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Bretagne-Pays de la Loire
École Mines-Télécom

Motion Magnification

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SUMMARY

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Overview of Motion Magnification

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Overview of Motion Magnification

1.1 Goal of motion magnification

- **Amplify motion by a factor α.**
- **Make small motion visible**

Example: effect of the wind on a crane α=50

Original images :

$$I(x,t) = f(x,t)$$

$$I(x,t+dt) = f(x,t+dt) = f(x+\delta(t),t)$$

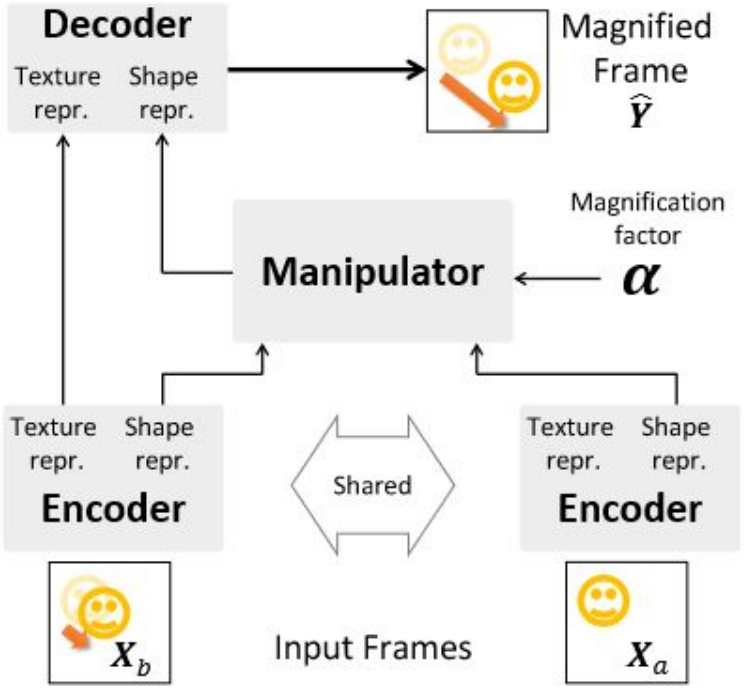
- Two input images
- One output frame

Magnified frame :

$$I_{magnified}(x,t+dt) = f(x+(1+\alpha)\delta(t),t)$$

Learning-Based Motion Magnification

1.3 Network



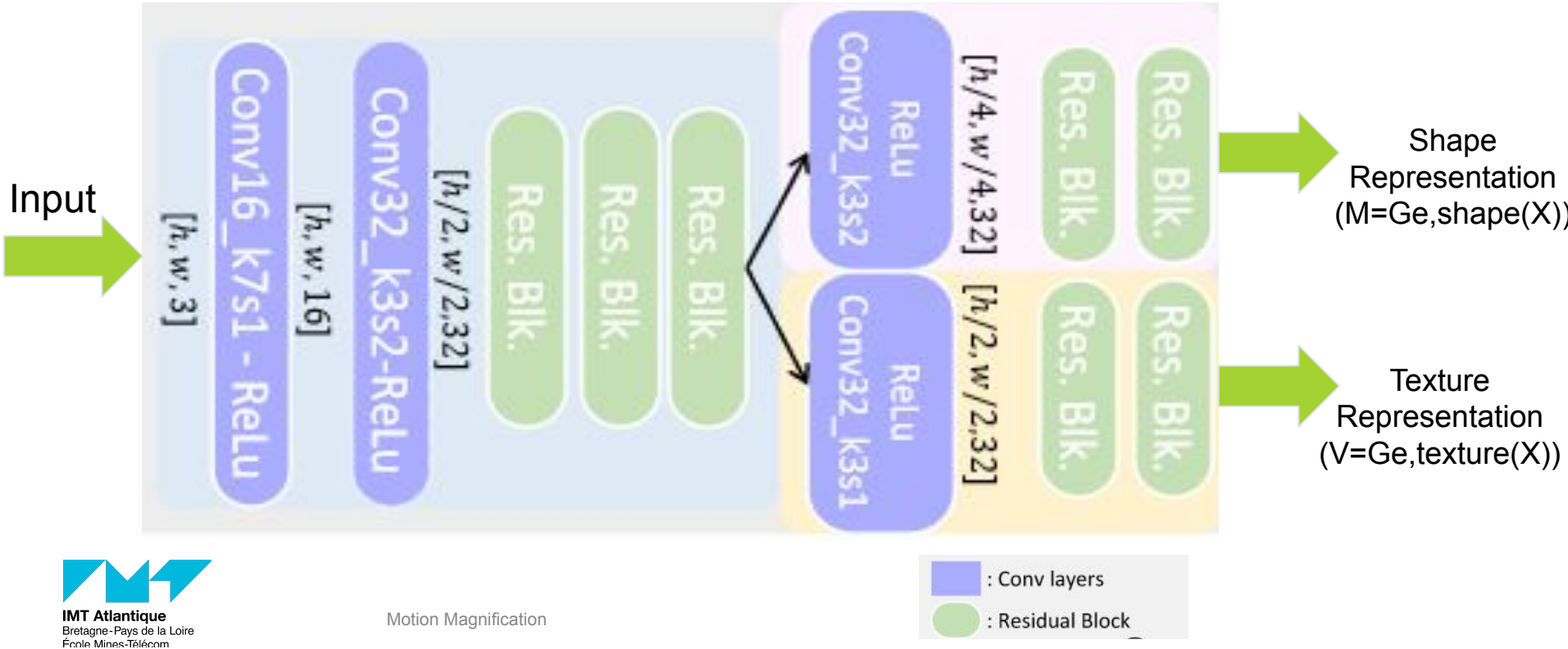
$$Loss = \left|\hat{Y} - Y\right| + \lambda(Regularisation)$$

