



Zlepšenie presnosti v indoor navigácii s využitím obrazu z kamery

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Charakteristika problému

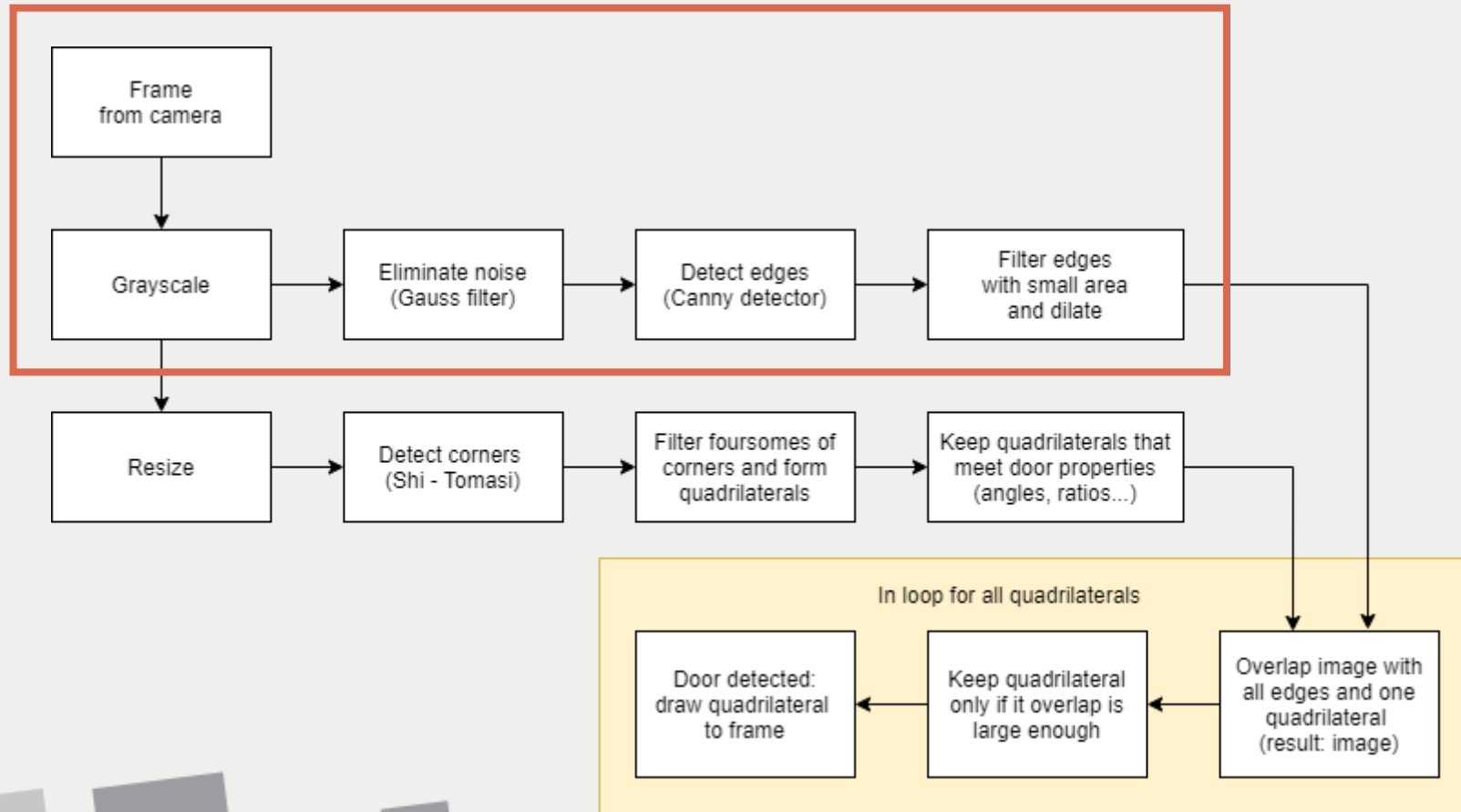
- Lokalizácia v indoor prostredí s využitím informácií z obrazu
- Zvoliť vhodné charakteristiky obrazu užitočné pre lokalizáciu
- Otestovať prístupy založené na computer vision
- Otestovať prístupy založené na neurónových sieťach



