NCS 362: Embedded Systems
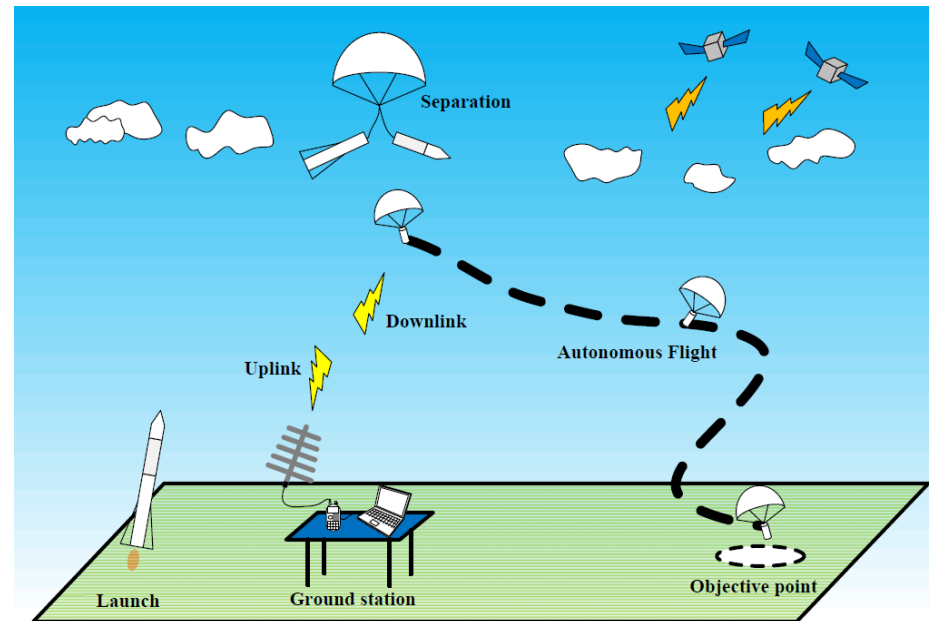
Instructor:

Dr. Ahmed Shalaby

http://bu.edu.eg/staff/ahmedshalaby14#

Dr. Ahmed Shalaby

Academic Position: Asst. Professor

Current Administrative Position:

Ex-Administrative Position:

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Scientific Name: Ahmed Shalaby

Publications [Titles(**11**) :: Papers(**3**) :: Abstracts(**11**) **]**

Courses Files(**93**)

Inlinks: (**0**)

External links: (**41**)

News

Great Teams: Embedded System Course: CanSat Project. [2022-07-04]
https://www.youtube.com/watch?v=w7v8W1ENgqM more

Research Interests

Hardware Security, System on Chip, Network on Chip, VLSI, Embedded System, High Efficiency Video Coding (HEVC)

Selected Publications

Efficient autoencoder-based human body communication transceiver for WBAN

Sentry-NoC: a statically-scheduled NoC for secure SoCs

Automatic arrival time detection for earthquakes based on Modified Laplacian of Gaussian filter

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Sidebar navigation:

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Learn any language!
Past, Present, and Future of Computer Architecture
History of computers | تاريخ الكمبيوتر
History of Operating Systems | تاريخ أنظمة التشغيل
Try to understand and Improve your English: Surah al-Kahf (in-depth) Tafsir
WHY IS JESUS WHITE BY MUHAMMAD ALI
Improve you English ... audio books
Motivation: سيمون سينك - جيل الألفية
What If Money Was No Object? - Alan Watts
awesome Tech : Michi Yamamoto Channel
BBC Learning English
Longman 3000 Words List Pronunciation
Longman Communication 3000 Words
Speak English: English Coach Chad
IEEE Spectrum Magazine
MIT Technology Review
zAmericanEnglish - Channel
50 years of Computer Architecture- by David Patterson
ملخص كتاب : 12 قاعده للحياه - جوردن بيترسون
Silicon Run : manufacture microchips
بابائية اعتنقت الإسلام وتطرح أسئلة جميلة
أول منصة عربية متخصصة في التحديات البرمجية
Calculus - anaHr
The Now Habit - عادة الإنجاز
The astounding athletic power of quadcopters
PROJECTION MAPPING

Navigation menu:

CSE234: Embedded Systems
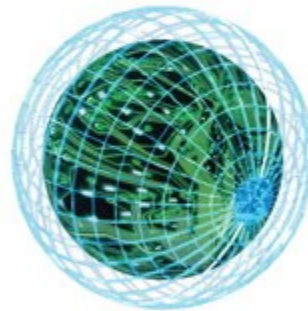
Why?

