

EvHandy: Making Event Cameras Handy with a Smartphone App

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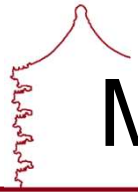
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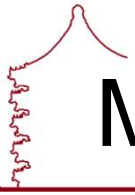


Motivation



- Event cameras have high speed, high dynamic range, ...
- but current PC-tethered usage is too inconvenient!





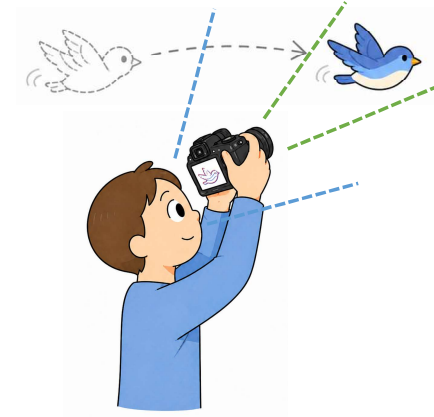
Motivation



- Handheld photography is convenient in many ways.
- How can we get a handheld event camera?



(a) PC-tethered usage



(b) Handheld photography

Motivation

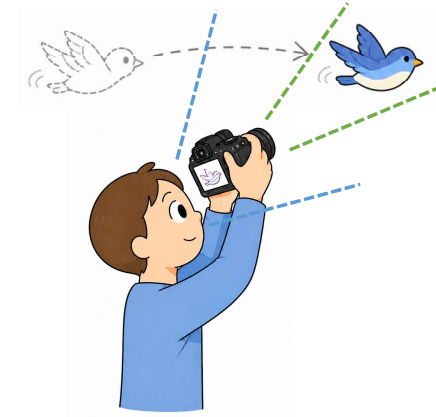


- Smartphones have battery, computation, storage, display...
- ... and everyone already has one!



(a) PC-tethered usage

**Smartphone
+ EvHandy APP**



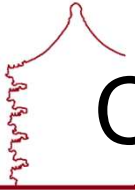
(b) Handheld photography

EvHandy



- Runs on Android; currently supports Prophesee EVK4

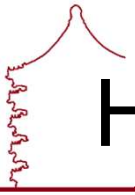




Challenges



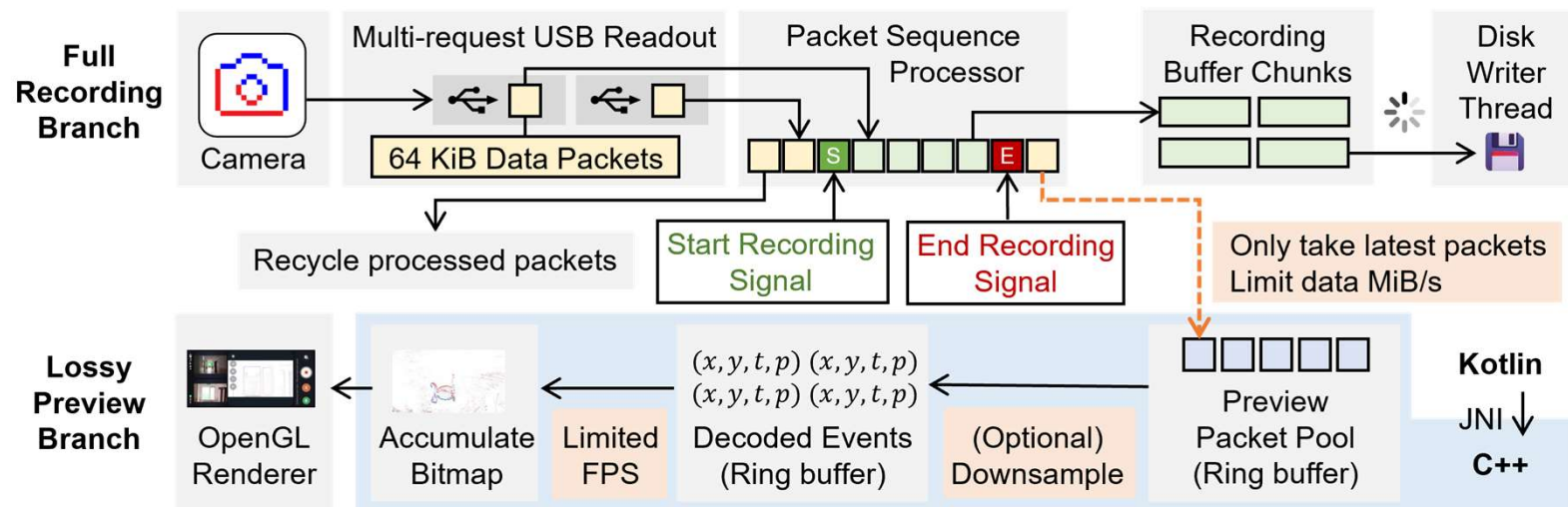
- Challenge 1: Limited computation on mobile platforms
→ High performance mobile acquisition
- Challenge 2: Difference between phone & PC interfaces
→ Convenience-oriented user interface design



