



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 4 Issue: IX Month of publication: September 2016

DOI:

www.ijraset.com

Call: © 08813907089 E-mail ID: ijraset@gmail.com

www.ijraset.com Volume 4 Issue IX, September 2016 IC Value: 13.98 ISSN: 2321-9653

International Journal for Research in Applied Science & Engineering Technology (IJRASET)

View Independent Drowsy Behaviour and Tiredness Detection

Amol S Patwardhan

Senior Researcher, VIT, University of Mumbai, 400037, India.

Abstract— Automatic identification of driver fatigue, drowsiness and sleepiness has many applications such as vehicle safety, operator safety and accident prevention, automatic monitoring and detection systems. This research paper examines use of color and depth data for detection of drowsy behavior. The data was recorded using two cameras, one on front and one on side view along with a depth sensor. The facial expressions, hand motion and body posture was used to classify fatigue, tiredness, sleepiness, drowsiness and boredom using support vector machines (SVM). In this study the upper torso and parts above waist were tracked. The evaluation of actions was done in dim as well as natural lighting inside a closed settings similar to interiors of a car. The recognition accuracy was better when data from both views was combined. The recognition accuracy was less in low lit and dim lighting settings inside car.

Keywords—Drowsiness, Fatigue, Human Activity Recognition, Emotion Recognition, Safety System, RGB-D, SVM

I. INTRODUCTION

Several occupations require that the operator of the vehicles is alert and completely fit in terms of physical and mental capability. Sometimes work related fatigue causes drowsiness and boredom adversely affecting the ability of the operators of the vehicle to perform their duty. After long driving hours and continuously sitting behind the wheels, stress, tiredness and sleepiness takes over. Such symptoms are extremely dangerous for the safety of the vehicle operator, people around the vehicles, vehicles in the surrounding and any passengers. This paper focusses on detecting fatigue, drowsiness, boredom among vehicle drivers. Specifically, the research focusses on capturing the driver behavior from the dashboard and side view using two video cameras and an infrared RGB-D sensor. Study [1] presented the current developments among various automobile research departments to develop car safety features. Research [2] has focused on the driver fatigue and the causes behind road accident. The survey compares various techniques to recognize and prevent fatigue. Drowsiness among vehicle operators has been examined in research [3] on automatic recognition systems. Research by Frank [4] focused on recognition of driver tiredness and drowsiness. Walger et. Al [5] have examined use of head pose and its contribution in effective driver emotions, physical and mental states. Several studies have been done on human activity recognition [6] to [18]. Researchers [19] to [31] have used various RGB-D and sensor based techniques for automatic multimodal emotion and intensity recognition.

II. METHOD

A total of eight participants enacted drowsiness and fatigue in a controlled environment. Two cameras and a sensor was place to capture side-view as well as frontal view of the actor. The actors sat against a desk under controlled lighting and only the upper body parts were tracked. The facial expressions, hand and body movement were tracked. The feature vector was used to train an SVM classifier. The data was divided as 70% for training and 30% for testing. We used 3-fold cross validation to train the classifier. Weka data mining tool was used for the training and classification. Once the classifiers were trained, the recognition accuracy was evaluated using following five scenarios:

- A. Front-only view data (controlled lighting)
- B. Side-only view data (controlled lighting)
- C. Front-side view data combined (controlled lighting)
- D. Front-side view data combined (dim lighting)
- E. Front-side view data combined (actual field test under natural conditions)

III.RESULT

The recognition accuracy results between front and side combined, front-view only and side-view only were compared. The results are as below:

www.ijraset.com Volume 4 Issue IX, September 2016 IC Value: 13.98 ISSN: 2321-9653

International Journal for Research in Applied Science & Engineering Technology (IJRASET)

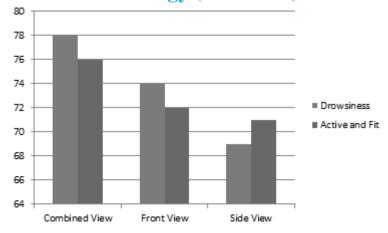


Fig. 1 Accuracy comparison between front, side and combined view

The accuracy results of combined data (78%) from front and side view cameras was better compared to front only (74%) or side only (69%) view data alone. Additionally, the experiment was performed in dim lighting and actual field test on the road. The results are as below:

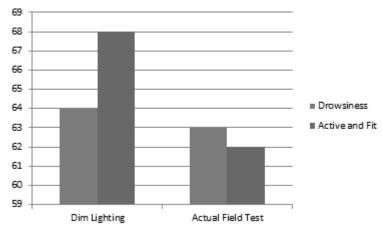


Fig. 2. Comparison of recognition accuracy between dim and field test.

The results indicated a drop in recognition accuracy when compared to controlled conditions. The tests under dim lighting produced 64% and tests under actual field (natural lighting) showed 63% recognition accuracy.

