Learning-based Video Motion Magnification

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Introduction

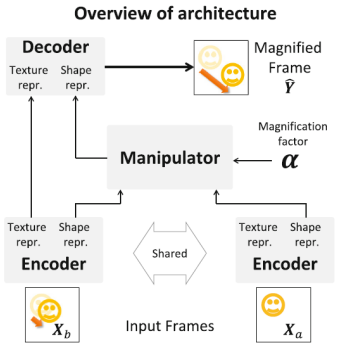
Industrial equipment commonly produces very small vibrations and movements. As elements vibrate, they can become misaligned, imbalanced, loose, or cracked, and their operating efficiency can be reduced. These vibrations are so small that the human eyes cannot detect them.

To mitigate this, predictive maintenance is commonly performed, and which purpose is to act before faults or failures happen.

Methods

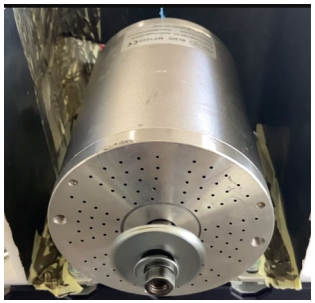
The study implements a video processing algorithm to amplify small movements. The algorithm uses deep convolutional neural networks to process the video and output the magnified vibrations.

And the network architecture is shown in the following picture.

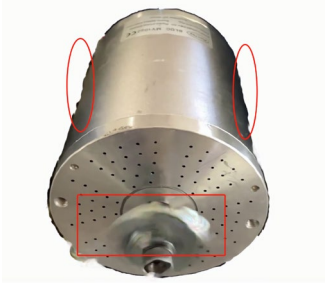


Results

One frame in the original video:



After video background removal process (U-2-net algorithm) and magnification process:



Limitations

However, The algorithm performance degrades when the magnification factor is high and the motion is small. Additionally, GPU speeding up is necessary for training and using the network. GPU memory with more than 10GB is also required in the study. Future research should be conducted to use less computational resource and be more robust.