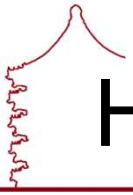
High performance mobile acquisition



- Priority: Recording integrity > In-time preview > Precise preview
- Preview (event decoding & visualization) is heavy
- Discard event packets from preview branch when necessary



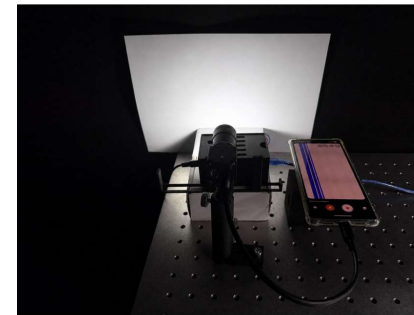
Recording-preview dual-branch architecture



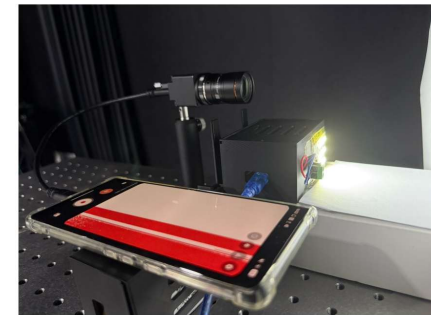
High performance mobile acquisition



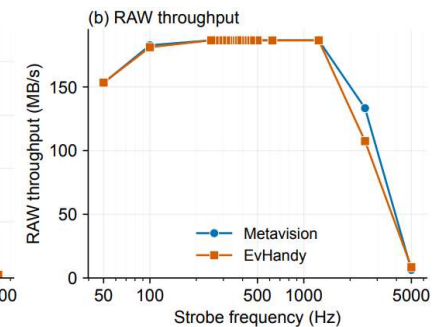
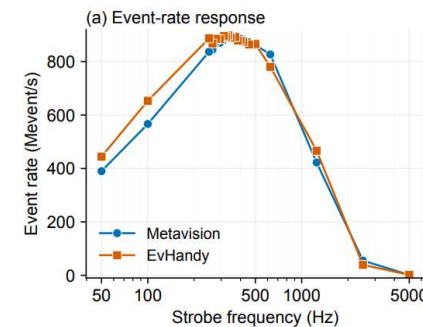
- Stress-test environment: Darkroom + high frequency flashing probe
- EvHandy + Google Pixel 6 Pro (12GB) vs. Metavision Studio + Laptop (AMD Ryzen 9 + 64 GB)
- EvHandy records up to 900Mevent/s: max output rate of Prophesee EVK4, same to as Metavision

