ISSN:0975-9646

Detection of Child Events with the kinetic Components of a Vehicle to Avoid the Hidden Dangers-A Survey

Mortha Manasa Devi
VNR Vignana Jyothi Institute of Engineering And Technology
Hyderabad

Abstract National Highway Traffic Safety Administration instigated a research which shows that hyperthermia is the underrated risk which can lead to serious injuries or even to death for children. Many precautions and automation tools have been taken/developed to detect the presence of an infant in the locked car. But, there are other hidden dangers, which led to accidents. One of the major causes of serious and lethal injuries to children and parents in accidents with cars is founded when kids playing with gears, acceleration, etc. while driving by the (parent/driver).To avoid such hidden dangers, this paper provides an approach to develop an algorithm to detect a child events associated with the kinetic components (gears, an accelerator, the steering wheel, brakes, etc.) of a car.

Keywords: Child Detection, Age Detection, Video Capture, Face Detection

1. INTRODUCTION

Today, many people are dying in road accidents as a consequence of inexperience, spending intoxication through drink or drugs or due to recklessness. The majority of road accidents are caused by human error. Research has shown that driver error accounts for over 80% of all fatal and injury crashes on roads. But by wearing seat-belts and fatigue detection system, the cause of death and injury is eradicated. Although experts often focus on more common safety measures, like using car seats correctly and basic childproofing, there are many less well known 'hidden dangers' that may put your kids at risk. Your family car is one of these 'hidden dangers,' and it is not just because of car accidents. In addition to the risk of getting hit or run over by a car, being left or getting trapped in a car can be just as deadly as danger. In fact, at least 600 children have died after being left in a car (sometimes on relatively mild days with only 45- degree temperatures) since 1998.Each year, an average of 37 kids die after being left in a car. The danger of being left alone isn't limited to kids getting overheated. Simply leaving the car running and the keeping air condition “ON” doesn't keep your child safe, even if it is just for a few minutes. Your child might be abducted, put the car into drive, or even get caught in a closing power window. To avoid such dangers, the researchers have developed many tools. Apart from this issue, there is another major cause of serious injuries to children in accidents with cars is founded when playing with kinetic components of a car while in drive.

In May, 2013 a tragedy occurred when a couple of young boys who were playing in a car accidently put the vehicle into drive, running over a 1-year old baby girl. The boys were listening to the music in the car put into gear. Another accident has taken place in March, 2013, where a parent left his/her kid in an unattended car and went to the glossary shop. A scenario that plays out too often, little Johnny is bored and begins playing around in the car and knocks the kinetic missile into launch mode, the vehicle smashed through the store. Kids are our precious cargo when you're running errands in a car, but they can also be the biggest distraction. In 2011, 3,331 people were killed in crashes involving a distracted driver compared to 3,267 killed in 2010, according to the National Highway Traffic Safety Administration. An Australian study found that kids cause 12% of driver distraction, according to a report on ABC's "Nightline". The 2011 study, which recorded families with kids ages 1 to 8 in the car, found that the drivers did the following when kids were in the car:

- 76.4% of the drivers turned to look at the backseat passengers or viewed them in the rearview mirror
- 16% talked to their children in the backseat
- 7% helped their children (by passing food and drinks)
- 1% played with their kids

The above study also proposes a solution to kids distract their drivers by playing with gears, steering etc. To avoid such accidents, I am proposing an approach to develop an algorithm to detect a child in an unattended car and also kids playing with the kinetic components of a vehicle while driving by a parent.

2. PREVIOUS WORK

No previous work has been reported on any aspects of kinetic component associated with child in car information. However, it is appropriate to review research on facial image analysis, age classification, as many of the issues encountered in our problem are similar to those encountered in a related problem. The previous computational work has been carried out for facial and age classification, this paper will continue with kinetic component analysis associated with children to detect the actions of the kids in a car while driving to avoid accidents. Previous computational work has been carried out to extract the features of the face such as eye, nose, mouth, etc. [8]. Few research papers have been reviewed for facial and age classification [1, 2, 3]. For facial analysis, a subsequent attempt at age classification was undertaken by Young H. Kwon [7].He showed the computing ratios (for eye, chin, mouth, etc.,) and detection of the presence of wrinkles to yield age categorization. However, the

