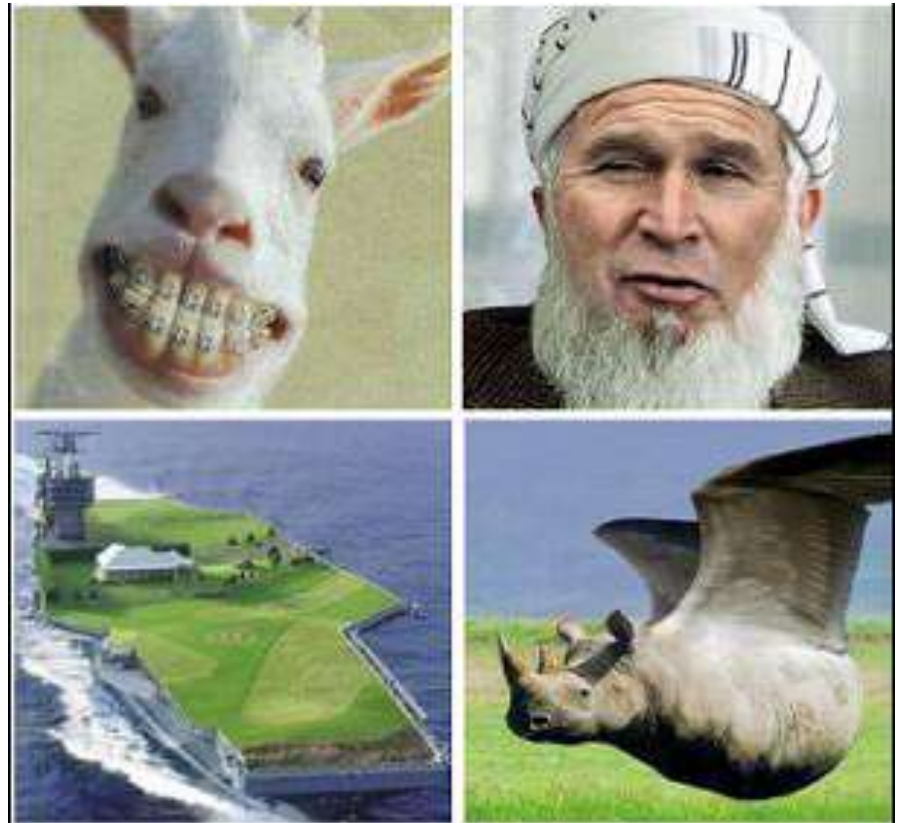


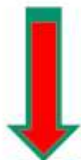
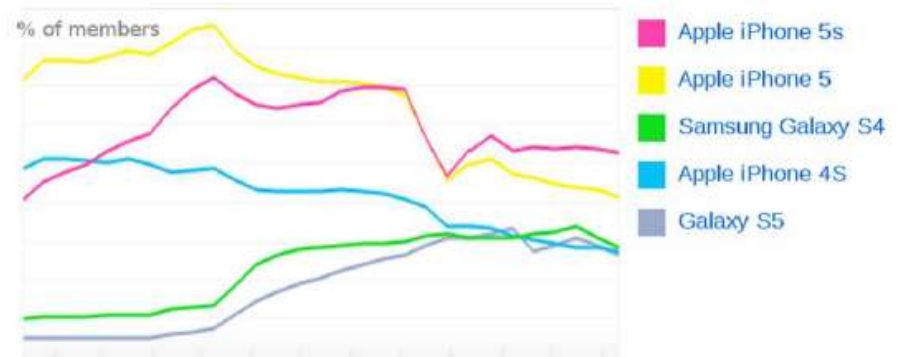
Jak moc můžeme věřit publikovaným fotografiím?

Babak Mahdian
mahdian@utia.cas.cz



Akademie věd
České republiky

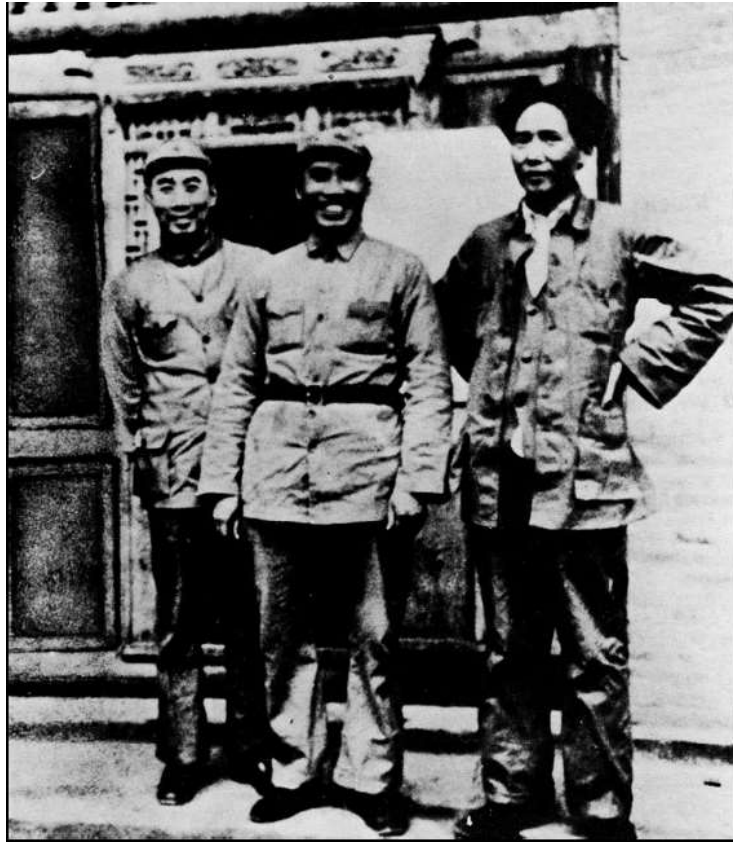




Stalin 1930



Mao Tse-tung and Po Ku (1936)



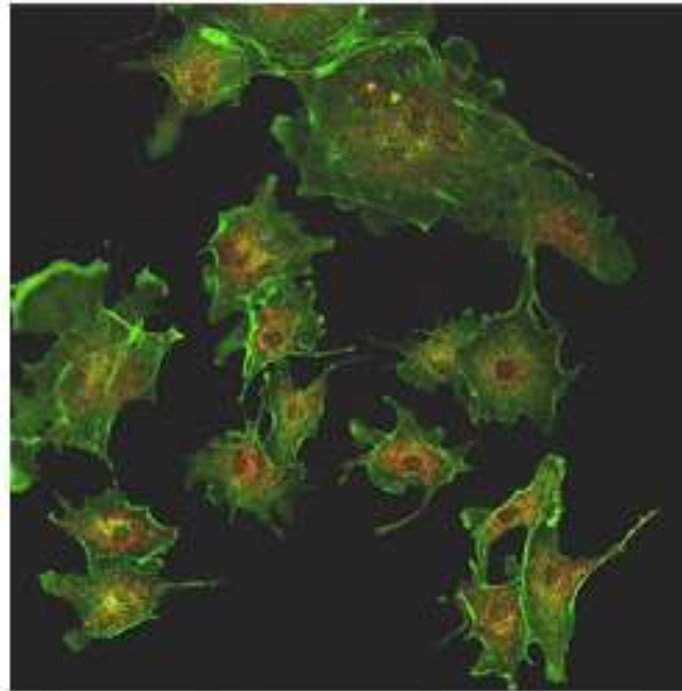
Adolf Hitler and Joseph Goebbels (1937)



Vladimir Clementis, Karel Hájek and Klement Gottwald (1948)



Dr. Hwang Woo-Suk: Science (2005)



Nicolas Sarkozy (2007)



Sarah Palin (2008)



Izrael (2009)



Írán (2013)





