Digital Signal Processing

Introduction

Areas of Applications - General

Areas of Applications - Mechanical Engineering

3 types of general problems addressed

Some typical signals and processing

DSP in various disciplines

Communication (Electronics, speech)

EE – home appliances (TV, Music)

Image processing

Control

Civil Engineering –Earthquakes, ground motions

Aeronautical Engineering

Medicine (EEG, ECG etc)

Physics (Optical devices)

Economics, Finance (Economic models, Stock market)

and many more

DSP in mechanical Engineering
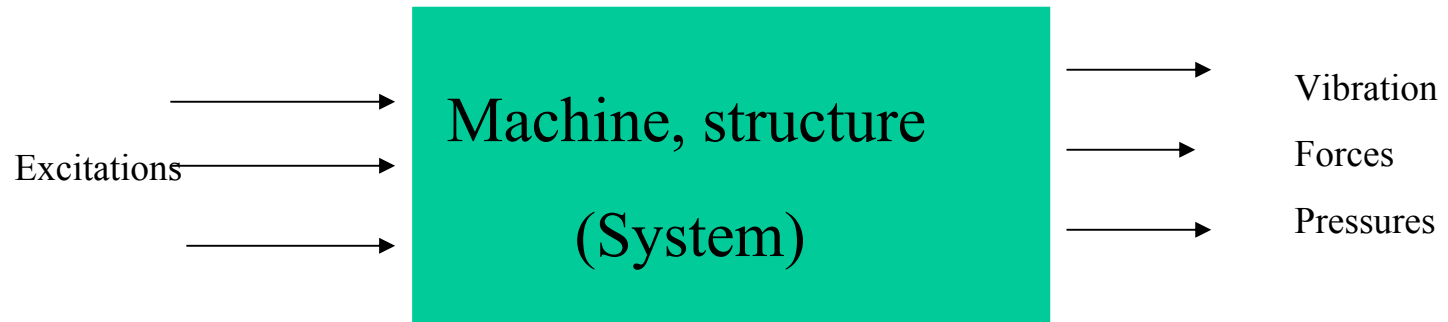
Control

Measurements

Manufacturing

Diagnostics

Design (dynamic aspects)

Products (Mechatronics)

Vibration (noise) control

and many others

Black box model

Excitations → **Machine, structure (System)** → Vibration, Forces, Pressures

Surveillance

Machine, structure

(Not identified)
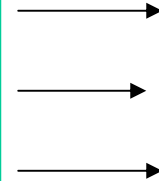
→ Vibration

→ Forces

→ Pressures

Example of application: Diagnostics

Identification

Machine, structure (To be identified)

Excitations →

→ Vibration
→ Forces
→ Pressures
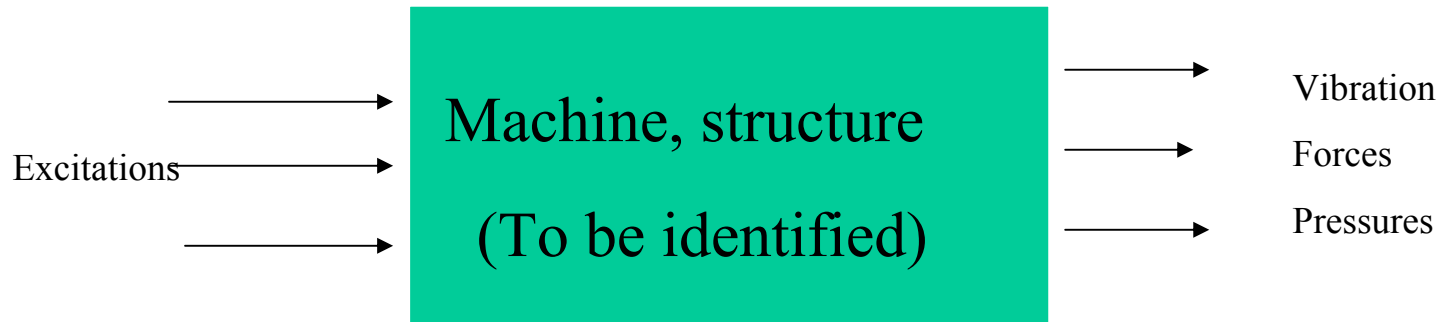
Example of application: Experimental Modal Analysis

