PERSONALITY STABILIZER AND CATHODE BASED PROCESSING SYSTEM

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ABSTRACT:

Visual representation of a real-life object (a person or any other object) in a two-dimensional form is called an image. An image is nothing but a collection of pixels in different color spaces. From this definition, two terms are prominent in understanding what an image really is, these are the term; 'twodimensional' and 'pixels'. Two-dimensional form. When an object is in the two-dimensional for (2D) it means simply that there are only two dimensions of measurements that are used to define it. This could be the common width and height, or the geometric x-axis and y-axis. This property of an image is very important in carrying out mathematical operations to an image. In other words, we are simply saying that we can define or map an image on to an x-y plane simplifies this by defining an image as a two-dimensional function, F (x, y), where x and y are spatial coordinates and the amplitude of F at any pair of coordinates (x, y) is called the intensity of that image at that point. When x, y, and amplitude values of F are finite, we call it a digital image. In other words, an image can be defined by a two-dimensional array specifically arranged in rows and columns. Pixels. To understand more about what an image is, we can think about what exactly makes up an image. A complete image is a set that consists of small samples. These samples are called pixels. They are the smallest elements in any digital image. So, pixels are subsamples of an image that, when get combined, give us the complete image.

Keywords: Ninox-K, Pixel-Classifer, Image classifier, Fomation, Plane

INTRODUCTION:

In this section, I will introduce some file formats that we may encounter on our journey in image processing. It is important to know and understand the image format so that we can carry out various carry out appropriate technics when doing image processing. JPEG (or JPG) - Joint Photographic Experts Group JPEGs are known for their "lossy" compression, meaning that the quality of the image decreases as the file size decreases. You can use JPEGs for projects on the web, in Microsoft Office documents, or for projects that require printing at a high resolution. Paying attention to the resolution and file size with JPEGs is essential in order to produce a nice-looking project. PNG - Portable Network Graphics PNGs are amazing for interactive documents such as web pages, but are not suitable for print. While PNGs are "lossless," meaning you can edit them and not lose quality, they are still low resolution. The reason PNGs are used in most web projects is that you can save your image with more colors on a transparent background. This makes for a much sharper, web-quality image. GIF - Graphics Interchange Format GIFs are most common in their animated form, which are all the rage on Tumblr pages and in banner ads. In their more basic form, GIFs are formed from up to 256 colors in the RGB colorspace. Due to the limited number of colors, the file size is drastically reduced. This is a common file type for web projects where an image needs to load very quickly, as opposed to one that needs to retain a higher level of quality. (Lee, 2018) TIFF - Tagged Image File A TIF is a large raster file that doesn't lose quality. This file type is known for using "lossless compression," meaning the original image data is maintained regardless of how often you might copy, re-save, or compress the original file. Despite TIFF images' ability to recover their quality after manipulation, you should avoid using this file type. it can take forever to load. TIFF files are also commonly