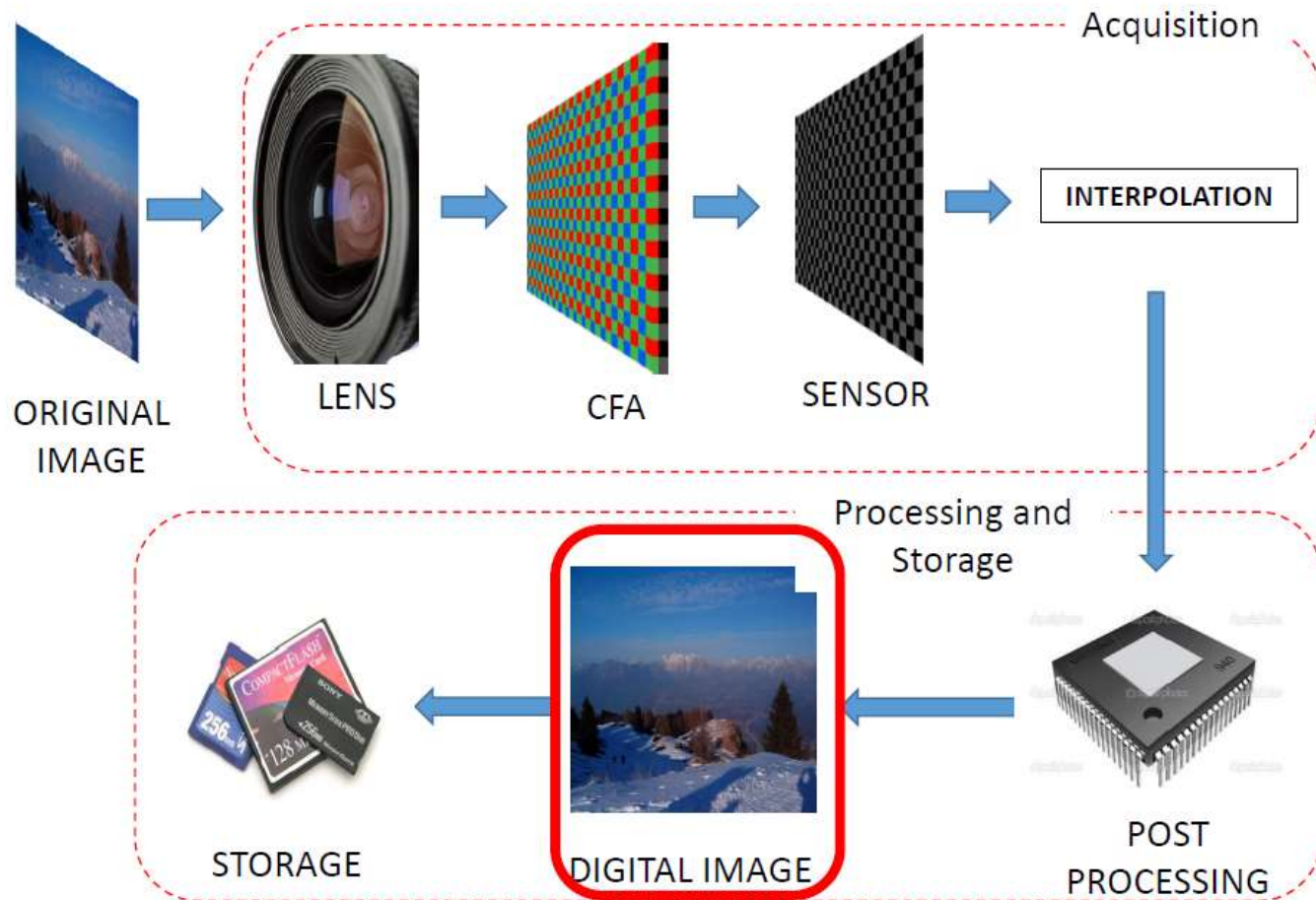
+



=



Konstrukce a princip fotoaparátů



Analýza dodatečných změn v obraze

- Aktivní metody
 - Neviditelný vodoznak
 - Digitální podpis
- Pasivní metody



EXIF



EXIF Metadata for DigitalCameraPhoto.jpg

title	description
Make	Canon
Model	Canon PowerShot A50
Orientation	top, left side
X Resolution	180 dots per inch
Y Resolution	180 dots per inch
Resolution Unit	Inch
Date/Time	2000:01:25 04:41:26
Shutter Speed Value	1/32 sec
Aperture Value	F5.6
Exposure Bias Value	0
Subject Distance	1.684 metres
Metering Mode	Center weighted average
Flash	No flash fired
Focal Length	4.312 mm
FlashPix Version	1.00
Color Space	sRGB
Sensing Method	One-chip color area sensor
File Source	Digital Still Camera (DSC)
Compression	JPEG compression
Self Timer Delay	Self timer not used
Continuous Drive Mode	Single shot
Image Number	1131314
Image Height	960 pixels
Image Width	1280 pixels

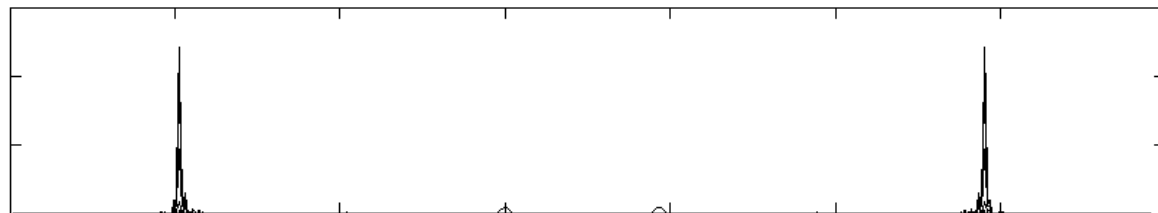
(Google) Image Search



Převzorkování a interpolace



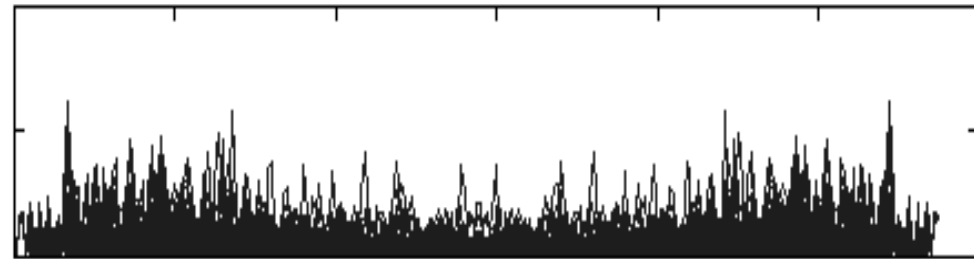
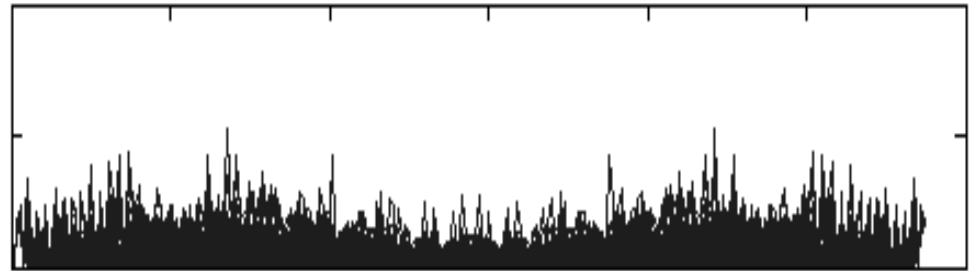
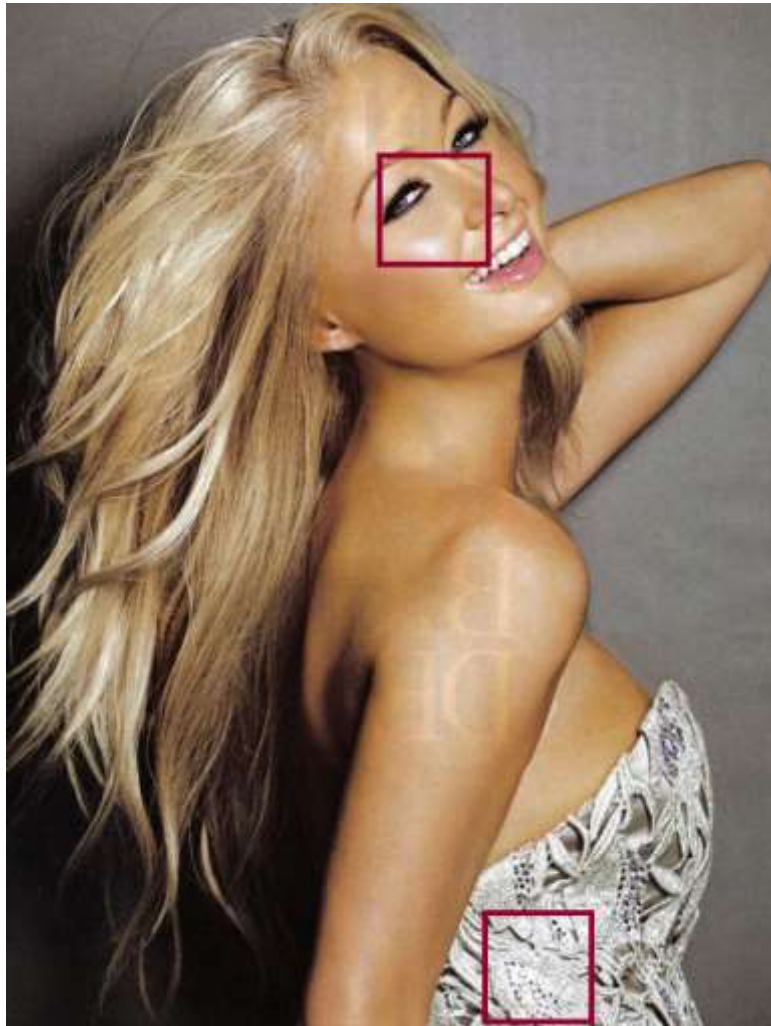
Převzorkování a interpolace