computation of age in the presence of eye patches, dark glasses, other occlusions and shadowing effects needs to be explored. Hans Weda, Mauro Barbieri [3] describes a method to detect the faces using the Viola-Jones face detection technique. They have used iterative canny edge detection and a modified circular Hough transform to find irises. Their results showed an accuracy of over 80% when tested on a set of 289 real life photographs of frontal faces. Napa Sae-Bae, Xiaoxi Sun[1] has adapted a method to identify the human skin tone in digital images, extracts, features to detect explicit images and performs facial image based age classification. Test conducted on 105 images involving semi-naked children (with no sexual context) revealed that the system has true positive rates of 83% in detecting explicit-like images and 96.5% in detecting child faces. However, Ramanathan et al. has reported that many of these works require some prior information to estimate age range (like images collected over time), as opposed to actual age, would be more feasible [13]. On the detection of eyes and irises in digital images, a large body of literature has been published. Eye detection and tracking are important for many applications, such as face recognition, a red eye reduction in digital photography, and emotion recognition. An overview of the latest developments in this area can be found in [14].

3. PROPOSED APPROACH

This paper presents an approach that detects the child presence and actions associated with the kinetic components of a car by analyzing the connectivity between a child and other components. The method proposed can be divided into the following phases:

3.1 Video Acquisition

The purpose of this phase is to acquire video images [8] of an entire car in real time so that directly observable internal visual cues could be gathered for a child and kinetic component determination. The acquired video should be relatively invariant to light conditions and should facilitate face detection. They should provide enough information related to these visual bio-behaviors that typically characterize the child and adult. In achieving this, a capture device will be fixed on the chassis of the dashboard, so that the complete video of actions performing by driver and child can be recorded. From the recorded video, by applying the techniques of object detection, we can detect face, body, and kinetic components.

3.2 Face Detection

In order to classify the age of a person, we need to analyze the chin, sides of the face, the virtual top of the head, eyes, mouth and nose of the image [6]. As all these parameters are part of the face, first we have to detect the face of an adult and child from the video which can be achieved through cascade classifiers. After classifying the faces, we will compare the features to differentiate features adult and child by taking few parameters like head circumference, nestles, eye length, forehead [12] etc. Then, we will compare based on the above-mentioned parameters by using comparison technique. After that, adult face and child face features will be separated and store in a database.

3.3 Age Classification

While classifying the age of the person (associated with the face), we will categorize the age of a baby (up to the age of 5), an adult (over 15 years old).The process is to find the facial features of the image encompassing the parameters described in the previous stage. Then we compute the facial feature ratios and combine the last two steps to categorize the age of the facial image [7].

3.4 Kinetic Component Detection

We detect for different components in the vehicle like accelerator, steering, brakes, etc., by applying cascade classifier [11]. By using edge and threshold segmentation, we will detect the features of kinetic components to differentiate each. Then, will take these components as an input along with the child component for connectivity between both for detecting association as explained in the next phase.

3.5 Child and Kinetic Component Association Analysis

After detecting required inputs from the previous two stages for the system to analyze the association i.e. when a child touch any of the component in a vehicle which could lead to hidden dangers ,will be analyzed, so that corresponding action will be taken to avoid such dangers. This can be analyzed by using a connected-components technique which scans an image and groups its pixels into components based on pixel connectivity, *i.e.* all pixels in a connected component share similar pixel intensity values and are in some way connected with each other. Once all groups have been determined, each pixel is labeled with a gray level or color (color labeling) according to the component it was assigned to. Extracting and labeling of various disjoint and connected components in an image is central to many automated image analysis applications.