- Trained of synthetic data. (Hard to reproduce the ground truth data in real life)
- Separate the shape and texture representation of each image

Overview of Motion Magnification

1.3 Network

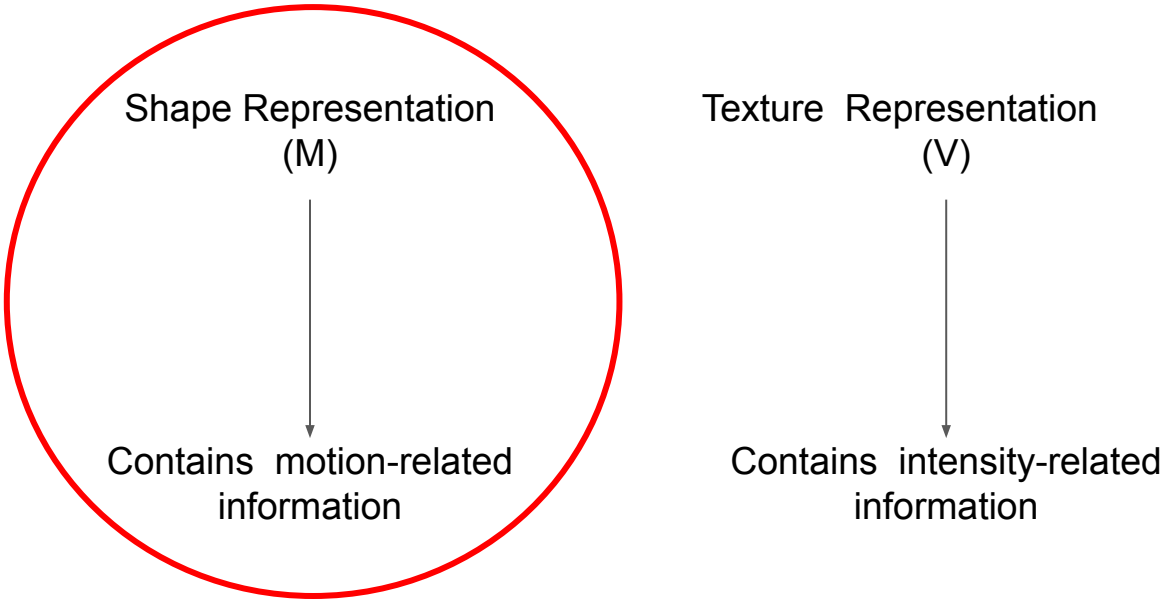
Encoder



Overview of Motion Magnification

1.3 Network

Why this division ?



We need to magnify M **&** **Avoid intensity Magnification**

Manipulator - 2 Frames

$$G_m(\mathbf{M}_a, \mathbf{M}_b, \alpha) = \mathbf{M}_a + h\left(\alpha \cdot g(\mathbf{M}_b - \mathbf{M}_a)\right)$$

Where
Ma: Shape representation of the first frame A
Mb: Shape representation of the second frame B
α: Magnification factor
h(.): 3*3 conv + residual block
g(.): 3*3 conv + RELU

Application on real data

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Application on real data

2.0 The use of a GitHub code of the implementation

https://github.com/ZhengPeng7/motion_magnification_learning-based : A 3-years old implementation, but up to date

Unfortunately, the official implementation: 2018, not up to date, issues of past libraries

