The *discrete wavelet transform* decomposes a time series (or other sampled function) into $l^2$-orthogonal components each having a characteristic length scale. Actually there are many wavelet transforms, that is, many orthogonal bases of $l^2$ whose members are dilates and translates of a single “mother wavelet”. Haar introduced the first such transform, around 1910. Beginning with Daubechies’ pioneering work in the 1980’s, many other wavelet transforms have been discovered.

Electrical engineers have also a natural interest in decomposition of time series according to scale. Longer scales pose less stringent sampling requirements, so such a scale decomposition can lead to economical signal storage and processing. In the 1970’s, several researchers in digital signal processing proposed *multirate filter banks* to accomplish scale-related decomposition and sampling.

This thesis will explain the close relation between these concepts, wavelet transform and filter bank, originating in two different disciplines. In fact, the discrete wavelet transform is a so-called conjugate mirror filter. In showing this equivalence, I will describe in detail the implementation of some special instances of the wavelet transform or filter bank. I will illustrate the decomposition of signals using the *WaveLab* software suite, written in Matlab by Donoho.

I will use as my initial sources *Introduction to Wavelets and Wavelet Transforms: A Primer* by Burrus, Gopinath, and Guo, *A Wavelet Tour of Signal Processing*, 2nd edition, by Mallat, and *Ten Lectures on Wavelets* by Daubechies. These texts give good overviews of the topic proposed for the thesis. Also their extensive bibliography should help me identify the primary literature.