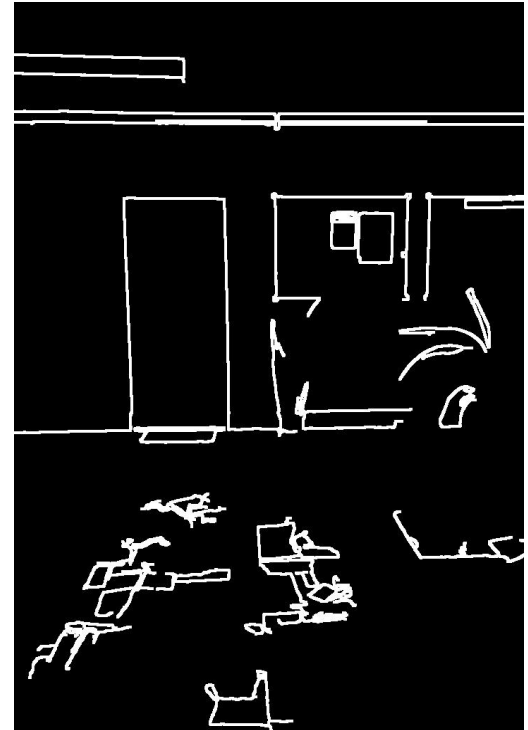
Detekcia dverí



Computer Vision-Based Door Detection for Accessibility of Unfamiliar Environments to Blind Persons (1)



