HELMET, TRIPLE RIDE AND VEHICLE NUMBER PLATE DETECTION

¹G S Ranganath, ²CH Akhil, ³E Akhil Varma, ⁴G Punya Karthik, ⁵Dr Arul Prakash

^{1,2,3,4}Students, ⁵Professor

Bharath Institute of Higher Education and Research

Abstract- The 3-way helmet and registration code recognition machine is one such shrewd transportation gadget. The goal is to extract the numbers from the plate. This method is utilized in various security applications for registration code and helmet retrieval. This painting is based totally on facet detection and green morphological operations. Character segmentation is the technique of extracting characters and numbers from a registration code. Voices within the picture are removed by using filtering strategies. Character recognition uses Optical Character Recognition (OCR) technology. In OCR, a character filters out is matched against a pattern the use of a matching algorithm, and the individual is ultimately extracted. Motorcycle accidents have been growing hastily over the years in many countries. A helmet is the primary protecting gadget of motorcyclists. But many drivers do not use it. The cause of a helmet is to shield the driving force's head in case of a twist of fate

INTRODUCTION

Riding without a helmet and riding a triple is like risking your life. In the occasion of a crash, a bike lacks the structural support that a car has to maintain its occupants safe and cozy [1]. Even when a passenger can be furnished, injuries nonetheless arise because of harm [2]. The major function of the helmet is to defend the driving force's head in case of an twist of fate or fall from the bicycle [3]. Currently using helmets is low [4]. The purpose of the notion is to assist motorcyclists wear a seat belt, i.E. A helmet, even as using or not [5]. This proposed design makes use of Mobilenet-SSD, which is supposed to immediately stumble on cyclists without helmets and trip as a trio the use of real-time surveillance.

LITERATURE SURVEY

[1] J. Chiverton, "Helmet presence classification with motorcycle detection and tracking," Intelligent Transport Systems (IET), vol. 6, no. 3, pp. 259–269, September 2012.

Helmets are important for bike safety, however carrying a helmet is exhausting and time-ingesting. Therefore, a machine for mechanically classifying and tracking bikes with and without helmets has been defined and tested. The gadget makes use of support vector machines skilled on histograms, photo facts from bikes of the location the usage of each static photographs and character frames of photos from video information. A skilled classifier is protected within the song system in which motorcyclists are mechanically segmented primarily based on subduction of user image information. The heads of the horses are remoted and later classified consistent with their use. The output of each rider is a chain of areas in contiguous time tables referred to as lines. These whole tracks are then labeled the use of the average of the results of the person classifiers. Tests show that the classifier can accurately indicate whether horsemen are wearing helmets or not in static pictures. Systematic studies tests also demonstrate the electricity and utility of the category approach.

[2] Z. Chen, T. Ellis, and S. Velastin, "Vehicle detection, tracking and classification in urban traffic," in Procs. of the IEEE Int. Conf. on Intelligent Transportation Systems (ITS), Anchorage, AK, Sept 2012, pp. 951–956.

This article introduces a gadget for detecting, monitoring and monitoring motors the use of avenue video surveillance. The device counts motors and divides them into 4 classes: cars, vans, buses and bikes (consisting of bicycles). A new heritage Gaussian mixing model (GMM) and shadow elimination techniques are used to fight sudden adjustments and digital camera shake. A Kalman filter changed into carried out on the tracks to offer a larger type of votes into several consecutive frames, and a layer approach turned into used to construct the blob. Extensive experiments were conducted with actual statistics to evaluate the performance of the gadget. The quality overall performance is executed with the formation of SVM (Support Vector Machine) using a combination of the vehicle silhouette and the depth based on the capabilities of the cone of the pig drawn after subduction of the heritage, indicating the the front drops with more votes. The consequences of the video assessment are encouraging: with a detection charge of 96.39%, false positives are handiest 1.36%, false negatives are 4.97%. Even taking into account the weather problems, the type accuracy is 94.69%.

[3] B. Duan, W. Liu, P. Fu, C. Yang, X. Wen, and H. Yuan, "Real-time on- road vehicle and motorcycle detection using a single camera," in Procs. of the IEEE Int. Conf. on Industrial Technology (ICIT), 10-13 Feb 2009, pp. 1–6.

