modern projects. Transmitting images will always consume large amounts of bandwidth, and storing images will always require special devices. Our goal is to describe an image compression transform coder based on artificial neural networks techniques (hereafter Neural Network Compression Transform Coder or NNCTC). Like all generic image compression transform coders, the NNCTC embodies a three-step algorithm: invertible transformation to the image (transform), lossy quantization (quantize), and entropy coding (remove redundancy). Efficient algorithms have already been developed to achieve the two last steps, quantize and remove redundancy [4]. The NNCTC offers an alternative invertible transformation based on neural network analysis [3].

A comparison of the compression results obtained from digital astronomical images by the NNCTC and the method used in the compression of the digitized sky survey from the Space Telescope Science Institute based on the H-transform [3] is performed in order to assess the reliability of the NNCTC.

Artificial neural network techniques are based on the dot-product calculation, which is very simple to perform in hardware [4]. It is in this sense that the NNCTC can be useful when high compression and/or decompression rates are required (e.g., space applications, remote observing, remote database access).

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N93-28812 160758 p-1

PROTOTYPE BACKSCATTER MÖSSBAUER SPECTROMETER FOR MESURment OF MARTIAN SURFACE MINERALOGY. T. D. Shelfer[1], R. V. Morris[1], D. G. Agresti[2], T. Nguyen[3], E. L. Wills[2], and M. H. Shen[2], [1]Code SN4, NASA Johnson Space Center, Houston TX 77058, USA, [2]Physics Department, University of Alabama at Birmingham, Birmingham AL 35294, USA, [3]Lockheed Engineering and Sciences Co., Houston TX 77058, USA.

We have designed and successfully tested a prototype of a backscatter Mössbauer spectrometer (BaMS) targeted for use on the martian surface to (1) determine oxidation states of iron and (2) identify and determine relative abundances of iron-bearing mineralogies. No sample preparation is required to perform measurements; it is only necessary to bring sample and instrument into physical contact. The prototype meets our projected specifications for a flight instrument in terms of mass (<500 g), power (<2 W), and volume (<300 cm^3).

A Mössbauer spectrometer on the martian surface would provide a wide variety of information about the current state of the martian surface:

1. *Oxidation state:* Iron Mössbauer spectroscopy (FeMS) can determine the distribution of iron among its oxidation states. Is soil oxidized relative to rocks?

2. *Mineralogy:* FeMS can identify iron-bearing mineralogies (e.g., olivine, pyroxene, magnetite, hematite, ilmenite, clay, and amorphous phases) and their relative abundances. FeMS is not blind to opaque phases (e.g., ilmenite and magnetite), as are visible and near-IR spectroscopy.

3. *Magnetic properties:* FeMS can distinguish between magnetite and maghemite, which are putative mineralogies to explain the magnetic nature of martian soil.

4. *Water:* FeMS can distinguish between anhydrous phases such as hematite, olivine, pyroxene, and hydrous phases such as clay, ferrihydrite, goethite, and lepidocrocite. What are the relative proportions of hydrous and anhydrous iron-bearing mineralogies?

In summary, a BaMS instrument on MESUR would provide a very high return of scientific information about the martian surface (with no sample preparation) and would place a very low resource demand (weight, power, mass, data rate) on spacecraft and lander. Our BaMS instrument can be flight-qualified within two years and is also suitable for lander missions to the Moon, comets, and asteroids.

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N93-28813 160759 p-1

SPACECRAFT COMPUTER TECHNOLOGY AT SOUTHWEST RESEARCH INSTITUTE. D. J. Shirley, Southwest Research Institute, San Antonio TX 78228-0510, USA.

Southwest Research Institute (SwRI) has developed and delivered spacecraft computers for a number of different near-Earth-orbit spacecraft including shuttle experiments and SDIO free-flyer experiments. Here we describe the evolution of the basic SwRI spacecraft computer design from those weighing in at 20 to 25 lb and using 20 to 30 W to newer models weighing less than 5 lb and using only about 5 W, yet delivering twice the processing throughput. Because of their reduced size, weight, and power, these newer designs are especially applicable to planetary instrument requirements. The basis of our design evolution has been the availability of more powerful processor chip sets and the development of higher-density packaging technology, coupled with more aggressive design strategies in incorporating high-density FPGA technology and use of high-density memory chips. In addition to reductions in size, weight, and power, the newer designs also address the necessity of survival in the harsh radiation environment of space. Spurred by participation in such programs as MSTI, LACE, RME, Delta 181, Delta Star, and RADARSAT, our designs have evolved in response to program demands to be small, low-powered units, radiation tolerant enough to be suitable for both Earth-orbit microsats and for planetary instruments. Present designs already include MIL-STD-1750 and Multi-Chip Module (MCM) technology with near-term plans to include RISC processors and higher-density MCMs. Long-term plans include development of whole-core processors on one or two MCMs.

N93-28814 160760 p-2

THE BACKGROUNDS DATA CENTER. W. A. Snyder[1], H. Gursky[1], H. M. Heckathorn[1], R. L. Lucke[1], S. L. Berg[2], E. G. Dombrowski[3], and R. A. Kessel[2], [1]Code 7604, Naval Research Laboratory, Washington DC 20375-5352, USA, [2]Computational Physics, Inc., Suite 600, 2750 Prosperity Avenue, Fairfax VA 22031, USA, [3]Sachs-Freeman Associates, 1401 McCormick Drive, Landover MD 20785, USA.

The Strategic Defense Initiative Organization (SDIO) has created data centers for midcourse, plumes, and backgrounds