DETECTION OF HELMETS ON MOTORCYCLISTS

ABSTRACT

The use of motorcycle accidents has rapidly increased. Although the helmet is the main safety equipment of motorcyclists, many drivers do not use it. This paper proposed a method for motorcycle detection and classification and a system for the detection of motorcyclists without helmets. For vehicle classification, we have employed the wavelet transform (WT) as the descriptor and the random forest as the classifier. For helmet detection, the circular Hough transform (CHT) and the histogram of oriented gradients (HOG) descriptor were applied to extract the image attributes, and the multilayer perceptron (MLP) classifier was used to classify the objects. The results for vehicle classification achieved an accuracy rate of 97.78 %. The algorithm step in the helmet detection accomplished an accuracy rate of 91.37 %. The results were obtained with the author’s database.

Keywords- Helmet detection · Descriptors · Classifiers

CONCLUSION

This study addresses the detection of motorcyclists without helmets on public roads. A computational vision system was proposed and classified as follows: – vehicle segmentation and classification, and – detection of helmet use. In the stage of vehicle segmentation and classification, algorithms for the background calculation and tracking of objects, descriptors and classifiers that exhibited reasonable hit rates and low processing times were selected from the literature achieving an accuracy of 0.9778. In the stage of detection of helmet use, algorithms for the extraction of features in images and classification algorithms were employed. The proposed system also obtained satisfactory hit rates. The MLP classifier that incorporated the HOG descriptor obtained the best results, with an accuracy of 0.9137.

HELMET DETECTION USING ML & IOT

ABSTRACT

This paper is about detecting motorbike riders without a helmet with the assistance of machine learning and IoT. Motorcycle accidents are increasing day by day in many countries. The helmet is that the primary safety equipment of Bike riders, however many drivers don't use it. The primary objective of a helmet is to protect the driver's or pillion rider head just in case of an accident or fall from bike. We came up with an approach that first collected a dataset of the time-image of road traffic where we've got differing kinds of photos like with helmet, without a helmet and also the rider is wearing a helmet and another person not wearing a helmet so differentiates the 2 wheelers from other vehicles on road. It then checks whether the rider and pillion rider is wearing a helmet or not using an open-source computer vision and machine-learning software called OpenCV. If anybody of the riders is found not wearing the helmet, their vehicle number plate is processed using optical character recognition (OCR).

Key words—Helmet Detection; Machine Learning; OpenCV; OCR.

CONCLUSION

The software of the helmet detection has been thoroughly tested and implemented we have very good exercise in high level language and have realized the ingenuity and patience with this job has to be done. In our project we provided the YOLO based Helmet detection and also made a detailed study about CNN. We used jupyter notebook to implement the program and we successfully implemented the program. Our project was tested successfully tested in python. We also made study of applications and future scope of the project. Our project can be linked with the traffic cameras and with some modifications it can be used to detect helmets in the real time system. Further more we can merge the algorithm of automated license plate detection and make a system which generates challans for those who don’t wear helmets.

AUTOMATIC HELMET DETECTION ON PUBLIC ROADS

ABSTRACT

Bike riding is a lot of fun, but accidents happen. People choose motorbikes over car as it is much cheaper to run, easier to park and flexible in traffic. In India more than 37 million people are using two wheelers. Since usage is high, accident percentage of two wheelers are also high compared to four wheelers. Motorcycles have high rate of fatal accidents than four wheelers. The impacts of these accidents are more dangerous when the driver involves in a high speed accident without wearing helmet. It is highly dangerous and can cause severe deaths. So wearing a helmet can reduce these number of accidents and may save the life. This paper aims for avoidance of accidents and develop helmet detection system. We intend to use background subtraction and optical character recognition for fall detection and for helmet detection we use background subtraction and Hough transform descriptor.

