Defining Embedded Systems

An embedded system is a computer and associated devices that provides control, monitoring or assistance in the operation of a larger system.

This implies that a typical embedded system:

- may be all or partially invisible to the user;
- consists of both a hardware and software component;
- has a limited compute functionality;
Examples of Embedded Systems

- The control system for a microwave oven (consumer).
- The speech system in your stuffed Spongebob Squarepants (toy).
- The vision system in an industrial robot (industrial).
- The anti-lock braking system in a 1995 Buick Regal (automotive).
- The pressure control in the turbine of a electrical power plant (industrial).
- Cellular telephone control (communications).
- Heart pacemakers (medical)
Properties of Interest

EM’s may have:

- power constraints.
- physical location constraints.
- sensor components.
- control components.
- real-time behavior.
- failure modes that are catastrophic.
- cost limitations.
- no programming interface.
Importance

- Annual growth of 18% versus about 7 computers.
- Many emerging technologies.
- More embedded systems are in control of major infrastructure components.
- Opportunities in language development, operating systems and algorithms.
Topics to Study

- The architectures of embedded systems.
- Hardware software co-design.
- Embedded system and processor architectures.
- Embedded system programming methodologies.
- Real-time software design and implementation.
- Sensors and sensor interfacing.
- Control systems.
- Reliability and fault-tolerance.