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used when saving photographs for print. (Lee, 2018) PSD - Photoshop Document PSDs are files that are created and saved in Adobe Photoshop, a popular graphics editing software. This type of file contains "layers" that make modifying the image much easier to handle. The largest disadvantage to PSDs is that Photoshop works with raster images as opposed to vector images. (Lee, 2018)raster images are pixel-based, they suffer a malady called image degradation. Just like photographic images that get blurry and imprecise when blown up, a raster image gets jagged and rough. (connection, 2020) vector images. vector-based graphics are more malleable than raster images — thus, they are much more versatile, flexible and easy to use. The most obvious advantage of vector images over raster graphics is that vector images are quickly and perfectly scalable. (connection, 2020) PDF - Portable Document Format PDFs were invented by Adobe with the goal of capturing and reviewing rich information from any application and device. If a designer saves your vector logo in PDF format, you can view it without any design editing software and they have the ability to use this file to make further manipulations. (Lee, 2018) EPS - Encapsulated Postscript EPS is a file in vector format that has been designed to produce high-resolution graphics for print. Almost any kind of design software can create an EPS. The EPS extension is more of a universal file type (much like the PDF) that can be used to open vector-based artwork in any design editor. (Lee, 2018) What is Image processing? Now that we have a good idea of what exactly an Image is, we can move on to understanding the subject of many conversations in the sector research and computer science. The subject is image processing. In this data age that we live in, data scientists, students and researchers have been coming up with advanced ways and technics to extract information from any piece of data. Images have not been left out in this process. Images have proven to be every useful because of the human vision ability that can quickly assimilate large amounts of information within a very short time. It is said that a picture is worth a thousand words, this is particularly true because it is much easier for the brain to understand and remember what it interprets with vision that any other sense. Computers scientists, data scientists and researchers have been trying to give this interpretation ability and data extraction for better understanding to computers. By definition, image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. it is a type of signal dispensation in which the input is an image and the output is an image or characteristics associated with that image. (R. Suganya, 2018) What are the uses of Image processing? Today there is almost no area of technical endeavour that is not impacted in some way by digital image processing. As optics, imaging sensors, and computational technology advanced, image processing has become more commonly used in many different areas. Some areas of application of digital image processing include image enhancement for better human perception, image compression and transmission, as well as image representation for automatic machine perception (ElizaYingzi Du). We can cover only a few of their applications in the context and space of the current discussion. In general, the fields that use digital image processing techniques can be divided into criminology, morphology, microscopy, photography, remote sensing, medical imaging, forensics, transportation and military application but not limited to. Criminology / Forensics: The growth of sophisticated image processing and editing software has made the manipulation of digital images easy and imperceptible to the naked eyes. This has increased the demand to assess the trustworthiness of digital images when used in crime investigation, as evidence in court of law and for surveillance purposes (Ms. Neha Singh, 2015). Ideally, the image will be clear, with all persons, settings, and objects reliably identifiable. Unfortunately, though, that is not always the case, and the photograph or video image may be grainy, blurry, of poor contrast, or even damaged in some way. In such cases, investigators may rely on computerized technology that enables digital processing and enhancement of an image. (Thomas) Medical Imaging: This is a technology that can be used to generate images of a human body (or part of it). These images are then processed or analysed by experts, who provide clinical prescription based on their observations. Ultrasonic, X-ray, Computerized Tomography (CT) and Magnetic Resonance Imaging (MRI) are quite often seen in daily life, though different sensory systems are individually applied. (James J. Park, 2017) Remote Sensing: This is technology of employing remote sensors to gather information about the Earth. Usually the techniques used to obtain the information depend on electromagnetic radiation, force fields, or acoustic energy that can be detected by cameras, radiometers, lasers, radar systems, sonar seismographs, thermal meters. Image processing is almost always the first step of any remote sensing application project but it is often given greater significance than it deserves. In fact, one of the main objectives of image processing is to optimise visualisation of particular thematic dataset. Visual interpretation is therefore essential. Thematic maps are the most important products of remotely sensed imagery and they are derived either by visual interpretation or image segmentation (computerised classification). (Mason, 2016) Military: digital image processing has been widely deployed for defence and security applications such as small target detection and tracking, missile guidance, vehicle navigation, wide area surveillance, and automatic/aided target recognition. One goal for an image processing approach in defence and security applications is to reduce the workload of human analysts in order to cope with the ever-increasing volume of image data that is being collected. A second, more challenging goal for image processing researchers is to develop algorithms and approaches that will significantly aid the development of fully autonomous systems capable of decisions and actions based on all sensor inputs (ElizaYingzi Du).Transportation: This is a new area that has just been developed in recent years. One of the key technological progresses is the design of automatically driven vehicles, where imaging systems play a vital role in path planning, obstacle avoidance and servo control. With the development of digital image processing technology, traffic video monitoring technology based on image processing technology has become an important frontier research field of intelligent transportation system. (Wenshuai Ji, 2016).

