Supplementary Material for *Depth from Optical Turbulence, CVPR 2012*

Yuandong Tian
Carnegie Mellon University
yuandong@cs.cmu.edu

Srinivasa G. Narasimhan
Carnegie Mellon University
srinivas@cs.cmu.edu

Alan J. Vannevel
U.S. Naval Air Warfare Center
alan.vannevel@navy.mil

April 10, 2012

All turbulence videos are on the website *http://www.cs.cmu.edu/∼yuandong/*, under the project *Depth from Optical Turbulence*.

No.	L_c	L_t	L^{near}	L^{far}	Measured	Predicted
Exp1	54	171	163	225	1.77	1.79
Exp2	74	173	183	382	3.60	3.52
Exp3	74	173	247	382	1.67	1.94
Exp4	74	173	247	320	1.56	1.55

Table 1: Columns 1-4 show the ground truth measurement (in cm) for the four checker-board experiments. Columns 5-6 show comparison between the measured (5^{th} column) variance ratio and that predicted by the model (6^{th} column). In all but one case, the measurements are very accurate.

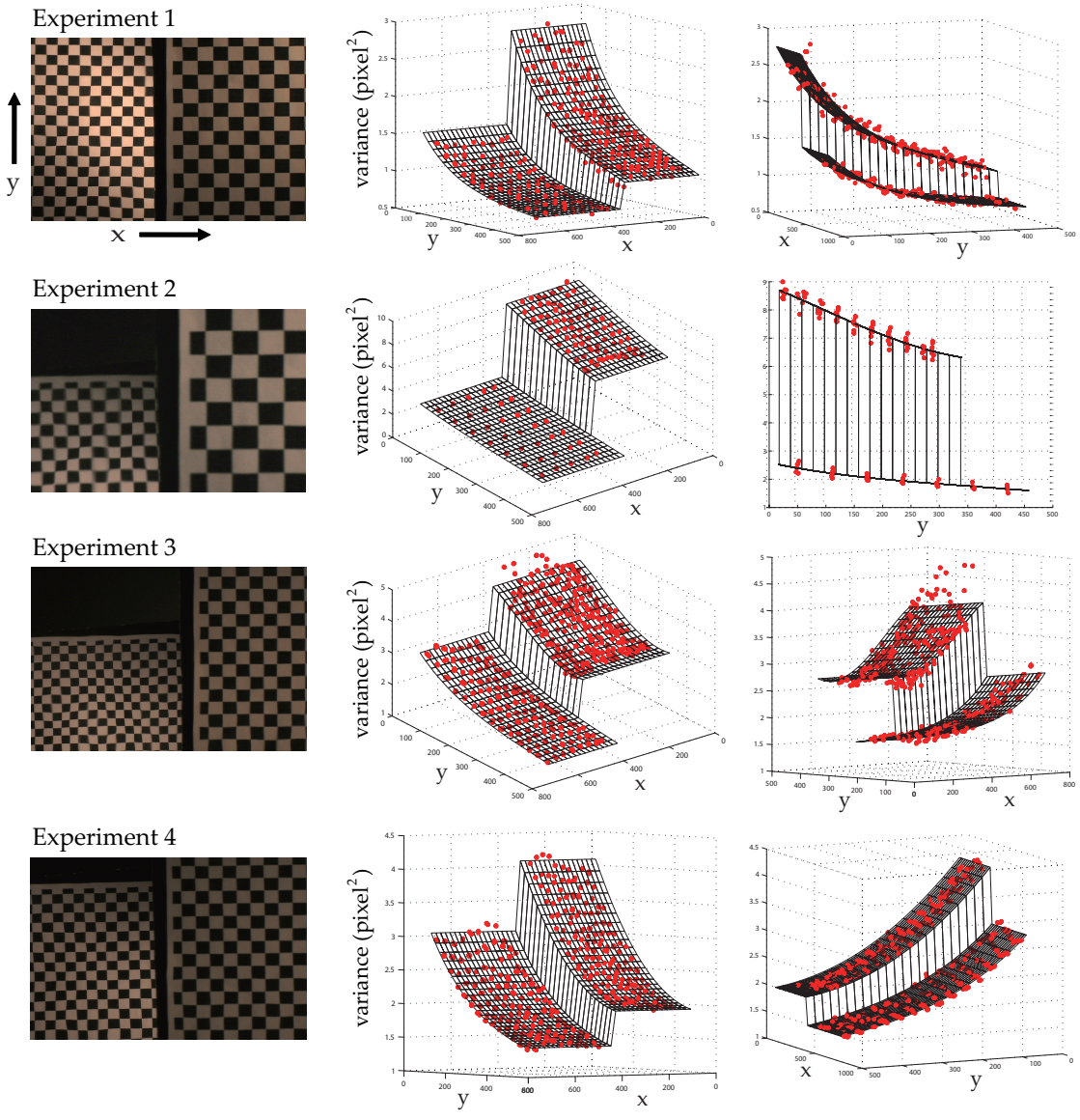


Figure 1: Experiments with two planar checker-boards placed at different distances from the camera. Rows correspond to different experiment settings (Table 1). The first column shows a sample distorted frame, the second and third columns show two views of the variance distribution of the corners of the checker-boards. In all cases, variances changes due to depth discontinuity and height is obvious. We detect the discontinuity and fit smooth surfaces to the variances. The ratio of variances of the two depth planes are then computed and quantitatively compared to the ground truth (Table 1).