How?
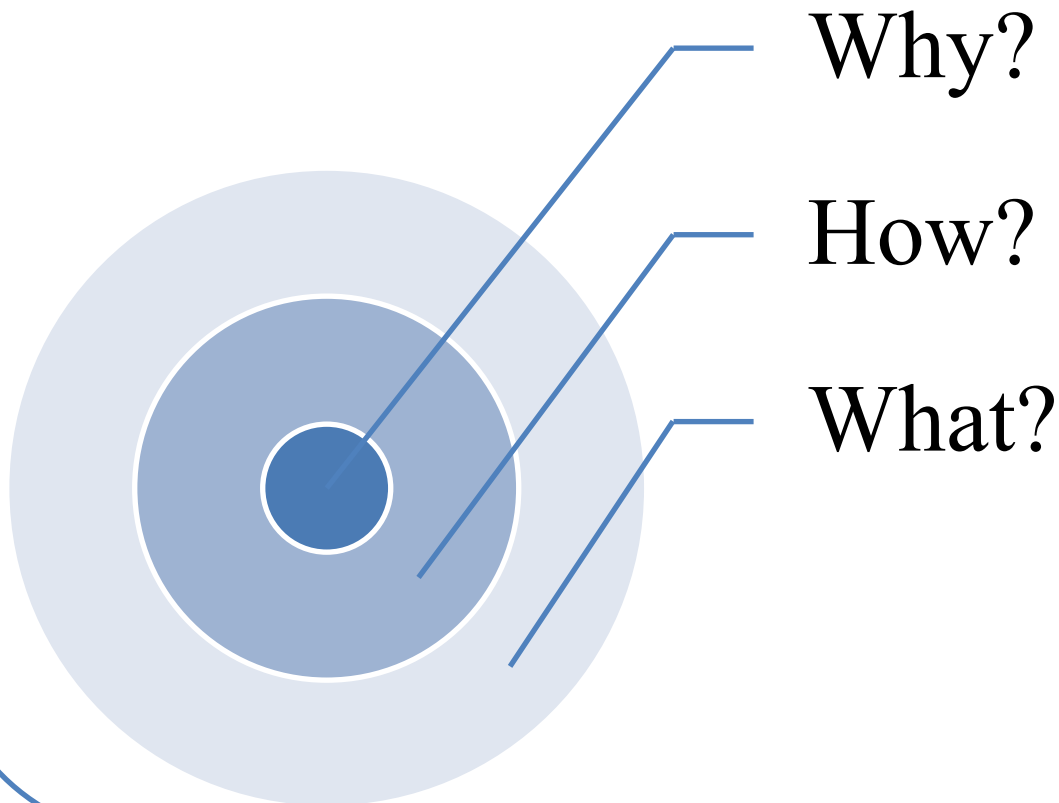
What?

What ? Embedded Systems

- **Embedded computing system**: any device that includes a programmable computer but is **not** itself **a general-purpose** computer.

- Take advantage of application characteristics to optimize the design.

How ? Course Book

the avr
microcontroller
and embedded
systems
using assembly and c
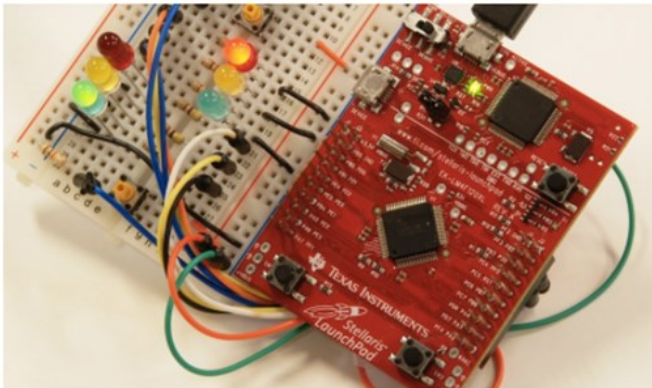
MUHAMMAD ALI MAZIDI