METHODOLOGY:

Industrial inspection/ quality control: A major area of digital image processing is in automated visual inspection of manufactured goods. A system has a controller board for a CD_ROM drive. A typical image processing task with products like this is to inspect them for missing parts. Detecting anomalies like there is a major theme of industrial inspection that includes other products such as wood and cloth. (Oprea, Lita, Jurianu, Visan, & Cioc) Digital Camera Images: Digital cameras generally include dedicated digital image processing chips to convert the raw data from the image sensor into a color-corrected image in a standard image file format. Images from digital cameras often receive further processing to improve their quality, a distinct advantage that digital cameras have over film cameras. The digital image processing typically is executed by special software programs that can manipulate the image in many ways. Many digital cameras also enable viewing of histograms of images, as an aid for the photographer to understand the rendered brightness range of each shot more readily. (Florin) Image processing operations There are a lot of operations that could be executed in image processing. The following are some of the operations but the list is not limited to these listed operations. • Changing Colorspaces • Geometric Transformations of Images • Image Thresholding • Smoothing Images • Morphological Transformations • Image Gradients • Canny Edge Detection • Image Pyramids • Image Transforms in OpenCV In this section, I will demonstrate how some of the above operations can be done with the python library called OpenCV. What is python and why python? According to the official Python execute summary, Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed. (Python, 2020) The above statement explains both the what and why question. Python is equipped with the necessary packages and tools that make it possible for user to do many tasks and operations such as image processing. Apart from OpenCV, python also has the Pillow library that can be installed and used for basic operations like cropping and resizing. If we want to perform more advanced operations using Pillow, we must always convert the image to digital form, because by default the images in pillow are not automatically in digital form. We also have Scikit learn and Matplotlib that are also used for image processing. Changing Colorspaces Our aim here is to change or convert the color spaces in an image for example, from BGR to Gray. A color space is defined as all the possible tones generated by a color model. A color model is actually a set of equations and/or rules used to calculate a given color and are capable of describing a wide range of tones from the visible spectrum of light. (Marco A. Pérez Cisneros, 2019). This property of images is important because according to (Shreyank N. Gowda, 2019) Image classification is a fundamental application in image processing. Recently, deeper networks and highly connected networks have shown state of the art performance for image classification tasks. Most datasets these days consist of a finite number of color images. These color images are taken as input in the form of RGB images and classification is done without modifying them. Now that we know the importance of changing Colorspaces, we will now execute the operation using python and OpenCV as earlier mentioned. Basically what the program above does is more than just convert Colorspaces from BGR to HSV, we use cv2.VideoCapture (0) the webcam and capture a video a very short video, which is in essence an image, we also use cv2.cvtColor(frame, cv2.COLOR_BGR2HSV) to convert our color spaces BGR to HSV and we use cv2.imshow to display the results after defining the threshold of HSV image for a range of blue color. Geometric Transformations of Images According to (Rhody), Geometric transformations are widely used for image registration and the removal of geometric distortion. Common applications include construction of mosaics, geographical mapping, stereo and video. A spatial transformation of an image is a geometric transformation of the image coordinate system. It is often necessary to perform a spatial transformation to: • Align images that were taken at different times or with different sensors • Correct images for lens distortion • Correct effects of camera orientation • Image morphing or other special effects Transformation OpenCV provides two transformation functions, cv2.warpAffine and cv2.warpPerspective, with which you can have all kinds of transformations. cv2.warpAffine takes a 2x3 transformation matrix while cv2.warpPerspective takes a 3x3 transformation matrix as input. (Revision, 2020) Scaling Scaling is just resizing of the image. OpenCV comes with a function cv2.resize() for this purpose. The size of the image can be specified manually, or you can specify the scaling factor. Different interpolation methods are used. Preferable interpolation methods are cv2.INTER_AREA for shrinking and cv2.INTER_CUBIC (slow) & cv2.INTER_LINEAR for zooming. By default, interpolation method used is cv2.INTER_LINEAR for all resizing purposes. You can resize an input image by following the methods below (Revision, 2020). An image may be defined as a two-dimensional function, f(x, y), where x and y are spatial (plane) coordinates, and the amplitude of f at any pair of coordinates (x, y) is called the intensity or gray level of the image at that point. When x, y, and the amplitude values of f are all finite, discrete quantities, we call the image a digital image. The field of digital image processing refers to processing digital images by