ACKNOWLEDGEMENTS

I would like to thank my dissertation advisor Dr. Marc P. Christensen for his unyielding support and guidance during my Ph.D. work. His invaluable insights influenced my scientific thinking and research work to a significant degree. I admire his ability to deconstruct complex problems quickly and illuminate the essence in simple terms.

I would like to thank my dear friend and colleague Dr. Prasanna Rangarajan. I have spent well over seven years collaborating with him in our Photonics Architecture Laboratory on a multitude of Optics and Imaging problems. I have grown as a researcher seeing and admiring his method of working. He is a math wizard and very talented researcher. I am indebted to him not only for not suggesting me to derive a model more general than required for solving the problem specific to my thesis but also for helping me with the math when I got stuck.

I would like to express my gratitude to Dr. Panos Papamichalis, Dr. Dinesh Rajan and Dr. Predrag Milojkovic for shaping my education, giving advice and for helping me without question whenever I required.

I thank Dr. Delores M. Etter and Dr. Yunkai Zhou for agreeing to serve on my dissertation committee and giving valuable inputs on the research work despite their busy schedule. I am grateful to Dr. Duncan MacFarlane for providing valuable feedback on my work and giving critical suggestions on improving as a researcher.

I have been very fortunate to be part of a highly motivated and talented group of researchers during my time at SMU from whom I have learned a lot and will always cherish their friendship. They are Dr. Vikrant Bhakta, Dr. Manjunath Somayaji, Dr. Esmaeil Faramarzi, and Ting Li.

I will always be indebted to Dr. Manjunath Somayaji who has been both a friend and a professor to me and has thoughtfully guided me whenever I needed. I am thankful to Dr. Vikrant Bhakta being supportive friend and collaborator.

Life would have been difficult during my time at SMU without the help, support and care I received from Susan Bailey, Jay Kirk, Mitzi Hennessey, Julie Bednar, Misti Compton, Kristine R. Reiley and Jim Dees. Susan is very thoughtful, smart and compassionate. I will always be grateful for the kindness and understanding Susan, Mitzi, Julie, Misti, and Kristine have shown towards me. Jim's attention has ensured the quality of the dissertation through his attention to details. He has also been very kind and helpful with issues related to admission.

I would like to thank my family and friends especially to my wife, Vibha, for her steadfast support, unfathomable patience, and eternal love; our parents for their love, blessings, and constant encouragement; my brother and sister for their love and wishes; Kiran and Runa; Srinivas Bandi; Arun Hegde; and Zahid.

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Scheimpflug with Computational Imaging to Extend

the Depth of Field of Iris Recognition Systems

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Doctor of Philosophy December 17, 2016

Dissertation completed November 28, 2016

Iris recognition is a promising biometric surveillance technology. However, the inability of an iris camera to operate across a large range severely restricts its use. For example, subjects are required to either stand still at a fixed standoff distance or move slowly through a pre-defined and narrow zone during the capture. Such restrictions pose sever challenges for scaling iris recognition systems that can be used with multiple subjects and in crowded areas.

Two main methods for improving the imaging volume of current iris cameras have been proposed recently: By making the imaging system's response insensitive to focusing errors using wavefront coding. Or by aggregating a large imaging volume using multiple cameras juxtaposed in time or space. While the wavefront coding systems improve the imaging volume by a few folds at close standoff distances, they generally entail high computational cost and are plagued by low SNR. The second method, which requires multiple synchronized cameras for tracking and capturing subjects with the specified volume, has significant system complexity and incur high system cost.

To extend the imaging volume of iris acquisition systems by multiple folds while using a single camera, I propose to use a combination of classical Scheimpflug photography with modern computational imaging. Using Scheimpflug imaging techniques, the plane of sharp focus and the associated DOF can be oriented within a prescribed imaging volume. An optimal orientation of the DOF will be found that maximizes the ability to capture in-focus iris images from multiple subjects positioned within the volume. Computational imaging techniques will be used to address the space variance associated with Scheimpflug imaging, and for further improving the spatial resolution of the camera.

The complexity of such a system is minimal as it will not require multiple cameras and sophisticated tracking mechanism. This system can be scaled simply by using a lens with higher magnification and/ or a sensor with larger area which can be highly cost effective and efficient for installment in public places.

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To Vibha.