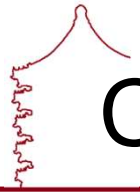


(a) Overview



(b) Side view

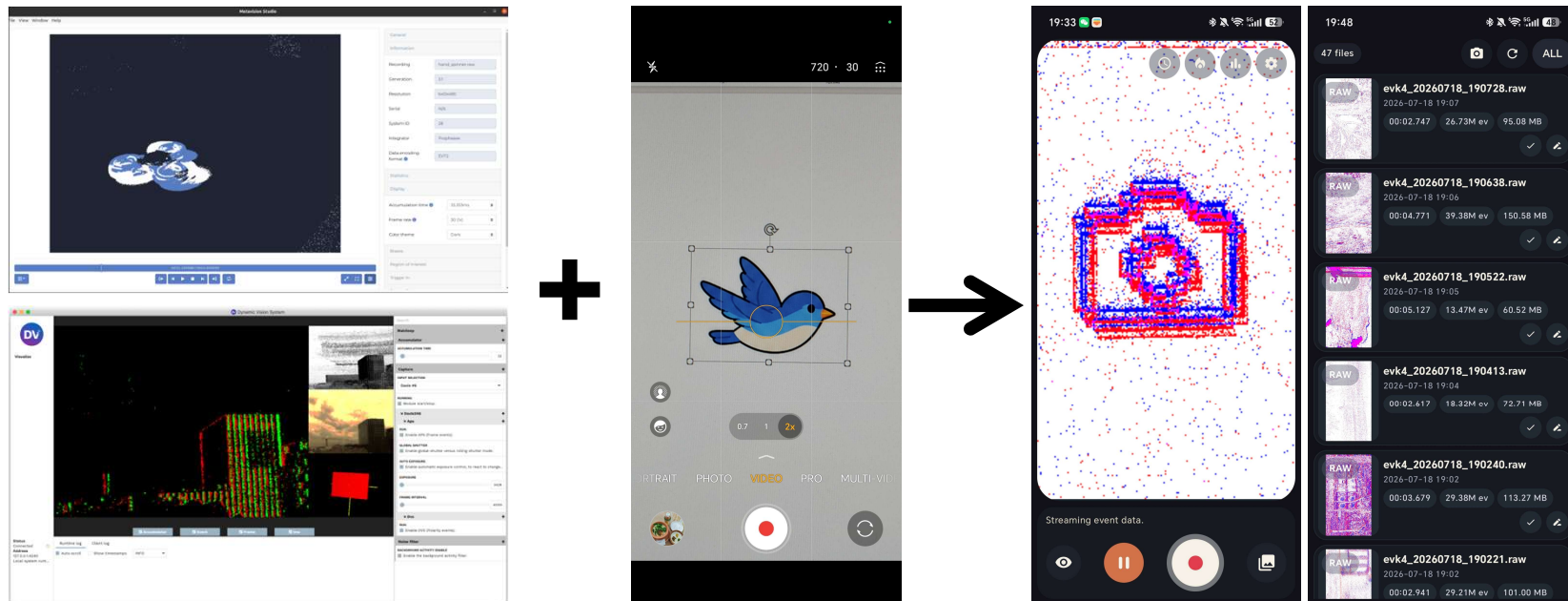


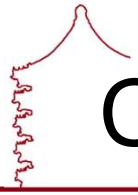


Convenience-oriented interface design



- PC-based event recorders: Lots of functions, menus & buttons
- Mobile interface: Small screen, no precise mouse input

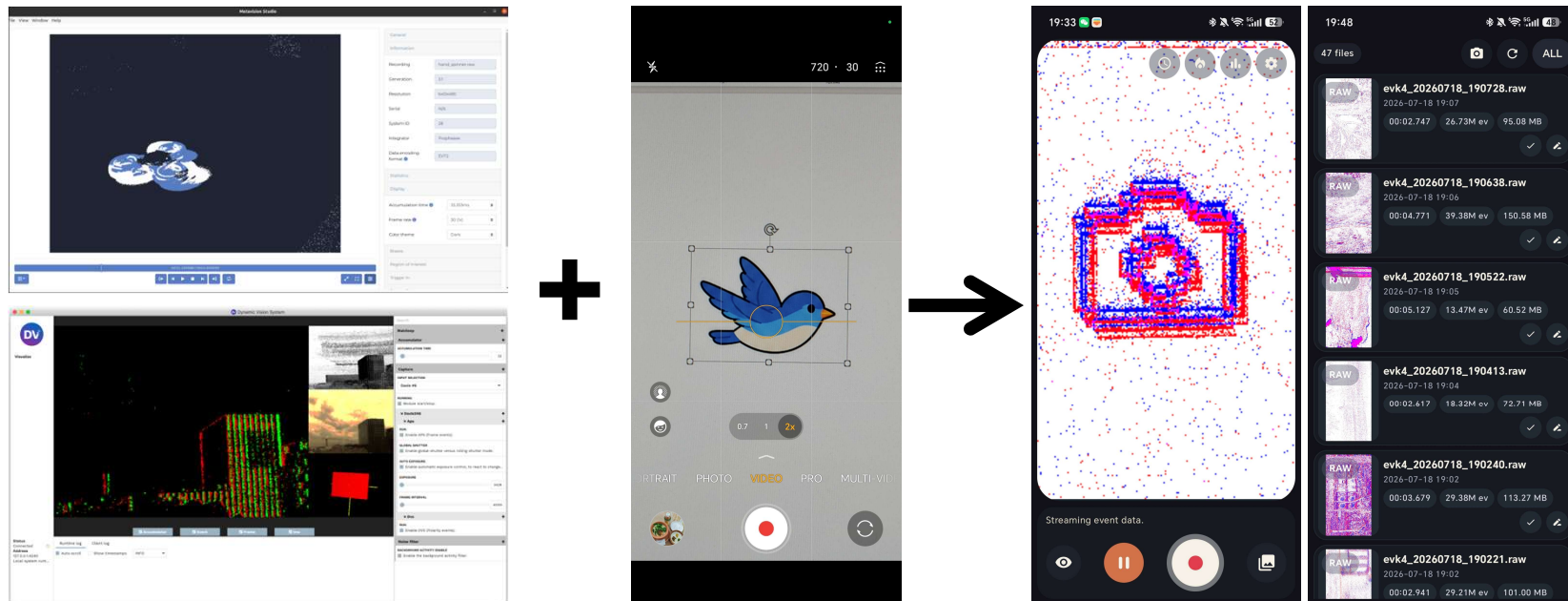


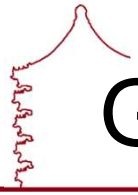


Convenience-oriented interface design



- Adopt visual language & hierarchy of smartphone camera apps
- Organize functionalities according to frequency of usage