means of a digital computer. Note that a digital image is composed of a finite number of elements, each of which has a particular location and value. These elements are referred to as picture elements, image elements, pels, and pixels. Pixel is the term most widely used to denote the elements of a digital image. Vision is the most advanced of our senses, so it is not surprising that images play the single most important role in human perception. However, unlike humans, who are limited to the visual band of the electromagnetic (EM) spectrum, imaging machines cover almost the entire EM spectrum, ranging from gamma to radio waves. They can operate on images generated by sources that humans are not accustomed to associating with images. These include ultrasound, electron microscopy, and computer-generated images. Thus, digital image processing encompasses a wide and varied field of applications [1]. 2. Fundamental steps in digital image processing The digital image processing steps can be categorised into two broad areas as the methods whose input and output are images, and methods whose inputs may be images, but whose outputs are attributes extracted from those images. Image acquisition is the first process in the digital image processing. Note that acquisition could be as simple as being given an image that is already in digital form. Generally, the image acquisition stage involves preprocessing, such as scaling. The next step is image enhancement, which is one among the simplest and most appealing areas of digital image processing. Basically, the idea behind enhancement techniques is to bring out detail that is obscured, or simply to highlight certain features of interest in an image. A familiar example of enhancement is when we increase the contrast of an image because "it looks better." It is important to keep in mind that enhancement is a very subjective area of image processing. Image restoration is an area that also deals with improving the appearance of an image. However, unlike enhancement, which is subjective, image restoration is objective, in the sense that restoration techniques tend to be based on mathematical or probabilistic models of image degradation. Enhancement, on the other hand, is based on human subjective preferences regarding what constitutes a "good" enhancement result. Color image processing is an area that has been gaining in importance because of the significant increase in the use of digital images over the Internet. Color image processing involves the study of fundamental concepts in color models and basic color processing in a digital domain. Image color can be used as the basis for extracting features of interest in an image. Wavelets are the foundation for representing images in various degrees of resolution. Compression, as the name implies, deals with techniques for reducing the storage required to save an image, or the bandwidth required to transmit it. Although storage technology has improved significantly over the past decade, the same cannot be said for transmission capacity. This is true particularly in uses of the Internet, which are characterized by significant pictorial content. Image compression is familiar (perhaps inadvertently) to most users of computers in the form of image file extensions, such as the jpg file extension used in the JPEG (Joint Photographic Experts Group) image compression standard. Morphological processing deals with tools for extracting image components that are useful in the representation and description of shape. The morphological image processing is the beginning of transition from processes that output images to processes that output image attributes. Segmentation procedures partition an image into its constituent parts or objects. In general, autonomous segmentation is one of the most difficult tasks in digital image processing. A rugged segmentation procedure brings the process a long way toward successful solution of imaging problems that require objects to be identified individually. On the other hand, weak or erratic segmentation algorithms almost always guarantee eventual failure. In general, the more accurate the segmentation, the more likely recognition is to succeed. Representation and description almost always follow the output of a segmentation stage, which usually is raw pixel data, constituting either the boundary of a region (i.e., the set of pixels separating one image region from another) or all the points in the region itself. In either case, converting the data to a form suitable for computer processing is necessary. The first decision that must be made is whether the data should be represented as a boundary or as a complete region. Boundary representation is appropriate when the focus is on external shape characteristics, such as corners and inflections. Regional representation is appropriate when the focus is on internal properties, such as texture or skeletal shape. In some applications, these representations complement each other. Choosing a representation is only part of the solution for transforming raw data into a form suitable for subsequent computer processing. A method must also be specified for describing the data so that features of interest are highlighted. Description, also called feature selection, deals with extracting attributes that result in some quantitative information of interest or are basic for differentiating one class of objects from another. Recognition is the process that assigns a label (e.g., “vehicle”) to an object based on its descriptors. Recognition topic deals with the methods for recognition of individual objects in an image. 