For Lane Change Assist (LCA), an approach to come across and song motors and motorcycles behind is presented based on monocular vision. To attain reliability and accuracy, this work detects multiple vehicles and motorcycles on the street and combines the tracks of more than one alerts. To acquire actual era, a couple of resolutions have been used to reduce the computational complexity, and all algorithms have been implemented in IMAP (Integrated Memory Processor) parallel image files. The outcomes of road trying out in diverse conditions have tested the accuracy, reliability and effectiveness of this product.

[4] R. Silva, K. Aires, T. Santos, K. Abdala, R. Veras, and A. Soares, "Automatic detection of motorcyclists without helmet," in Computing Conf. (CLEI), XXXIX Latin American, Oct 2013, pp. 1–7. European Journal of Molecular & Clinical Medicine ISSN 2515-8260 Volume09, Issue 03, 2022 10787.

Over the years, the range of motorbike accidents has grown swiftly in many countries. Due to numerous social and monetary motives, this form of car is turning into an increasing number of popular. A helmet is a primary piece of motorcycle safety tools, but many riders do not use one. If he is not sporting a helmet, the coincidence can be fatal. This article ambitions to explain and illustrate an automatic method for detecting and classifying bikes on public roads, in addition to an automated detection system for riders with out a helmet. To this end, a hybrid descriptor for feature extraction primarily based on binary template locations, gradient histograms, and Hough rework descriptors is proposed. Traffic pix captured by way of a camera are used. The first-class category result became 0.9767 and the exceptional helmet detection performance turned into 0.9423.

[5] R. Rodrigues Veloso e Silva, K. Teixeira Aires, and R. De Melo Souza Veras, "Helmet detection on motorcyclists using image descrip- tors and classifiers," in Procs. of the Graphics, Patterns and Images (SIBGRAPI), Aug 2014, pp. 141–148. Over the years the quantity of motorbike injuries has been increasing unexpectedly in many nations. Due to numerous social and monetary reasons, this kind of car is becoming more and more famous. A helmet is a primary piece of motorbike protection equipment, but many riders do not use one. The motive of a helmet is to shield the motive force's head in case of an coincidence. But inside the occasion of an accident, if the rider does no longer use it, he may also perish. This article proposes a gadget for detecting bikes with out a helmet. To try this, we applied the round Hough remodel and implemented histogram descriptors to extract image attributes. Then the MultiLayer Perceptron classifier was used and the outcomes acquired had been as compared with different algorithms. Traffic pictures are captured by way of cameras from public roads and form a database of 255 pics. In truth, the helmet step detection set of rules indicates an accuracy of 91.37%.

CHAPTER-3

EXISTING SYSTEM

• Future packages of clever cars, including figuring out whether or not a car has the right to power, will depend closely on facial reputation.

• A huge facial recognition machine used in the car surroundings is the concern of the layout and implementation of this take a look at.

• The challenge is to expand a quick and correct system which can discover, understand and apprehend the driving force's identity in ordinary riding conditions.

• Using an inexpensive webcam to capture pictures of fountains is any other challenge.

DISADVANTAGES

you no longer understand

- Output efficiency is low.
- Difficult to put in force.

• This will only hit upon the license plate.

PROPOSED SYSTEM

• Automatically detecting whether drivers are sporting helmets or not, as well as triple rider check and vehicle registration code detection, this program targets to save you accidents. For this, the wavelet transformation function extraction descriptor is used.

- Algorithms use actual-time digital camera photographs and characteristic extractions.
- For this, a wavelet descriptor rework is used to extract the functions. Extract the wavelet remodel feature.
- The system is split into 2 principal subsystems: surroundings, schooling, model testing and vehicle coordination.

ADVANTAGES

• A pc known as "car detection" exams the image or video for the presence of the vehicle and its area points. Research in parking management, car monitoring, and registration code recognition is based on car detection.

• However, there are nonetheless many issues with car detection in actual life, consisting of occlusion, dislocation and item reformation.

• This article compares the performance and correctness of different algorithms in actual time and handles automobile detection technologies the usage of deep studying and machine vision.

• Although brand new automobile detection era is pretty advanced, it nevertheless wishes upgrades for actual-time, trap and small item detection.

• As regards vehicle detection era, the usage of generation to stumble on cars with small gadgets continues to be the focal point of research in several extraordinary regions.

SOFTWARE REQUIREMENTS

- Operating system: Windows 10.
- Coding Language : Python

HARDWARE REQUIREMENTS:

- System : Pentium i3 Processor.
- Hard Disk: 500 GB.
- Monitor : 15" LED
- Input Devices : Keyboard, Mouse
- Ram : 2 GB

SYSTEM DESIGN IMAGE PROCESSING What is Image Processing?