Edges detection



Laplace vs Canny edge detection



Laplace



Laplace dilated

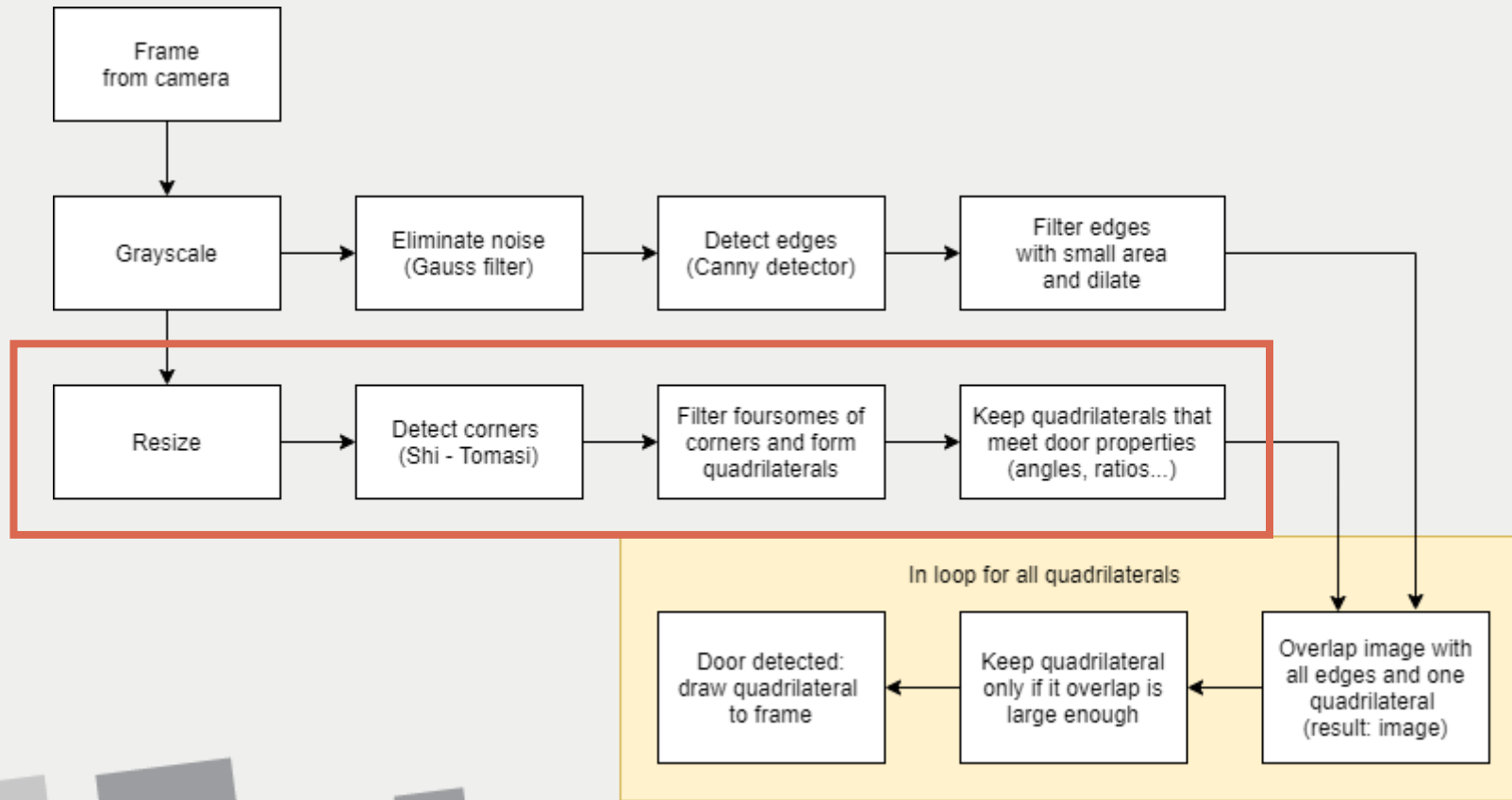


Canny



Canny dilated

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Corners detection



Corners detection

1. A door in an image at least has a certain width and height. So, SiZ_{12} and SiZ_{34} should be within a certain range:

$$HeightThresL < SiZ_{12}, SiZ_{34} < HeightThresH$$

$$WidthThresL < SiZ_{23}, SiZ_{41} < WidthThresH$$

2. Due to perspective deformation, L_{23} and L_{41} could form a certain angle with the horizontal axis. But, Dir_{23} and Dir_{41} should not be too large:

$$Dir_{23}, Dir_{41} < DirectionThresL$$

3. Vertical lines of a door frame are almost perpendicular to the horizontal axis of the image. So, Dir_{12} and Dir_{34} should be large enough:

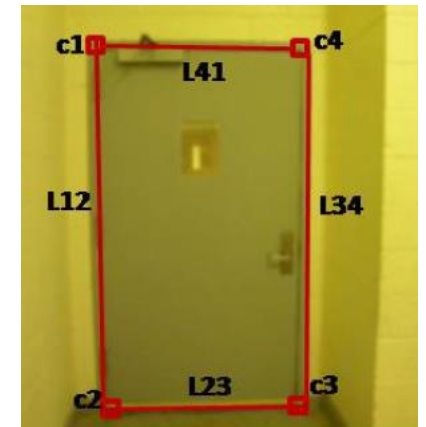
$$Dir_{12}, Dir_{34} > DirectionThresH$$