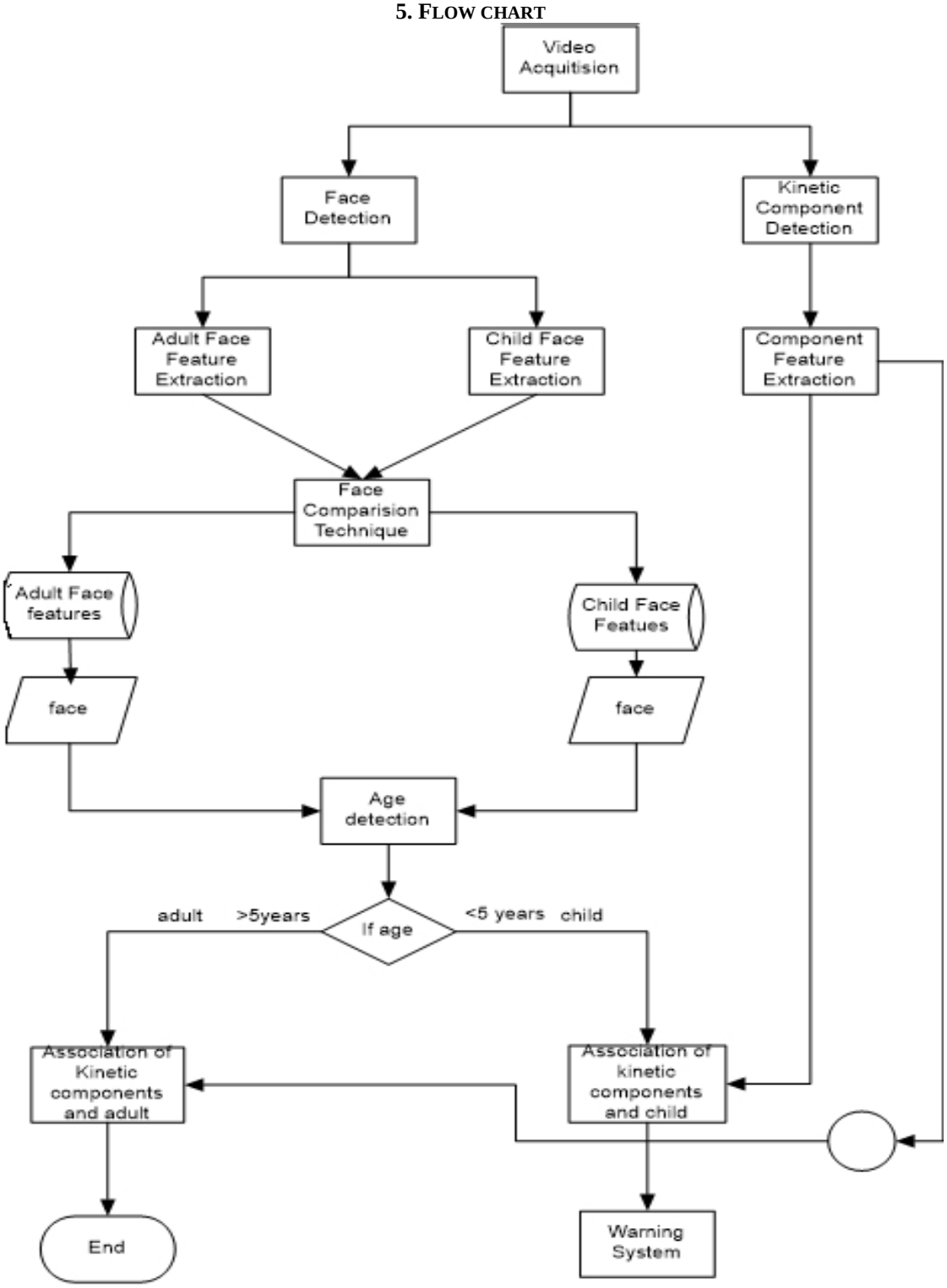
3.6. The Generation of Alarm

Warning conveys the driver about the state of distraction while driving so that corrective actions can be taken. As mentioned in the previous stage, if any danger occurs then an alarm is generated to alert the adult to look for the child from disturbing while driving. A vibrator is set to the driver's seat which will tremble him and thus preventing him from distraction and saving the life optimistically. Many methods have been adapted to design appropriate alarm modalities.