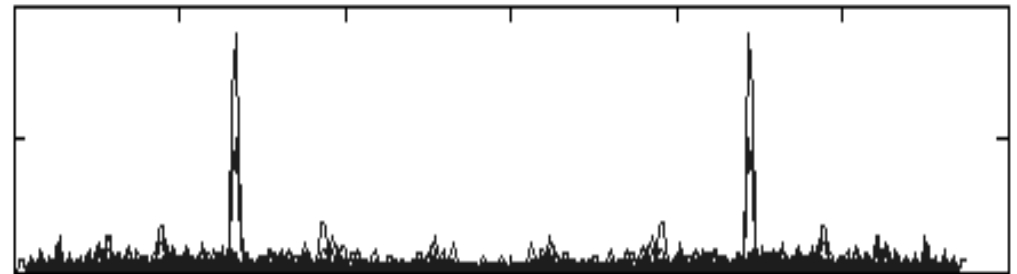
Převzorkování a interpolace



Převzorkování a interpolace



Převzorkování a interpolace



Detekce duplikovaných oblastí

original image
 $QF(1) = q_1$



+

2nd image
 $QF(2) = q_2$



duplicating



resizing



=



resulting image
 $QF(3) = q_3$

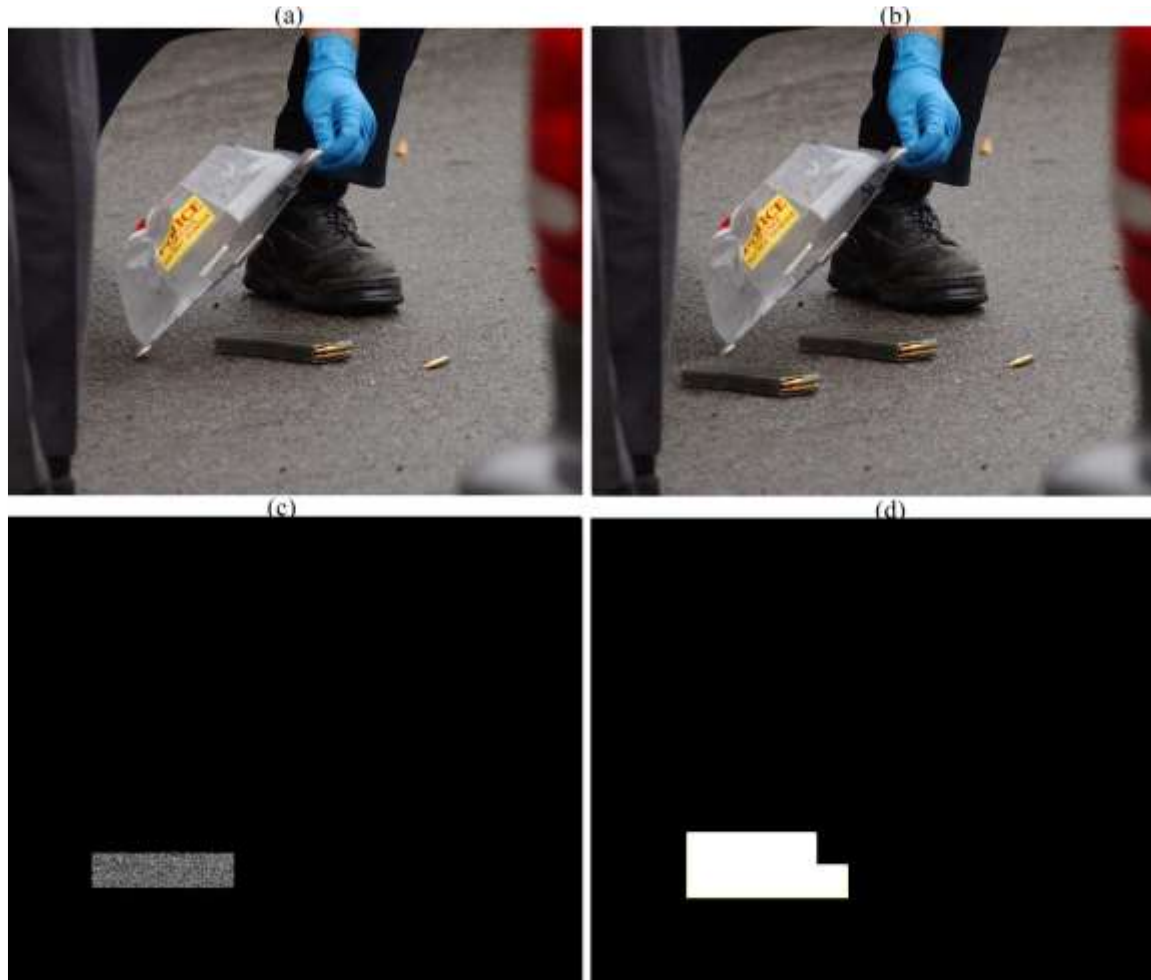
Detekce duplikovaných oblastí



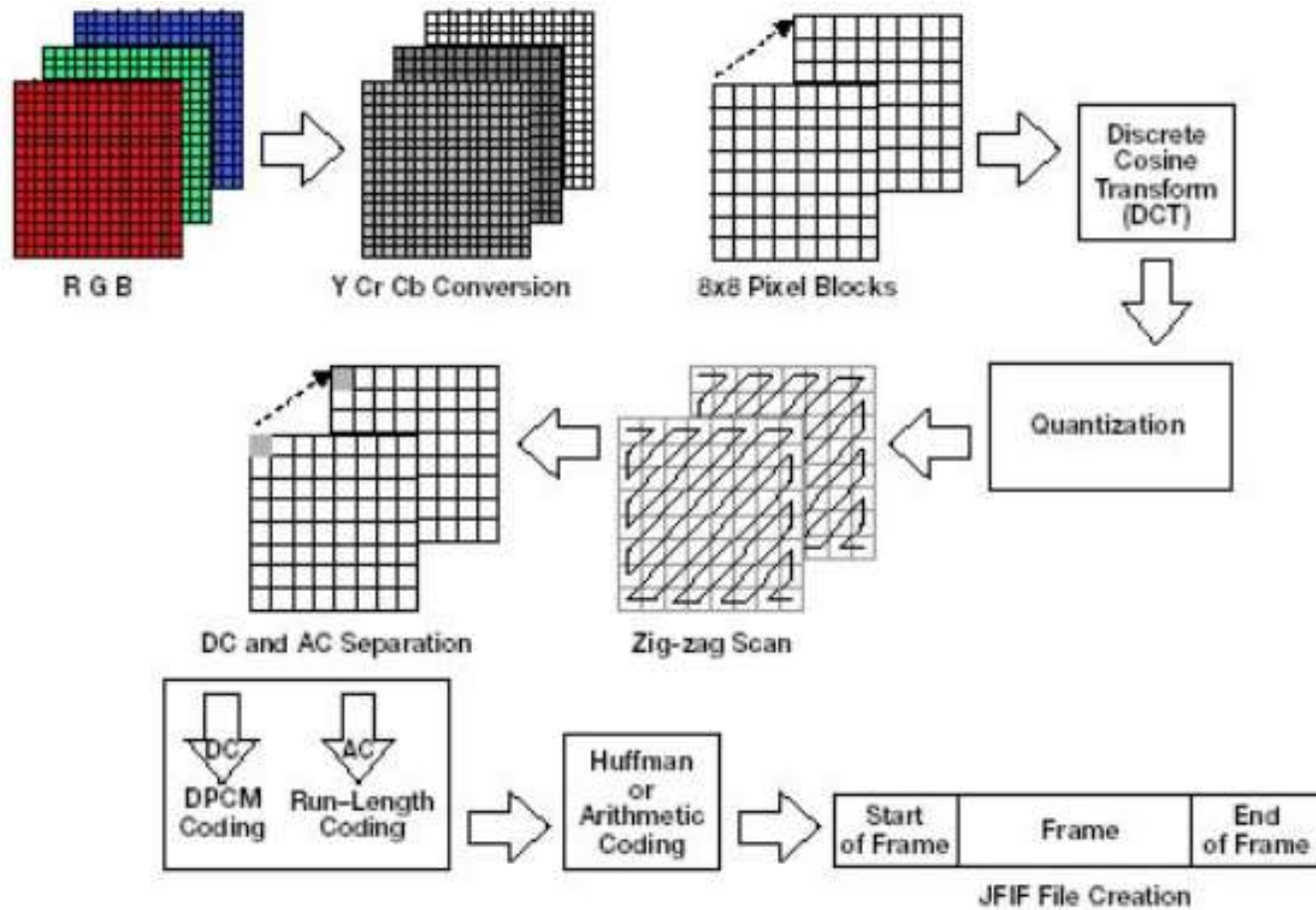
Detekce duplikovaných oblastí



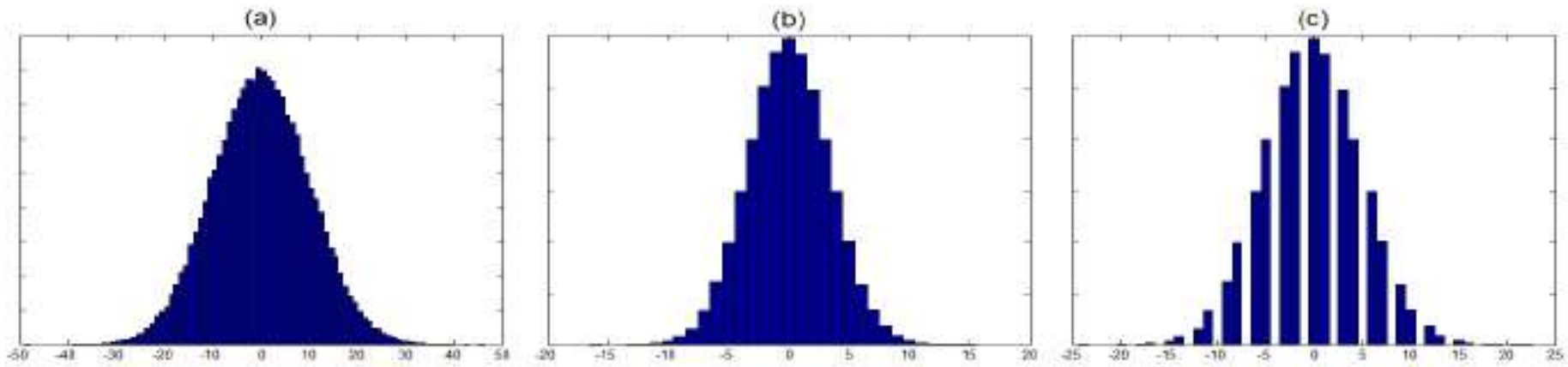
Detekce nekonzistentního šumu



JPEG



Detekce několikanásobného použití JPEG

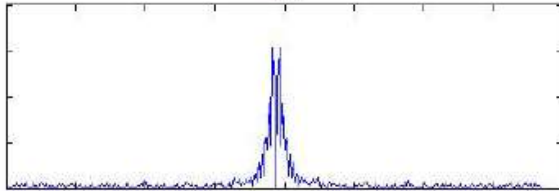


Detekce několikanásobného použití JPEG

(a)

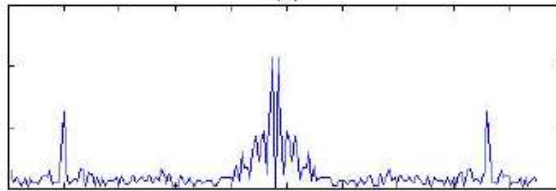


(b)



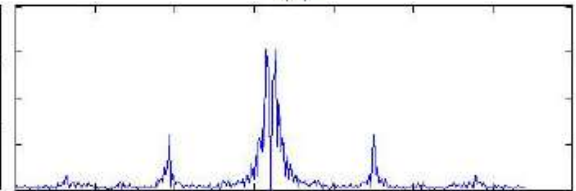
(e)

