

# Goals of this Talk

- Technical details, not a history
- Simple explanations
- No other methods of pitch shifting
- Appreciation of the technical achievement

After watching this talk, you should be able to read the patent and know what is going on

# Pitch Detection and Intonation Correction Apparatus and Method

Inventor: Harold A. Hildebrand  
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[54] PITCH DETECTION AND INTONATION  
CORRECTION APPARATUS AND METHOD

[75] Inventor: Harold A. Hildebrand, Auburn, Calif.

[73] Assignee: Auburn Audio Technologies, Inc.,  
Auburn, Calif.

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[51] Int. Cl.<sup>6</sup> G10H 7/00

[52] U.S. Cl. 84/603; 84/619; 84/645

[58] Field of Search 84/603–605, 619,  
84/645, 657

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Primary Examiner—Jeffrey W. Donels

Attorney, Agent, or Firm—Gary L. Bush, Esq.; Mayor, Day,  
Caldwell & Keeton, L.L.P.

[57] ABSTRACT

A device and method is disclosed to correct intonation errors  
and generate vibrato in solo instruments and vocal perfor-  
mances in real time. The device determines the pitch of a  
musical note produced by voice or instrument and shifts the  
pitch of that note to produce a very high quality, high fidelity  
output. The device includes a pitch detector that automati-  
cally recognizes the pitch of musical notes quickly. The  
detected pitch is then used as an input to a pitch corrector  
that converts the pitch of the input to an output with a desired  
pitch. The corrected musical note is then in tune with the  
pitch standard. The device and method employ a micropro-  
cessor that samples the signal from a musical instrument or  
voice at regular intervals using an analog-to-digital con-  
verter and then utilizes data derived from an auto-correlation  
function of the waveform to continuously determine the  
period of the waveform. The period of the waveform is then  
compared to a desired period or periods (such as found in a  
scale). The ratio of the waveform period and the desired  
period is computed to re-sample the waveform. This ratio is  
smoothed over time to remove instantaneous output pitch  
changes. The ratio is used to resample the input waveform.  
The resulting output waveform is processed through a  
digital-to-analog converter and output through audio inter-  
faces.

38 Claims, 9 Drawing Sheets