1 GEOMETRIC CORRECTION OF MULTI-PROJECTOR DATA FOR DOME DISPLAY

Using multiple projectors to project images that constitute to a dome display is an interesting phenomenon. This project deals with the development of a large seamless DOME display using overlapping projectors. The curved nature of a dome screen and the projectors' different intrinsic & extrinsic properties with respect to each other result into geometric and photometric distortions in the final augmented projection. Geometric correction deals with the alignment and warping of the projected data to compensate the effect of curved/dome screen.

Reference Material

- A survey of large-scale immersive displays E Lantz –2007
- A Unified Calibration Method with a Parametric Approach for Wide-Field-of-View. M Ogata, H Wada, J van Baar, R Raskar. 2009 IEEE Virtual Reality, 2009 ieee.org
- Immersive planar display using roughly aligned projectors R Raskar Proc. of IEEE Virtual Reality 2000
- Seamless multi-projector display on curved screens, J van Baar, T Willwacher, S Rao, 2003

2 PHOTOMETRIC CORRECTION FOR OF MULTI-PROJECTOR DATA FOR DOME DISPLAY

Using multiple projectors to project images that constitute to a dome display is an interesting phenomenon. This project deals with the development of a large seamless DOME display using overlapping projectors. The curved nature of a dome screen and the projectors' different intrinsic & extrinsic properties with respect to each other result into geometric and photometric distortions in the final augmented projection. Photometric correction aims at removing the colour differences across the various projected images & also compensate for the varying Black-Offset problem across different projectors.

Reference Material

- A survey of large-scale immersive displays E Lantz –2007
- A Unified Calibration Method with a Parametric Approach for Wide-Field-of-View. M Ogata, H Wada, J van Baar, R Raskar. 2009 IEEE Virtual Reality, 2009 ieee.org
- Immersive planar display using roughly aligned projectors R Raskar Proc. of IEEE Virtual Reality 2000
- Seamless multi-projector display on curved screens, J van Baar, T Willwacher, S Rao, 2003

3 OBJECT TRACKING AND TRACKED PATH GENERATION IN A MOSAIC VIDEO

In this project you will be developing a system that will generate the path traversed by an object being tracked in a mosaic video. A mosaic video is a video constructed by augmenting several different videos in a wide view single merged view. The tracked path will be stored as a GIF image, thus saving considerable storage space for surveillance storage.

There will be two main modules of the project: Planar Video Mosaicing and object tracking (e.g. Mean Shift based) Object tracking.

Consider multiple cameras (c1, c2, c3...) viewing different portions of a long corridor. The output of the system will be the tracked path of a person moving through the corridor and stored as a GIF image as shown below:



The deliverable shall be a successful digital path creation of the tracked object, like the one shown in sample figure in the left column

Useful References:

- [1] Vehicle and Person Tracking in Aerial Videos, LNCS, 2008
- [2] Automatic Video Object Tracking Using a Mosaic-Based Background, LNCS, 2005

4 NUMBER PLATE RECOGNITION

In number plate recognition (NPR) the goal is to locate a license plate in an image, extract the license plate and identify the text on the license plate. In this context a lot of work has been done. Most to the countries have some standards regarding license plates and this helps in efficient license plate recognition. However, in Pakistan there is no standard license plate system. Hence, there is a need to develop a license plate system which can effectively recognize both standard and non-standard license plates.

The goals of the project would be to

After literature review, implementation of a license plate location algorithm which best suits our requirements in real time.

Integration of an Optical Character Recognition (OCR) algorithm for recognition of number plates in real time.

References

- Christos-Nikolaos E. Anagnostopoulos, Ioannis E. Anagnostopoulos, Ioannis D. Psoroulas, Vassili Loumos, and Eleftherios Kayafas, *License Plate Recognition From Still Images and Video Sequences: A Survey.* IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS, VOL. 9, NO. 3, SEPTEMBER 2008.
- Wisam Al Faqheri and Syamsiah Mashohor, A Real-Time Malaysian Automatic License Plate Recognition (M-ALPR) using Hybrid Fuzzy, IJCSNS International Journal of Computer Science and Network Security, VOL.9 No.2, February 2009

5 AUTOMATIC IMAGE ACQUISITION

In number plate recognition (NPR) the goal is to obtain an image or a video of the car or motorcycle and extract the number plate from the image. The first task in this process is to capture an appropriate image or video of the car or motor cycle. Camera angle at which the image is taken has an impact on the successful detection and recognition of the number plate. Also, if a video camera is capturing the sequence it is desired to capture the video during a certain duration.