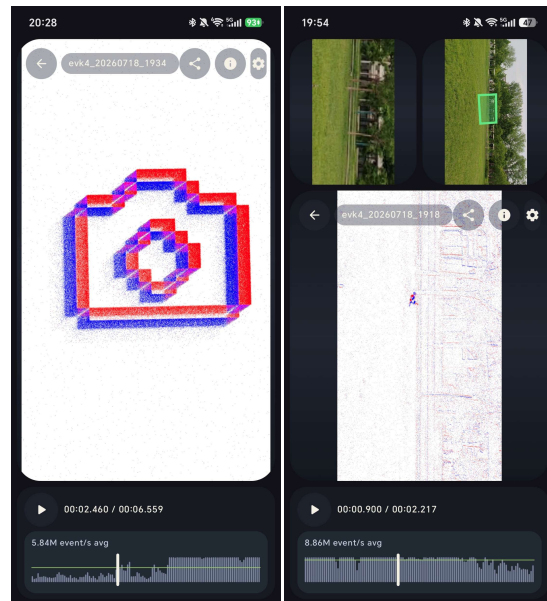




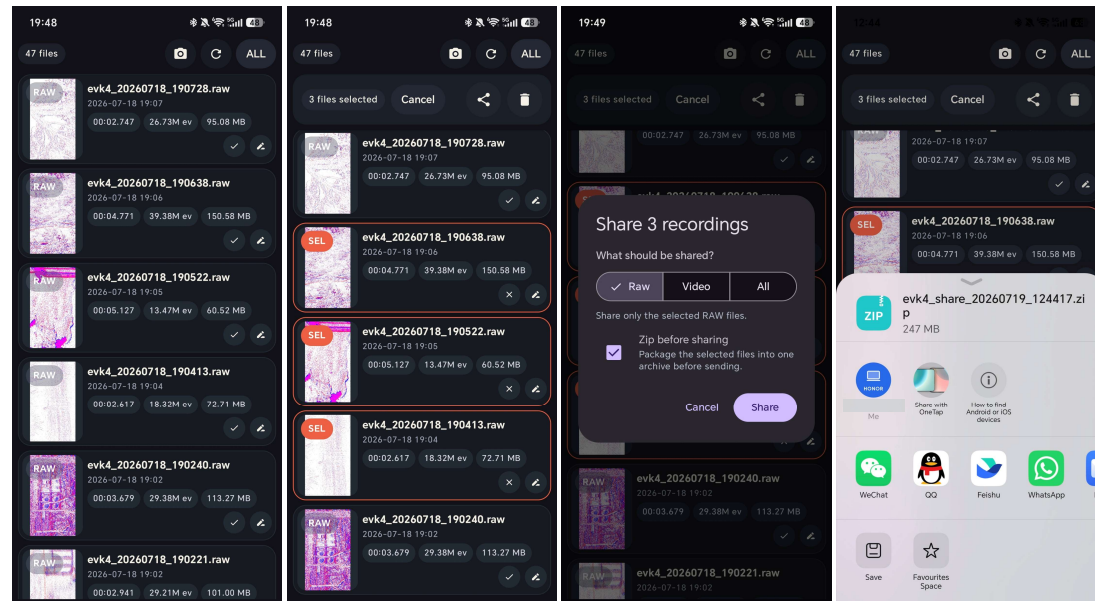
Gallery & Playback System



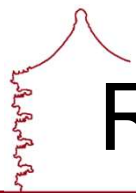
- Visualize sequences (by FPS / by events) for playback
- Thumbnails, renaming, zipping & sharing for data management



(a) Playback interface



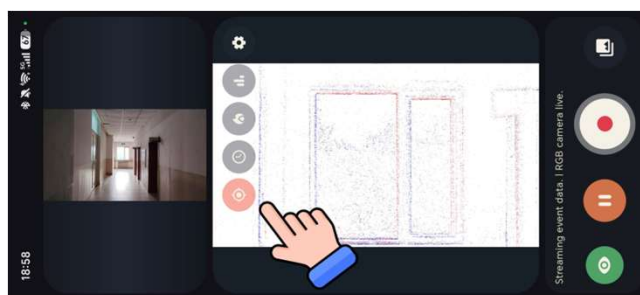
(b) Gallery browsing and file sharing



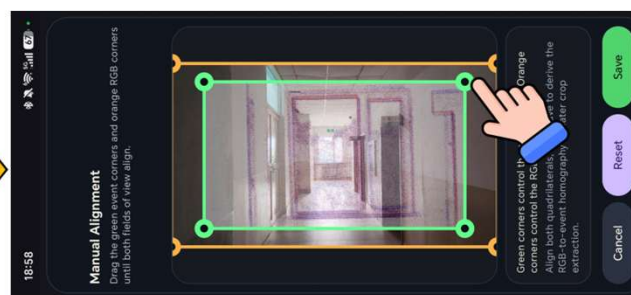
Reference RGB video recording



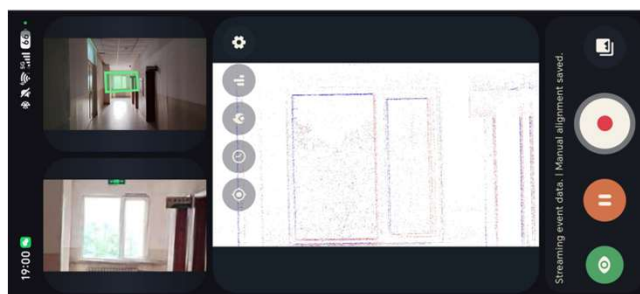
- Use smartphone's RGB camera to capture reference videos
- Supports manual coarse FoV align to use video as viewfinder