SARMAD NAIMI

SEPEHR NAIMI

How ? Course Book

Embedded Systems - Shape The World
http://users.ece.utexas.edu/~valvano/Volume1/E-Book/

users.ece.utexas.edu/~valvano/Volume1/E-Book/

Embedded Systems - Shape The World

Table of Contents

Jonathan Valvano and Ramesh Yerraballi

Embedded Software in C

http://users.ece.utexas.edu/~valvano/embed/toc1.htm

How ? Course Content

Software Engineering

Programming Assembly + C

Computer Architecture (AVR)

+

Electronics (Hardware)

Embedded Systems

How ? Course Content

Lec #	Subject	Week #
Lec1	Introduction to Embedded Systems	Week #1
Lec2	Introduction to microcontrollers.	Week #2
Lec 3	Microcontrollers - architecture & families	Week #3
Lec 4	microcontrollers – Software Engineering	Week #4
Lec 5	microcontrollers - C Language	Week #5
Lec 6	microcontrollers - assembly language	Week #6
	Mid-term Exam	Week #7
Lec 7	Input/ Output Interface.	Week #8
Lec 8	microcontrollers – addressing modes	Week #9
Lec 9	Serial, Parallel, and Analog I/O Interfacing	Week #10
Lec 10	Interrupt Programming	Week #11
Lec 11	Communication Protocols (Serial and Parallel)	Week #12
Lec 12	Debugging, and Code Optimization	Week #13
Lec 13	Prototyping, and Final Project.	Week #14

Assessment

Final-Term Exam   **40**

Projects final project -> lab exam   **20**

Team members

Ahmed Radwan Goda

Ahmed Mohamed Youseff

Mahmoud Reda

Ibrahim Tamer

Rahma Nagy

CanSat Mission Sequence

1. Set up CanSat and put it into a rocket and turn on switch .
2. Rocket side prepare launch (you cannot contact and not predict the time in this phase precisely)
3. Launch with high acceleration (CanSat may measure something in a rocket and write in memory)
4. CanSat starts certain operation triggered by some switch at the timing of release from the rocket
5. Downlink mission data as well as write in memory
6. Uplink command may tell CanSat to do something
7. Landing may trigger also another actions
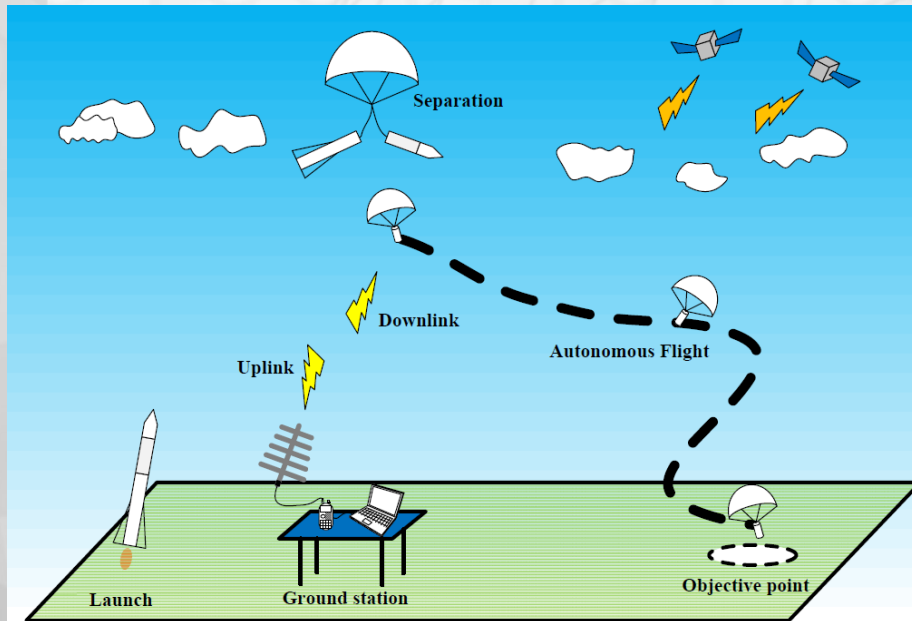
Assessment