Control of systems

Characterisation of excitations

Excitations

Machine, structure
(System)

Vibration

Forces

Pressures
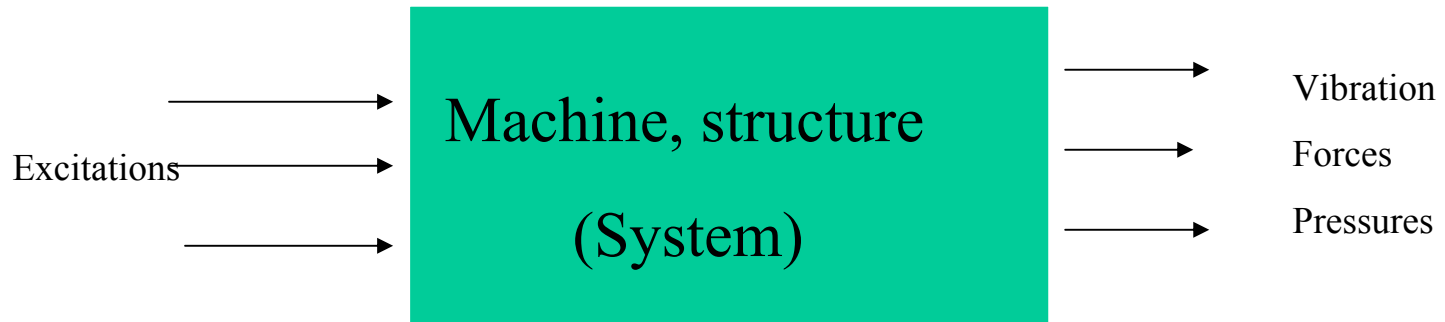
Example of applications: Exciting force estimation
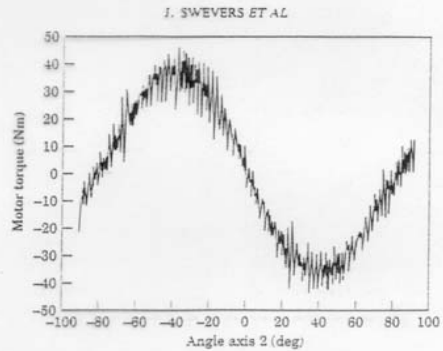
Identification of acoustic sources

Figure 9. Measured motor torque for axis 2 as a function of the angular position of a.
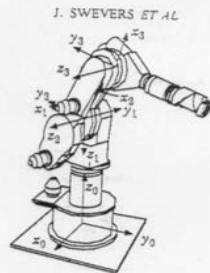

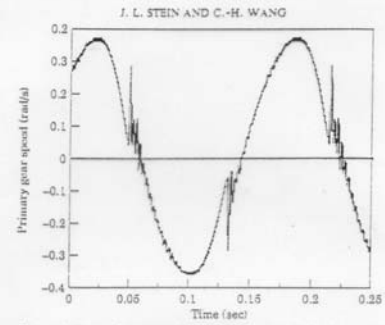Figure 1. Schematic representation of a KUKA IR/361 industrial robot.