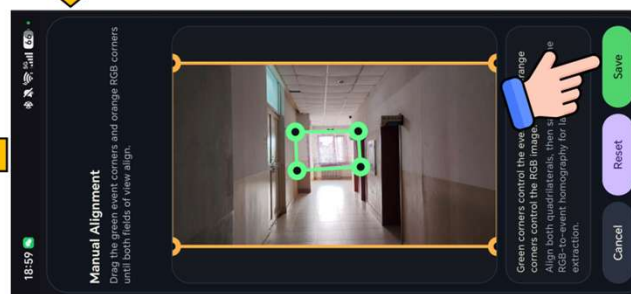
(1) Press button to start manual spatial alignment.



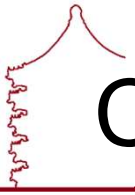
(2) Drag corners until images align.



(4) Cropped and warped previews will be displayed.



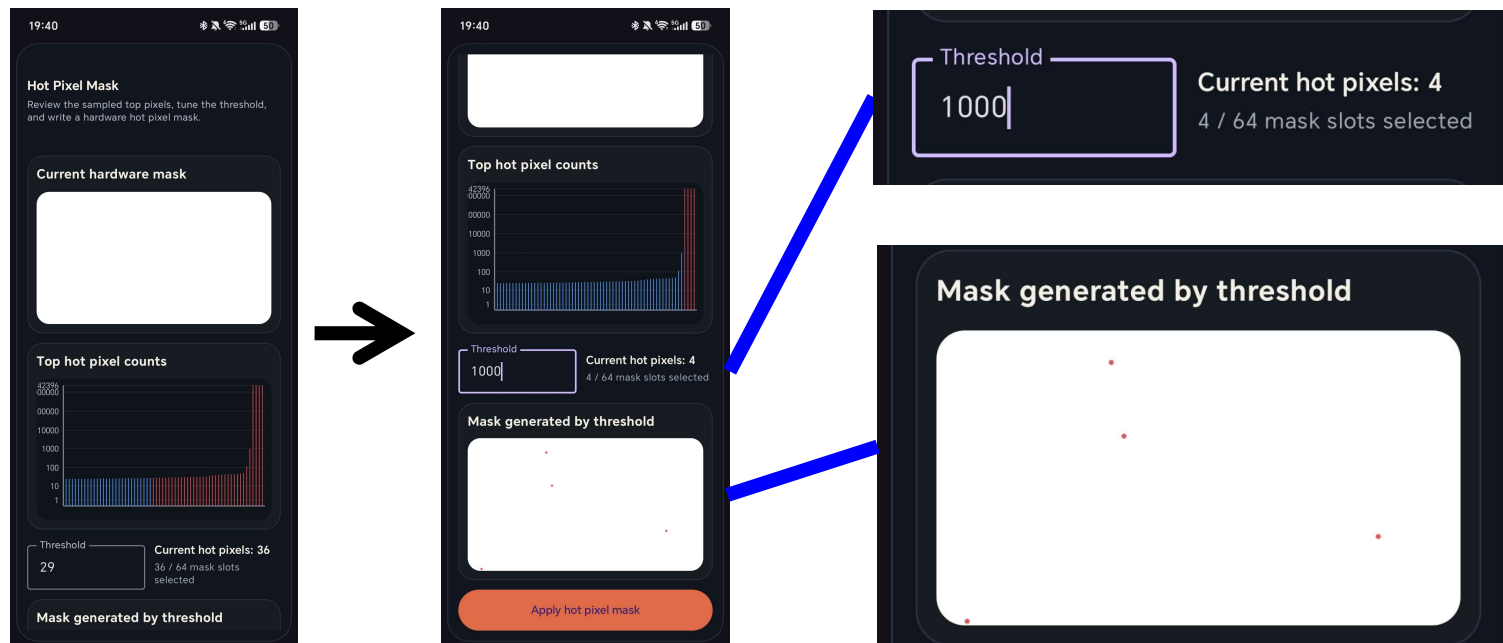
(3) "Save" to calculate the homography matrix.