(c)



(f)

(d)



(g)

EXIF-Image Correlation

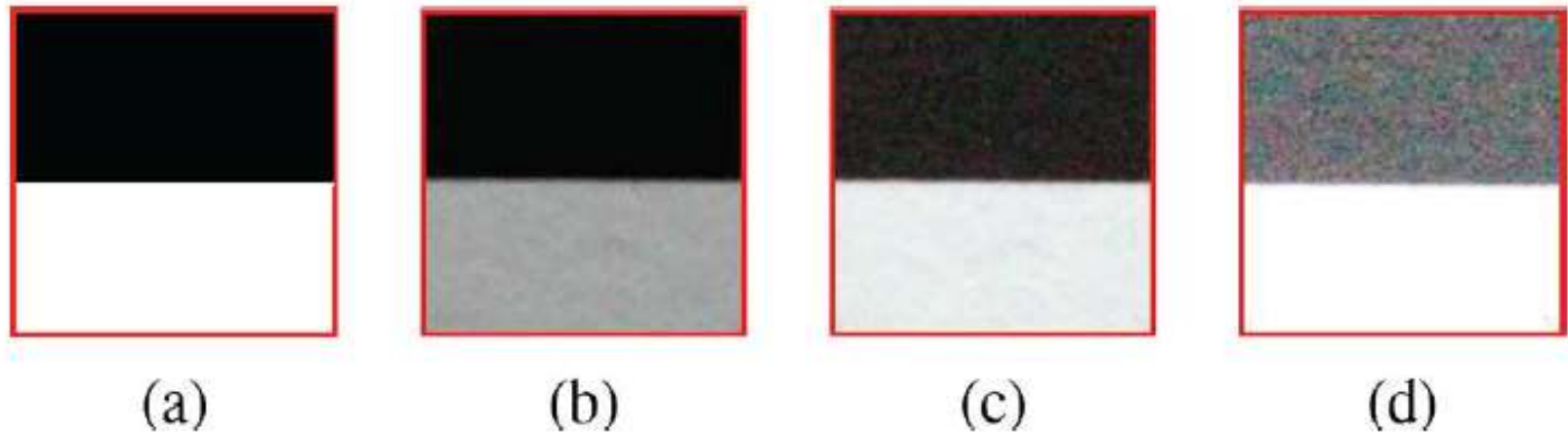
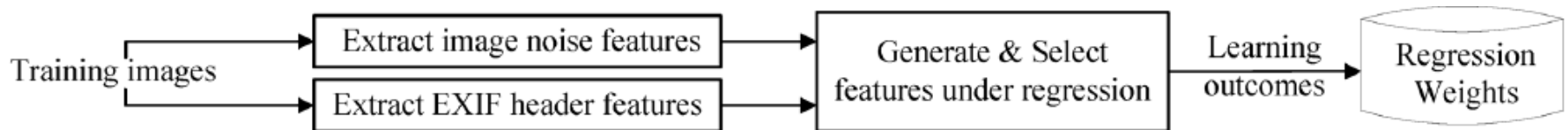
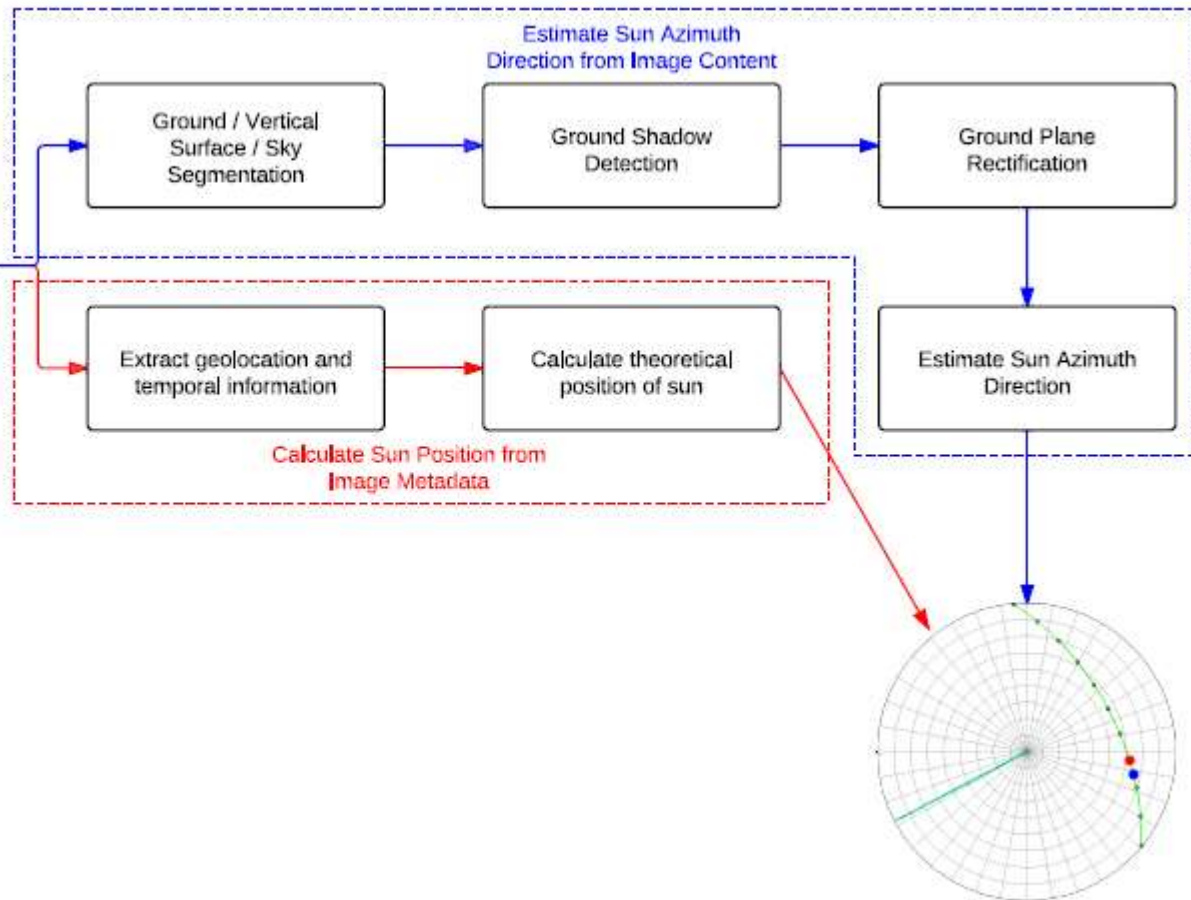


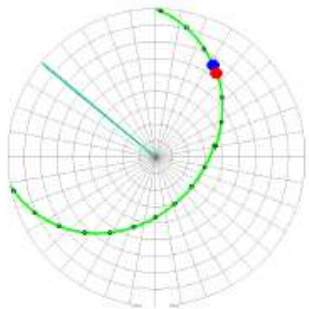
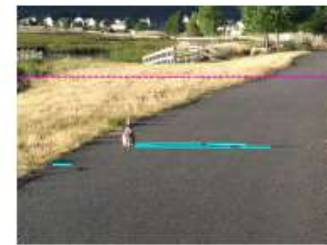
Fig. 1. Visual noise comparison for images captured of the same scenery by a Canon 550D camera with different ISO speed ratings. (a) Ground-truth scenery. Captured image (b) with ISO = 800; (c) with ISO = 3200; and (d) with ISO = 12800. F-number and exposure time are fixed at 4.5 and 1/60 s.



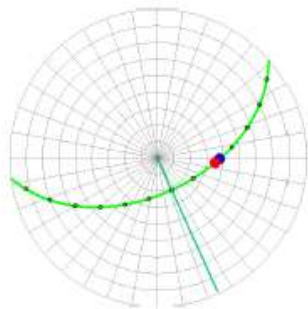
Azimuty slunce



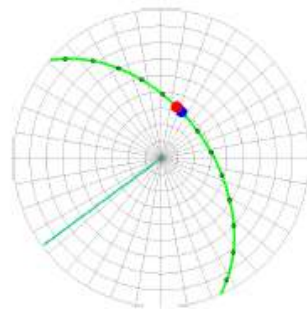
Azimuty slunce



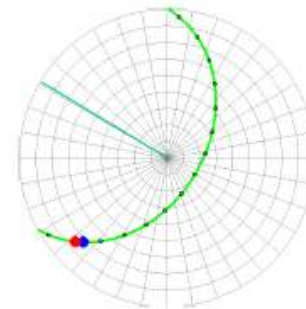
(a)



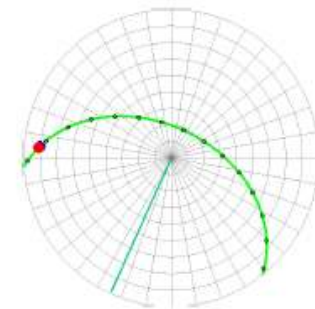
(b)



(c)

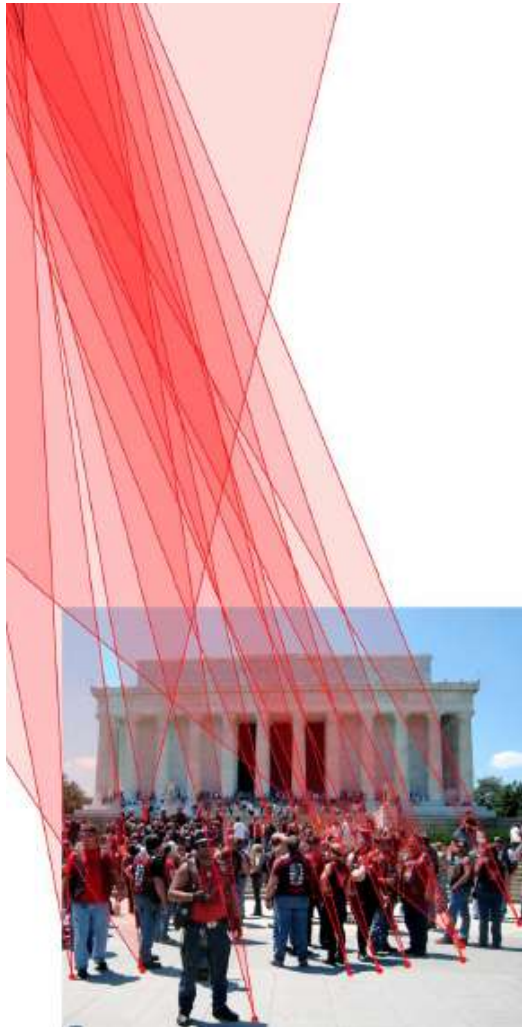


(d)



