



Space and Naval Warfare Systems Center Pacific

Speech Technology & Image Processing



Alma V. Moran • Southwestern College • Engineering Major

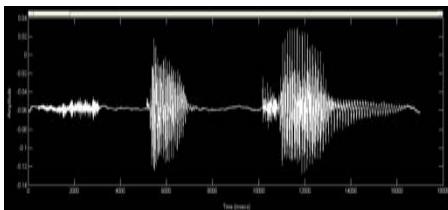
almavmoran@gmail.com

Introduction

The Space and Naval Warfare Systems Center Pacific (SPAWAR SSC Pacific) is the US Navy Research, Development, Acquisition, Test and Evaluation (RDAT&E) facility. It integrates Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR), Information Operations (IO), Enterprise Information Services (EIS) and Space capabilities.

As student interns, our team internship consisted of two different students working on two different areas: Alma Moran worked in Speech Science and Technology while Enrique Quijada worked in Image Processing.

Speech Science: How we produce, hear, process and interpret speech; how speech is modeled with equations and algorithms; how to translate those equations into a program that processes speech.



MATLAB spectrogram of the word 'Spectrum'.

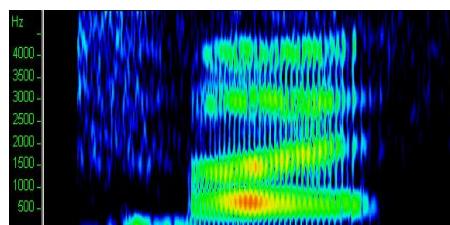
Image Processing: Set of computational techniques used for analyzing, enhancing, compressing, and reconstructing images. Its main components are importing; analysis and manipulation; and output.



MATLAB calculation of beam intersection.

Method: Speech Science

- To analyze speech, a course in how the human produces speech and a model of the vocal tract was taken by Alma Moran.
- The programming language of MATLAB was also learned and used throughout the internship, where Graphical User Interfaces (GUI) were also created.
- Different programs were used to record, process and analyze speech and sound, including MATLAB.



Formant spectrogram comparison of the word 'Foot'.

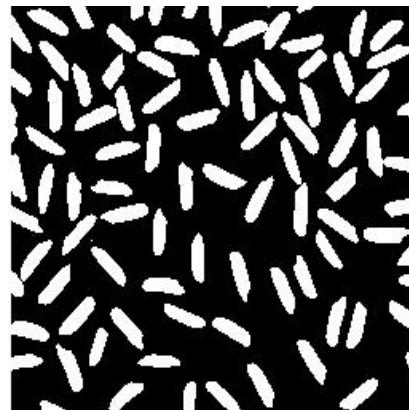
Results

- Simple and complex programs were successfully created in MATLAB.
- Working with other interns, different words were recorded and compared using MATLAB and Graphical User Interfaces.
- Speaker Verification and Speech Recognition Confusion Matrices were successfully created while working with other professionals and interns in the branch.

Enrique E. Quijada • Southwestern College • Computer Science Major

mr.quijada@gmail.com

Method: Image Processing



MATLAB digitized image showing some grains of rice.

- To perform advanced mathematical calculations based on digital information and specifically on digital images.
- To manipulate a digitized image in order to extract relevant information that otherwise would not be either available or visible to the human eye.
- To digitize images so that a broad range of processes can be applied to them such as image restoration, image compression, image segmentation, and object recognition.

Results

- Converted image processing algorithms from MATLAB to the C++ programming language.
- Developed new innovative algorithms for processing low contrast infrared (IR) imagery.
- Understood how to make a plug-in to Photoshop that allowed users to filter specific images with the algorithms converted to C++.

Conclusions

Both our mentors as well as all the other professionals with whom we came in contact not only shared a great deal of their vast professional knowledge with us but also gave us a most valuable insight into the engineering field by sharing some of their unique professional experiences.

Furthermore, the skills gained through hands-on exposure while at the same time enhancing our team building abilities will forever shape our future careers in the fields of science and technology as we were actually able to successfully follow directions from the very professionals we got to admire.

Acknowledgements

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