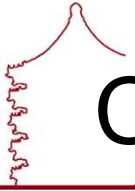


Camera setting management



- Visual hot pixel detection & mask setting
- Setting of other camera parameters is also implemented

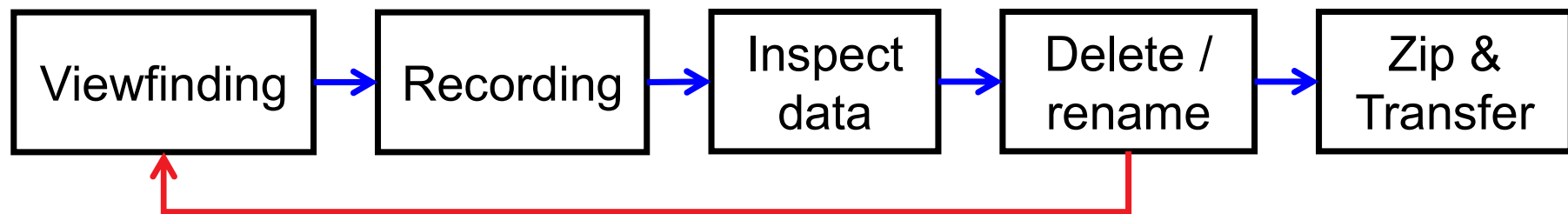




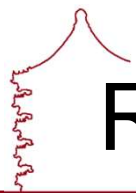
Convenience-oriented interface design



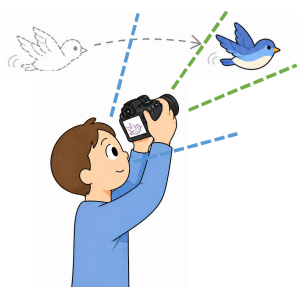
- Convenience in the entire data capture loop:



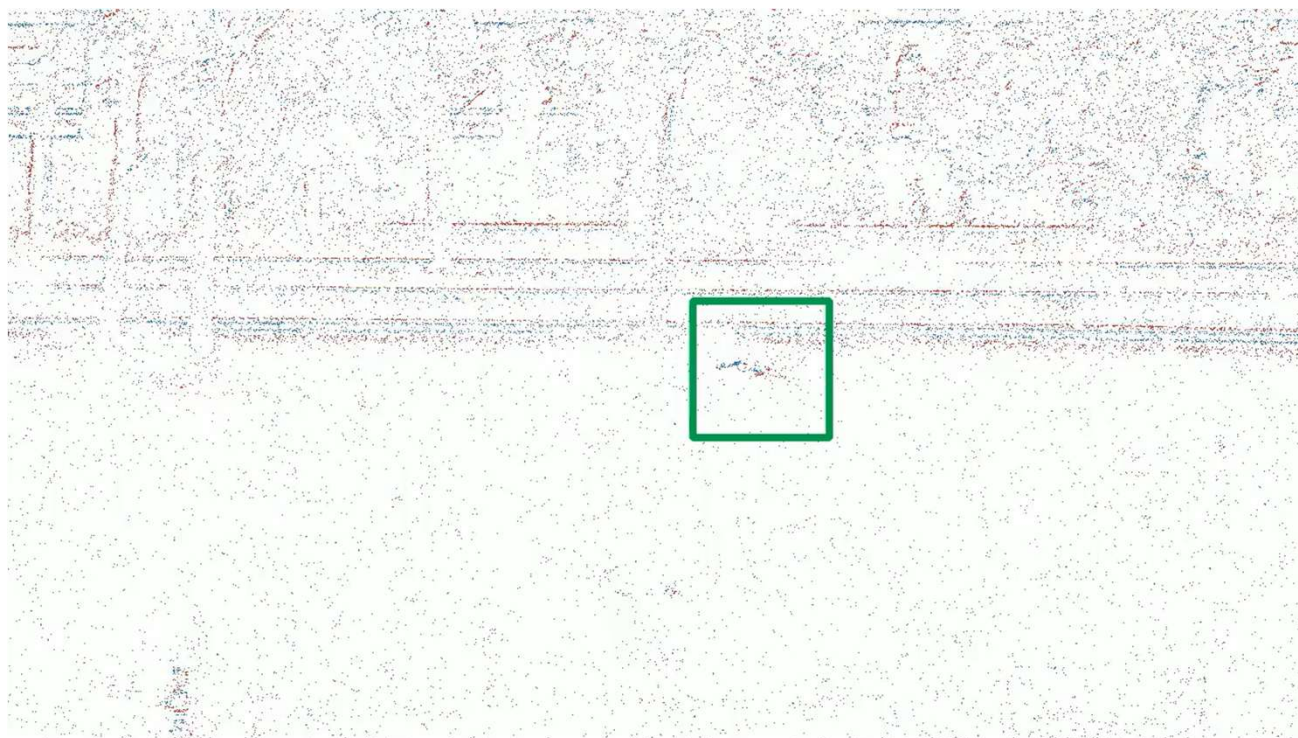
- Single-handed operation is easy
- Timed recording can be used to film oneself