4. Vertical lines of a door frame should parallel with each other:

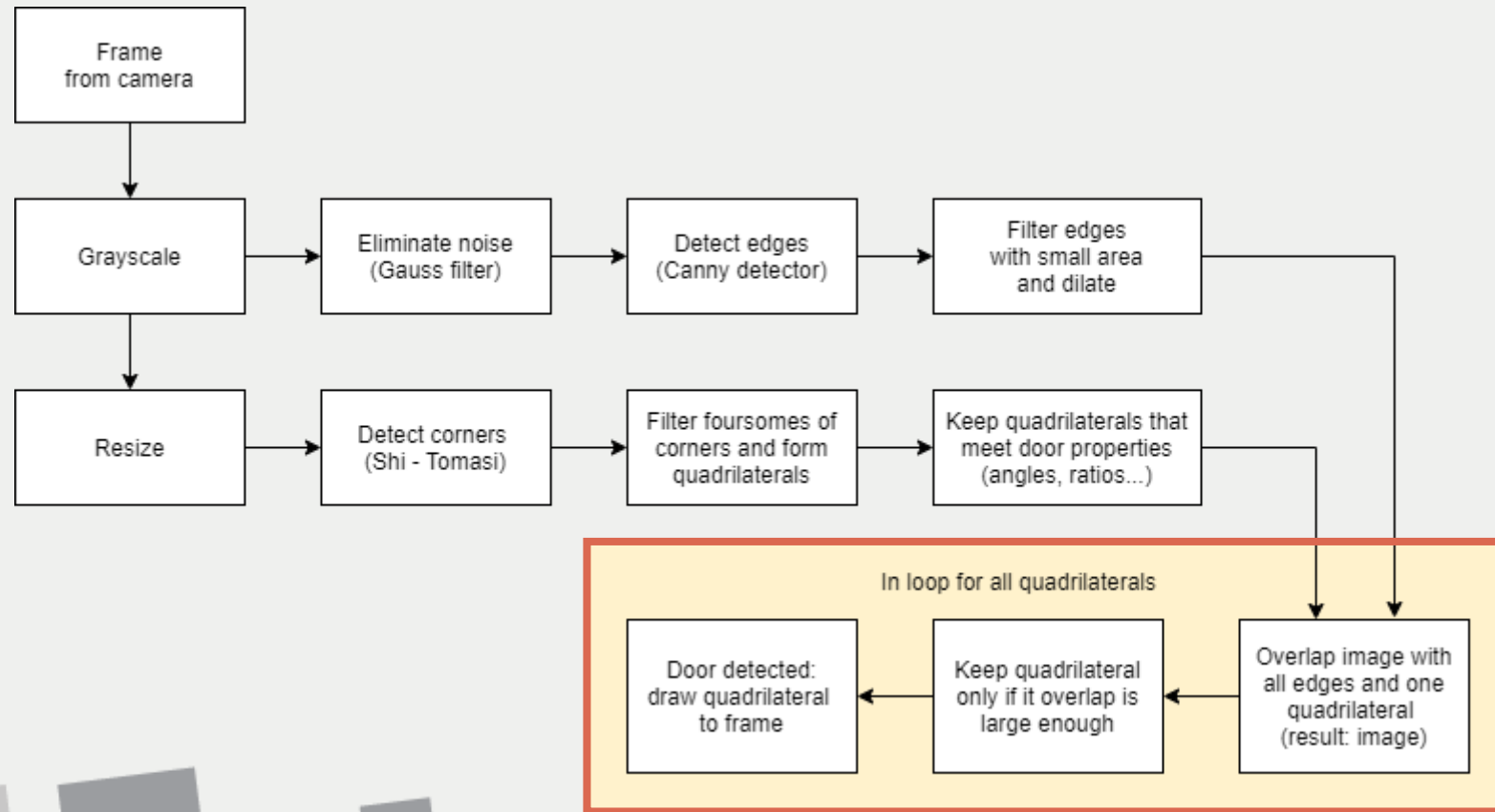
$$|Dir_{12} - Dir_{34}| < ParallelThres$$