The goals of the project would be to

- Develop an automated system which starts recording as soon as the car enters the video frame and stops when no more information about the car number plate or the person sitting in the driving seat can be obtained.
- By placement of cameras at different positions determination of the most appropriate angle for optimal image acquisition.

References

- Christos-Nikolaos E. Anagnostopoulos, Ioannis E. Anagnostopoulos, Ioannis D. Psoroulas, Vassili Loumos, and Eleftherios Kayafas, *License Plate Recognition From Still Images and Video Sequences: A Survey.* IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS, VOL. 9, NO. 3, SEPTEMBER 2008.
- Wisam Al Faqheri and Syamsiah Mashohor, A Real-Time Malaysian Automatic License Plate Recognition (M-ALPR) using Hybrid Fuzzy, IJCSNS International Journal of Computer Science and Network Security, VOL.9 No.2, February 2009

6 FINGER MOVEMENT RECOGNITION

Virtual class rooms are the future of education. In this context one of the applications can be to following the instructors hand movement to reproduce to a distant attendee the text written since it is not always easy to see the whiteboard in the class from a streaming video. In this context the goal of this project would be to follow a finger in a video sequence. Finger would be considered as a rigid object which will not bend and the movements would be in a straight line.

References:

Rochelle O'Hagan and Alexander Zelinsky. Finger Track – A robust and real-time gesture interface. Australian Joint Conference on Artificial Intelligence. 1997

7 FACIAL GESTURE RECOGNITION

Facial gesture recognition can be used to determine the emotions of a person. This information could be used as a feedback in certain systems, especially to determine automatically the response of a user or consumer. Before, the development of an application based the first part is the efficient and fast detection of human facial gestures. In this context the goals of the project would be to

Detect face in an image.

• Detect facial gesture. The initial goal would be to differentiate between happy and annoyed/angry gestures only.

Useful references:

- Christoph Mayer, Matthias Wimmer, Freek Stulp, Zahid Riaz, Anton Roth, Martin Eggers, Bernd Radig. A Real Time System for Model-based Interpretation of the Dynamics of Facial Expressions. In Proc. of the International Conference on Automatic Face and Gesture Recognition (FGR08), Amsterdam, Netherlands, September 2008.
- Matthias Wimmer_, Christoph Mayer, Sylvia Pietzsch, and Bernd Radig. Tailoring Model-based Techniques to Facial Expression Interpretation. In The First International Conference on Advances in Computer-Human Interaction (ACHI08), Sainte Luce, Martinique, February 2008.

8 MEDICAL IMAGE SEGMENTATION AND TEXTURE ANALYSIS (MISTEX)

Image analysis in the domain of Medical is both complex and challenging. Our aim is to develop algorithms that would help the medical community to improve the prognosis and diagnosis of ailments using computer assisted intervention.

Useful References

- Segmentation of Meningioma (Brain Tumour) and Prostate Cancer Images
- Feature extraction using Short Term Fourier Transform of Meningioma and Prostate Images.

9 VIDEO CODEC DESIGN (VICD)

Development of new CODECs for specialised applications and developing software and hardware implementations of existing video CODECs such as MPEG1, MPEG2, MPEG4 and H.264.

Useful References

- Implementation of the H.264 SVC.
- Design and development of a proprietary CODEC.

10 FACE RECOGNITION (FACEREC)

Apply various techniques for real-time face recognition.

- Implement Eigenfaces algorithm for face recognition.
- Use multiresolution analysis techniques such as Wavelet Transform for face recognition.

11 CARPET CLASSIFICATION

Carpets come in various types, colours, patterns & combinations. The aim of this project is to aid interior designers in selecting the most appropriate carpet, curtain combination that matches there required theme. This is an actual problem and dataset of carpets has already been acquired.