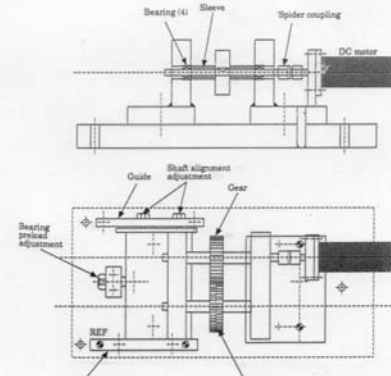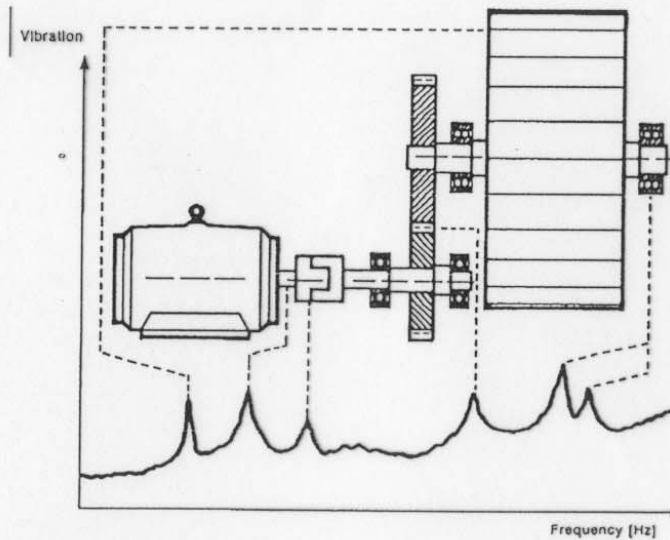Figure 5. A typical raw primary speed signal with bounces indicating tooth impact.

Figure 1. Servomechanism test stand.

Signal Processing: Introduction

Diagnostics of Machinery : Frequency analysis

Signal Processing: Introduction
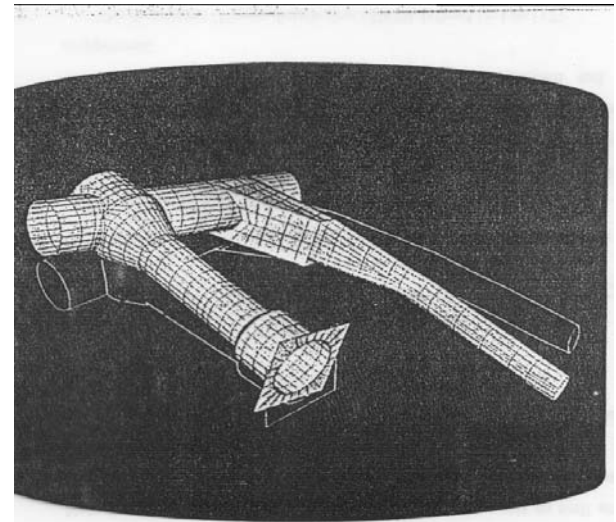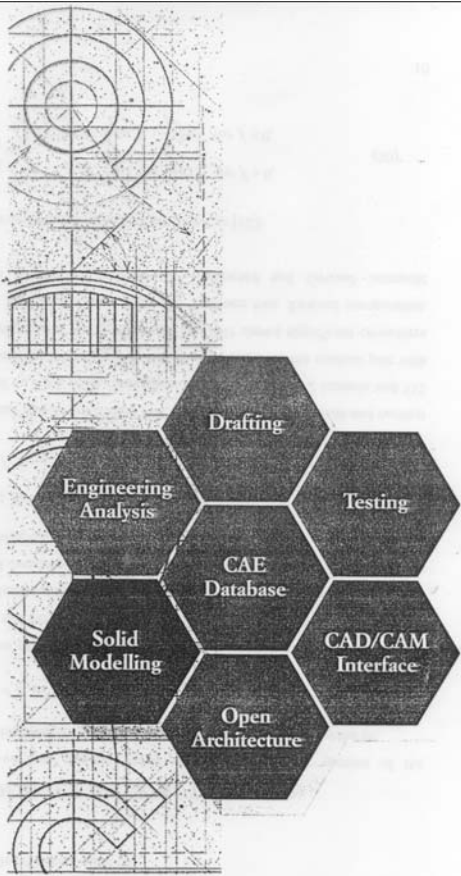
The Co-operative Marketing Programme (CMP)

electing the right software is vital for a uccessful and secure computer olution. The CMP helps you to choose ith confidence.

he CMP brings you a choice of top pplications from market leaders in our specialist area. They are horoughly vetted by Digital for quality, upport of Digital architecture, ntegration capabilities and onformance to industry standards.

ach third party supplier has a superb ustomer satisfaction record and roven long-term support ability All ave first-class working relationships ith Digital. Joint consultations with ustomers, demonstrations and romotions are essential to the CMP. ogether, we work towards optimum pplication performance, with ommitments on new product evelopment and support of new igital technology.