5. The ratio between height and width of a door frame should be within a range:

$$HWThresL < (SiZ_{12} + SiZ_{34}) / (SiZ_{23} + SiZ_{41}) < HWThresH$$



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Edge Detector



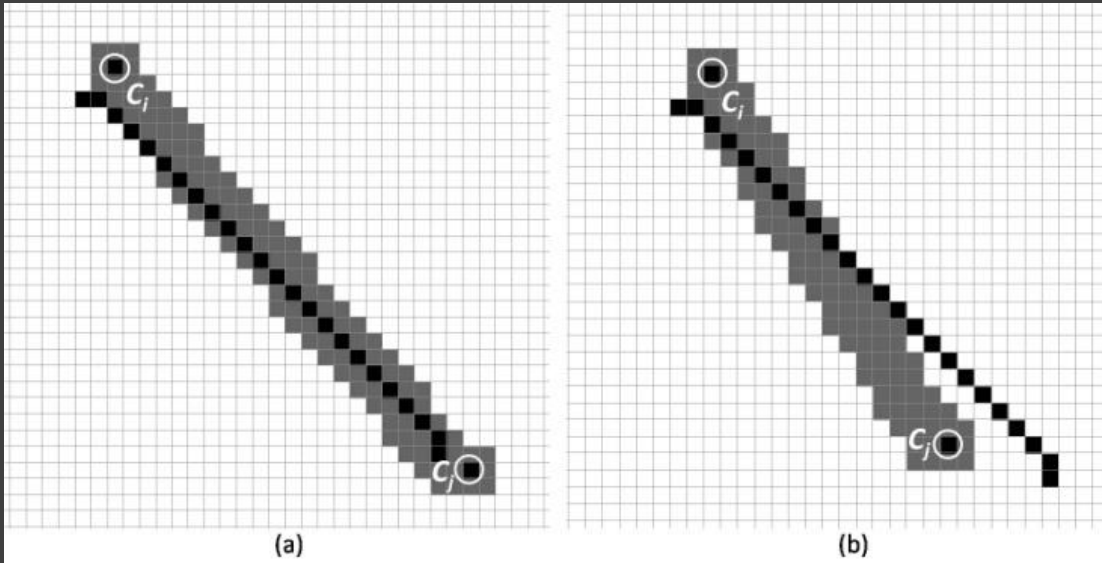
Quadrilaterals formed by edges from Corner Detector

> Fill ratio



Door detected

Compare edge to $c_i - c_j$ segment



(Tian, 2010)





Hodnotenie výsledkov algoritmu

Úspešná detekcia:

- Dvere s jasnými hranami pri pohľade spredu
- zmena osvetlenia nemá vplyv

Problémy:

- dvere pod veľkým sklonom (chýbajú rohy/hrany)
- komplexné dvere (chýbajú rohy)
- 4 rohy v takej pozícii, že sa nájdu dvere aj tam, kde nie sú (alebo okná a automat)
- Hrany v diaľke nie sú detegované kvôli redukcii malých hrán



