



# Automating Visual Privacy Protection Using a Smart LED

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ACM MobiCom'17

## I. Motivation

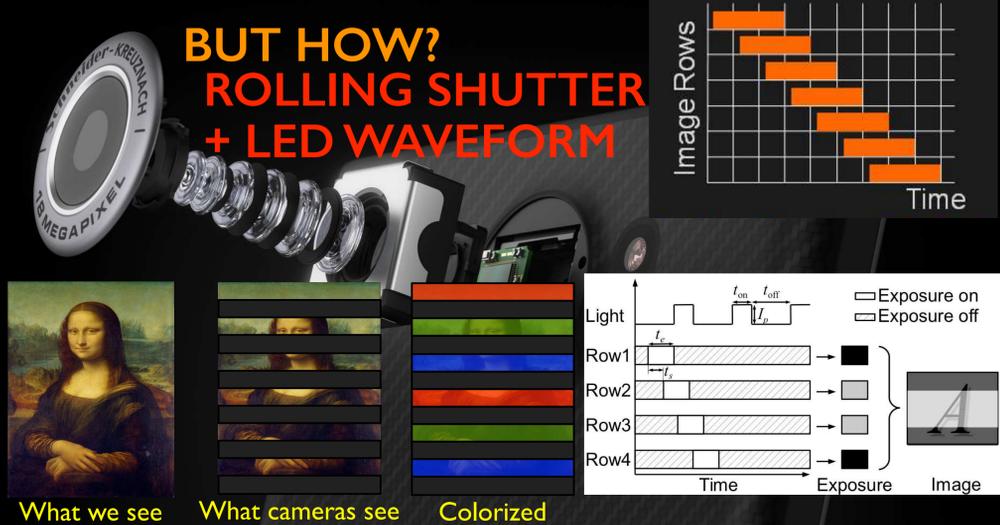
### ILLEGAL CAPTURING AND SHARING

- 350 Million photos/videos uploading on Facebook everyday
- Some items are **priceless** (in a museum)
- Privacy leakage** of passive objects



## III. Basic Protection Principle

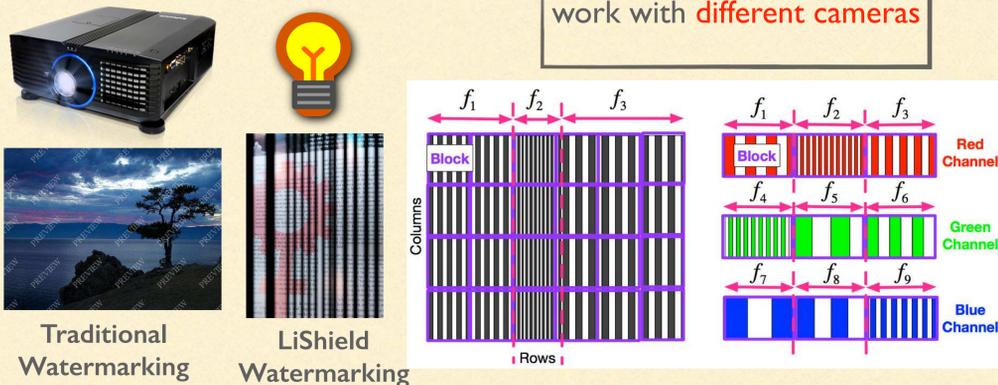
### BUT HOW? ROLLING SHUTTER + LED WAVEFORM



## V. Watermarking

### WATERMARKING

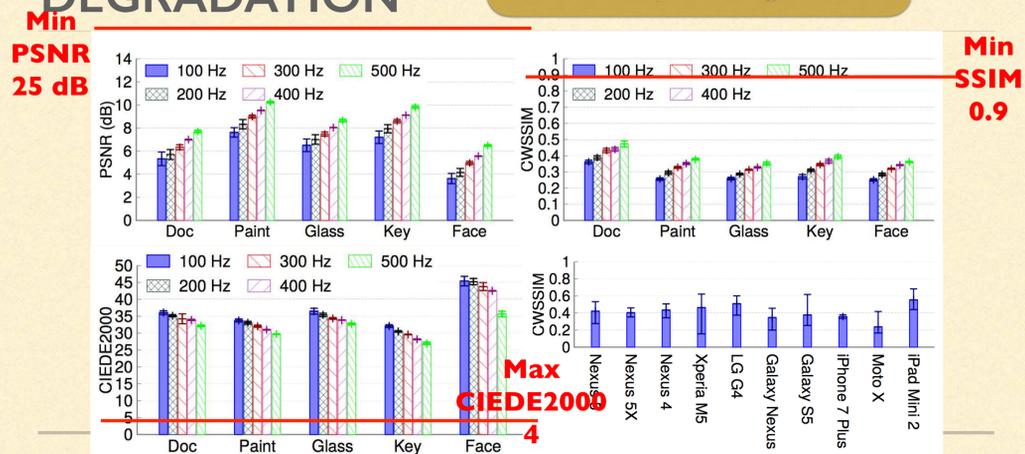
LiShield uses a robust information **container** to work with **different cameras**



## VII. Basic Protection Results

### QUALITY DEGRADATION

Captured quality is way out of acceptable range



## II. System Overview

### LISHIELD SYSTEM OVERVIEW

- No modification** on the objects
- Non-observable** enforcement
- Be **eye safe**
- Protect **passive** objects

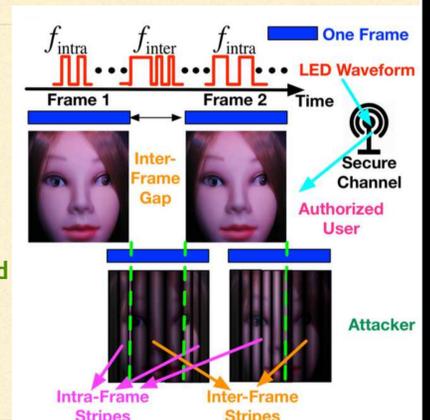
A **SMALL LED** CAN DO MUCH BETTER THAN YOU COULD EVER IMAGINE



## IV. Camera Authorization

### CAMERA AUTHORIZATION

CAMERA CAN RECOVER IMAGES GIVEN THE LED WAVEFORM



## VI. Implementation

### IMPLEMENTATIONS

- 2-D and 3-D objects
- LED can generate arbitrary OOK waveform by STM32 MCU
- Android app with Camera2 API for authorization
- Metrics: PSNR, CW-SSIM, CIEDE2000



## VIII. Conclusion

### CONCLUSION

- LiShield is a **cost-effective**, **automatic**, and **easy-to-setup** system which can enable privacy protection against illegal recorders
- We design an **authorization scheme** to unblock specific user, while blocking others
- Watermarking** is the last defence line, which can be embedded and detected effectively

