DIGITIZATION AND WEB ACCESS OF A HISTORIC COLLECTION OF REMOTELY-SENSED IMAGERY. L. Rakovecic1,5, J. C. Dixon1,2, J. D. Cothren4, J. B. Dixon3, 1Arkansas Center for Space and Planetary Sciences, University of Arkansas, Fayetteville, AR 72701; 2Geosciences Department, University of Arkansas, Fayetteville, AR 72701; 3University of Arkansas Libraries, University of Arkansas, Fayetteville, AR 72701; 4CAST, University of Arkansas, Fayetteville, AR; 5Computer Engineering Department, University of Arkansas, Fayetteville, AR 72701.

Abstract: The objective of this project is to provide web-access to remotely-sensed imagery from the 60s and 70s to the research community. To accomplish this, imagery was first prioritized by its uniqueness. Second, it was digitized. This process involved scanning imagery using appropriate resolution and dynamic range and recovery using Adobe Photoshop 8.0 and MatLab 7.0. The third step was the creation of a web-interface using Macromedia Dreamweaver MX and Fireworks MX. The final step was the creation of a database for imagery metadata using Windows Access. Once the process was finished the imagery will be searchable by its metadata categories and viewable through University of Arkansas Libraries and Geosciences websites.

Introduction: Remotely-Sensed imagery used in this project was collected by Dr. Harold MacDonald, a former U of A professor of geology. After his retirement, the imagery was given to the University of Arkansas Libraries. This imagery consists of 5 series grouped by platform type: SEASAT, Aircraft radar, Skylab, SIR-A and Aerial photography. Consequently not only are these images from different density films, but also images from the same film roll have different reflections and need different settings for digitizing. The uniqueness and fragility of the image collection warrants its provision to the broader space science community via interactive access on the World Wide Web.

Digitization: Prioritization of the imagery by its uniqueness focused the project on aircraft radar imagery. Consequently, this project started by looking at the Panama, Arkansas, Oklahoma and Kansas imagery. Decisions about which images should be scanned first depended on their landcover classification (Urban, wetland, agricultural land etc.). Once a decision had been made, a selection of images was taken to Kansas City to be scanned at the Western Air Maps offices using their UltraScan 5000 scanner. At this point most of the images were scanned with 20 microns (1270dpi) scanning resolution and 8 bit dynamic range, except one experimental image that was scanned with 12.5 microns (2116 dpi) resolution for comparison. Scanned images were imported into Adobe Photoshop 8.0 where their histograms have been stretched so that image curves cover a larger spectrum of the gray scale, in order to make data on images more accessible to human eye.

Even though images seemed detailed and clear there was a lot of “noise” along with actual image data. In order to remove the “noise”, images were imported into MatLab 7.0 for further analysis using FFT (Fast Fourier Transform) methods. To obtain the best results FFT was used with 5 different filters:

1) low frequency pass filter < 0.25 of the image Area
2) low frequency pass filter < 0.5
3) low frequency pass filter < 0.6
4) low frequency pass filter < 0.75
5) high frequency pass filter > 0.25

for every scanned image. Most images responded the best to < 0.5 high frequency filter, by having the best balance of clarity, sharpness and absence of “noise”.

The main purpose of this process was to convert analog imagery to digital by loosing as little as possible actual imagery data.
Web-access Process: In order to make imagery and related metadata useful for the research community, imagery needed to be web-accessible through a well-designed and user-friendly interface website. Design of the website was important because it needed to be unique but still meet University of Arkansas Libraries’ standards since it is going to be linked from their web-pages. Macromedia Dreamweaver MX and Fireworks MX were used for this purpose.

Once the website was created and the University of Arkansas Libraries agreed on its design, focus was turned to creating a user-friendly interface, which includes easy but variable search options. In other words, a database needed to be created for metadata for all digitized and non-digitized imagery. Users are supposed to be presented with all available imagery from the collection even if the imagery is still only in analog form. For this part of the process we used Microsoft Access.

Results and Conclusion: This research provided numerous new ideas and conclusion that will be useful in future work on this project. By digitizing samples of Aircraft Radar imagery it was realized that no higher than 20 microns (1270 dpi) scanning resolution is needed for most of the imagery because higher resolution would perhaps give us some more clarity but not necessarily more significant data. This observation lead to the conclusion that it was not necessary to scan at especially high resolution, but that a standard desk top scanner with a transparency adaptor would be adequate. After scanning imagery and using Adobe Photoshop 8.0, images are transferred into MatLab where they are first resized and then FFT with low frequency pass filter < 0.5 is done on them. Even though this filter was shown to work the best with available imagery there is some imagery that will need nonsymmetrical filters. This process is needed for “noise” removal.

Future Work: Research undertaken in this project is, although important, only the beginning of the larger project. From here the most important step is to develop a workable database and connect it to the website so that any changes in the database change the website immediately. Even though the creation of the initial database structure was undertaken in Microsoft Access, for future development this database will be transferred to an Oracle software platform. Moreover, this project initially focused on only nine sample images from the aircraft radar series, but there is a lot more imagery from other series, SIR-A, Skylab, SEASAT, that needs to be made accessible.

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Work on a web-site (www.cast.uark.edu/cast/library_collection/MacDonald/index.htm) has been started. While creating a web-access for this imagery it became obvious that creating a working database will take more time than available. However it has been decided on database structure and discussed on searchable categories of this database (Figure 3).