Keywords: Helmet detection system, fatal, impact, Hough transform descriptor, background subtraction

CONCLUSION

To ensure bike rider’s safety, we have designed this project. Many projects have been designed so far but they all are concentrated more on four wheelers. Very less importance was given to motorbikes. Today accidents caused by motorbikes are more than cars. Thus in this project safety of bike rider is major concern. The project consists of 3 parts: 1. Helmet Authentication; to ensure that the bike rider is wearing a helmet. 2. Alcohol detection; to ensure that the bike rider has not consumed any type of alcohol. 3. Fall detection; in case of accident, to inform bike rider’s family about the accident

In this paper we have proposed an approach which would detect fall & helmet detection of a two wheeler driver run-time. Our system would inform nearby hospitals, family members & law enforcement agencies in case of emergency. Hence it ensures safety of the drivers while driving. Automatic accident detection and reporting system is the motivation of this project. To prevent road accidents, our approach is very useful. Thus safety of bike riders is ensured. In future we intend to use more advanced safety measures like to check alcohol consumption, lane change detection, collision detection, traffic information, e-toll collection, license renewal etc. We also think of applying deep neural network techniques & make transportation more intelligent

AUTOMATIC DETECTION OF BIKE-RIDERS WITHOUT HELMET USING SURVEILLANCE VIDEOS IN REAL-TIME

ABSTRACT

In this paper, we propose an approach for automatic detection of bike-riders without helmet using surveillance videos in real time. The proposed approach first detects bike riders from surveillance video using background subtraction and object segmentation. Then it determines whether bike-rider is using a helmet or not using visual features and binary classifier. Also, we present a consolidation approach for violation reporting which helps in improving reliability of the proposed approach. In order to evaluate our approach, we have provided a performance comparison of three widely used feature representations namely histogram of oriented gradients (HOG), scale-invariant feature transform (SIFT), and local binary patterns (LBP) for classification. The experimental results show detection accuracy of 93.80% on the real world surveillance data. It has also been shown that proposed approach is computationally less expensive and performs in real-time with a processing time of 11.58 ms per frame.

CONCLUSION

In this paper, we propose a framework for real-time detection of traffic rule violators who ride bike without using helmet. Proposed framework will also assist the traffic police for detecting such violators in odd environmental conditions viz; hot sun, etc. Experimental results demonstrate the accuracy of 98.88% and 93.80% for detection of bike-rider and detection of violators, respectively. Average time taken to process a frame is 11.58 ms, which is suitable for real time use. Also, proposed framework automatically adapts to new scenarios if required, with slight tuning. This framework can be extended to detect and report number plates of violators.

A SUPER-RESOLUTION RECONSTRUCTION DRIVEN HELMET DETECTION WORKFLOW

ABSTRACT

The degrading of input images due to the engineering environment decreases the performance of helmet detection models so as to prevent their application in practice. To overcome this problem, we propose an end-to-end helmet monitoring system, which implements a super-resolution (SR) reconstruction driven helmet detection workflow to detect helmets for monitoring tasks. The monitoring system consists of two modules, the super-resolution reconstruction module and the detection module. The former implements the SR algorithm to produce high-resolution images, the latter performs the helmet detection. Validations are performed on both a public dataset as well as the realistic dataset obtained from a practical construction site. The results show that the proposed system achieves a promising performance and surpasses the competing methods. It will be a promising tool for construction monitoring and is easy to be extended to corresponding tasks.

Keywords: helmet detection; super-resolution reconstruction; you only look once v5 (YOLOv5)