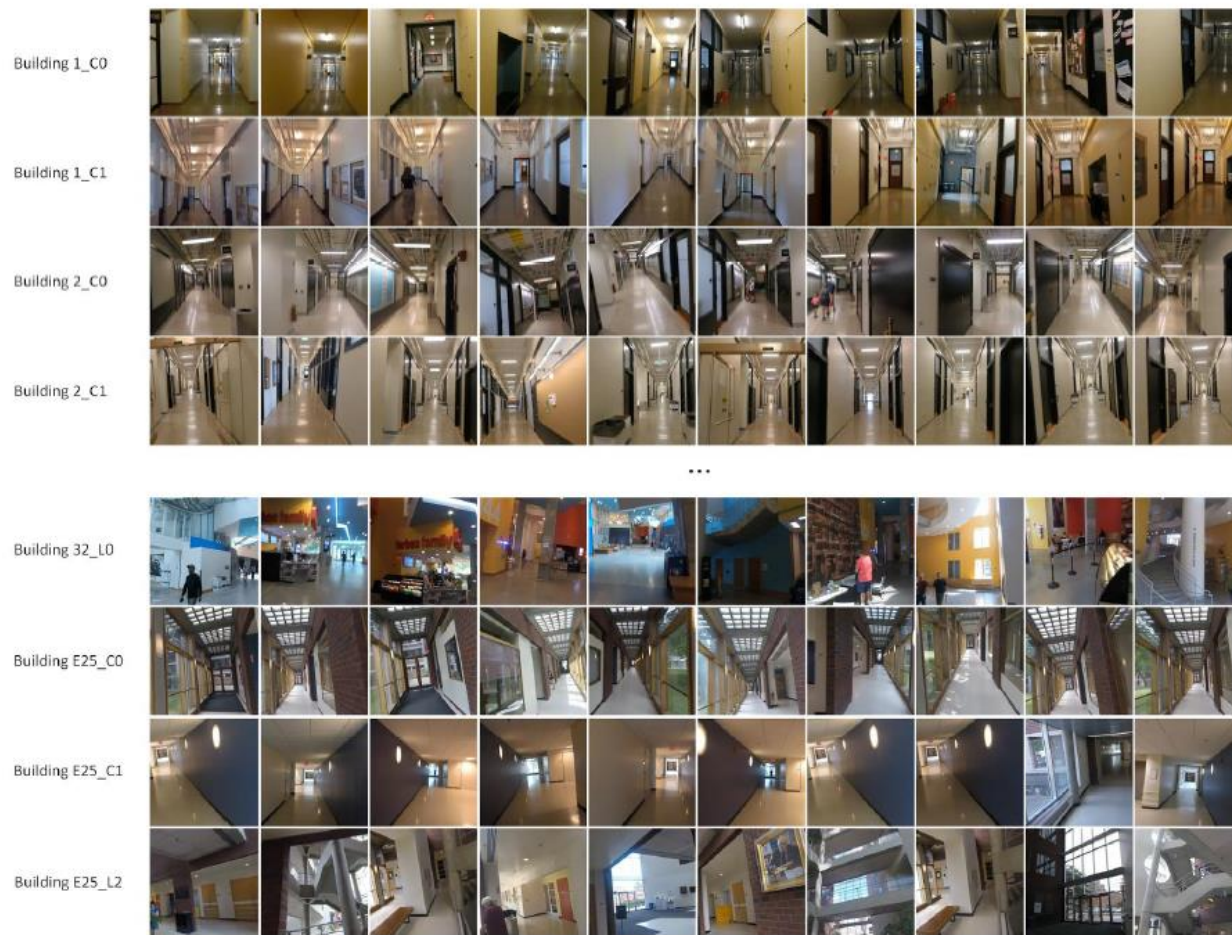


Figure 6 Example of training dataset. Ten images in each building subzone are randomly selected and shown above. Among them, the type of building 32_L0 and building E25_L2 are lobby, and the remaining ones are corridor.

Rozpoznávanie scény

- 2 DCNN modely na určenie budovy a miestnosti v rámci budovy – AlexNet, NIN (rôzna úroveň odlíšiteľnosti)



Fig. 1. Image examples from the Places2 dataset. **Top Row:** we show images from two separate scene classes (i.e., *Kitchen* and *Campus*). We notice that large intra-class variations are contained in these images. **Bottom Row:** we give two pairs of scene categories (i.e., *Cubicle office* and *Office cubicles*, *Baseball field* and *Stadium baseball*). As can be found, images from these pairs of ambiguous categories are highly confused.

Rozpoznávanie scény

1. Multi-resolution CNN – zachytáva vizuálny obsah a štruktúru na viacerých úrovniach
2. Nejednoznačnosť klasifikácie:
 - Súvisiace triedy spojené do supertriedy
 - Extra siete na určenie triedy v rámci supertriedy

Literatúra

1. TIAN, Yingli, Xiaodong YANG and Aries ARDITI. Computer Vision-Based Door Detection for Accessibility of Unfamiliar Environments to Blind Persons. MIESENBERGER, Klaus, Joachim KLAUS, Wolfgang ZAGLER a Arthur KARSHMER, ed. Computers Helping People with Special Needs [online]. Berlin, Heidelberg: Springer Berlin Heidelberg, 2010, 2010, s. 263-270 [cit. 2020-11-28]. Lecture Notes in Computer Science. ISBN 978-3-642-14099-0. Available at: [doi:10.1007/978-3-642-14100-3_39](https://doi.org/10.1007/978-3-642-14100-3_39)
2. ZHANG, Fan et. al. Indoor Space Recognition using Deep Convolutional Neural Network: A Case Study at MIT Campus. 2016. Available at: arxiv.org/abs/1610.02414v1
3. WANG, Limin et. al. Knowledge Guided Disambiguation for Large-Scale Scene Classification with Multi-Resolution CNNs. 2017. Available at: <https://arxiv.org/pdf/1610.01119v2.pdf>

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za pozornosť

