Fall Classification by Machine Learning Using Mobile Phones

Abstract

Fall prevention is a critical component of health care; falls are a common source of injury in the elderly and are associated with significant levels of mortality and morbidity. Automatically detecting falls can allow rapid response to potential emergencies; in addition, knowing the cause or manner of a fall can be beneficial for prevention studies or a more tailored
emergency response. The purpose of this study is to demonstrate techniques to not only reliably detect a fall but also to automatically classify the type. We asked 15 subjects to simulate four different types of falls–left and right lateral, forward trips, and backward slips–while wearing mobile phones and previously validated, dedicated accelerometers. Nine subjects
also wore the devices for ten days, to provide data for comparison with the simulated falls. We applied five machine learning classifiers to a large time-series feature set to detect falls. Support vector machines and regularized logistic regression were able to identify a fall with 98% accuracy and classify the type of fall with 99% accuracy. This work demonstrates how current machine learning approaches can simplify data collection for prevention in fall-related research as well as improve rapid response to potential injuries due to falls.

- What was the main theme of the paper?

The Theme of this study is to demonstrate techniques to not only reliably detect a fall but also to automatically classify the type. Automatically detecting falls can allow rapid response to potential emergencies; in addition, knowing the cause or manner of a fall can be beneficial for prevention studies or a more tailored emergency response.

- Was the discussed problem significant of addressing?

  Falls in the elderly are a relatively common occurrence that can have dramatic health consequences. For people over 75 years old, the estimated incidence of falls is over 30 percent per year . Nearly half of nursing home residents fall each year, with 40% falling more than once . Falls can cause physical injury including fractures, head injuries, or serious lacerations. In community-dwelling patients who have fallen in a given year ,the rate of serious injury is 5–10% . Falls can also elicit psychological consequences such as decreased independence and increased fear of falling

- How problem was solved?

  We first wanted to know how well the system could distinguish between the four different types of falls. We used five different classifiers: support vector machines (SVM), sparse multinomial logistic regression (SMLR, also referred to as regularized logistic regression), Naive Bayes, k-

nearest neighbors, and decision trees. Using 10-fold cross-validation, SVM and SMLR classifiers were able to achieve 99% accuracy .Importantly, the fall-like events were selected based on the highest-impact events from a set of eight week-long recordings .Both the SVM and SMLR classifiers achieved accuracies near 98% for pooled subject data when using 10-fold cross-validation, while that accuracy decreased to only 97% when subject-wise cross-validation was used.

- What are the strengths of the approach?

  SVM and SMLR classifiers are most accurate over all cross-validation methods used, providing 98% accuracy for fall detection and 99% accuracy for fall classification. Also, price is significantly reduced due to high production volume. Due to these advantages, mobile phones have the promise to provide a convenient, inexpensive, and objective means to track falls.
  SVM can produce accurate and robust classification results on a sound theoretical basis, even when input data are non-monotone and non-linearly separable. So they can help to evaluate more relevant information in a convenient way. Since they linearize data on an implicit basis by means of kernel transformation, the accuracy of results does not rely on the quality of human expertise judgement for the optimal choice of the linearization function of non-linear input data.

- What are the lackness of the approach?

The fall-like events from the week-long recordings, though perhaps better than using certain simulated daily activities, may not have provided an adequate control data set. There is no guarantee that the fall-like events selected are a representative sample of potential misclassifications.

The disadvantages are that the theory only really covers the determination of the parameters for a given value of the regularisation and kernel parameters and choice of kernel. In a way the SVM moves the problem of over-fitting from optimizing the parameters to model selection. Sadly kernel models can be quite sensitive to over-fitting the model selection criterion

- Anything important that authors have not discussed?

The mobile phones used here were placed in a standardized position. This allowed highly stereotypical measurements that aided accuracy ratings, but made the results less applicable to the way people carry their mobile phones every day.

- Any improvement possible in the approach?

  It would have ability to detect the fall classification even when even the phone is not placed in standardized position.

Crowd Behavior Detection for Abnormal Conditions

Abstract :-

The need to detect behavior of crowd is to address social issues and have safer and more secure society. The surveillance videos can be used for detecting abnormal behavior of crowd. People naturally run away from the place where unexpected event takes place. Based on this observation we propose a system which detects behavior of crowd automatically when unusual events happen. The proposed system performs appropriate detection of unexpected events. The proposed system is based on optical flow and detects the pattern in crowd motion. The system takes sequence of images i.e. video as input. Preprocessing of video is done. Then frames are extracted from video. Every frame is processed to remove the background and to extract foreground patches. Then features are extracted on the basis of position, magnitude and direction. These extracted features are given to proposed system for further processing. Optical flow is then calculated to find the pattern between frames. The system then detects behavior of crowd as normal or abnormal. The proposed system gives more accurate results then the existing system and identifies crowd behavior through real time videos.