CONCLUSION

5. Discussion and Conclusions We propose an end-to-end helmet monitoring system, which implements a super resolution reconstruction driven helmet detection workflow. It is designed for the scenario where the input image quality is limited, which is easily faced in engineering practice. For example, input images are acquired from a moving camera and transmitted through a bandwidth-limited wireless channel. Because of the limited bandwidth, images are always compressed and so have poor resolution and quality. The degrading of the input images will consequently decrease the helmet detection precision. To overcome this problem, the proposed SR driven helmet detection workflow consists of two sequential steps in the entire workflow. First, we use a super-resolution reconstruction module to improve the image resolution and quality instead of direct interpolation. Then, the processed images are fed into the detection module consisting of YOLOv5 to perform helmet detection. The two modules are trained separately from scratch and finetuned together, alternately. This is a typical multi-task learning strategy to help increase task specific accuracy by utilizing other tasks as constraints. Validation shows the effectiveness of our workflow. The comparison of the performance of different SR reconstruction methods shows that the proposed SR module could increase the PSNR value while maintaining a consistent SSIM value. The comparison of the performance of different detection workflows shows that the proposed SR module is effective at guiding the YOLOv5 and detection precision and AP are both increased. Generally speaking, based on current results, this will be a promising tool for helmet detection, which can be easily used in construction monitoring or traffic safety monitoring. Moreover, SR driven detection is a general workflow that is easy to be extended to other similar object detection tasks to solve the problem of performance degrading caused by poor inference input quality when the training input quality is good. Currently, our main idea is to use the individual model on specific tasks and combine tasks together. The model will be redundant if there are a large number of tasks. In the future, we will keep working on identifying a semantic subspace to attempt to remove the influence of image quality on detection performance.

MULTI-SCALE SAFETY HELMET DETECTION BASED ON SAS-YOLOV3-TINY

ABSTRACT

In the practical application scenarios of safety helmet detection, the lightweight algorithm You Only Look Once (YOLO) v3-tiny is easy to be deployed in embedded devices because its number of parameters is small. However, its detection accuracy is relatively low, which is why it is not suitable for detecting multi-scale safety helmets. The safety helmet detection algorithm (named SAS-YOLOv3-tiny) is proposed in this paper to balance detection accuracy and model complexity. A light Sandglass-Residual (SR) module based on depthwise separable convolution and channel attention mechanism is constructed to replace the original convolution layer, and the convolution layer of stride two is used to replace the max-pooling layer for obtaining more informative features and promoting detection performance while reducing the number of parameters and computation. Instead of two-scale feature prediction, three-scale feature prediction is used here to improve the detection effect about small objects further. In addition, an improved spatial pyramid pooling (SPP) module is added to the feature extraction network to extract local and global features with rich semantic information. Complete-Intersection over Union (CIoU) loss is also introduced in this paper to improve the loss function for promoting positioning accuracy. The results on the self-built helmet dataset show that the improved algorithm is superior to the original algorithm. Compared with the original YOLOv3-tiny, the SAS-YOLOv3-tiny has significantly improved all metrics (including Precision (P), Recall (R), Mean Average Precision (mAP), F1) at the expense of only a minor speed while keeping fewer parameters and amounts of calculation. Meanwhile, the SAS-YOLOv3-tiny algorithm shows advantages in accuracy compared with lightweight object detection algorithms, and its speed is faster than the heavyweight model.

Keywords: YOLOv3-tiny; object detection; attention mechanism; deep learning; intelligent transportation

CONCLUSION

The original lightweight algorithm YOLOv3-tiny was low at accuracy. Even though YOLOv3-tiny has a faster speed and fewer parameters, its detection accuracy needs to be improved. First of all, the lightweight Sandglass-Residual module based on depthwise separable convolution and channel attention mechanism was constructed to replace the original convolution layer while the max-pooling layer was replaced with the convolution layer of stride two, which could reduce the number of parameters and improve detection performance. Furthermore, the detection performance is further improved when threescale feature prediction is utilized. Next, the improved spatial pyramid pooling module was merged behind the backbone network to extract expressive features. Finally, we utilized CIoU to improve the loss function, which also improved the location effect. In conclusion, for the validation set, SAS-YOLOv3-tiny made P from 70.7% to 73.2%, made R from 73.3% to 80.2%, made mAP from 73.7% to 81.6% and made F1 from 71.9% to 76.4%. For the test set, SAS-YOLOv3-tiny had good generalization, and it performed better than the original YOLOv3-tiny at the expense of 0.7 ms speed, which was comparable to YOLOv4-tiny in terms of detection accuracy; compared with the heavyweight algorithms YOLOv3 and YOLOv4, SAS-YOLOv3-tiny had a great advantage in speed although its detection accuracy was not as good as theirs. The experimental results and contrast curves reveal that the improved methods can strengthen the effect of detection. The next work is to expand the safety helmet dataset based on the dataset in this paper and further improve the detection accuracy while maintaining a lower number of parameters and speed.

