A Feature-Wise Attention Module Based on the Difference with Surrounding Features for Convolutional Neural Networks

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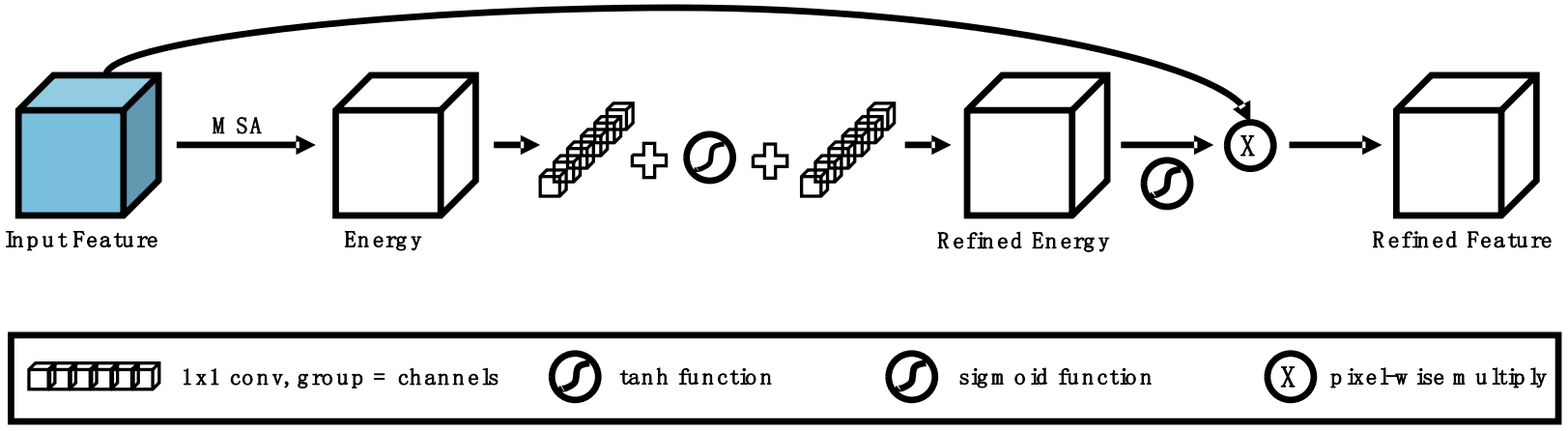
Problems & Ideas

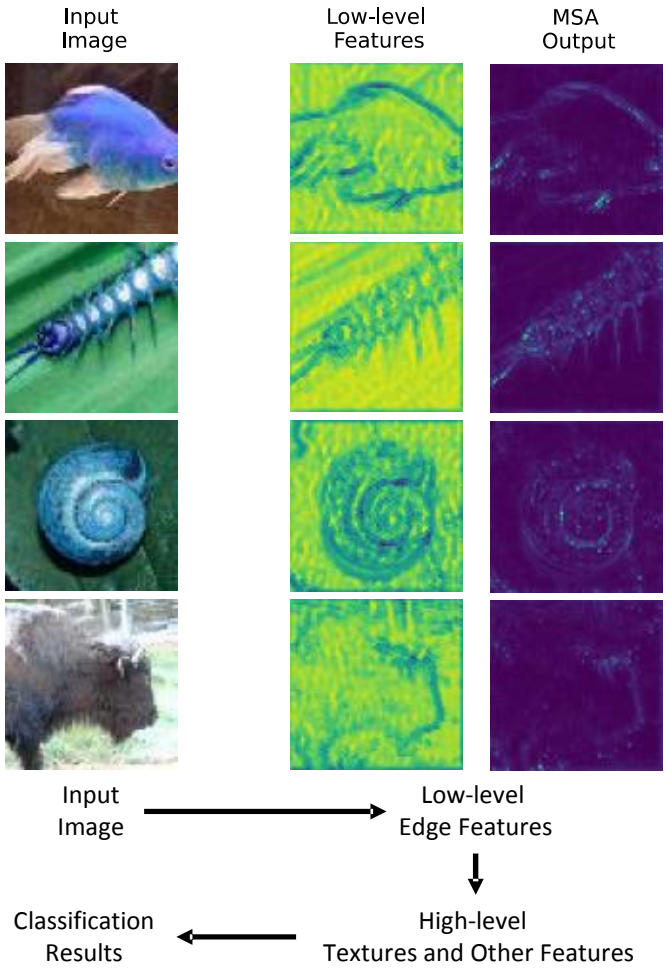
- Problems of conventional attention approaches:
  - Most of them can only capture either channel-wise attention or spatial-wise attention at one time.
  - Existing feature-wise attention approaches are either inflexible or contain assumptions.
- Ideas: A new approach to calculating feature-wise attention that effectively avoids assumptions and calculates quickly by simplification.



Overview of the proposed module. Two 1 × 1 convolution modules of the number of groups equal to that of the channels with a tanh function are used to implement the group of non-linear functions.

Main Contributions

- Contributions:
  - A simple method based on the surround suppression in neuroscience called MSA is proposed to capture feature-wise attention.
  - A series of simple equivalent transformations are derived to speed up energy calculation, and the MSA is turned to a lightweight form.
  - A group of learnable non-linear mapping functions is introduced to refine the energy calculated by the MSA, and the effectiveness of combining it with the MSA is verified.



Visualization results of the intermediate features and the attention weights calculated by the MSA.