(e)

Nekonzistence stínu

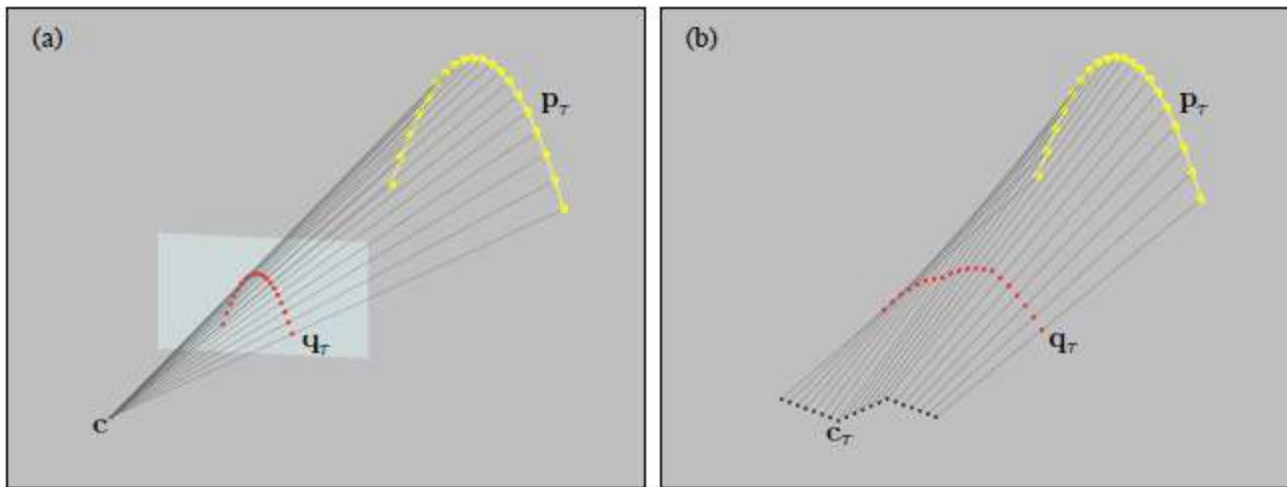


Robust to JPEG.
Manual shadow detection

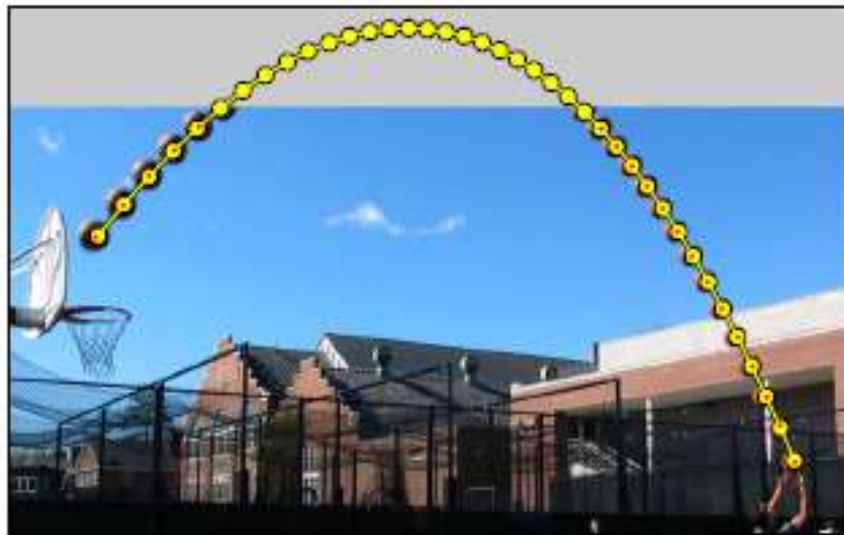
Ověřování reality scény



Ověřování reality scény



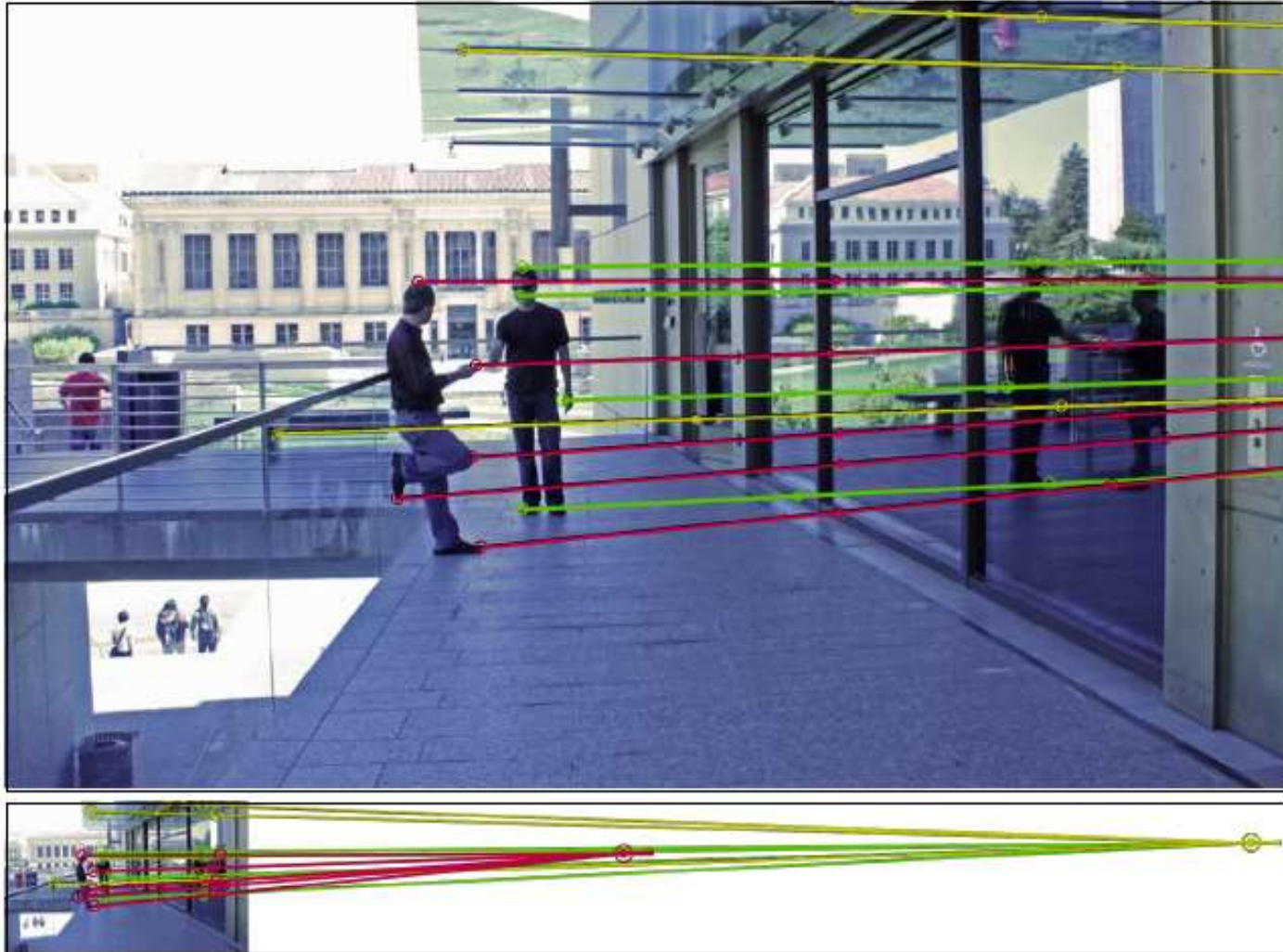
Ověřování reality scény



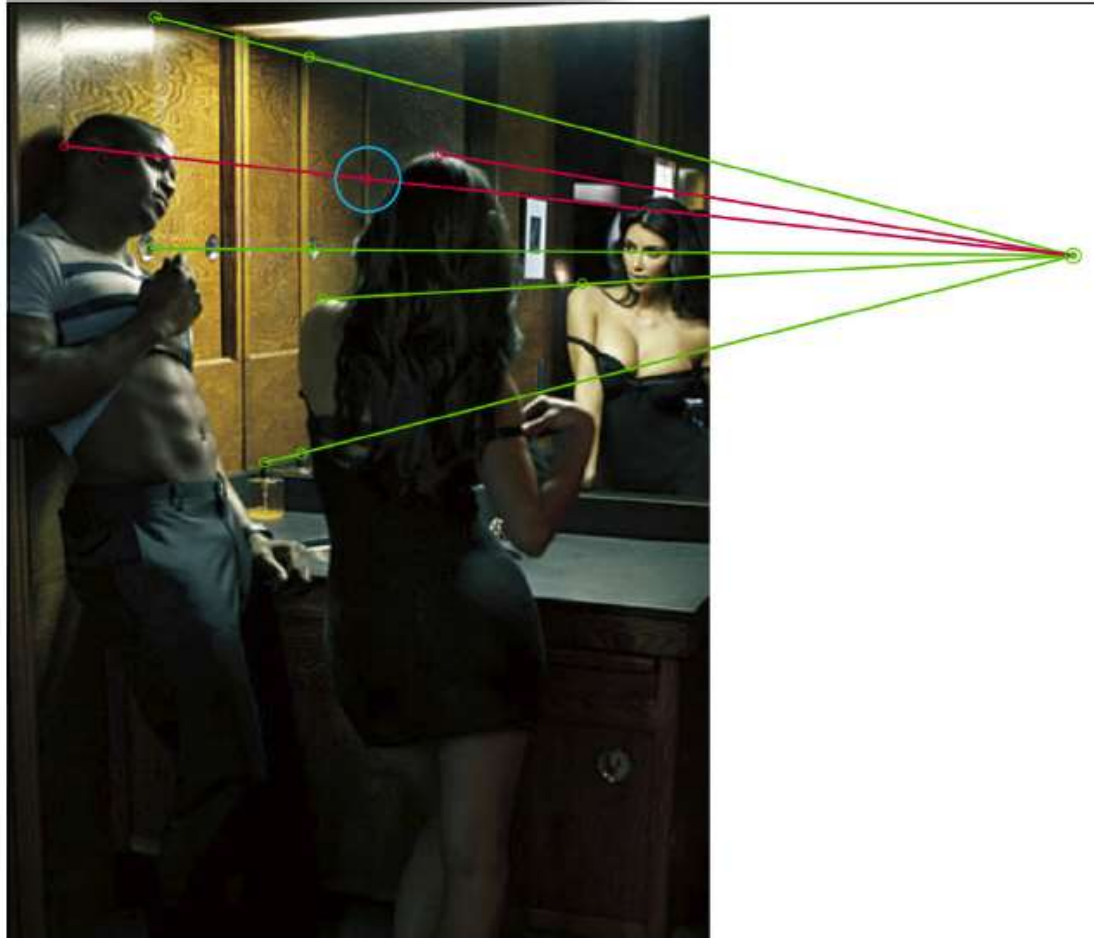
Ověřování reality scény



Ověřování reality scény



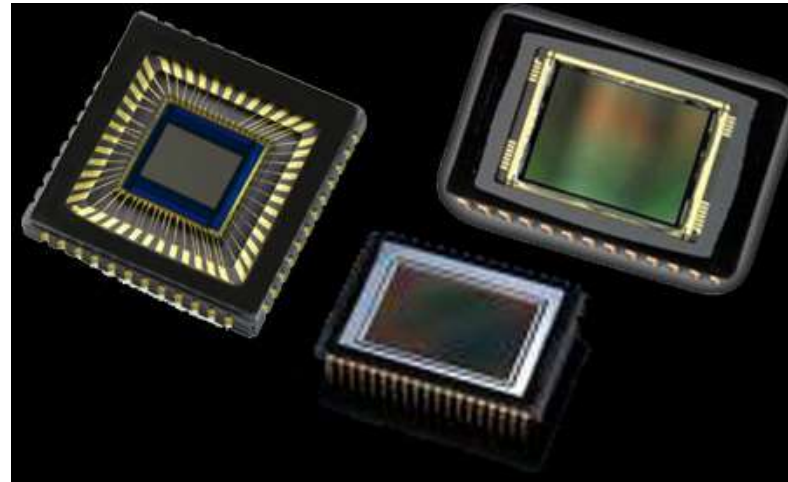
Ověřování reality scény



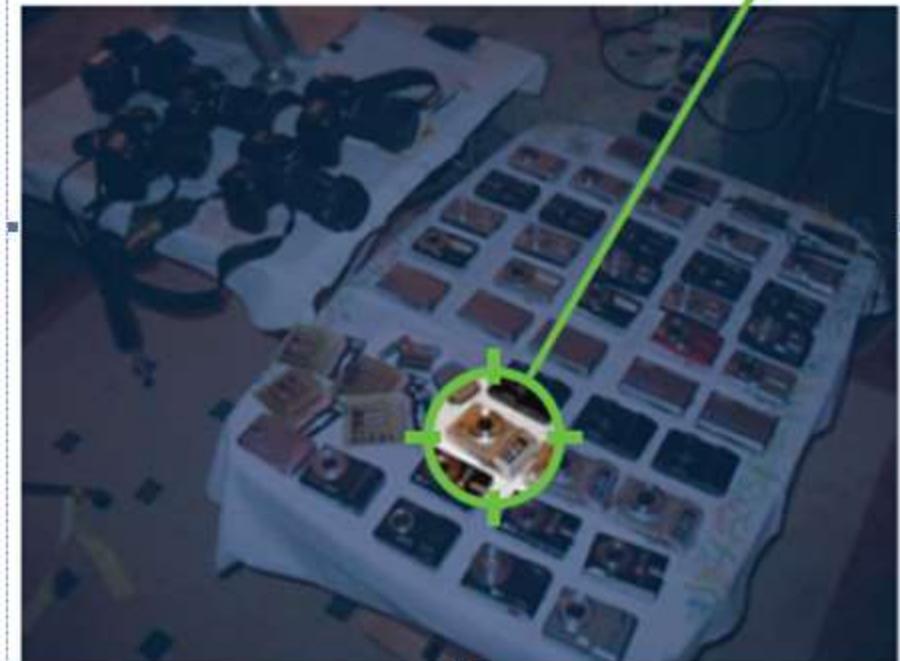
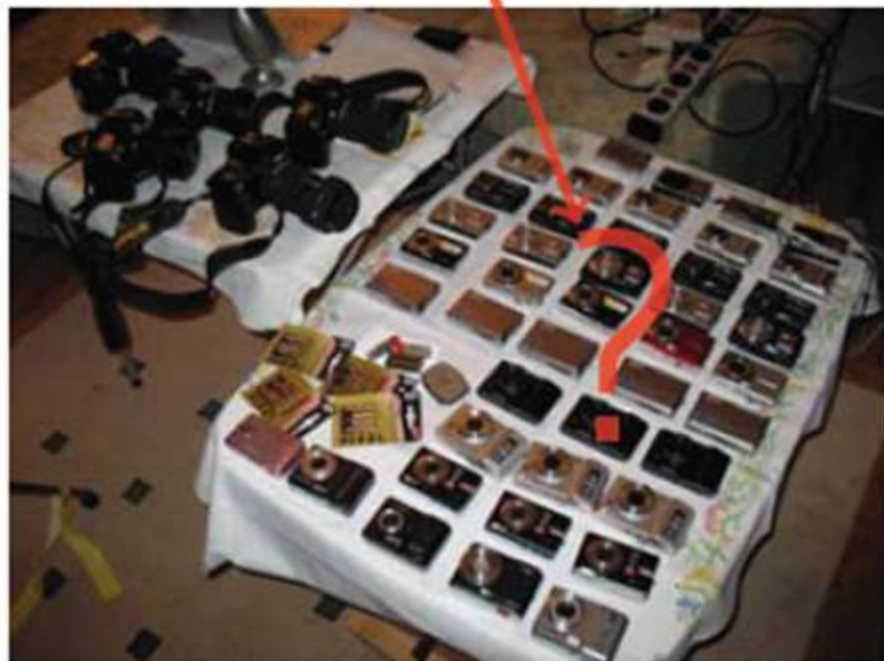
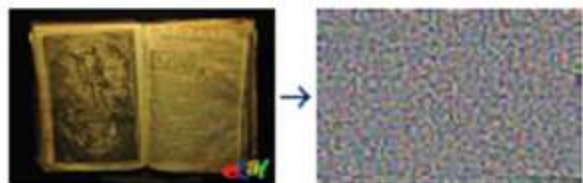