DETECTING MOTORCYCLE HELMET USE WITH DEEP LEARNING

ABSTRACT

The continuous motorization of traffic has led to a sustained increase in the global number of road related fatalities and injuries. To counter this, governments are focusing on enforcing safe and law-abiding behavior in traffic. However, especially in developing countries where the motorcycle is the main form of transportation, there is a lack of comprehensive data on the safety-critical behavioral metric of motorcycle helmet use. This lack of data prohibits targeted enforcement and education campaigns which are crucial for injury prevention. Hence, we have developed an algorithm for the automated registration of motorcycle helmet usage from video data, using a deep learning approach. Based on 91,000 annotated frames of video data, collected at multiple observation sites in 7 cities across the country of Myanmar, we trained our algorithm to detect active motorcycles, the number and position of riders on the motorcycle, as well as their helmet use. An analysis of the algorithm’s accuracy on an annotated test data set, and a comparison to available human-registered helmet use data reveals a high accuracy of our approach. Our algorithm registers motorcycle helmet use rates with an accuracy of -4.4% and +2.1% in comparison to a human observer, with minimal training for individual observation sites. Without observation site specific training, the accuracy of helmet use detection decreases slightly, depending on a number of factors. Our approach can be implemented in existing roadside traffic surveillance infrastructure and can facilitate targeted data-driven injury prevention campaigns with real-time speed. Implications of the proposed method, as well as measures that can further improve detection accuracy are discussed.

Keywords: Deep learning, Helmet use detection, Motorcycle, Road safety, Injury prevention

CONCLUSION

The lack of representative motorcycle helmet use data is a serious global concern for governments and road safety actors. Automated helmet use detection for motorcycle riders is a promising approach to efficiently collect large, up-to-date data on this crucial measure. When trained, the algorithm presented in this paper can be directly implemented in existing road traffic surveillance infrastructure to produce real-time helmet use data. Our evaluation of the algorithm confirms a high accuracy of helmet use data, that only deviates by a small margin from comparable data collected by human observers. Observation site specific training of the algorithm does not involve extensive data annotation, as already the annotation of 270 s of video data is enough to produce accurate results for e.g. the Yangon II observation site. While the sole collection of data does not increase road safety by itself , it is a prerequisite for targeted enforcement and education campaigns, which can lower the rate of injuries and fatalities

In conclusion, we are confident that automated helmet use detection can solve the challenges of costly and time-consuming data collection by human observers. We believe that the algorithm can facilitate broad helmet use data collection and encourage its active use by actors in the road safety field.

HELMET DETECTION ON TWO-WHEELER RIDERS USING MACHINE LEARNING

ABSTRACT

Road safety is often neglected by riders worldwide leading to accidents and deaths. To address this issue, most countries have laws which mandate the use of helmets for two-wheeler riders. In addition to the law, there is a significant proportion of the police force that discourages this behavior by issuing a traffic violation ticket. As of now, this process is manual and tedious. This project aims to solve this problem by automating the process of detecting the riders who are riding without helmets. Furthermore, the system also extracts the license plate so that it could be used to issue traffic violation tickets. The system implements machine learning and image processing techniques to detect riders, riding two-wheelers, who are not wearing helmets. The system takes a video of traffic on public roads as the input and detects moving objects in the scene. A machine learning classifier is applied to the moving object to identify if the moving object is a two-wheeler. If it is a two-wheeler, then another classifier is used to detect whether the rider is wearing a helmet. The license plate is provided as the output in case the rider is not wearing a helmet.