Drafting

Engineering Analysis

Testing

CAE Database

Solid Modelling

CAD/CAM Interface

Open Architecture

Deformed geometry, presented in
either static or animated form,
lets you see clearly how a
structure will move under load.

Signal Processing: Introduction
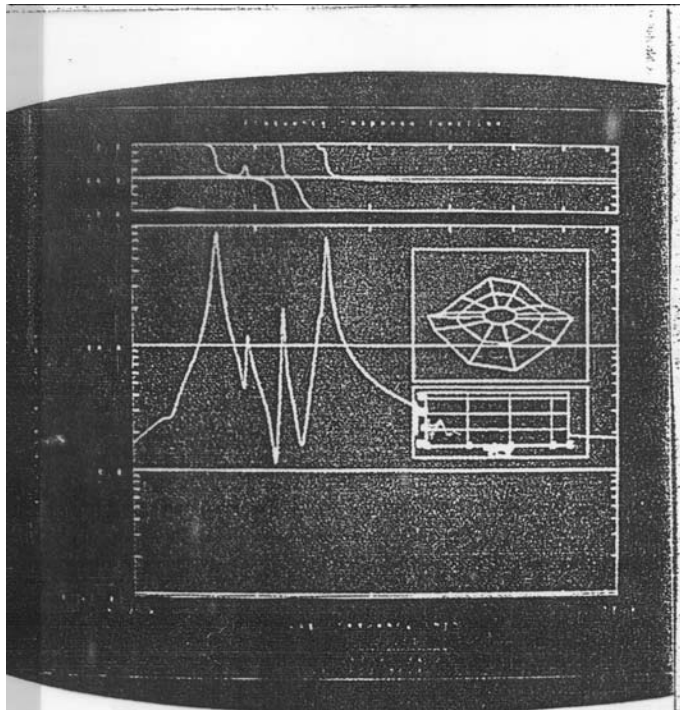
Geometric data and an impulse response functions are inset on a frequency response function plot.