https://www.researchgate.net/publication/318888888

Analýzy zdrojového zařízení

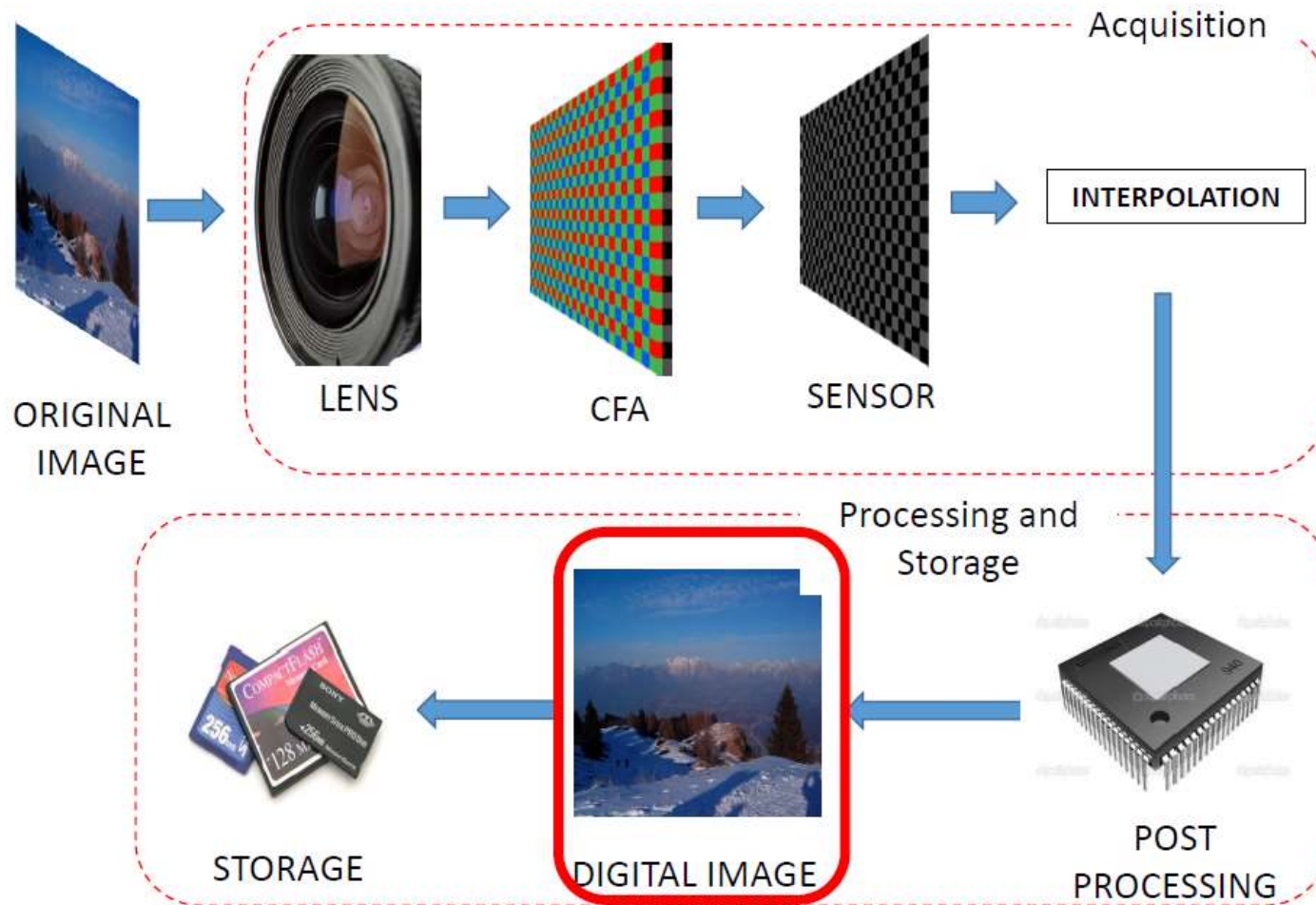
340		RMS			
Name: MALCOLM LITTLE	Classification: 92A 10				
Alias:	Est: 128				
No.:	Color: BLACK Sex: MALE				
1--Right Thumb	2--R. Index Finger	3--R. Middle Finger	4--R. Ring Finger	5--R. Little Finger	
6--Left Thumb	7--L. Index Finger	8--L. Middle Finger	9--L. Ring Finger	10--L. Little Finger	
Left Hand		Amputated	Right Hand		
Impressions taken by [Signature]		Finger's opinion			
Classified by [Signature]		Fingerprinter's signature: Malcolm Little			