Many potential applications… => choice of a direction

Application on real data

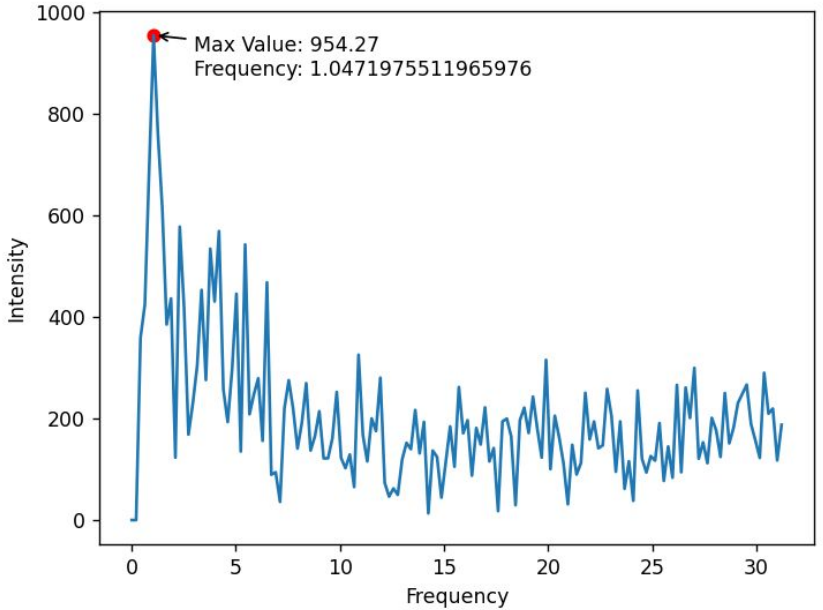
2.1 Baby breathing

Video

Application on real data

2.1 Baby breathing

- Extract variation of the light intensity in certains points of the image.
- Retrieve the frequency at which the baby is breathing



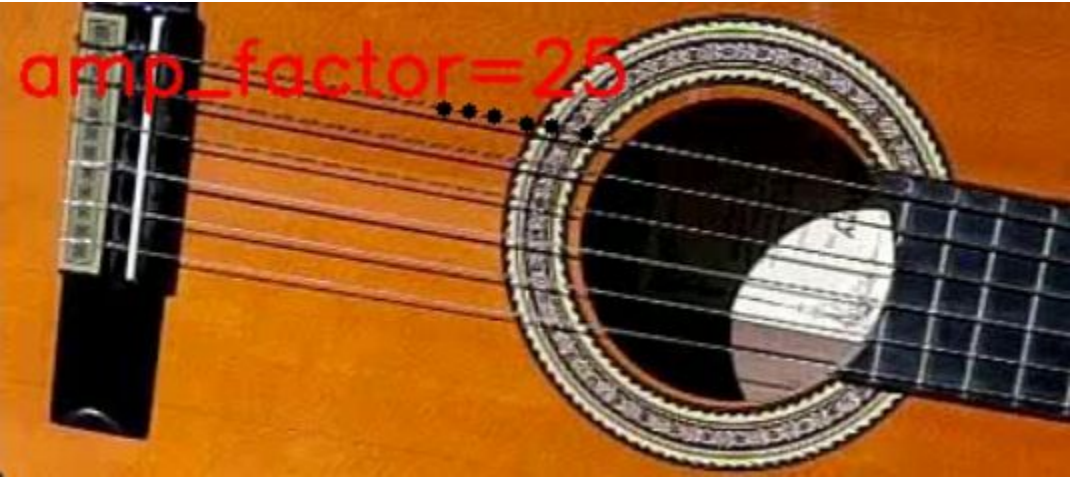
- The Baby is breathing every second

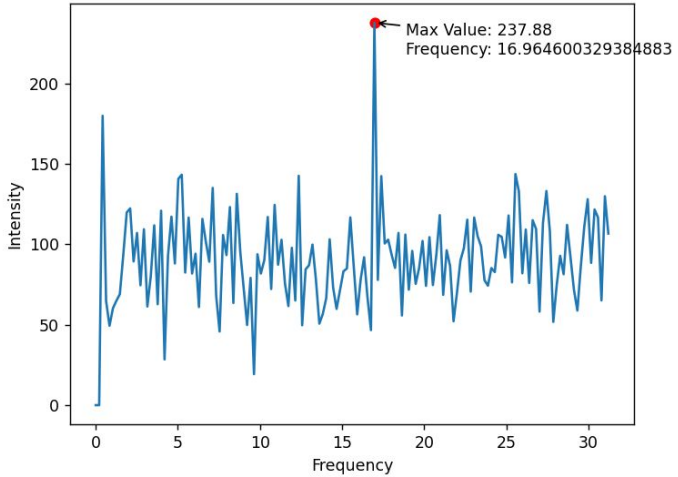
Application on real data
2.2 Guitar

Video

Introduction to Motion Magnification

2.2 Guitar





There is a pick of frequency at 17 Hz for the guitar string.

⇒ This is lower than what we expect, ie at least 82 Hz

Though we still have the right order of magnitude

Issue of the current Network

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Issues of the current Network

- Noise with high value of α.
- Camera has to be stable

Thank you for your attention

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