Keywords - Machine Learning, Supervised Learning, Feature Extraction, Background Subtraction, MATLAB Function

CONCLUSION

From the results shown above, one can infer that random forest outperforms all the other algorithms by a significant difference. A deep neural network is expected to perform better than a random forest in image recognition, but due to lack of data, it does not perform as expected. As stated earlier, deep learning algorithms shine when there is a lot of training data. In the future, the system can be improved by scrutinizing its drawbacks. There are a couple of drawbacks. First, the system doesn’t work when there are multiple vehicles in the scene. We have intentionally left that part out because our focus was more on surveying performance of different machine learning algorithms in this scenario rather than making the system best at detecting helmet. However, for the system to be practical, it needs to recognize multiple vehicles and successfully perform all the tasks as it does in the case of a single vehicle. Multiple vehicle detection has already been implemented . The second drawback is, instead of outputting an image of the number plate at the end, the system can output a license number using an OCR (Optical Character Recognition)

Extracting the license number will allow the system to automatically send a ticket to the registered owner of the two wheeler, in case they are not wearing a helmet. If the above two issues are addressed, and a lot of training data is gathered from surveillance cameras, the system can become much more robust and reliable than it is now.

DEEP LEARNING-BASED SAFETY HELMET DETECTION IN ENGINEERING MANAGEMENT BASED ON CONVOLUTIONAL NEURAL NETWORKS

ABSTRACT

Visual examination of the workplace and in-time reminder to the failure of wearing a safety helmet is of particular importance to avoid injuries of workers at the construction site. Video monitoring systems provide a large amount of unstructured image data on-site for this purpose, however, requiring a computer vision-based automatic solution for real-time detection. Although a growing body of literature has developed many deep learning-based models to detect helmet for the traffic surveillance aspect, an appropriate solution for the industry application is less discussed in view of the complex scene on the construction site. In this regard, we develop a deep learning-based method for the real-time detection of a safety helmet at the construction site. presented method uses the SSD-MobileNet algorithm that is based on convolutional neural networks. A dataset containing 3261 images of safety helmets collected from two sources, i.e., manual capture from the video monitoring system at the workplace and open images obtained using web crawler technology, is established and released to the public. image set is divided into a training set, validation set, and test set, with a sampling ratio of nearly 8 :1 :1. ,e experiment results demonstrate that the presented deep learning-based model using the SSD-MobileNet algorithm is capable of detecting the unsafe operation of failure of wearing a helmet at the construction site, with satisfactory accuracy and efficiency

CONCLUSION

The paper proposed a method for detecting the wearing of safety helmets by the workers based on convolutional neural networks. model uses the SSD-Mobile Net algorithm to detect safety helmets. Then, a dataset of 3261 images containing various helmets is built and divided into three parts to train and test the model. TensorFlow framework is chosen to train the model. After the training and testing process, the mean average precision (mAP) of the detection model is stable and the helmet detection model is built. Experiment results demonstrate that the method can be used to detect the safety helmets worn by the construction workers at the construction site. presented method offers an alternative solution to detect the safety helmets and improve the safety management of the construction workers at the construction site.

A REVIEW ON SMART HELMET FOR ACCIDENT DETECTION USING IOT

ABSTRACT

As we know that accidents are increasing day by day, we can also notice that many laws and regulations are posed by government in order to avoid this accidents. Accidents can be defined as the unplanned event or the mistake that may occur resulting in injury and sometimes it also leads to death. The accidents in case of two wheelers are more compared to other vehicles. This may be avoided by wearing helmets and riding vehicles without consuming alcohol. This survey is on smart helmet for accidence avoidance and also examining various related techniques. This research also helps us to understand IOT technology which is being emerged now a days .From the literature survey we find that the method proposed using microcontroller RF transmitter and other sensors is cost effective but we find the system proposed using Raspberry pi module, Pi camera, Pressure Sensor, GPS system which uses image processing algorithms is most efficient since the image processing is included so that we can easily detect the use of helmet from the rider. Smart helmet system helps to provide safety and security to the two wheeler riders.

Keywords: Accidents, smart helmet, IOT, Laws and Regulation.

CONCLUSION

The survey demonstrates Smart helmet for accident avoidance. The helmet should be designed in order to reduce number of accidents in two wheelers this can be done by designing the device using IOT technology. Some sensor like IR sensor, alcohol sensor, GPS modules etc can be used to design a cost effective and user friendly smart helmet. The result should be accurate and should be useful to the government and society. This smart helmet can also be changed to seat belt system in case of four wheelers and can be implemented in future.