Signal Processing: Introduction
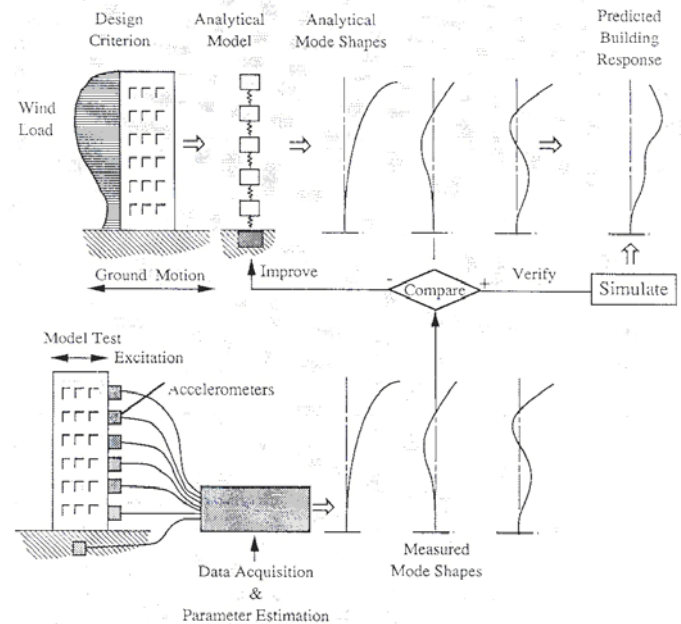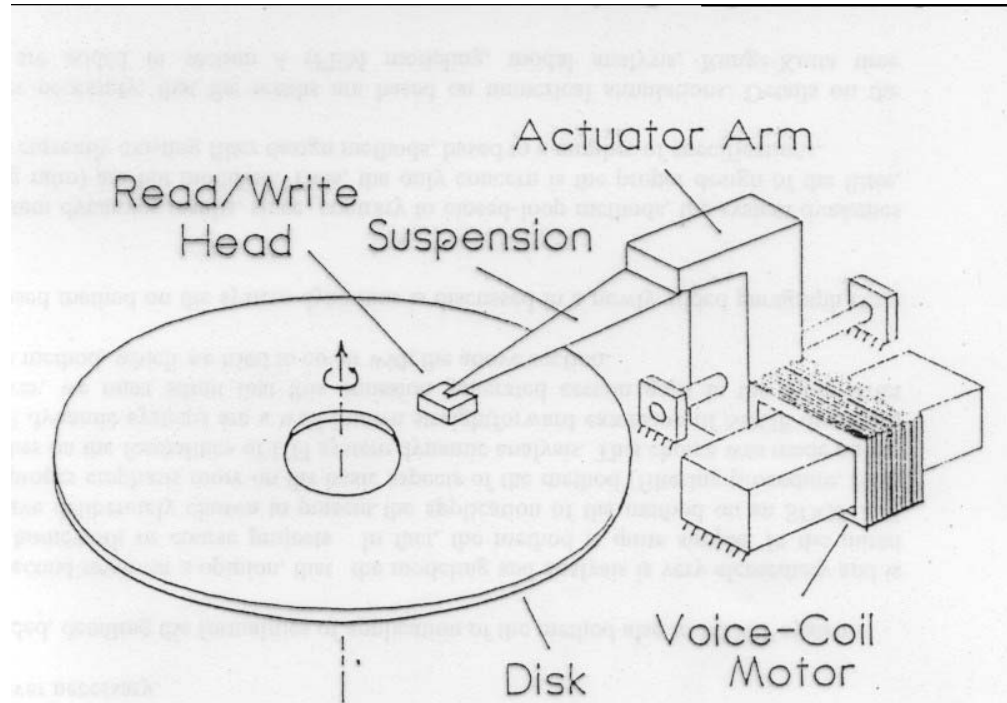
Fig. 1 Relevant mechanical components of small form factor rigid disk drives
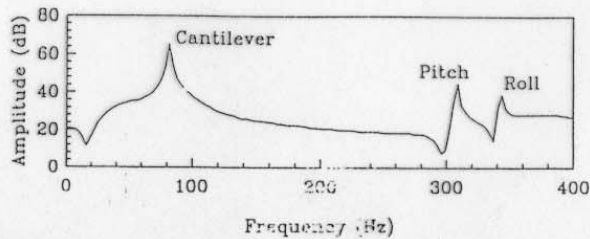
Signal Processing: Introduction

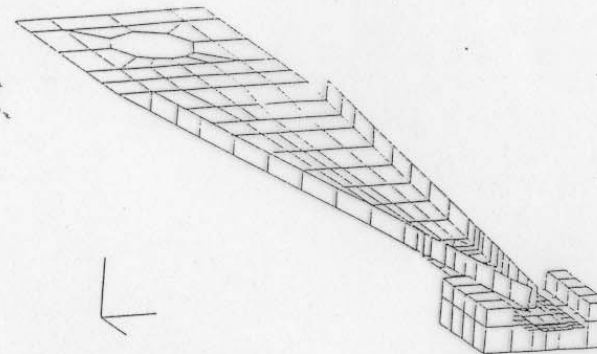Fig. 6 Frequency spectrum of transient response of head/suspension in free head vibration test