3. Applications of image processing There are a large number of applications of image processing in diverse spectrum of human activities-from remotely sensed scene interpretation to biomedical image interpretation. In this section we provide only a cursory glance in some of these applications. 3.1. Automatic Visual Inspection System Automated visual inspection systems are essential to improve the productivity and the quality of the product in manufacturing and allied industries [2]. We briefly present few visual inspection systems here. • Automatic inspection of incandescent lamp filaments: An interesting application of automatic visual inspection involves inspection of the bulb manufacturing process. Often the filament of the bulbs get fused after short duration due to erroneous geometry of the filament, e.g., nonuniformity in the pitch of the wiring in the lamp. Manual inspection is not efficient to detect such aberrations. In an automated vision-based inspection system, a binary image slice of the filament is generated, from which the silhouette of the filament is produced. This silhouette is analyzed to identify the non-uniformities in the pitch of the filament geometry inside the bulb. Such a system has been designed and installed by the General Electric Corporation. • Faulty component identification: Automated visual inspection may also be used to identify faulty components in an electronic or electromechanical systems. The faulty components usually generate more thermal energy. The infra-red (IR) images can be generated from the distribution of thermal energies in the assembly. By analyzing these IR images, we can identify the faulty components in the assembly. • Automatic surface inspection systems: Detection of flaws on the surfaces is important requirement in many metal industries. For example, in the hot or cold rolling mills in a steel plant, it is required to detect any aberration on the rolled metal surface. This can be accomplished by using image processing techniques like edge detection, texture identification, fractal analysis, and so on. 3.2. Remotely Sensed Scene Interpretation Information regarding the natural resources, such as agricultural, hydrological, mineral, forest, geological resources, etc., can be extracted based on remotely sensed image analysis. For remotely sensed scene analysis, images of the earth's surface arc captured by sensors in remote sensing satellites or by a multi-Spectra) scanner housed in an aircraft and then transmitted to the Earth Station for further processing [3, 4]. We show examples of two remotely sensed images in Figure 1 whose color version has been presented in the color figure pages. Figure 1(a) shows the delta of river Ganges in India. The light blue segment represents the sediments in the delta region of the river, the deep blue segment represents the water body, and the deep red regions are mangrove swamps of the adjacent islands. Figure 1.1(b) is the glacier flow in Bhutan Himalayas. The white region shows the stagnated ice with lower basal velocity. (a) (b) Fig. 1: Example of a remotely sensed image of (a) delta of river Ganges, (b) Glacier flow in Bhutan Himalayas Techniques of interpreting the regions and objects in satellite images are used in city planning, resource mobilization, flood control, agricultural production monitoring, etc. 3.3. Biomedical Imaging Techniques Various types of imaging devices like X-ray, computer aided tomographic (CT) images, ultrasound, etc., are used extensively for the purpose of medical diagnosis [5]-[7]. Examples of biomedical images captured by different image formation modalities such as CT-scan, X-ray, and MRI are shown in Figure 2. (a) (b) (c) Fig. 2: Examples of (a) CT Scan image of brain, (b) X-ray image of wrist and (c) MRI image of brain (i) localizing the objects of interest, i.e. different organs (ii) taking the measurements of the extracted objects, e.g. tumors in the image (iii) interpreting the objects for diagnosis. Some of the biomedical imaging applications are presented below. (A) Lung disease identification: In chest X-rays, the structures containing air appear as dark, while the solid tissues appear lighter. Bones are more radio opaque than soft, tissue. The anatomical structures clearly visible on a normal chest X-ray film are the ribs, the thoracic spine, the heart, and the diaphragm separating the chest cavity from the ab-dominal cavity. These regions in the chest radiographs are examined for abnormality by analyzing the corresponding segments. (B) Heart disease identification: Quantitative measurements such as heart size and shape are important diagnostic features to classify heart diseases. Image analysis techniques may be employed to radiographic images for improved diagnosis of heart diseases. (C) Digital mammograms: Digital mammograms are very useful in detect-ing features (such as microcalcification) in order to diagnose breast tumor. Image processing techniques such as contrast enhancement, segmentation, feature extraction, shape analysis, etc. are used to analyze mammograms. The regularity of the shape of the tumor determines whether the tumor is benign or malignant. 