Abstract Submitted
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High-Speed Surface Reconstruction of Flying Birds Using Structured Light MARC DEETJEN[1], DAVID LENTINK, Stanford University — Birds fly effectively through complex environments, and in order to understand the strategies that enable them to do so, we need to determine the shape and movement of their wings. Previous studies show that even small perturbations in wing shape have dramatic aerodynamic effects, but these shape changes have not been quantified automatically at high temporal and spatial resolutions. Hence, we developed a custom 3D surface mapping method which uses a high-speed camera to view a grid of stripes projected onto a flying bird. Because the light is binary rather than grayscale, and each frame is separately analyzed, this method can function at any frame rate with sufficient light. The method is automated, non-invasive, and able to measure a volume by simultaneously reconstructing from multiple views. We use this technique to reconstruct the 3D shape of the surface of a parrotlet during flapping flight at 3200 fps. We then analyze key dynamic parameters such as wing twist and angle of attack, and compute aerodynamic parameters such as lift and drag. While this novel system is designed to quantify bird wing shape and motion, it is adaptable for tracking other objects such as quickly deforming fish, especially those which are difficult to reconstruct using other 3D tracking methods.

[1]The presenter needs to leave by 3 pm on the final day of the conference (11/21) in order to make his flight. Please account for this in the scheduling if possible by scheduling the presentation earlier in the day or a different day.

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