

Violin Vibrato Video Imaging: A Novel Method to Analyze Vibrato Frequencies Using Computer Vision

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Is it possible to replicate violin vibrato waveforms with computer vision techniques?

Background

- Vibrato is an artistic modulation of a violin's pitch that gives the tone of the instrument a desired aesthetic effect.
- Using computer vision techniques, the purpose of this research is to analyze frequencies from vibrato phenomenon.

Methodology

- Finger positions will be plotted against the video frames to generate a frequency pattern.
- Hand tracker uses HSV filters (Hue, Saturation, Value) for image segmentation
- A hand tracking algorithm can more accurately plot the finger position and amplitude.
- Generate a wave function to model the vibrato modulation for analysis

Progress

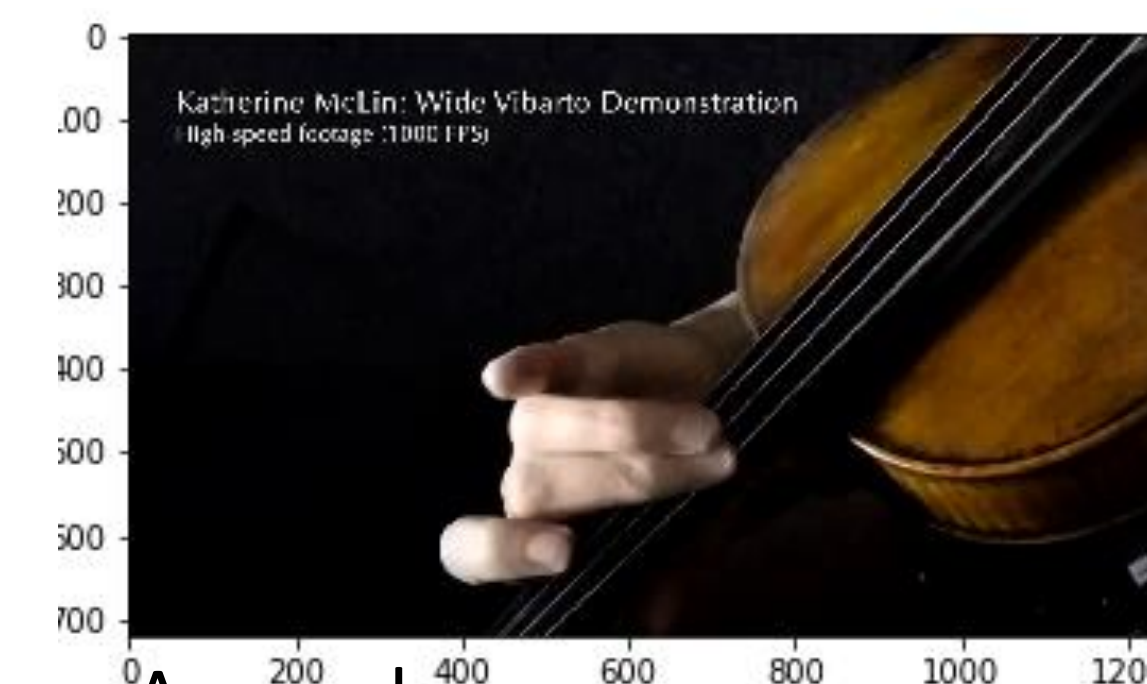
- A primitive vibrato waveform was generated by tracking individual pixel color values.
- A basic hand tracking algorithm has run successfully on the ASU Agave Cluster.
- A general waveform has been generated with the HSV Filter

Current Work

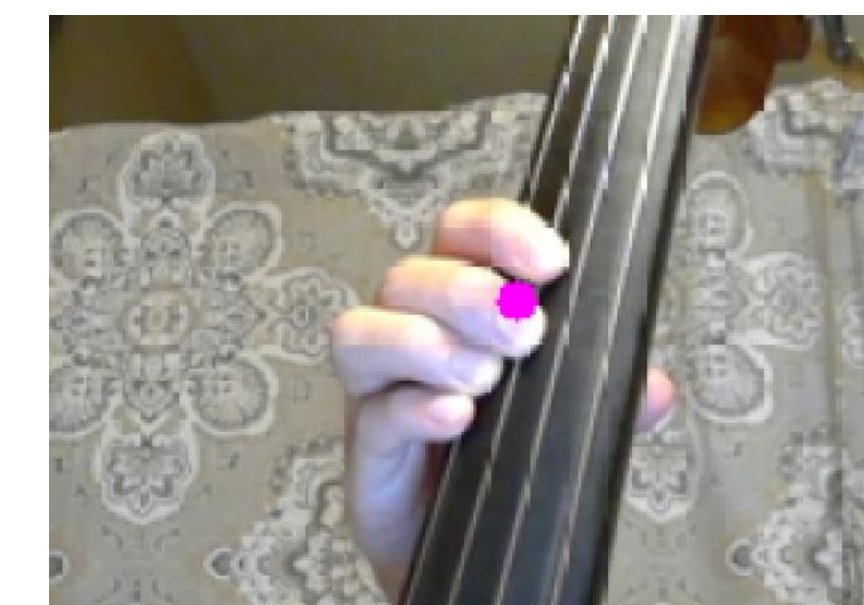
- Current efforts involve improving the HSV filter to generate cleaner waveforms
- As the current HSV filter is not accurate for smaller instruments and smaller hand movement, a string bass is used for vibrato hand tracking.
- Implementing HSV filtration to read violin vibrato images is the next step after the live recording.
- Utilizing a neural network for hand recognition is a possibility in the future.