IV.CONCLUSIONS

The frontal and side view data combined resulted in better recognition accuracy for drowsiness and fatigue when compared to unimodal front only or side only recognition. The recognition accuracy decreased when the conditions of lighting were poor (dim) or in natural lighting during actual field test. This was because we did not consider the noise, bumps and jitter that occur during actual driving, during the training and enactment of drowsiness under the controlled indoor environment. As a future scope, a more realistic simulator needs to be used to obtain data and train the classifiers.

REFERENCES

- [1] "Driver drowsiness detection The technology race in the car to keep the driver awake and focused". Retrieved 2016-05-12.
- [2] "DRIVER FATIGUE AND ROAD ACCIDENTS A LITERATURE REVIEW and POSITION PAPER", Royal Society for the Prevention of Accidents. February 2001.
- [3] "Driver Drowsiness Detection System for Cars". Retrieved 2015-11-05.
- [4] Sgambati, Frank, "Driver Drowsiness Detection"
- [5] Walger, D.J.; Breckon, T.P.; Gaszczak, A.; Popham, T. (November 2014). "A Comparison of Features for Regression-based Driver Head Pose Estimation under Varying Illumination Conditions", Proc. International Workshop on Computational Intelligence for Multimedia Understanding (IEEE): 1–5. doi:10.1109/IWCIM.2014.7008805.
- [6] Anne Veenendaal, Elliot Daly, Eddie Jones, Zhao Gang, Sumalini Vartak, Rahul S Patwardhan, Drunken Abnormal Human Gait Detection using Sensors,

www.ijraset.com Volume 4 Issue IX, September 2016 IC Value: 13.98 ISSN: 2321-9653

International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Computer Science and Emerging Research Journal, vol 1, 2013.