Image processing is the system of changing an photograph right into a virtual shape and performing some operations on it to gain a better photo or to extract a few beneficial statistics from it. This is a type of code distribution wherein the input is an photograph, including a picture or video, and the output image or features may be related to that photo. Typically, the photograph processing gadget consists of processing pictures in two dimensions with the aid of applying classical techniques already established.

Today it's far one of the quickest developing technology with its programs in numerous enterprise components. Image processing is likewise a main region of studies in engineering and laptop technological know-how.

Image processing specifically includes the subsequent three steps.

• Import an image the use of optical or digital photography.

• Image analysis and processing, such as records compression and picture enhancement, as well as figuring out styles that are not visible to the human eye, inclusive of satellite tv for pc pics.

• Output is the remaining step in which the result can be a exchange of photograph or a report based totally on the evaluation of the picture.

PURPOSE OF IMAGE PROCESSING

The stop of the photograph processing is divided into five agencies. Are:

- 1. Visualization. Watch for the invisible.
- 2. Sharpen and repair the photo To create a higher photo.
- 3. Image seek. Search for an photograph of interest.
- 4. Measure measurements measure different things within the photo.
- 5. An picture of honor. Distinguishing items in the photo.

TYPES

Two sorts of methods are used for image processing: analog and digital image processing. Analogy or visual imaging techniques may be utilized in revealed patterns consisting of figures and photos. Image analysts use exceptional bases of interpretation whilst using those visible techniques. Image processing is restrained no longer only to the sphere of examine, however additionally to the knowledge of the analyst. Association is some other essential tool for organizing pix the usage of visual methods. Thus, analysts practice a aggregate of private expertise and records associated with picture processing.

Digital processing techniques help manipulate virtual pictures using a computer. Because the uncooked photograph sensor information from the satellite platform includes errors. To put off such defects and achieve authentic facts, it should undergo diverse degrees of processing. There are 3 principal steps that all styles of data must undergo with using virtual technology: preprocessing, amplification and show, and records extraction.



IMAGE PROCESSING CONCEPTS BINARY IMAGES

Binary photos are photographs whose factors can most effective have depth values. They are commonly in black and white. These two numeric values are often 0 for black and 1 or 255 for white.

Binary pictures are often created via thresholding a grayscale or shade photo to split the image item from the history. The shade of the item (generally white) is referred to as the foreground color. The relaxation (normally black) is referred to as the heritage colour. However, depending at the picture threshold, the verticality may be inverted, wherein case the object is provided with 0 and the difficulty with a non-zero value.

Some morphological operators anticipate a positive verticality of the input binary photo, so if the photograph is processed with inverted verticality, the operator may have the alternative impact. For instance, if we placed a declaration for black textual content in a white region, the textual content will be opened.

COLOR IMAGES

It is possible to assemble all seen shades with the aid of combining the three essential hues: red, green and blue, because the human eye has simplest three different shade receptors, each of which perceives one of the three colorations. Various combinations of

received stimulation allow the human eye to distinguish approximately 350,000 colorings. An RGB color photograph is a composite photo of one group of every color: purple, green, and blue, which creates a complicated mixture of 3 number one colorations for every pixel.

A full 24-bit coloration photograph carries one little bit of fee for every colour, permitting more than one hues to be displayed. However, the use of the overall 24-bit image to keep the shade of each pixel is computationally expensive and often unnecessary. Therefore, the shade of every pixel is regularly encoded in one byte, ensuing in an 8-bit color photo. The process of decreasing the colour representation from 24-bit to eight-bit, called coloration quantization, limits the quantity of possible colours to 256. However, there may be typically no seen difference between a 24-colour picture and the same image as displayed. Eight-bit. Eight-bit colour photographs are based totally on color maps, that are lookup tables that use an 8-bit pixel fee in the index and offer an output cost for every coloration.

8-BIT COLOR IMAGES

Full RGB coloration requires that the intensities of the 3 coloration components be targeted for each pixel. The intensity of every aspect is usually stored as an eight-bit integer, so every pixel needs 24 bits to fully and appropriately outline its color. If this is done, the image is recognized as a 24-bit color photo. However, there are problems with this approach:

• Stored 24 pieces for every pixel effects in very big snap shots which can be inconvenient to shop and system with modern-day generation. For example, a 24-bit 512x512 photograph is 750 KB uncompressed.

