can also be well represented using the AM-FM features. The combination of feature extraction and classification using PLS has produced robust systems for the analysis of chest radiographs, where an automatic grading system for pneumoconiosis has been demonstrated on a limited-size database. For diabetic retinopathy, a screening sys-tem has been developed and it is currently being tested on an extensive database for FDA approval.

Mohammad Sameti et al. [46] discussed Image feature extraction which was utilized to retrospectively analyse screening mammograms taken prior to the detection of a malignant mass for early detection of breast cancer. Feature extraction system, at its current stage, can be used by a radiologist as follows. The radiologist can mark any region on the screening mammogram to examine. The system then calculates the features for this region and classifies the region as normal or abnormal.

2. Pedestrian Protection

Tarak Gandhi et al. [47] deal with pedestrian safety and collision avoidance. Pedestrian safety measures, including infrastructure enhancements and passive safety features in vehicles, are described, followed by a systematic description of active safety systems based on pedestrian detection using sensors in vehicle and infrastructure. The pedestrian detection approaches are classified according to various criteria such as the type and configuration of sensors, as well as the video cues and classifiers used in detection algorithms. It is noted that collision avoidance not only requires detection of pedestrians but also requires collision prediction using pedestrian dynamics and behaviour analysis. Mike McCarthy et al. [48] discussed pre-crash sensing and active safety systems. Such systems require sensors capable of accurately and reliably detecting the presence of a pedestrian prior to a collision, and activating protective countermeasures effectively in order to reduce the pedestrian injury risk. P.N. Holding et al. [49] studied Advanced Active Adaptive Secondary Safety systems, which comprised of sensors to identify a pedestrian within the vicinity of a vehicle and determine the likelihood of an impact and airbags fitted to various parts of the vehicle front to protect the pedestrian in an impact. The research comprised modelling in MADYMO followed by impact testing. Sensor systems were investigated in parallel. C. Keller et al. [50] explained Active pedestrian safety system, which combines sensing, situation analysis, decision making and vehicle control. The sensing component is based on stereo vision; it fuses two complementary approaches for added robustness: motion-based object detection and pedestrian recognition. The highlight of the system is the ability to decide within a split second whether to perform automatic braking or evasive steering, and to execute this maneuver reliably, at relatively high vehicle speeds (up to 50 km/h).

3. Biometrics

i. Fingerprint Detection

Marios S. Pattichis et al. [51] suggested that AM–FM models are well suited for fingerprint analysis and classification. Ridge variations are represented as an FM function, while variations in the ridge intensity modelled as an AM function. We show how the FM component can be isolated (by band pass filtering) and extracted using a dominant component analysis algorithm. Mary Lourde R et al. [52] proposed an application of accurate personal identification is securing limited access systems from malicious attacks. He deals with the issue of selection of an optimal algorithm for fingerprint matching in order to design a system that matches required specifications in performance and accuracy. Muhammad Umer Munir et al. [53] proposed a fingerprint matching scheme that uses a set of 16 Gabor filters, whose spatial frequencies correspond to the average inter-ridge spacing in fingerprints, is used to capture the ridge strength at equally spaced orientations. A circular tessellation of filtered image is then used to construct the ridge feature map. This ridge feature map contains both global and local details in a fingerprint as a compact fixed length feature vector. The fingerprint matching is based on the Euclidean distance between two corresponding feature vectors. The primary advantage of our approach is improved translation and rotation invariance.

ii. Face Recognition

Selin Baskan et al. [54] discussed about detection of facial features and then circumscribe each facial feature with the smallest rectangle possible by using Vertical and horizontal gray value projections of pixels. The result is evaluated with respect to the manually located enclosing rectangle on the images of a publicly available database. Kin Choong Yow et al. [57] investigated the effects of varying the scale and orientation parameters of a feature-based face detection algorithm, and have proposed an extension of the algorithm to work under different imaging conditions. The algorithm is shown to be able to work well in detecting faces under different scale, orientation and viewpoint.

4. Object Tracking

Alper Yilmaz et al. [54] discussed tracking methods on the basis of the object and motion representations used, provide detailed descriptions of representative methods in each category, and examine their pros and cons. Moreover, discuss the important issues related to tracking including the use of appropriate image features, selection of motion models, and detection of objects. Jifeng Ning et al. [58] explained the model which is effectively extracts the edges and corners, which are important and robust features, of the object while suppressing the smooth background features and are used especially in tracking objects that have similar colour appearance to the background.