- [7] Anne Veenendaal, Elliot Daly, Eddie Jones, Zhao Gang, Sumalini Vartak, Rahul S Patwardhan, Fear Detection with Background Subtraction from RGB-D data, Computer Science and Emerging Research Journal, vol 1, 2013.
- [8] Anne Veenendaal, Elliot Daly, Eddie Jones, Zhao Gang, Sumalini Vartak, Rahul S Patwardhan, Code Definition Analysis for Call Graph Generation, Computer Science and Emerging Research Journal, vol 1, 2013.
- [9] Anne Veenendaal, Elliot Daly, Eddie Jones, Zhao Gang, Sumalini Vartak, Rahul S Patwardhan, Multi-View Point Drowsiness and Fatigue Detection, Computer Science and Emerging Research Journal, vol 2, 2014.
- [10] Anne Veenendaal, Elliot Daly, Eddie Jones, Zhao Gang, Sumalini Vartak, Rahul S Patwardhan, Group Emotion Detection using Edge Detecttion Mesh Analysis, Computer Science and Emerging Research Journal, vol 2, 2014.
- [11] Anne Veenendaal, Elliot Daly, Eddie Jones, Zhao Gang, Sumalini Vartak, Rahul S Patwardhan, Polarity Analysis of Restaurant Review Comment Board, Computer Science and Emerging Research Journal, vol 2, 2014.
- [12] Anne Veenendaal, Elliot Daly, Eddie Jones, Zhao Gang, Sumalini Vartak, Rahul S Patwardhan, Sentiment Analysis in Code Review Comments, Computer Science and Emerging Research Journal, vol 3, 2015.
- [13] Anne Veenendaal, Elliot Daly, Eddie Jones, Zhao Gang, Sumalini Vartak, Rahul S Patwardhan, Temporal Analysis of News Feed Using Phrase Position, Computer Science and Emerging Research Journal, vol 3, 2015.
- [14] Anne Veenendaal, Elliot Daly, Eddie Jones, Zhao Gang, Sumalini Vartak, Rahul S Patwardhan, Decision Rule Driven Human Activity Recognition, Computer Science and Emerging Research Journal, vol 3, 2015.
- [15] Anne Veenendaal, Elliot Daly, Eddie Jones, Zhao Gang, Sumalini Vartak, Rahul S Patwardhan, Depression and Sadness Recognition in Closed Spaces, Computer Science and Emerging Research Journal, vol 4, 2016.
- [16] Anne Veenendaal, Elliot Daly, Eddie Jones, Zhao Gang, Sumalini Vartak, Rahul S Patwardhan, Dynamic Probabilistic Network Based Human Action Recognition, Computer Science and Emerging Research Journal, vol 4, 2016.
- [17] Anne Veenendaal, Elliot Daly, Eddie Jones, Zhao Gang, Sumalini Vartak, Rahul S Patwardhan, Fight and Aggression Recognition using Depth and Motion Data, Computer Science and Emerging Research Journal, vol 4, 2016.
- [18] Anne Veenendaal, Elliot Daly, Eddie Jones, Zhao Gang, Sumalini Vartak, Rahul S Patwardhan, Sensor Tracked Points and HMM Based Classifier for Human Action Recognition, Computer Science and Emerging Research Journal, vol 5, 2016.
- [19] A. S. Patwardhan, 2016. "Structured Unit Testable Templated Code for Efficient Code Review Process", PeerJ Computer Science (in review), 2016.
- [20] A. S. Patwardhan, and R. S. Patwardhan, "XML Entity Architecture for Efficient Software Integration", International Journal for Research in Applied Science and Engineering Technology (IJRASET), vol. 4, no. 6, June 2016.
- [21] A. S. Patwardhan and G. M. Knapp, "Affect Intensity Estimation Using Multiple Modalities," Florida Artificial Intelligence Research Society Conference, May. 2014.
- [22] A. S. Patwardhan, R. S. Patwardhan, and S. S. Vartak, "Self-Contained Cross-Cutting Pipeline Software Architecture," International Research Journal of Engineering and Technology (IRJET), vol. 3, no. 5, May. 2016.
- [23] A. S. Patwardhan, "An Architecture for Adaptive Real Time Communication with Embedded Devices," LSU, 2006.
- [24] A. S. Patwardhan and G. M. Knapp, "Multimodal Affect Analysis for Product Feedback Assessment," IIE Annual Conference. Proceedings. Institute of Industrial Engineers-Publisher, 2013.
- [25] A. S. Patwardhan and G. M. Knapp, "Aggressive Action and Anger Detection from Multiple Modalities using Kinect", submitted to ACM Transactions on Intelligent Systems and Technology (ACM TIST) (in review).
- [26] A. S. Patwardhan and G. M. Knapp, "EmoFit: Affect Monitoring System for Sedentary Jobs," preprint, arXiv.org, 2016.
- [27] A. S. Patwardhan, J. Kidd, T. Urena and A. Rajagopalan, "Embracing Agile methodology during DevOps Developer Internship Program", IEEE Software (in review), 2016.
- [28] A. S. Patwardhan, "Analysis of Software Delivery Process Shortcomings and Architectural Pitfalls", PeerJ Computer Science (in review), 2016.
- [29] A. S. Patwardhan, "Multimodal Affect Recognition using Kinect", ACM TIST (in review), 2016.
- [30] A. S. Patwardhan, "Augmenting Supervised Emotion Recognition with Rule-Based Decision Model", IEEE TAC (in review), 2016.
- [31] A. S. Patwardhan, Jacob Badeaux, Siavash, G. M. Knapp, "Automated Prediction of Temporal Relations", Technical Report. 2014.
- [32] A. S. Patwardhan, "Edge Based Grid Super-Imposition for Crowd Emotion Recognition", International Research Journal of Engineering and Technology (IRJET), May. 2010.
- [33] A. S. Patwardhan, "Human Activity Recognition Using Temporal Frame Decision Rule Extraction", International Research Journal of Engineering and Technology (IRJET), May. 2010.
- [34] A. S. Patwardhan, "Low Morale, Depressed and Sad State Recognition in Confined Spaces", International Research Journal of Engineering and Technology (IRJET), May. 2011.
- [35] A. S. Patwardhan, "View Independent Drowsy Behavior and Tiredness Detection", International Journal for Research in Applied Science and Engineering Technology (IJRASET), May. 2011.
- [36] A. S. Patwardhan, "Sensor Based Human Gait Recognition for Drunk State", International Journal for Research in Applied Science and Engineering Technology (IJRASET), May. 2012.
- [37] A. S. Patwardhan, "Background Removal Using RGB-D data for Fright Recognition", International Journal for Research in Applied Science and Engineering Technology (IJRASET), May. 2012.
- [38] A. S. Patwardhan, "Depth and Movement Data Analysis for Fight Detection", International Research Journal of Engineering and Technology (IRJET), May. 2013.
- [39] A. S. Patwardhan, "Human Action Recognition Classification using HMM and Movement Tracking", International Research Journal of Engineering and Technology (IRJET), May. 2013.
- [40] A. S. Patwardhan, "Feedback and Emotion Polarity Extraction from Online Reviewer sites", International Journal for Research in Applied Science and

www.ijraset.com Volume 4 Issue IX, September 2016 IC Value: 13.98 ISSN: 2321-9653

International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Engineering Technology (IJRASET), May. 2014.

- [41] A. S. Patwardhan, "Call Tree Detection Using Source Code Syntax Analysis", International Journal for Research in Applied Science and Engineering Technology (IJRASET), May. 2014.
- [42] A. S. Patwardhan, "Walking, Lifting, Standing Activity Recognition using Probabilistic Networks", International Research Journal of Engineering and Technology (IRJET), May. 2015.
- [43] A. S. Patwardhan, "Online News Article Temporal Phrase Extraction for Causal Linking", International Journal for Research in Applied Science and Engineering Technology (IJRASET), May. 2015.
- [44] A. S. Patwardhan, "Online Comment Processing for Sentiment Extraction", International Journal for Research in Applied Science and Engineering Technology (IJRASET), May. 2016.









45.98



IMPACT FACTOR: 7.129



IMPACT FACTOR: 7.429



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call: 08813907089 🕓 (24*7 Support on Whatsapp)