Lecture 6
Engineering Problem Solving

October 14, 2010

Engineers are to solve problems

- Transportation: Car, plane, Boat, ...
- Medical Equipments: Temperature sensor, blood pressure, ER Room, Operating room,..
- Communications: Radio, TV, cellular, Wireless,...
- Computer: Unlimited resources.

Famous Engineers

- According to the September 16-17, 2006 edition of the Wall Street Journal's Weekend Edition, about 20% of the CEO's of the top US companies have engineering degrees - the most common degree - followed by business administration, liberal arts, economics, and accounting.

Politicians

- **Yasser Arafat** - Palestinian leader, graduated as a civil engineer from the University of Cairo

Politicians

- **Leonid Brezhnev** - leader of the former Soviet Union, metallurgical engineer.

Politicians

- **Jimmy Carter -** 39th President of the United States, Nuclear Engineer
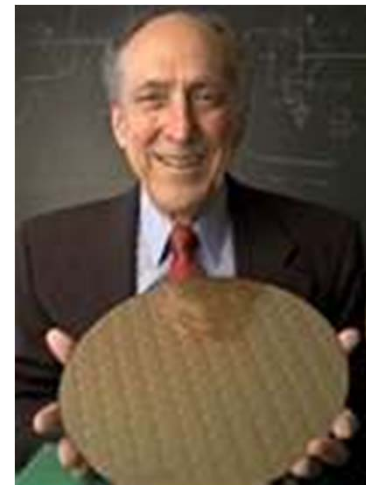
Famous Electrical Engineer

- ## Steve Wozniak   Robert Dennard

cofounded Apple   Invented the DRAM

Computer   (dynamic random access memory)

Famous Electrical Engineer

- [James Truchard, PhD](#) - founder and CEO of National Instruments,

- [Martin Cooper](#) - inventor of the cell phone

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Famous Electrical Engineer

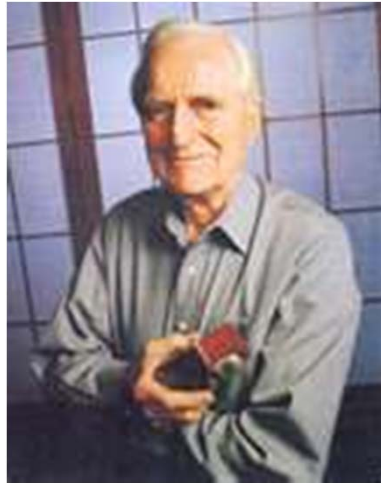- Karlheinz Brandenberg - co-developer of the MP3 compression scheme

- Amar Bose, PhD - founder of the Bose Corp

Famous Electrical Engineer

- [Douglas Engelbart](#) - inventor of the mouse

- [David Packard](#) - co-founder of the HP Company,

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- Rowan Atkinson, better known as Mr. Bean, was into Electrical Engineering.

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- Alfred Hitchcock, film director, Mechanical and Electrical Engineer

Discussion on Problem solving

- Focus Question: How do you solve a problem?

- What do you need to know?

- Suppose you don't have a question, you just have a goal? What do you do then?

Steps Suggested by the students

Read the problem with an open mind

➢Look for information.

➢Identify key facts.

➢Separate the givens from the unknown.

General Guidelines

➢ Breakdown the known information into familiar and unfamiliar territory.

➢ Identify what appears logical, that you know is derived from what.

➢ Identify similar problems

Formulate the question into an equation

- Go for the obvious.

- Recall what are the rules.

- An equation describes behavior.

- Relate this question to previous solutions or decide how it is different.

Hypothesis

➢ Tentative path to a solution.

➢ Evaluate the solution

➢ Look at your units for consistency.

➢ Is the solution reasonable and "in the ballpark" of your expectations

PROBLEM SOLVING EXAMPLE

Problem: Fill a bottle with stones

Instructions:

- Document any assumptions that may be required

- Write a step-by-step procedure for solving the problem

- Do this in pairs first then have a solution for your table

PROBLEM SOLVING EXAMPLE

Assumptions:

- Bottle is present
- Stones are present
- There are enough stones to fill bottle
- Bottle is empty (or at least not full)
- Some (or all) stones fit through opening

Problem Chart

Algorithm:

1. Set bottle upright near stones

2. Check to see if bottle is full. If so, then go to Step #6

3. Pick up a stone and try to put it in bottle

4. If stone too large to fit, discard stone, and go to Step #3

5. Otherwise, the stone fits, go to Step #2

6. Stop