Iryna Gordon et al. [56] describes a sparse metric model of the real-world environment, provides interactive means for specifying the pose of a virtual object, and performs model-based camera tracking of image with visually pleasing augmentation results. Duy-Nguyen Ta et al. [57] explain an efficient algorithm for continuous image recognition and feature descriptor tracking in video which operates by reducing the search space of possible interest points inside of the scale space image pyramid. Jifeng Ning et al. [58] Evaluated a scale and orientation adaptive mean shift tracking (SOAMST) algorithm is proposed in this paper to address the problem of how to estimate the scale and orientation changes of the target under the mean shift tracking framework.

5. Vehicle Detection and Monitoring

V.ELAMARAN et al. [59] discussed a real time image processing algorithm which is implemented on FPGA. Point processes are the simplest and basic image processing operations. They operate on a pixel bases only on that pixel’s value. Point processing operations such as arithmetic operations, XOR operations, Histogram with Equalization, Contrast stretching and intensity transformations. Tran Duc Duan et al. [64] discussed a method which optimizes speed and accuracy in processing images taken from various positions. The problem of VLP recognition is a very interesting but difficult one. It is very useful for many traffic management systems. VLP recognition requires some complex tasks, such as VLP detection, segmentation and recognition. Abhijit Mahalanobis et al. [63] show advantage of multiple cameras in order to monitor activity over a large area. The system must be able to handle both stationary and moving objects. The system must be able to detect, track and handed over moving objects between cameras in real-time. Richard E. Raymond P.E et al. [66] explained to identify and quantify the more significant, heavier vehicular loads to which the city’s streets are subjected, and provide a means of visualizing and Understanding how the various loads affect the service life of the city’s pavement infrastructure particularly the local access streets. C.C. CAPRANI et al. [67] discussed about traffic loading is one of the most variable parameters in a bridge reliability assessment. Its accurate assessment potentially offers large savings due to reduced bridge rehabilitation or replacement costs. The authors conclude that contrary to the common assumption, the governing form of traffic may be congested traffic. Alexandra Koutsia et al. [68] described traffic control and monitoring using video sensors that has recently drawn increasing attention, due to the significant advances in the field of computer vision. The paper presents a real-time vision system for automatic traffic monitoring based on a network of autonomous tracking units that capture and process images from one or more pre-calibrated cameras.

M.Y. Siyal et al. [69] discussed the processing of vehicle detection, vehicle count and queue parameters. A common and simple vehicle detection technique is the background differencing technique. This technique is based on a pixel-by-pixel comparison of a background image of a traffic scene (without any moving vehicles) and the current frame of the scene.

6. Traffic queue detection algorithm

The algorithm used to detect and measure queue parameters consists of two operations—one involving motion detection operation and the other vehicle detection operation. Fathy M. et al. [66] proposed a method based on applying the combination of noise insensitive and simple algorithms on a number of sub-profiles (a one-pixel-wide key-region) along the road. The proposed queue detection algorithm consists of motion detection and vehicle detection operations, both based on extracting edges of the scene, to reduce the effects of variation of lighting conditions. To reduce the computation time, the motion detection operation continuously operates on all the sub-profiles, but the vehicle detection is only applied to the tail of the queue. Alok T. et al. [67] Discussed about Algorithm which measure basic queue parameters such as period of occurrence between queues, the length and slope of occurrence.

7. Motion Detection

Amina A. Dawood et al. [68] discussed about various approaches for motion detection in a real-time video stream. All of them are based on comparing of the current video frame with one from the previous frames or with background. The most efficient algorithms are based on building the so called background of the scene and comparing each current frame with the background. Orasa patsadu et al. [69] conducts a survey of existing smart systems and techniques in detecting fall motion in human movement, including the emergence of new natural user interface (NUI) devices and systems in the consumer market. Secondly, the paper categorizes smart technologies for fall motion detection into three main technological groups: acoustic and ambient sensor-based, kinematic sensor-based, and lastly the computer vision and NUI. Lovendra Solanki et al. [70] focused on detection of moving human objects in video surveillance system, before tracking the objects in the scene. Detection of person is first low level important task for any video surveillance application. In this survey, we described background subtraction with alpha, statistical method, temporal frame differencing and optical flow methods to detect moving object. After moving objects are detected, to further track people and analyse their activities, it is very necessary to correctly distinguish them from other moving objects, therefore shape based and motion based classification is studied under human body classification.