• Many video display units display eight-bit coloration maps for customers, that can display best 256 distinctive shades. So anyhow, storing extra than 256 colors in an image is often wasted, due to the fact that it is not possible to display they all on the display screen.

Because of this, many image formats (consisting of 8-bit GIF and TIFF) use eight-bit shade maps to restrict the most range of awesome shades to 256. Using this approach, we simplest want to bring together an eight-bit index into a file. Coloration map for each pixel, no longer the overall cost of 24-bit hues. Thus, eight-bit picture codecs include two parts: a palette that describes which shades are in the image, and an array of index values for each pixel inside the picture.

When a 24-bit full-shade picture is transformed to 8-bit, it is usually vital to discard some colours, a technique referred to as shade quantization. This outcomes in some deterioration inside the first-rate of the pictures, however in exercise the discovered impact can be very small, and inside the case of this type of deterioration can not be prevented if the display device (consisting of a screen or printer) can best display 256 colours or less.

Using 8-bit images with coloration spots results in a few troubles in photograph processing. First, each photo have to have its very own colormap, and there is nearly no assure that every one photographs will have precisely the equal colormap. Thus, in 8-bit presentations it's far regularly not viable to correctly display two photographs of various colors at the same time. Note that in exercise eight-bit snap shots regularly use slower color engines with fewer than 256 colorings to keep away from this problem.

Another trouble takes place while the output photograph from an photograph processing operation incorporates distinct hues than the enter image or pictures. This may be executed very without difficulty, for instance, whilst two coloration photos are brought pixel by way of pixel. Since the output image incorporates distinct hues than the input pics, it is able to well require a new color map this is distinct from the enter picture colour map, and this calls for a further quantity of color, as a way to degrade the photo best. Therefore, the ensuing effect is usually best an approximation to the preferred effect. Repeated photograph processing operations permanently degrade the picture colorings. And of direction we still have the problem of now not being able to display images on the same time, to display every other within the identical 8-bit layout.

Because of those problems, it's far to be predicted that, as laptop reminiscence and processing strength end up cheaper, there could be a shift from 8-bit pics to complete 24-bit photograph processing.

MATHEMATICAL MORPHOLOGY

The field of mathematical morphology presents a wide variety of useful photo processing primarily based on some simple mathematical principles from set principle. Operators are particularly beneficial for reading binary snap shots, and commonplace uses encompass facet detection, noise removal, picture enhancement, and photograph segmentation.

The two predominant operations in mathematical morphology are erosion and growth. Both operators take as enter two portions of records: a blurred or accelerated picture and a characteristic detail (also known as a kernel function). Each of the 2 input additives is dealt with so that the representation of the coordinate sets differs barely for binary and grayscale images.

For a binary picture, white factors typically constitute the foreground regions and black factors constitute the historical past. (Note that this convention is reversed in some implementations, so it is critical to enter images with the ideal orientation for the implementation used). Then the order of coordinates similar to this photograph is in reality the order of -dimensional Euclidean coordinates of all of the the front factors within the photo, with the origins typically taken in one of the corners, so that each one the coordinates have high quality factors.

For a grayscale photograph, the depth cost is used to symbolize the height above the reference plane, so that the grayscale photo represents the surface in 3D Euclidean area. It was carried out the day earlier than. 1 shows such a surface. Then the set of coordinates related to the picture surface is definitely the set of 3D coordinates of all factors inside that floor, and all factors underneath the floor, together with the bottom aircraft. Note that even when we handiest take into account points with fundamental coordinates, this is lots of points, so algorithms are normally used that don't require all factors to be taken into consideration.



Figure 1 Simple gray level image and the corresponding surface in image space

A detail of a point coordinate shape is only a factor already hooked up (although it is often represented as a binary picture). It is a way from the coordinates of the enter photograph in that it is also lots smaller, and its origin is regularly now not at an angle, so some coordinate elements may have bad values. Note that many implementations of morphological operators expect that the structure element has a certain form (as an example a three \times 3 square) and consequently in the set of rules.

Binary morphology may be thought of as a unique case of gray morphology, wherein the enter photograph has handiest two gray degrees with values zero and 1.

Erosion and dilation work (at least theoretically) by using transferring the structural element to different points in the input photo and getting to know the intersection between the coordinates of the translated kernel and the coordinates of the enter image. For example, inside the case of erosion, the status quo of coordinates is composed handiest of these factors wherein the precept of the structure can be moved, at the same time as the detail remains absolutely "inside".