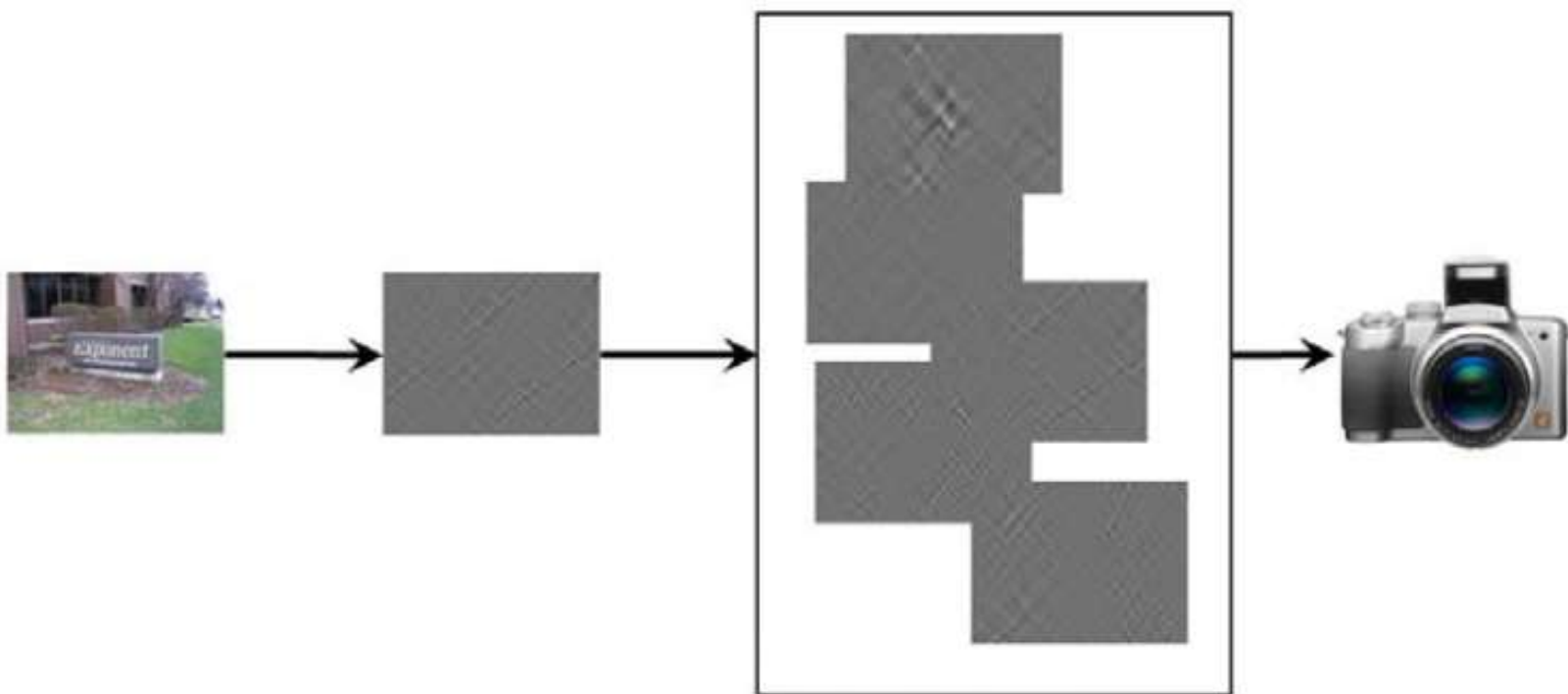
Analýzy zdrojového zařízení



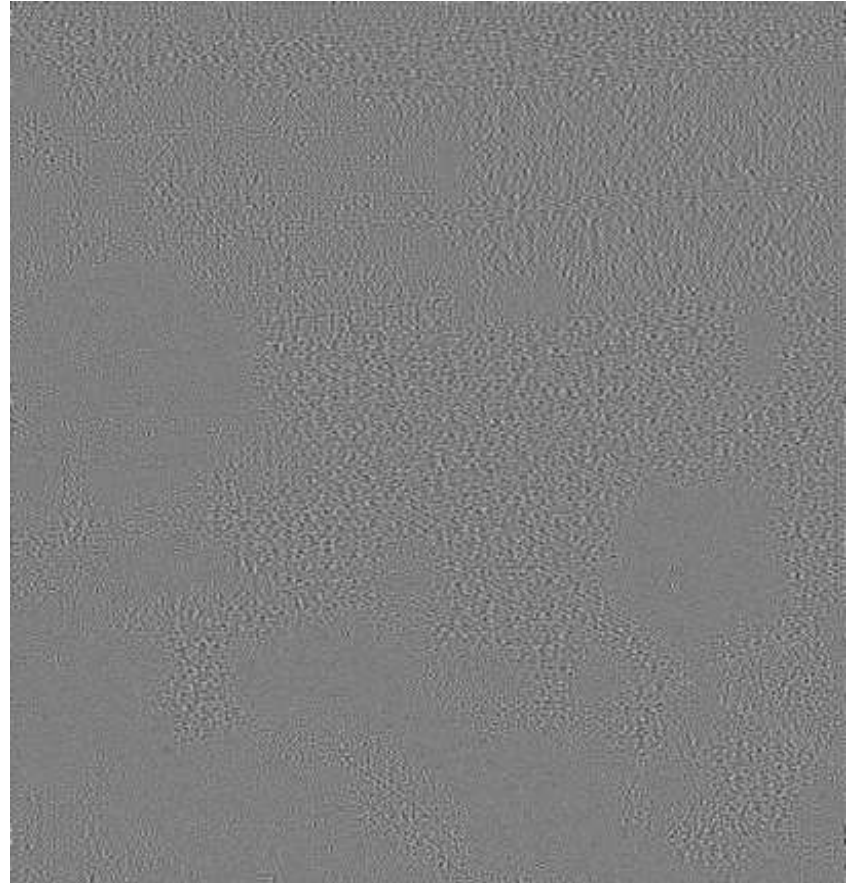
Analýzy zdrojového zařízení



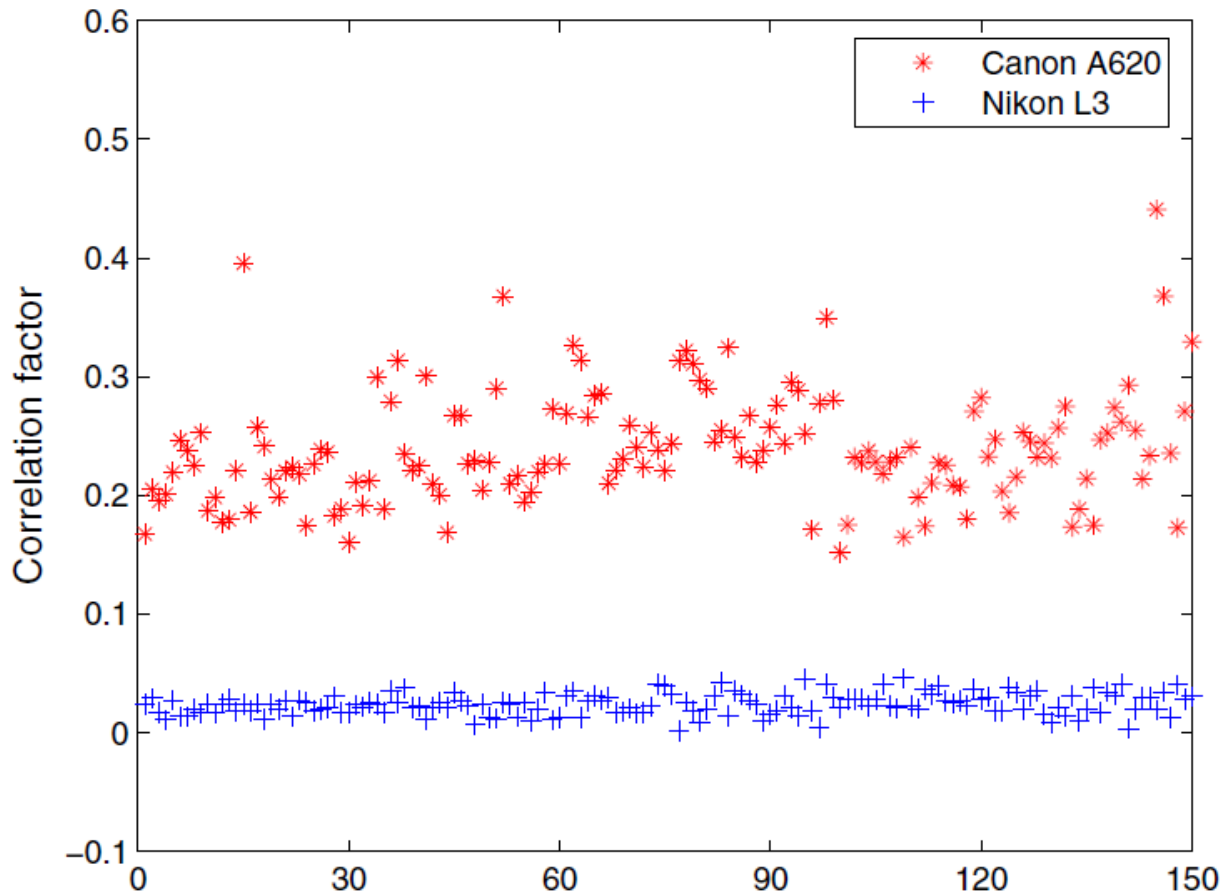
Analýzy zdrojového zařízení



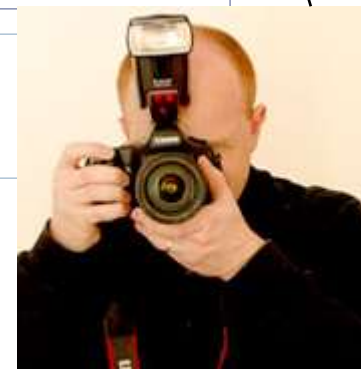