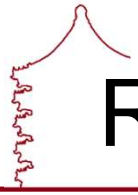


Results: EvHandy for Event Birding

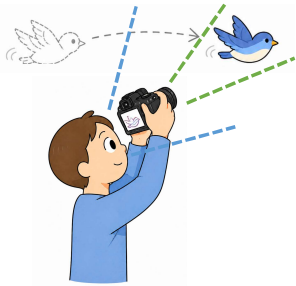


Oriental magpie
Pica serica

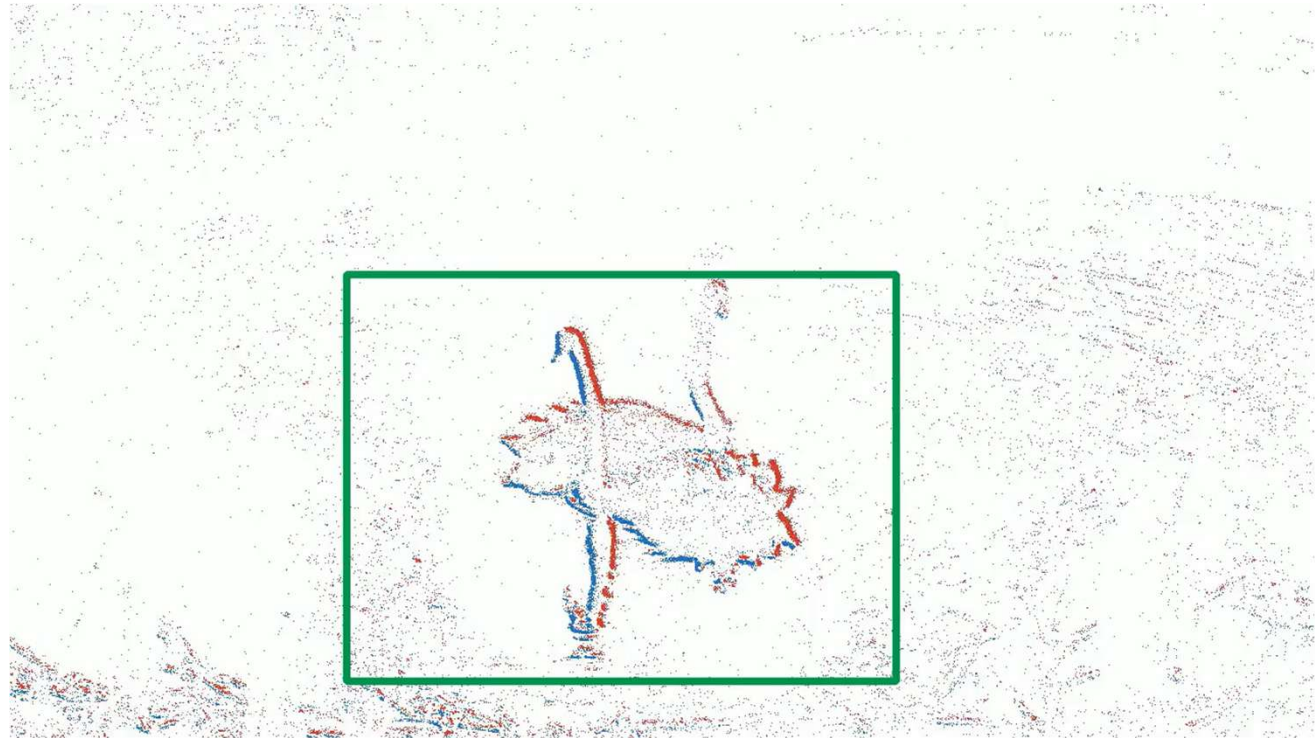


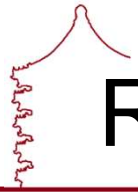


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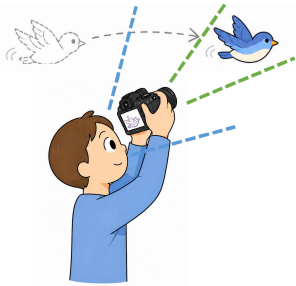