4. ALGORITHM

1. Place a camera on the dash board of a vehicle to capture video.
2. Classify the age between the child and adult by extracting facial features.
3. Detect kinetic components (acceleration, steering, gears, etc.,) in a vehicle by using an object detection technique.
4. Pass step 2 and step 3 as an input to an algorithm to detect the association of child and components by connected- components principle.
5. The warning system/alarm generation can be given when a child touches any component of a vehicle.

5. FLOW CHART



6. CONCLUSION

This paper proposes an approach to avoid accidents due to the driver's distraction caused by kids while driving a car. According to the National Traffic Safety Administration, drivers are getting distracted while driving because; the kids often play with kinetic components of a car which leads to an accident. This can be happen even when the car is unattended (with ref. Article-2327571, daily mail, UK.). So, to avoid such hidden dangers, my approach will help in developing an algorithm to detect the child associating with the components in the car.

REFERENCES

[1] Sae-Bae,Napa Sun Xiaoxi Sencar, Husrev T. ; Memon, Nasir D.CSE Department NYU, Polytechnic School of Engineering Brooklyn, NY 11201 USA "Towards automatic detection of child pornography" Image Processing (ICIP), 2014 IEEE International Conference

[2] Islam,M. Internet Commerce Security Lab., Univ. of Ballarat, Ballarat, VIC, Australia Watters, P. ; Yearwood, J. "Child face detection using age specific luminance invariant geometric descriptor" Signal and Image Processing Applications (ICSIPA), 2011 IEEE International Conference

[3] Weda,H. Philips Res.Eur.,Eindhoven Barbieri, M. "Automatic Children Detection in Digital Images" Multimedia and Expo, 2007 IEEE International Conference

[4] Ilkwon Park, Jung-Ho Ahn and Hyeran Byun, "Efficient Measurement of the Eye Blinking by Using Decision Function for Intelligent Vehicles", in ICCS 2007, LNCS 4490, Part IV, 2007, pp. 546-549.

[5] Luis, M., Bergasa,Jesus Nuevo,Miguel A. Soteli, Rafeal Barea, Maria Elena Lopez, "Real time system for monitoring driver Vigilance", IEEE Transactions on Intelligent Transportation Systems, Vol.7, No.1, March 2006.

[6] Paul A. Viola, Michael J. Jones: "Robust Real-Time Face Detection" International Journal of Computer Vision 57(2): 137-154 (2004)

[7] Young H. Kwon∗ and Niels da Vitoria Lobo "Age Classification from Facial Images" School of Computer Science, University of Central Florida, Orlando, Florida 32816.

[8] Mortha Manasa Devi , B.V.kiranmayee , G.Ramesh Chandra "Detection and Analysis of Eye State for Driver's Fatigue" International Journal of Graphics & Image Processing Vol 2,issue 1,Feburary 2012

[9] Lijuan Duan, Guoqin Cui, Wen Gao, and Hongming Zhang, "Adult image detection method base-on skin color model and support vector machine," in Asian conference on computer vision, 2002, pp. 797–800

[10] Adrian Ulges and Armin Stahl, "Automatic detection of child pornography using color visual words," in Multimedia and Expo (ICME), 2011 IEEE International Conference on, july 2011, pp. 1 –6

[11] Paul Viola and Michael Jones, "Robust real-time object detection," International Journal of Computer Vision, vol. 4, 2001.

[12] Frank Y Shih and Chao-Fa Chuang, "Automatic extraction of head and face boundaries and facial features," Information Sciences, vol. 158, pp. 117–130, 2004.

[13] Narayanan Ramanathan, Rama Chellappa, Soma Biswas, et al., "Age progression in human faces: A survey," Visual Languages and Computing, vol. 15, pp. 3349–3361, 2009.

[14] Q. Ji, H. Wechsler, A. Duchowski, M. Flickner (editors), Computer Vision and Image Understanding, Special issue on eye detection and tracking, Vol. 98, Issue 1, 2005.

[15] Xiaodan Zhuang, Xi Zhou, Mark Hasegawa-Johnson, and Thomas Huang, "Face age estimation using patch-based hidden markov model supervectors," in Pattern Recognition, 2008. ICPR 2008. 19th International Conference on. IEEE, 2008, pp. 1–4.