Analýzy zdrojového zařízení



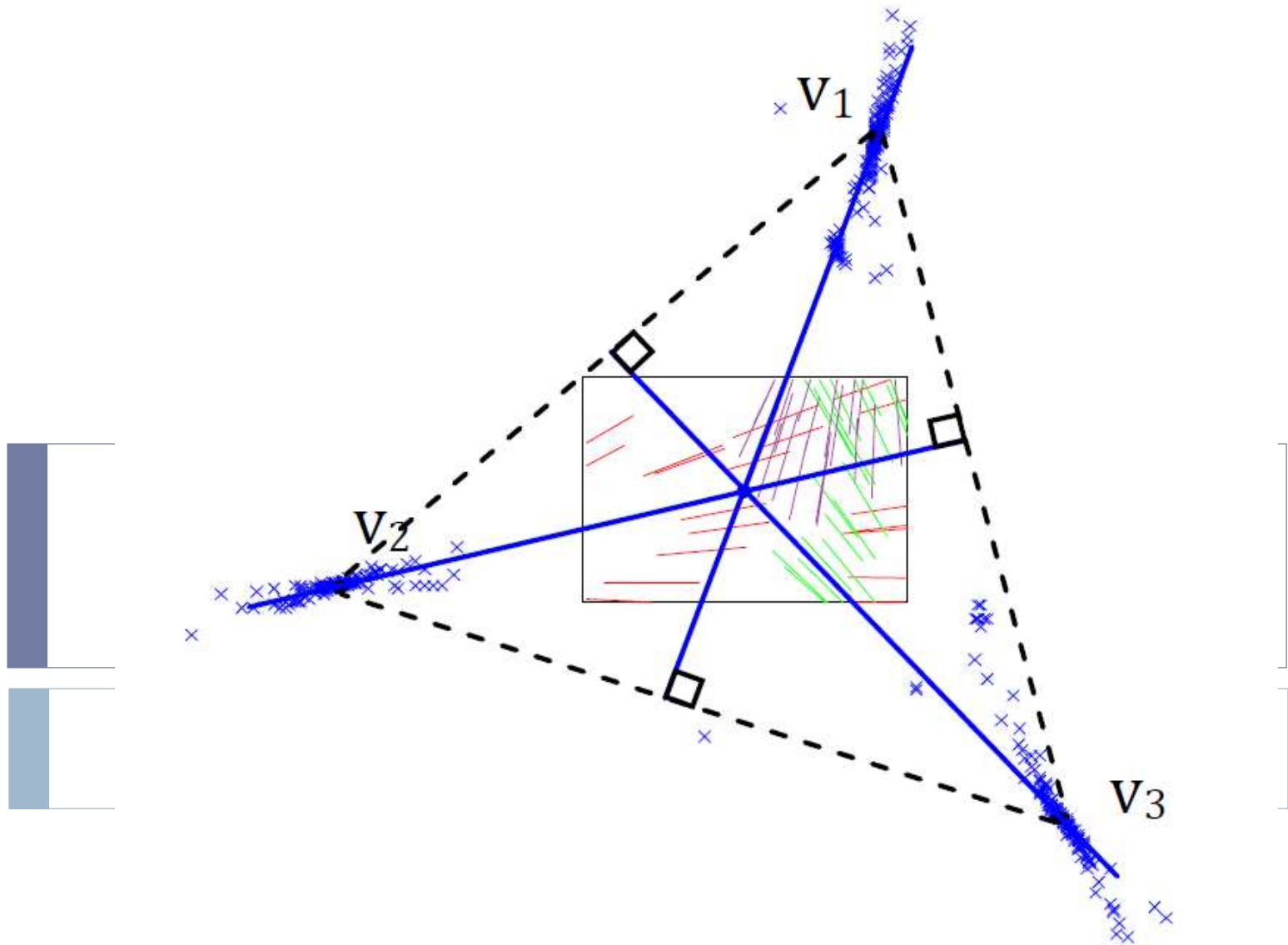
Analýzy zdrojového zařízení



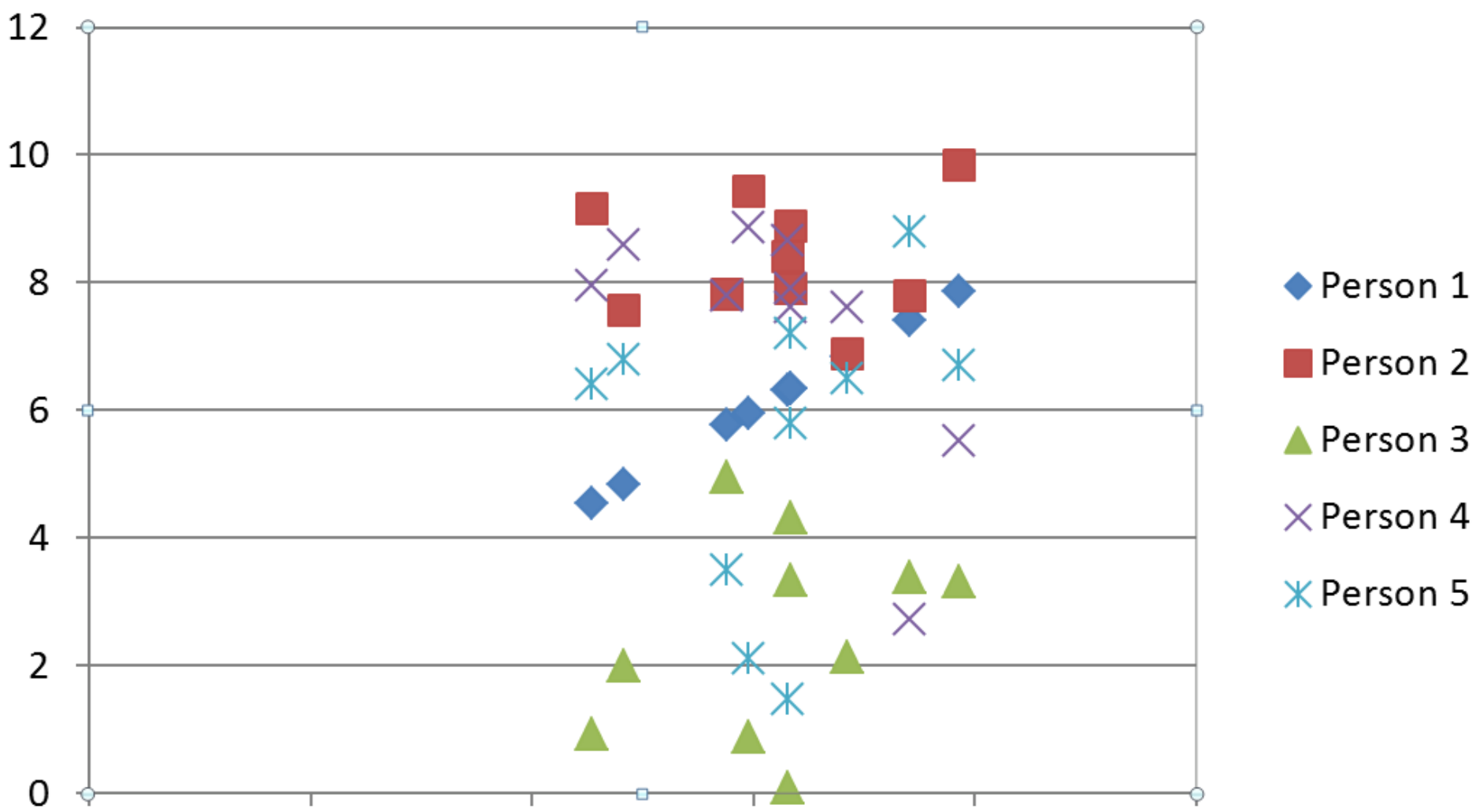
Identifikace fotografa



Identifikace fotografa







Děkuji za pozornost.