Project Checklist

Working Vector Generation Pipline (Nick)

- Filters in pipeline before FFT audio data to allow for an effective Fourier Transform.

- 512 point FFT generates frequency measurements of preprocessed input audio.

- Magnitude Calculator computes magnitudes of different frequencies in signal from FFT output.

- Mel Scale Converter converts frequency magnitude measurements based on Mel Scale coefficients into a vector more reflective of how the human ear interprets the frequency data.

- Endpoint detector determines when a vector from this pipeline is contained in a word or is uninteresting non-word noise.

- Endpoint detector streams detection output and vectors to word recognition system.

- Endpoint detector generates average energy data to display.

Working Joystick and VGA output

- FFT Sprite displays current 512 point FFT output (Nick)

- Mel Value Sprite displays current Mel values (Nick)

- Word Input Detection Sprite displays output of end point recognizer to demonstrate when input data is determined to be a word. (TB)

- Word Matching Sprite displays distances between last sample and trained words and indicates "winning" match (TB)

- Complete VGA Display displays all sprite modules (Nick)

- Some mechanism for translating distinct word recognitions into joystick signals should be implemented. (Nick/TB)

  - NOTE: As a backup plan this may only involve wiring word recognition outputs to an existing joystick.

Working Word Recognition System (TB)

- DTW module implements DTW algorithm

- DTW module uses a basic distance calculation

- Word recognition system effectively stores trained words and new word samples

- System can effectively query stored words and samples

- DTW module can compute a useful measure of the distance between a trained word and a sample

- Master module effectively manages DTW modules. The Master should:
  - Send data to the DTW modules as appropriate,
  - Control global module operation (tell DTW modules to run after a new sample is received),
  - Deal with words received while DTW modules are busy

- Judge module accurately receives and compares DTW module results

- Judge module determines best match and whether there was a match at all

If Time Permits:

- Optimized DTW Module. This should be an improvement in that the DTW module now does not perform unnecessary calculations and/or simply operates more quickly overall. (TB)

- Non-intuitive Distance Calculation. An alternative distance calculation may yield better distance measurements from DTW. (TB)

- Cepstral vector values. These values may make a more useful feature vector for describing words. (Nick)

- Translation module from Judge output to USB signals for USB joystick. This should allow our system to interface as a joystick to any modern PC. (Nick/TB)

- Implement HMM-based comparison algorithm in place of DTW. This alternative algorithm may provide better distance measurements then DTW. (TB)