Almost all different operators of mathematical morphology may be described in terms of combos of erosion and growth with operators along with intersection and union. Some of the maximum critical are opening, ultimate, and skeletonization.

MULTI-SPECTRAL IMAGES

A multispectral photo is a hard and fast of different monochrome photographs of the identical scene, every involved in one-of-akind sensors. Each image is referred to as a pin. A multispectral (or multichannel) image is an RGB colour image consisting of purple, green, and blue colours, every of that's captured by using the sensor at a different wavelength. In picture processing, multispectral photos are typically used for far off sensing packages. Satellites typically take a couple of snap shots from frequency bands within the seen and invisible bands. Landsat five, as an example, creates 7-key photographs with a wavelength band from 450 to 1250 nm.

All widespread unmarried-channel picture processing operators can be carried out to method multispectral pictures via man or woman channels. For example, they could come across the edges of a multispectral picture by way of locating the rims in every channel and then joining the three area pics together using the OR operation. However, we would have greater dependable margins if we combined the threshold pixel based totally on its properties in all 3 channels in preference to one.

To take complete gain of the facts contained in a couple of channels, pix ought to be handled as a single multispectral image, as opposed to as a fixed of grayscale monochrome photographs. Then, for an photograph with okay stripes, we will describe the brightness of each pixel for a factor in k-dimensional area, represented via a vector of duration okay.

There are special techniques for processing unique images. For instance, if you want to insert a pixel of one particular area, its intensities in distinct bands are said to form a vector describing its position in a linear size of area. The simplest manner to outline a class is to pick out the higher and decrease thresholds of every band, as a result creating a okay-dimensional "hypercube" in the characteristic space. Only if a pixel's characteristic vector factors to a area within that cube is the pixel classified in that class. A more complex class technique is defined within the corresponding sheet.

The disadvantage of a couple of pictures is that, as we stated for the data processing procedure, the specified computing time and memory size increases substantially. However, as hardware pace increases and reminiscence charges decrease inside the destiny, more than one imaging may be anticipated to come to be greater critical in more areas of pc vision.

RGB AND COLORSPACES

The colour perceived by means of the human eye may be decided by a linear combination of the 3 number one colorations: crimson, green and blue. These 3 colorations form the idea of the RGB color area. Therefore, any perceived coloration can be defined by a vector within the 3-D color space. The intensity is decided by using the duration of the vector, and the colour itself is determined via angles that describe the orientation of the vector in coloration space.

RGB space can also be transformed to other coordinate structures that can be more beneficial for a few packages. The not unusual base color space is IHS. In this coordinate machine, coloration is described through depth, hue (average uniformity), and saturation (how tons of a coloration a color is). This colour space makes it less difficult to without delay determine the depth and shades of perceived mild, and is therefore much more likely to be used by people.

STRUCTURING ELEMENTS

The vicinity of mathematical morphology offers a number of critical photograph processing operations, inclusive of erosion, expansion, commencing and ultimate. All those morphological operators take pieces of information as enter. There is one input image, which for most customers can be both binary or grey. The 2nd detail is structural. This is what defines the precise details of the impact at the photo.

The structural element is once in a while referred to as the nucleus, but this time period is reserved for comparable matters in stems. A structural detail of a model includes the coordinates of a series of discrete points relative to some starting place. Cartesian coordinates are generally used, so it is appropriate to symbolize the element as a small image on a rectangular grid. It turned into achieved the day earlier than. 1 suggests diverse structural factors of various sizes. The beginning is marked on each sides via a

hoop round that factor. The origin does now not have to be in the center of the structural detail, however it regularly is. As shown in the discern, the structural elements that in shape inside the center of the authentic 3x3 grid are the maximum not unusual type.

1	1	1			1	1	1			1	1	
1	1	1		1	1	1	1	1		1	Θ	
1	1	1	1	1	1	1	1	1	1	1		0
			1	1	1	1	1	1	1			
	1		1	1	1	1	1	1	1	1	1	-
1	(1)	1		1	1	1	1	1		1	6	1
	1				1	1	1			1	1	1

Figure 1 Some example structuring elements.

Note that every point within the functions can have an detail fee. In the only shape factors with binary photographs used for operations including erosion, the factors have most effective one value, that is readily represented as a unit. More complex factors, together with the ones used with morphological decimation or grayscale operations, may have special pixels.

