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Compressed Histogram of Gradients: A low bit rate descriptor

Local image features have become pervasive in the areas of computer vision and image retrieval and are increasingly finding application in real-time object recognition, 3-D reconstruction, panorama stitching, robotic mapping, and video tracking. Many of these applications require large numbers of features to be transmitted or stored, which warrants low bit rate descriptors for increased scalability and efficiency. However, current feature descriptors perform well at image recognition tasks, but are very inefficient in terms of bit-rate. For example, SIFT descriptors are conventionally stored as 1024 bits and SURF feature descriptors are stored as 2048 bits. In the present invention, the novel Compressed Histogram of Gradients (CHoG) descriptors are stored as only 50 bits, yet perform on par with SIFT and SURF descriptors. This 20x reduction in size will prove vital for computer vision applications on mobile devices.

Applications

- Server-side Storage: Image retrieval applications need query images to be matched against databases of millions of features stored at application servers in the Internet. Feature compression can yield significant savings in storage space.
- Application Latency: When data are sent over a network, the system latency can be reduced by sending fewer bits resulting from compression of image features.
- Data Transmission: For mobile applications, bandwidth is a limiting factor. Feature compression can help reduce the data needed to be transmitted over the wireless channel and the back-haul links in a mobile network.

Advantages

- 20x reduction in bit rate with comparable matching performance
- Outperforms several existing schemes in literature at equivalent bit rates
- Descriptors can be compared in their compressed representations
- Complexity of computing CHoG descriptors is low

Patents

- Published Application: 20100226575
- Published Application: WO2010055399
- Published Application: 20110286627
- Published Application: WO2011061709
- Published Application: WO2010226575
- Issued: 9,710,492 (USA)
- Issued: 8,687,891 (USA)

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