Fig. 8 Finite element model of read/write head suspension

Cantilever
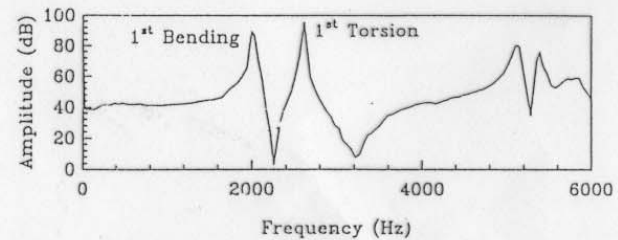80.4 Hz

77.4 Hz

Pitch
304.1 Hz
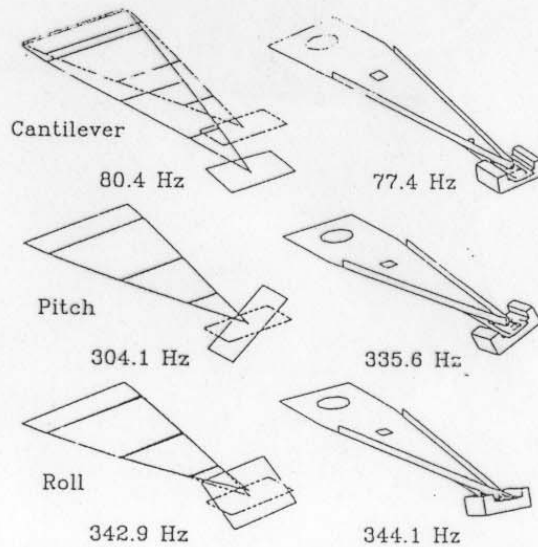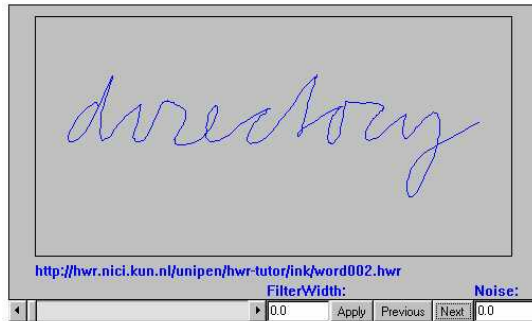
335.6 Hz

Roll
342.9 Hz

344.1 Hz

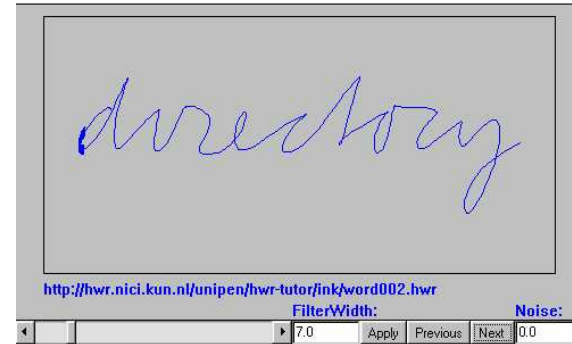Fig. 9 Transfer function of suspension with regular head (fixed head vibration test)

Also in Fig. 7, results from the finite element analysis (FEA) are shown for comparison. Figure 8 shows the complete finite element model which consists of 419 nodes and 310 elements. Although the primary focus of the current work is on experimentation, numerical analysis is an important and integral

Signal Processing: Introduction

An interactive demo of low-pass filtering of on-line ha:

http://hwr.nici.kun.nl/unipen/hwr-tutor/ink/word002.hwr

FilterWidth: 0.0   Apply   Previous   Next   Noise: 0.0

An interactive demo of low-pass filtering of on-line hand

http://hwr.nici.kun.nl/unipen/hwr-tutor/ink/word002.hwr

FilterWidth: 7.0   Apply   Previous   Next   Noise: 0.0

Source code

An interactive demo of low-pass filtering of on-line hand

http://hwr.nici.kun.nl/unipen/hwr-tutor/ink/word002.hwr

FilterWidth: 18.0   Apply   Previous   Next   Noise: 0.0

Source code

An interactive demo of low-pass filtering of on-line l

http://hwr.nici.kun.nl/unipen/hwr-tutor/ink/word002.hwr

FilterWidth: 27.0   Apply   Previous   Next   Noise: 0.0

Source code

Signal Processing: Introduction