A Catadioptric Projector System with Application to Pseudo HDR Display

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Introduction

- A catadioptric imaging system includes both reflective components (i.e. mirrors) and refractive components (i.e. lenses) – widely used in computer vision (to increase FOV, for example)
- A projector can benefit from catadioptric optics as well (e.g. for optical distortion compensation)
- A common disadvantage to this approach is that different configurations require a different mirror shape.
- An ideal (and future) solution to this problem would be to use a computer-controlled deformable mirror.
- Our method trades off spatial resolution for flexibility, using a fixed micro-spherical mirror array in front of the projector.
- The mirror array acts as a ray scatterer. By selectively turning on pixels in the projector, we can select a coherent subset of rays (as if they are being reflected from a differently shaped mirror).

Application to Pseudo HDR Display

- Current HDR display technology is based on using an LCD panel to modulate a high intensity backlight image from an LED array or traditional projector.
- We aim to extend the projector-based approach to increase the intensity and number of color steps of this pseudo HDR (pHDR) backlight image.

Results and Conclusions

- In simulation, we have shown that it is possible to use this setup to achieve brightness and color control comparable to LED array based HDR displays, while retaining greater resolution.
- Because our approach is projector-based, it may be possible to use this technique to create larger HDR displays while still remaining affordable.
- The idea of using a fixed micromirror array to approximate an arbitrary mirror has many possible applications.
- For example, the fact that the projection beam can be electronically steered could be used in conjunction with laser projectors to create an in-focus image suitable for outdoor augmented reality applications.
- We are currently implementing these experiments with a real setup to evaluate real-world performance and possible applications.

References


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