8. Agriculture

Anup Vibhute et al. [73] discussed about Imaging techniques with different spectrum such as Infrared, hyper spectral imaging, X-ray were useful in determining the vegetation indices, canopy measurement, irrigated land mapping etc. with greater accuracies. Weed classification which affects the yield can be correctly classified with the image processing algorithms. Muhammad Hameed Siddiqi et al. [74] discussed an algorithm is developed for automatic spray control system. The algorithm is based on erosion followed by dilation segmentation algorithm. This algorithm can detect weeds and also classify it. Currently the algorithm is tested on two types of weeds i.e. broad and narrow. The developed algorithm has been tested on these two types of weeds in the lab, which gives a very reliable performance. The algorithm is applied on 240 images stored in a database in the lab, of which 100 images were taken from broad leaf weeds and 100 were taken from narrow leaf weeds, and the remaining 40 were taken from no or little weeds. Xavier P. Burgos-Artizzu et al. [75] explained a computer-based image analysis system allowing users to input digital images of a crop field, and to process these by a series of methods to enable the percentages of weeds, crop and soil present in the image to be estimated. The system includes a Case-Based Reasoning (CBR) system that, automatically and in real time, determines which processing method is the best for each image. The main challenge in terms of image analysis is achieving appropriate discrimination between weeds, crop and soil in outdoor field images under varying light, soil background texture and crop damage conditions. The performance of the developed system is shown for a set of images acquired from different fields and under different, uncontrolled conditions, such as different light, crop growth stage and size of weeds, reaching correlation coefficients with real data of almost 80%.

IV. ISSUSES AND CHALLENGES

- Critical address aligning is the main issue in real time DSP image processing systems. SAD and byte array moving operation are sensitive aligning issue.
- Another issue is providing real time image processing for the portable devices.
- Challenge in woodworking Industry [76] is how to determine the log rotation before processing order to process the log with the right angle. When the log is moving along the production live the log inevitably moves and rotates. This rotation to be corrected before processing takes place.
- Performance requirement is special issue on parallel computing for real time image processing to present the current state-of-the-art in the field of parallel programming and the future trends in real time image and video processing as related to parallel computing [78].
- Real time image processing poses a challenge to the machine vision designer. Even a simple situation to examine products of size 64*64 pixel moving at the rate of 10 to 20 per sec along a conveyor amounts to a requirement to process up to 100,000 pixels per sec or typically 4 times this rate if space between objects is taken into account[77].
- Another issue is a basic process such as edge detection generally requires a neighborhood of at least 9 pixels to be examine before an output pixel value can be computed. Thus, the no of pixel memory assesses is already 10 times that is given by the basic pixel processing rate [77].
- Skeletonization function or size filtering require a number of basic processes to be applied in turn for example eliminating objects up to 20 p0ixels wide requires 10 erosion operations[77].

V. CONCLUSION

We conclude that following technologies are used in following application areas with future scope:

TECHNIQUES	APPLICATION	FUTURE SCOPE

Corner detection	Biometrics, Security, Object tracking, Traffic load computation, medical applications etc.	Used in security & surveillance.
Focal plane	Image recognition for image compression & image half toning, Focal plane SIMD is capable of real time performance with throughput of 500-1500 giga operations.	Used in X-ray image intensifier, Infrared detectors & 3-D TVs.
FPGA	Image & video processing platform, laser image detector, real time multi object tracker, SLOT Radiology, Vehicle detection and monitoring etc.	Used in VLSI circuitry to improve throughput by preserving the sequential programming model.
Segmentation	Parallel Image segmentation, traffic load computation, object tracking, boundary & region information.	Used in watershed IP, 3-D segmentation of a great vessels using active contours.
A3 method	It minimizes the hardware resources, implementation of reactive real time data flow algorithm.	Used in Hybrid system simulation for real time implementation.
SURE engine	To improve the S/N ratio, contrast and time resolution, provide higher image quality.	Used to improve performance of flat panel detectors.
Cloud based IP	CBIP is done by extracting quantized random projections & developed image de-noising system, low delay cloud based FVV rendering framework.	Used in image retrieval.
Edge detection	Object tracking, Traffic load computation, medical applications etc.	Used For Edge Linking in Discontinuing segments, Sharp the

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