

With Systems Control Technology (SCT) Inc., JOS is professionally obligated to write a final report for a three-year project which has recently ended. This will be carried out under an ongoing consulting agreement whose term is currently set at one year. The main purposes of the long term of the consulting agreement are (1) to provide a vehicle for payment for incidental support services (such as fixing a JOS signal processing program or delivering a briefing on past JOS work), and (2) to maintain JOS' government clearances in the event he returns to SCT in the near future. JOS is not obligated to perform any services under this consulting contract other than to deliver the final report. This report is not to exceed 60 hours consulting time.

With MathWorks Inc., JOS is developing a high-level signal processing package for the PC-MatLab product. He will be receiving royalties on its sale. The planned DSP MatLab package for MathWorks is estimated to require about one man-month of effort distributed throughout the remaining evenings and weekends of this year.

Note in passing that the MatLab language is ideal for prototyping and checking applications for the DSP chip. MatLab would also be a good choice of DSP application language on the Next machine.

JOS is co-inventor of a MIDI pitch detector which is in manufacturing development at present. He is contractually obligated to provide, if requested, up to 50 hours per year of free consulting to the manufacturer and up to 50 additional hours per year of paid consulting.

JOS is inventor on a few music-related patents which are owned by Stanford University. The principal inventions are "waveguide reverberators" and specific table-lookup techniques for the synthesis of winds and strings. These patents will require some minor maintenance (occasional meetings and short write-ups) by JOS. In addition, there are several other music-related signal processing techniques developed jointly by JOS and CCRMA. If Next desires to make use of CCRMA technology, some agreement involving machines for CCRMA and non-secrecy will be needed. CCRMA also has some outstanding programmers who might very likely want to join the fun.

JOS is one of the key technical people in the CCRMA Associates program. Once per year, representatives from the music industry come to CCRMA for two days of technical presentations. JOS and his students present their recent work at this seminar. JOS also mails copies of his latest papers to the Associates, thus facilitating access to research at CCRMA.

By September 1 1986, JOS has promised to deliver two articles with sound examples for the System Development Foundation (SDF) book on computer music. These articles will document work already completed on the synthesis of strings and woodwinds. It is hoped this will be largely completed in June.

JOS has submitted papers for presentation to the IEEE Workshop on Audio and Signal Processing and the International Computer Music Conference, both occurring in the Fall of 1986.

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1986  
Julius Smith

ATTACHMENT 3: Prior Ideas, Inventions, Discoveries and Improvements

Julius Smith retains intellectual property rights in the following areas of his prior work:

- Digital Synthesis of All Stringed Musical Instruments  
(Examples: Piano, Guitar, Harpsichord, Violin, Viola, Cello)
- Digital Synthesis of All Wind Musical Instruments  
(Examples: Clarinet, Saxophone, Brasses, Flutes, Pipe-Organs)
- Digital Synthesis of All Percussive Musical Instruments  
(Examples: Snare, Bass Drum, Timpani, Triangle, Woodblock)
- Digital Synthesis of Voice  
(Examples: Patented "waveguide" vocal tract model,  
Novel method for estimating vocal tract parameters  
Pulse model for voiced excitation)
- Musical Use of Digital Delay  
(Examples: Room simulation, phasing, flanging, reverberation)
- Fundamental Structures in Digital Filter Implementation  
(Examples: Waveguide filters, Time-Varying Limit-Cycle  
Suppression, Overflow Oscillation Suppression,  
Single-Parameter Constant-Gain Digital Resonator)
- Analysis of Musical Sound  
(Examples: Piano Spectrum Envelope Measurement,  
Pitch Detection (Guitar to MIDI Converter Currently Licensed))
- Digital Signal Processing  
(Examples: Simplified Computation of Group Delay,  
Conformal Mapping Techniques for Filter Design,  
Sampling-Rate Conversion by Arbitrary Factors,  
Methods for Adaptive Delay Estimation)
- Modeling of Acoustical Systems  
(Examples: Efficient Simulation of Acoustic Tubes,  
Methods for Fitting Filters to Measure Spectra,  
Ways to model the Saxophone Bore,  
Patented method for Efficient Reed Modeling)