3.4. Defense surveillance Application of image processing techniques in defense surveillance is an important area of study. There is a continuous need for monitoring the land and oceans using aerial surveillance techniques. Suppose we are interested in locating the types and formation of naval vessels in an aerial image of ocean surface. The primary task here is to segment different objects in the water body part of the image. After extracting the segments, the parameters like area, location, perimeter, compactness, shape, length, breadth, and aspect ratio are found, to classify each of the segmented objects. These objects may range from small boats to massive naval ships. Using the above features it is possible to recognize and localize these objects. To describe all possible formations of the vessels, it is required that we should be able to identify the distribution of these objects in the eight possible directions, namely, north, south, east, west, northeast, northwest, southeast and southwest. From the spatial distribution of these objects it is possible to interpret the entire oceanic scene, which is important for ocean surveillance. Content-Based Image Retrieval Retrieval of a query image from a large image archive is an important application in image processing. The advent of large multimedia collection and digital libraries has led to an important requirement for development of search tools for indexing and retrieving information from them. A number of good search engines are available today for retrieving the text in machine readable form, but there are not many fast tools to retrieve intensity and color images. The traditional approaches to searching and indexing images are slow and expensive. Thus there is urgent need for development of algorithms for retrieving the image using the embedded content in them. The features of a digital image (such as shape, texture, color, topology of the objects, etc.) can be used as index keys for search and retrieval of pictorial information from large image database. Retrieval of images based on such image contents is popularly called the content-based image retrieval [8, 9]. 3.6. Moving-Object Tracking Tracking of moving objects, for measuring motion parameters and obtaining a visual record of the moving object, is an important area of application in image processing (13, 14). In general there are two different approaches to object tracking: (i) Recognition-based tracking (ii) Motion-based tracking. A system for tracking fast targets (e.g., a military aircraft, missile, etc.) is developed based on motion-based predictive techniques such as Kalman filtering, extended Kalman filtering, particle filtering, etc. In automated image processing based object tracking systems, the target objects entering the sensor field of view are acquired automatically without human intervention. In recognition-based tracking, the object pattern is recoguized in successive image-frames and tracking is carried-out using its positional information. 3.7. Neural Aspects of the Visual Sense The optic nerve in our visual system enters the eyeball and connects with rods and cones located at the back of the eye. The neurons contain dendrites (inputs), and a long axon with an arborization at the end (outputs). The neurons communicate through synapses. The transmission of signals is associated with the diffusion of the chemicals across the interface and the receiving neurons arc either stimulated or inhibited by these chemicals, diffusing across the interface. The optic nerves begin as bun-dles of axons from the ganglion cells on one side of the retina. The rods and cones, on the other side, are connected to the ganglion cells by bipolar cells, and there are also horizontal nerve cells making lateral connections. The signals from neighboring receptors in the retina are grouped by the horizontal cells to form a receptive field of opposing responses in the center and the periphery, so that a uniform illumination of the field results in no net stimulus. In case of nonuniform illumination, a difference in illumination at the center and the periphery creates stimulations. Some receptive fields use color differences, such as red-green or yellow-blue, so the differencing of stimuli applies to color as well as to brightness. There is further grouping of receptive field responses in the lateral geniculate bodies and the visual cortex for directional edge defection and eye dominance. This is low-level processing preceding the high-level interpretation whose mechanisms are unclear. Nevertheless, it demonstrates the important role of differencing in the senses, which lies at the root of contrast phenomena. If the retina is illuminated evenly in brightness and color, very little nerve activity occurs. There are 6 to 7 million cones, and 110 to 130 million rods in a normal human retina. Transmission of the optical signals from rods and cones takes place through the fibers in the optic nerves. The optic nerves cross at the optic chiasma, where all signals from the right sides of the two retinas arc sent to the right half of the brain, and all signals from the left, to the left half of the brain. Each half of the brain gets half a picture. This ensures that loss of an eye does not disable the visual system. The optical nerves end at the lateral geniculate bodies, halfway back through the brain, and the signals are distributed to the visual cortex from there. The visual cortex still has the topology of the retina, and is merely the first stage in perception, where information is made available. Visual regions in two cerebral hemispheres are connected in the corpus callosum, which unites the halves of the visual field.

CONCLUSION:

Image processing has wide verity of applications leaving option to the researcher to choose one of the areas of his interest. Lots of research findings are published but lots of research areas are still untouched. Moreover, with the fast computers and signal processors available in the 2000s, digital image processing has become the most common form of image processing and generally, is used because it is not only the most versatile method, but also the cheapest.

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