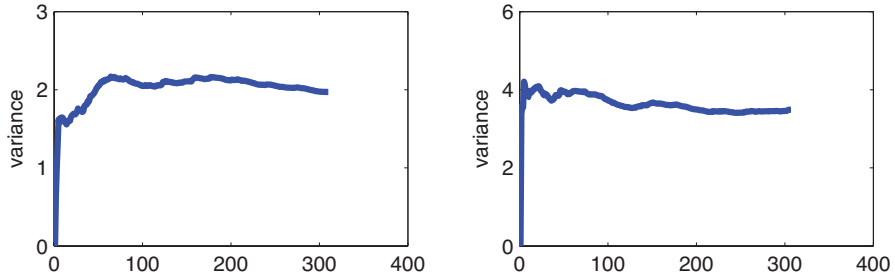
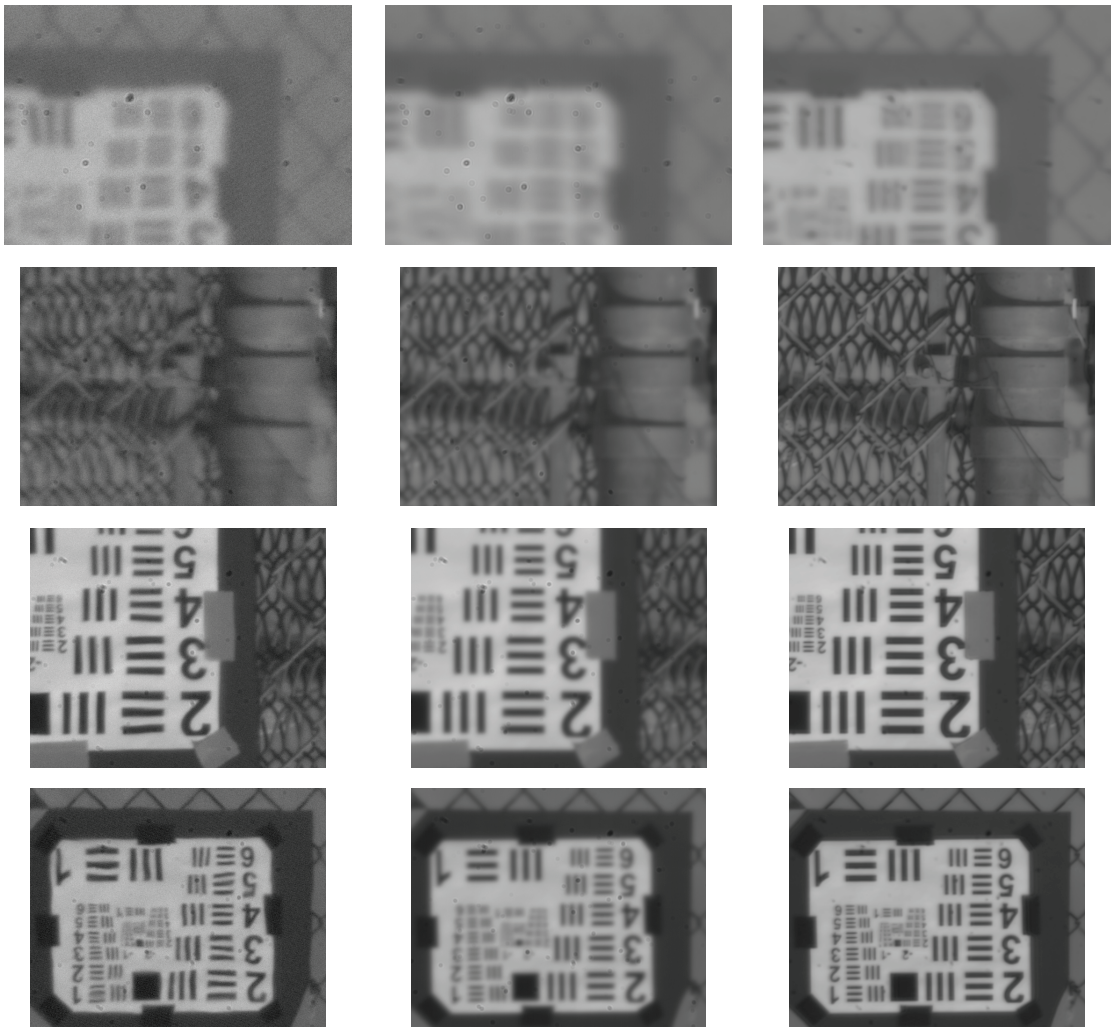
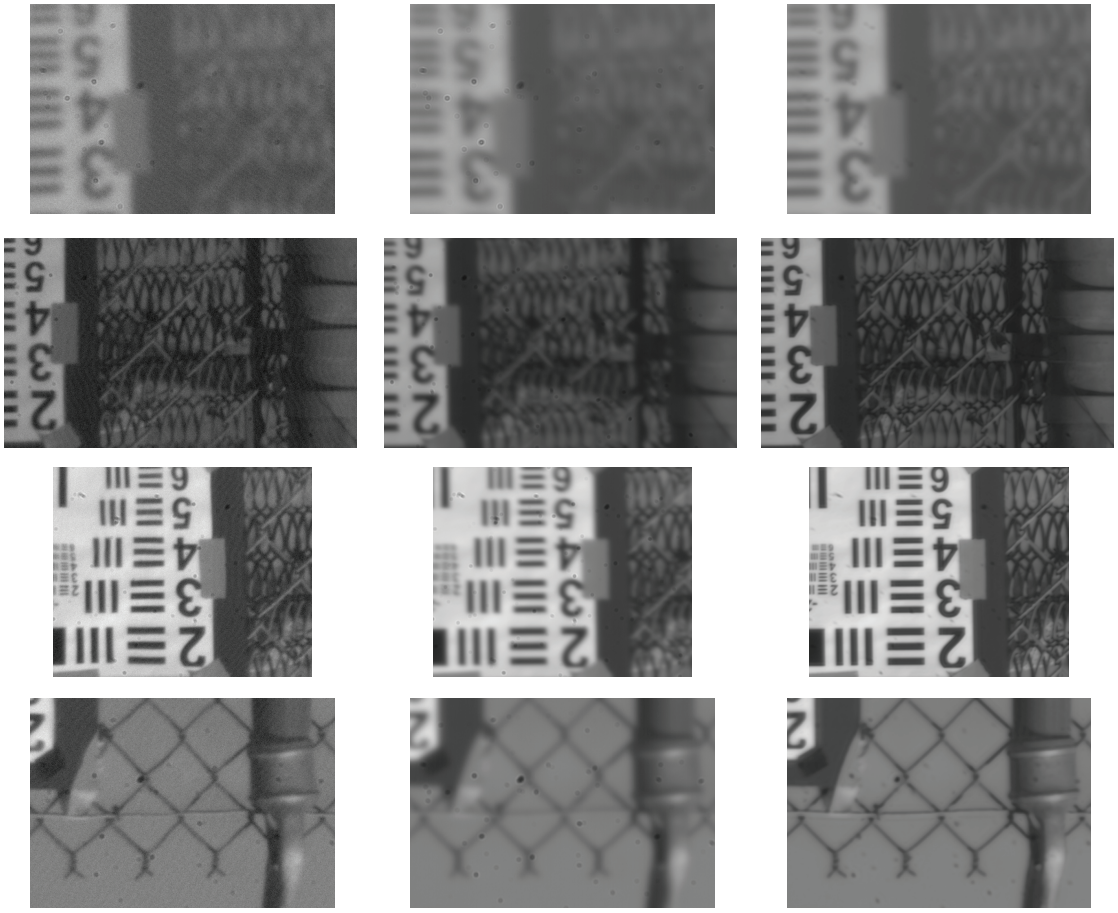


Figure 2: Convergence of average variance over time for different experiment setting. **(Left)** Morning capture, 110meters to target, 30mm aperture with 0.5ms exposure time. **(Right)** Morning capture, 160meters to target, 30mm aperature with 0.75ms exposure time.



(a) Sample Frame (b) Mean Image (c) Rectified using [1]

Figure 3: Scene Rectification. **(a)** Sample frame from a video. The image is sharp but noisy. **(b)** Mean image of the video. The image is noise-free but blurry. **(c)** Rectification using [1].



(a) Sample Frame (b) Mean Image (c) Rectified using [1]

Figure 4: Scene Rectification. **(a)** Sample frame from a video. The image is sharp but noisy. **(b)** Mean image of the video. The image is noise-free but blurry. **(c)** Rectification using [1].

References

[1] Y. Tian and S. Narasimhan. A globally optimal data-driven approach for image distortion estimation. In *CVPR*, 2010.