Challenges

- HSV filter tracks centroid at a slow frame rate, generating inconsistent waveforms.

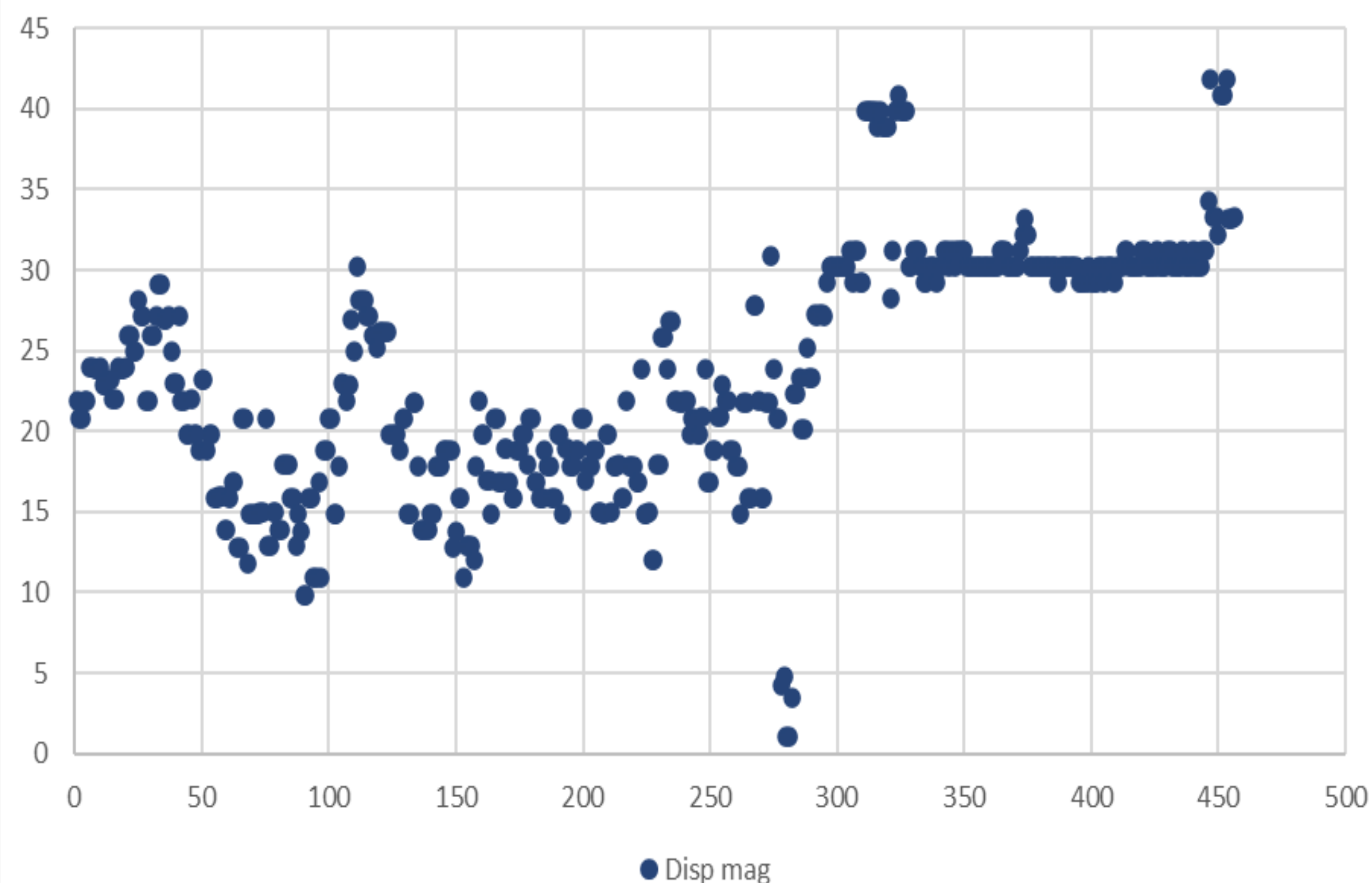


A sample vibrato frame



HSV filter tracks the fingertip of my hand.

Pixel Values



Vibrato waveform with RGB pixel values and video frames.
Vibrato follows a random sinusoidal pattern.