It ought to be stated that even though a square grid is used to symbolize the shape of an detail, a factor on that grid is not part of the line of the complete element. Therefore, the elements shown in Figure 1 incorporate spaces. In many texts these spaces are represented by way of numbers, but this could be difficult, so we avoid it right here.

When the morphological operation is achieved, the starting shape detail is robotically translated to the location of every photo pixel in turn, and the factors in the translated shape element are as compared with the pixel values of the underlying photo. The information of this contrast and the effects depend upon which morphological operator is used.

WRAPPING AND SATURATION

If the photo is in byte or integer pixel layout, the maximum pixel price is restricted via the quantity of grains used for illustration, e.G. The pixel values of an 8-bit picture are restricted to 255.

However, many image processing operations produce output values that probably exceed the specified maximum cost. In which instances we have to decide how this pixel overflow works.

One possibility is to consist of ample pixel values. This way that if the fee is more than the maximum viable, we subtract the range of pixel values in order that the cost starts offevolved once more at the minimal viable cost. It become done the day before. 1 suggests an task function that converts the output values of an operation into 8-bit layout.



Figure 1 Mapping function for wrapping the pixel values of an 8-bit image.

Another possibility is to set all of the redundancy elements to their maximum feasible values, an effect known as saturation. The corresponding mapping feature for an 8-bit image can be seen in Figure 2.



Figure 2 Mapping function for saturating an 8-bit image.

If a few pixels of the image exceed the most price, it's miles frequently better to use this method, in particular if we are able to use the photo for display functions. However, by means of putting all redundant elements to the same fee, we lose a extensive quantity of information. In the worst case, while all pixels exceed the maximum cost, this will result in an photograph with consistent pixel values. Wrapping pixel redundancy preserves variations among values. On the other hand, the hassle may be that the pixel values of the most price "bounce" passing from the maximum to the minimal value. Examples of each strategies may be visible within the workshop for various working factors.

If viable, it's far simplest to alternate the factor ratio of the photo, for example to floating point, so that every one the pixels can be represented. However, it ought to be considered that this implies an growth in processing time and memory.

FUTURE SCOPE AND CONCLUSION

In this assignment we are seeking to create a version that would stumble on a cyclist in snap shots or video streams. The dataset used on this task was created and annotated so that the model can distinguish between an photograph without or with cycles. The proposed bike owner detector became efficaciously educated the usage of Faster R-Cnn education methods on a pattern automobile dataset, and the automobile detection method turned into correctly completed through the automobile detector tested at the test outcomes. In the destiny, this case can be beneficial for a challenge in which we stumble on a bike owner without a helmet or riding a tricycle and understand the motorcycle's registration code in order that challah can be generated electronically.

REFERENCES

1] J. Chiverton, "Helmet presence classification with motorcycle detection and tracking," Intelligent Transport Systems (IET), vol. 6, no. 3, pp. 259–269, September 2012.

[2] Z. Chen, T. Ellis, and S. Velastin, "Vehicle detection, tracking and classification in urban traffic," in Procs. of the IEEE Int. Conf. on Intelligent Transportation Systems (ITS), Anchorage, AK, Sept 2012, pp. 951–956. [3] B. Duan, W. Liu, P. Fu, C. Yang, X. Wen, and H. Yuan, "Real-time on- road vehicle and motorcycle detection using a single camera," in Procs. of the IEEE Int. Conf. on Industrial Technology (ICIT), 10-13 Feb 2009, pp. 1–6.

[4] R. Silva, K. Aires, T. Santos, K. Abdala, R. Veras, and A. Soares, "Automatic detection of motorcyclists without helmet," in Computing Conf. (CLEI), XXXIX Latin American, Oct 2013, pp. 1–7. European Journal of Molecular & Clinical Medicine ISSN 2515-8260 Volume09, Issue 03, 2022 10787

[5] R. Rodrigues Veloso e Silva, K. Teixeira Aires, and R. De Melo Souza Veras, "Helmet detection on motorcyclists using image descrip- tors and classifiers," in Procs. of the Graphics, Patterns and Images (SIBGRAPI), Aug 2014, pp. 141–148.

[6] A. Saumya, V. Gayathri, K. Venkateswaran, S. Kale and N. Sridhar, "Machine Learning based Surveillance System for Detection of Bike Riders without Helmet and Triple Rides," 2020 International Conference on Smart Electronics and Communication (ICOSEC), 2020, pp. 347-352, doi: 10.1109/ICOSEC49089.2020.9215266.