CONCLUSION

Automatically crowd behavior is identified from surveillance videos. The existing method does not give the accurate results for the identifying the crowd behavior in the videos. Therefore proposed system by using the classification gives the more accurate result. The proposed method is able to update the density of optical flow and calculate the magnitude of feature vector when unexpected events take place. The proposed method detects crowd behavior which involves changes in position, speed and direction. In future we plan to study the different characteristics of crowd in high density situations.

What was the main theme of the paper ?

This paper presents an approach for crowd behavior detection by modeling optical flow in both normal and abnormal situations. Based on this observation we propose a system which detects behavior of crowd automatically when unusual events happen. The proposed system performs appropriate detection of unexpected events.

Was the discussed problem significant of addressing ?

Crowd detection is mainly required in dense urban areas where pedestrians often move in groups. These scenarios are extremely difficult to analyze because no individual pedestrian can be properly segmented out for detection, the path people take can be quite chaotic and the background is not homogenous and hence it is difficult to distinguish humans from man-made objects. The need to detect behavior of crowd is to address social issues and have safer and more secure society. Increase in population has made crowded scenes frequent in day to day life. Therefore, there is variety of human activity .Massive challenges such as public safety, management, or security has attracted researchers in the computer vision community to develop automatic system. The study of crowd behavior analysis is based on public safety and transportation.

How problem was solved ?

The proposed system is based on optical flow and detects the pattern in crowd motion. The system takes sequence of images i.e. video as input. Preprocessing of video is done. Then frames are extracted from video. Every frame is processed to remove the background and to extract foreground patches. Then features are extracted on the basis of position, magnitude and direction. These extracted features are given to proposed system for further processing. Optical flow is then calculated to find the pattern between frames. The system then detects behavior of crowd as normal or abnormal. The proposed method detects crowd behavior which involves changes in position, speed and direction.

What are the strengths of the approach?

Optical flow also depends on relative distance between the object and the camera. The crowd velocity is calculated by assuming the magnitude of optical flow vectors. Magnitude value will be zero if there is no movement otherwise it will be nonzero. The proposed method easily handles both local abnormal events and global abnormal events. It also support detection of online events. The method is robust.

Direct motion estimation .

What are the lacknesses of the approach?

In case of crowded scenes, the challenge is that it cannot be handled well due to large number of individual participation. Because of large number of individuals tracking and detection of crowd behavior fails. It can may be generate false alert .

Computationally expensive .

Anything important that authors have not discussed or ignored?

The author does not discuss if the unfortunately system is fail suddenly and unpleasant events is happen then how to handle such situation .

Finally any improvement possible in the approach and how?

The improvement is possible by including a system that handle the emergency situation if unfortunately the crowd detection system is fail in this condition including a function that behave like the this function or handle the situation .

Emergency Alert Prediction for Elderly Based on Supervised Learning

Abstract

At the older age, the likelihood of disability increases and hence the increasing need for long-term care and facilities to assist elderly people who endure gradual loss of body function. Early detection of changes in health condition of elderly can increase safety for elderly people in

emergency conditions. Alert prediction can be viewed as an assistive technology that will deliver appropriate escalation in the earliest time so that elderly can receive immediate responses. Supervised learning can be used as a tool to predict alert in emergency condition by training historical data of elderly behaviors and conditions. This paper proposed emergency alert prediction using supervised learning algorithms. Three algorithms of supervised learning, namely deep learning, k-NN, and LVQ were used to simulate the proposed system. The objective of this paper is to investigate the performance of three algorithms in making emergency alert prediction for elderly living independently. We conducted experiments for 30 days to elderly living independently and we obtained 1038 datasets.

- What was the main theme of the paper?

  As people age, decline in physiological occurs as a natural part of ageing process. Elderly is at high risk of having chronic diseases that lead to disability and movement impairment. Health care for elderly independently living at home becomes crucial. Thus, alert for elderly in emergency conditions should be prepared well. The theme of this paper is to investigate the performance of supervised learning in making emergency alert prediction for elderly.

- Was the discussed problem significant of addressing?

  Problem significant of addressing , As people age decline in physiological occurs as a natural part of ageing process. Elderly is at high risk of having chronic diseases that lead to disability and movement impairment . These changes are a natural part of the aging process, they also lead to different types of movement impairment. These problems rise in all countries in the world, particularly it becomes burden for low and middle income countries.

- How problem was solved?

  Supervised learning is considered as a tool to predict alert for elderly in emergency condition by training the historical data of elderly behaviors and conditions. We conducted experiments for 30 days to elderly living independently and we obtained 1038 datasets. The simulation results showed deep learning performed the best accuracy 99.57% correct. Whereas k-NN obtained the best accuracy 90.79% correct, and LVQ obtained the best accuracy 80.32%.

- What are the strengths of the approach?

  As the experiment was conducted for long period of thirty days so it is very much possible that it has covered all the expected situations.

  Deep learning has best-in-class performance on problems that significantly outperforms other solutions in multiple domains. This includes speech, language, vision, playing games like Go. Reduces the need for feature engineering, one of the most time-consuming parts of machine learning practice.

- What are the lacknesses of the approach?

