Abstract

Engineering education is to move engineering students along the progressive path from being novices toward becoming experts in design, problem-solving and application of knowledge. Engineering problem may require more computations than is possible by hand. Computer-aided engineering is the process of solving engineering problems with the aid of computer software. Engineering Lecturers need to help engineering students to develop expertise in Computer-aided engineering with examples. The development of Discrete Wavelet Transformation is used as a case study. A wavelet is a small wave whose energy is concentrated in time. Wavelets applications include signal processing, noise filtering, image processing, and document analysis. Among wavelet families, Haar wavelet is selected. Scientific representations of the problem and a logical plan of attacking the problem are presented. Necessary equations are derived. A modular approach to programming is demonstrated. A complex problem is broken down into simple tasks and steps which are coded into simple short MATLAB programs. A program calls another program to execute some specific tasks. Programs are checked against possible errors using a situation where the answers are
known. Discrete wavelet transformation and inverse discrete wavelet transformation for 1D, 2D, and 3D discrete-time signals have been implemented. 2D gray level images and 3D color images are also considered. The use of similar examples is recommended for Engineering Lecturers.

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**Index Terms**

Computer Science  
Software Engineering

**Keywords**

Engineering Education, Problem-solving, Computer-aided engineering, MATLAB, Discrete Wavelet transformation.