The Vector, Signal, and Image Processing Library (VSIPL):
Emerging Implementations and Further Development

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Abstract

INTRODUCTION

In the application domain of real-time embedded signal processing systems based on commercial off-the-shelf (COTS) hardware and software, an increasingly important goal is portability and vendor-neutrality of application software. The Vector, Signal, and Image Processing Library (VSIPL) Forum is a consortium comprised of industry, government, and academia that is developing the VSIPL API. The API is intended to serve as an open, vendor-neutral, industry-standard interface to vector arithmetic, signal and image processing operations for users of COTS workstations and embedded signal processing products.

Since the release of the completed VSIPL 1.0 API specification in April 2000, the standard is becoming more widely adopted by commercial vendors. In addition, extensions to the standard are planned that correspond to current growth areas in military embedded signal processing. In this presentation, we will review the final changes to the API and discuss commercial implementations and extensions.

VSIPL FORUM PRODUCTS

The completed VSIPL 1.0 API specification became available from the VSIPL web site (www.vsipl.org) in April 2000. Other documents publicly released on the VSIPL web site include definitions of the VSIPL Core and Core Lite profiles, subsets of the full API targeted toward particular well-defined application areas. Publicly available C language prototype implementations for both of these profiles are available on the web site. A VSIPL compliance test suite has been developed to assure that a given implementation satisfies the API specifications. The first version of the test suite supports the Core Lite profile of VSIPL.

COMMERCIAL PRODUCT STATUS

VSIPL is becoming widely available on workstations and military-class embedded computing hardware. Core Lite implementations of VSIPL are available on VME-class embedded COTS signal processors from Mercury Computer Systems, SKY Computers, and CSPI. MPI Software Technology has produced implementations of VSIPL Core Lite for use on commercial single-board VME computers and personal computers. Some of these vendors are working on implementing the full Core profile as well. DARPA has funded Annapolis Microsystems to develop a VSIPL API interface for use with its FPGA-based adaptive computing technology.

FUTURE EFFORTS

Future activities of the VSIPL Forum will concentrate in the near term on necessary revisions of the specification based on user feedback. Areas under development include the addition of image processing functions and a C++ binding to the VSIPL API, as well as extensions for error handling and for better functioning in a cluster environment.
The Vector, Signal, and Image Processing Library (VSIPL):
Emerging Implementations and Further Development

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VSIPL Goals

- Portable to workstations, embedded systems, FPGAs
- Applicable to simple and complex applications
- Easier upgrade cycle
- Reduced development time and cost
VSIPL API Properties

Object Based ANSI C Binding

Functionality
- float, complex, signed int types
- FFT, FIR Filters
- Vector arithmetic
- Matrix arithmetic
- Random numbers
- Convolution
- Correlation
- Matrix decomposition and solvers

Core Lite Profile

Core Profile

- Two modes of operation
  - Development mode with extensive error checking
  - Production mode with minimal error checking
VSIPL Forum Products

- Standard API for Vector/Signal Processing
  - Version 1.0 issued April 2000
- TASP VSIPL demonstration library
  - ANSI C production mode implementation
  - Developed by Randy Judd of SPAWAR
  - Core and Core Lite versions
  - “Core Plus” version including additional matrix functionality
- Portable C Test Suite
  - Tests compliance with Core Lite Profile of VSIPL 1.0 API
  - Does not test performance (speed or memory)

All may be downloaded from VSIPL web site
<http://www.vsipl.org>
## Implementations

<table>
<thead>
<tr>
<th>Available Now</th>
<th>Target Profile</th>
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<tbody>
<tr>
<td><strong>Vendor</strong></td>
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<tr>
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<td>Version for Linux under development</td>
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<tr>
<td>SKY Computers</td>
<td>Core</td>
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**In Development**

- Annapolis MicroSystems’ WildStar Boards
- MCCI’s Autocoding Toolset
The Future of VSIPL

Near-term

Get VSIPL 1.0 Established
  • Used in real programs

Mid-term

• C++ Binding
  – Better data type support
• Image Processing
  – Broader user base

Long-term

Parallel VSIPL
  • Higher level of abstraction
Summary

- VSIPL is an API for signal and image processing
  - Portable
  - Profiles defined for simple and complex applications
- Version 1.0 is complete and available

- Implementations are here

- The Forum is continuing to support and to enhance VSIPL

- Actively soliciting examples and “field reports”

- Next Meeting January 9-10 at Mercury in Chelmsford, MA