

Research Opportunities in Electromagnetics, Astronomy, and Acoustics

1. Radar system analysis
2. Optical astronomy
3. Radio astronomy
4. Sound/vibration measurement

Radar System Analysis

Project Goal: Use computer simulation and emulation to evaluate the performance of advanced instrumentation radar systems.

Examples:

1. Random Noise Radar
2. Inverse Synthetic Aperture Radar
3. Portable FMCW Radar



Why?

1. Stealthy radar for low-observable platforms
2. Location of radar scattering centers
3. Anti-missile applications

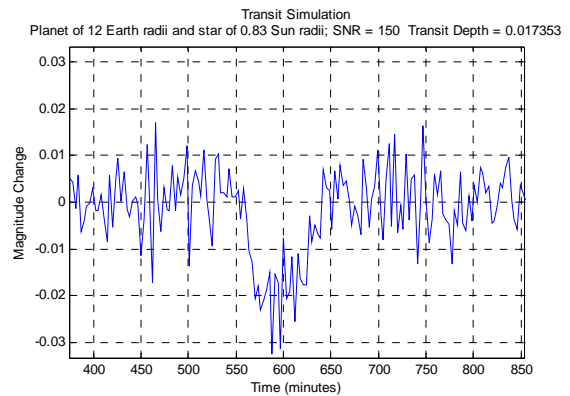
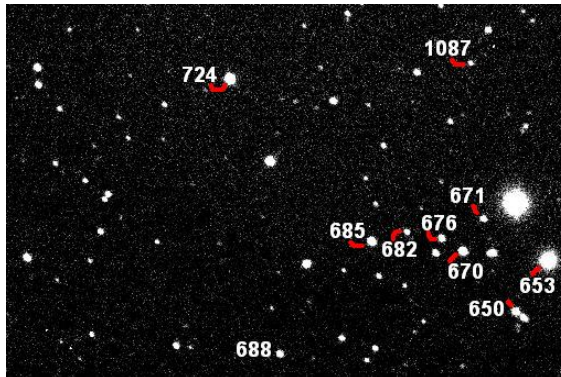
Sponsor: Star Dynamics Corporation

Specific Tasks: Project-dependent, but most involve:

- MATLAB simulation
- LabView emulation
- Analysis of data from prototype hardware

Optical Astronomy: Asteroid and Variable Star Photometry

Project Goal: Measure variation in light intensity from asteroids and/or variable stars using the 10" Lundin telescope at Weaver Observatory and CCD camera



Why? Contribute to study of asteroid properties

Specific Tasks:

1. Review previous work
2. Identify candidate asteroids and/or variable stars
3. Calibrate system (telescope, camera, software)
4. Collect data
5. Analyze data

Radio Astronomy: 1) **Twin-helix radio telescope**
 2) **Signal Detection Algorithms for SETI**

1) Project Goal: Calibrate and operate receiver for twin-helix radio telescope



Why? Several objects in the sky (the Sun, the galactic center, Cass A) radiate sufficiently strongly to permit detection by a radio telescope with relatively small aperture.

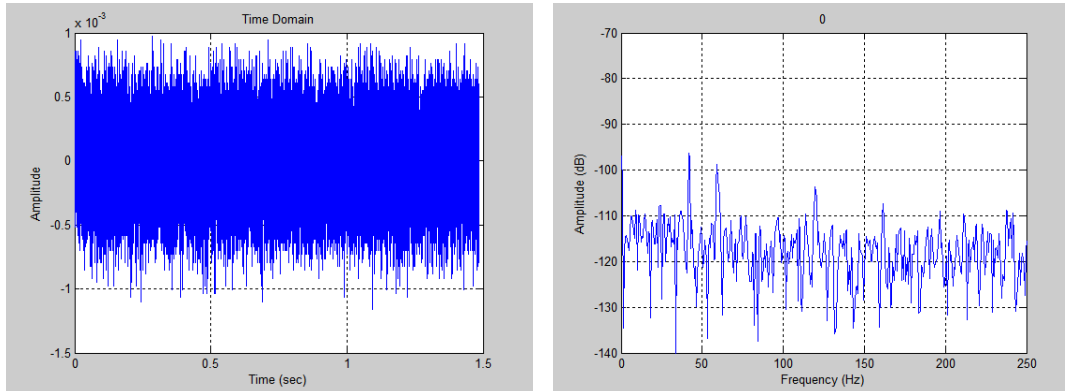
Status: Antennas constructed.
 Receiver designed, fabricated and tested.
 Receiver calibrated
 Data acquisition system developed.
 Antenna mismatch detected.

Specific tasks: Learn antenna and receiver technology
 Identify cause of antenna mismatch
 Test entire system using artificial and natural sources.

2) Project Goal: Evaluate the ability of the FFT and alternative algorithms to detect signals with novel time- and frequency-domain characteristics

Sound & Vibration Measurement and Analysis

Project Goal: Develop and use instrumentation and software to measure the intensity of sound and low-frequency vibrations in the environment.



Why? Environmental improvement through physics
General: Noise pollution
Specific: Homeowner Disturbance

Specific Tasks:

1. Review previous work
2. Design data-collection system
3. Assemble and test system
4. Collect data
5. Analyze data