Black swan
Cygnus atratus

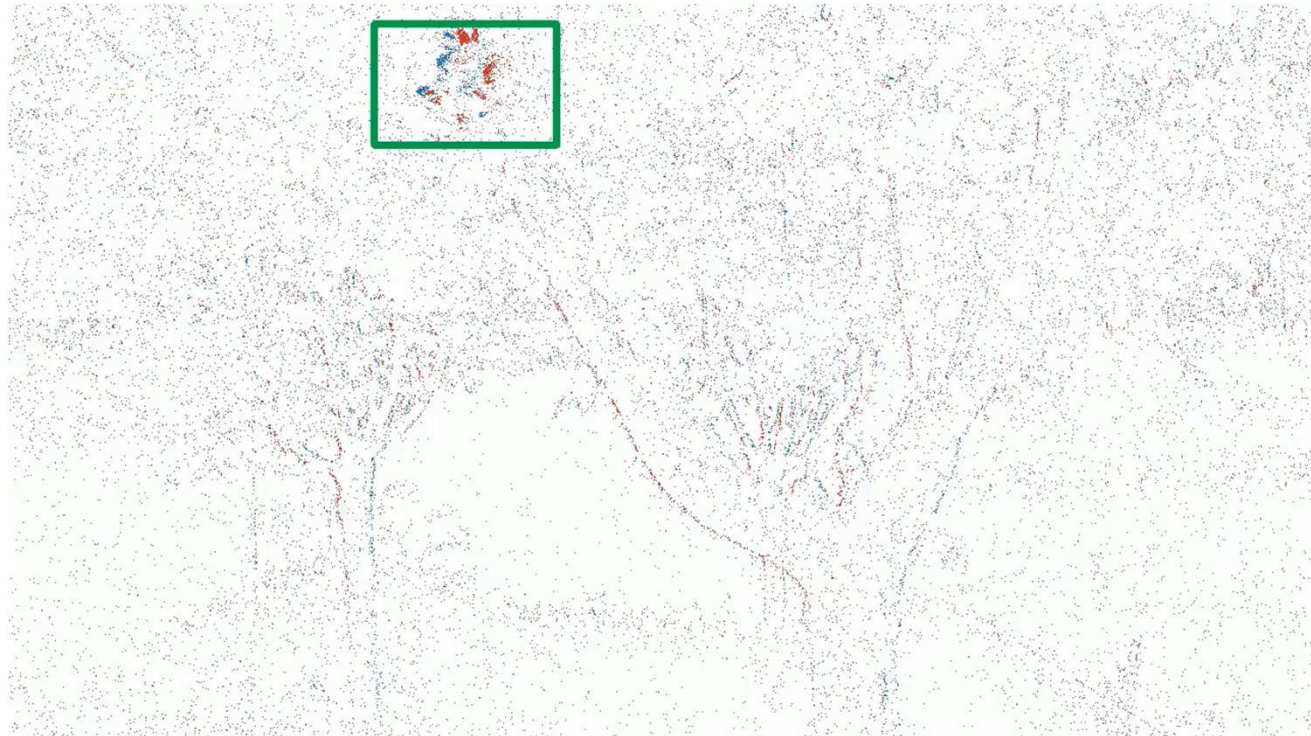


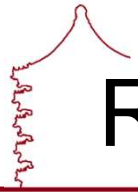


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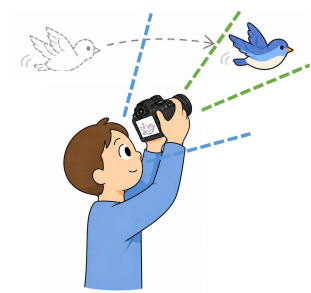


Tree sparrow
Passer montanus



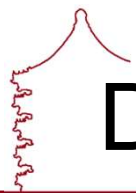


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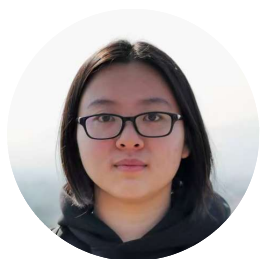


Barn swallow
Hirundo rustica





Demo & Download



Hanyue Lou



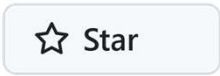
Yeliduosu Xiaokaiti

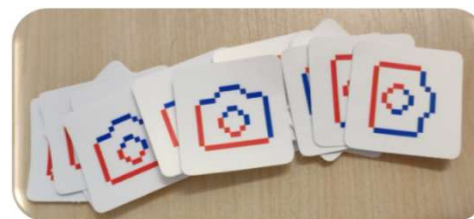


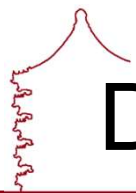
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Prof. Boxin Shi

- Free APP download:  
- github.com/HYLZ-2019/EvHandy
- Contact us:
- evhandy@163.com
- Try out **EvHandy** demo system & get logo sticker at EBMV workshop!





Demo & Download



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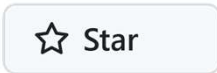


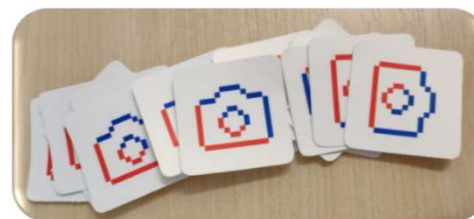
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Will be at EBMV Workshop!

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Thank You!

Lab page



<https://camera.pku.edu.cn>

Download available



<https://github.com/HYLZ-2019/EvHandy>