This case is categorized binary classification because we only have two options for final output, "ALERT" or "NO ALERT". Deep Learning requires a large amount of data — if you only have thousands of example, deep learning is unlikely to outperform other approaches. is extremely computationally expensive to train. The most complex models take weeks to train using hundreds of machines equipped with expensive GPUs.

- Anything important that authors have not discussed?
  In predicting emergency alert of elderly based on parameters .here pulse rate is not considered as a parameter as pulse rate is an essential parameter to predict or check the body condition.
- Any improvement possible in the approach?
  After successful prediction a mechanism would be added to inform the related departed about the emergency so that they can make suitable arrangement without any delay.as delays in emergency situations can lead to destructive results.

Automatic Stress Detection in Emergency (Telephone) Calls

Abstract: -

The abundance of calls to emergency lines during crises is difficult to handle by the limited number of operators. Detecting if the caller is experiencing some extreme emotions can be a solution for distinguishing the more urgent calls. Apart from these, there are several other applications that can benefit from awareness of the emotional state of the speaker. This paper describes the design of a system for selecting the calls that appear to be urgent, based on emotion detection. The system is trained using a database of spontaneous emotional speech from a call center. Four machine learning techniques are applied, based on either prosodic or spectral features, resulting in individual detectors. As a last stage, we investigate the effect of fusing these detectors into a single detection system. We observe an improvement in the Equal Error Rate (EER) from 19.0% on average for 4 individual detectors to 4.2% when fused using linear logistic regression. All experiments are performed in a speaker independent cross-validation framework.

Conclusions

In this work we propose an approach for automatic detection of speech colored by negative emotions. Such a system is relevant in several military scenarios, when critical situations need to be detected. Since we have used for training a corpus with neutral and emotionally colored speech from a call center thus real life data, we can regard our results as more reliable and more representative of what can be expected in a real application, compared to systems using acted data. We have extracted prosodic and spectral features and used them for training SVM- and GMM-based detectors. All GMM-based approaches, namely GMM, UBM- GMM-SVM and Dot Scoring lead to equal error rates close to 20%. SVM performs better showing an equal error rate of 15.5%. Fusing a GMM-based detector with an SVM one leads to a drop in equal error rate to 11% on average, based on a linear equal weight combination. The average becomes 10.3% when the weights are calculate using logistic regression. We can conclude

that detectors GMM-based on detectors with spectral features and SVM-based detectors with prosodic features complement each other very well. The highest improvement is when all classifiers are fused by Focal, and the EER drops to 4.2%.

What was the main theme of the paper ?

This paper describes the design of a system for selecting the calls that appear to be urgent, based on emotion detection. In this work we propose an approach for automatic detection of speech colored by negative emotions. Such a system is relevant in several military scenarios, when critical situations need to be detected.

Was the discussed problem significant of addressing ?

The abundance of calls to emergency lines during crises is difficult to handle by the limited number of operators. In the case of emergency call center, an operator can probably best assess the urgency of a call. However, it is not always possible to have an operator at any time and any place. Often during crises, emergency lines are overloaded with calls. Therefore, a system able to recognise emotions or the stress level of a speaker can be used together with an answering machine, so that the urgent calls should be selected and answered with high priority by the operator and less urgent calls are handled by the machine

How problem was solved ?

The system is trained using a database of spontaneous emotional speech from a call center . Four machine learning techniques are applied, based on either prosodic or spectral features, resulting in individual detectors. Three databases with natural and simulated recordings of stress were recorded for the NATO project “Speech under Stress Conditions”. The first one, susc-0/1 (Speech under Stress Conditions), includes recordings of speech during genuine stress from a crashing aircraft and an engine out situation. The second database, SUSAS (Speech Under Simulated and Actual Stress). , contains a large variety of stresses and speaking styles. The third database, DLP, is obtained from license plate reading tasks under psychological stress from time pressure.

What are the strengths of the approach?

What is particular about their approach is that the system does not use classification methods, but is rather a knowledge based system. The detection methodology is inspired from the way in which sounds are detected by the human auditory system.

Data Loss Prevention (DLP) is the practice of detecting and preventing data breaches, exfiltration, or unwanted destruction of sensitive data. Organizations use DLP to protect and secure their data and comply with regulations.

Prevent attempts to copy or send sensitive

The DLP term refers to defending organizations against both data loss and data leakage prevention.

What are the lacknesses of the approach?

The focus is on detecting one type of emotion, namely fear. The research is base on a database with segments from movies that show no emotion or different levels of fear is presented. A verbal aggression detection system is described it does not detect the non verbal aggression.

A DLP system will do your company no good if you don’t know where your data is stored. You need to **take inventory** of both classified and unclassified data.

If your company doesn’t take the time to define its data protection strategies and develop core technical and business requirements, the DLP system won't be effective

Finally any improvement possible in the approach and how?

This approach is improved by if it detect other different type of emotions rather then only one .The other emotion related database are used and using machine learning technique you can also detect the other relative emotion .