Air Command
Water Rockets
Day 90
Acceleron V & Axion IVb
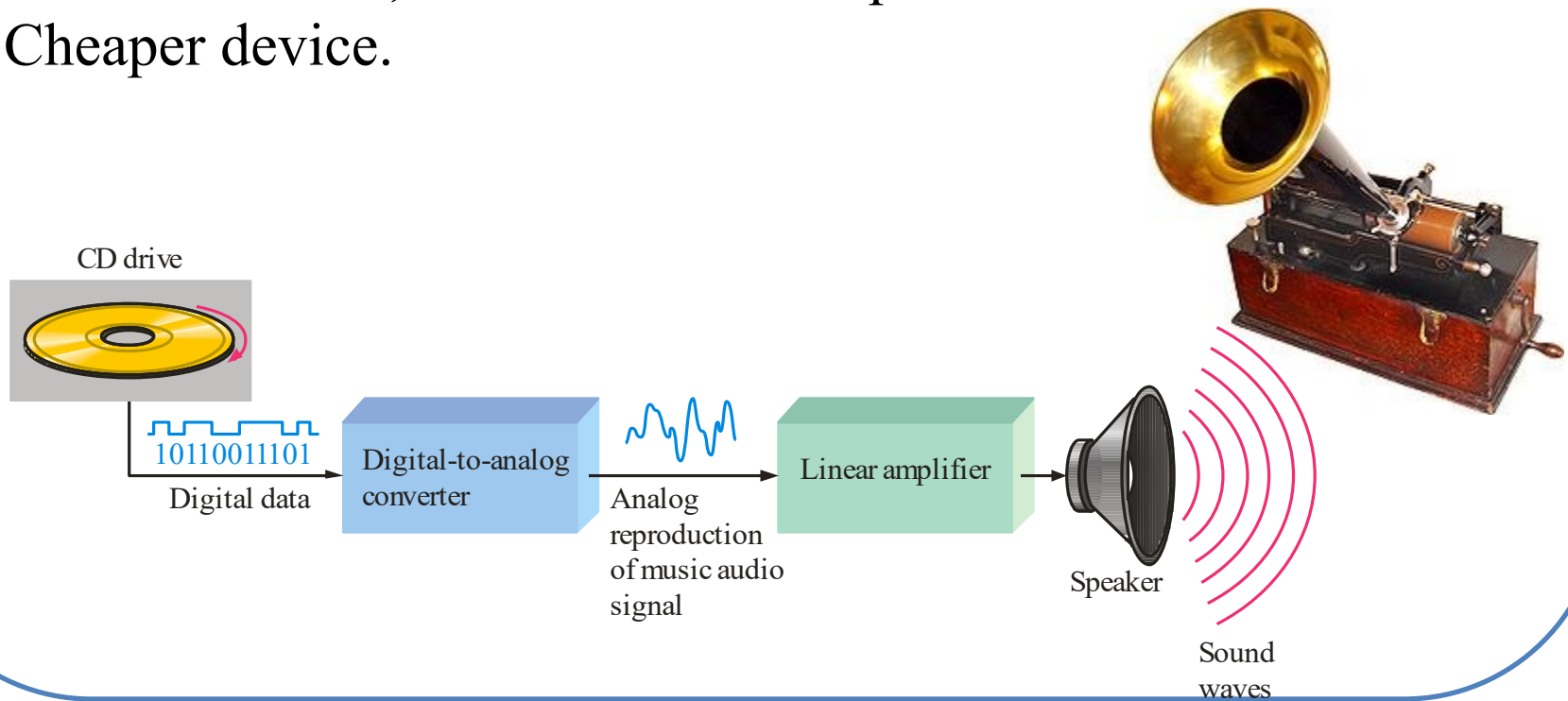flights to 787' and 810'

27th March 2010

www.AirCommandRockets.com

Why ? Embedded Systems

Analog to Digital Systems (Why)

- Easier to design.
- Flexibility and functionality.
    easier to store, transmit and manipulate information.
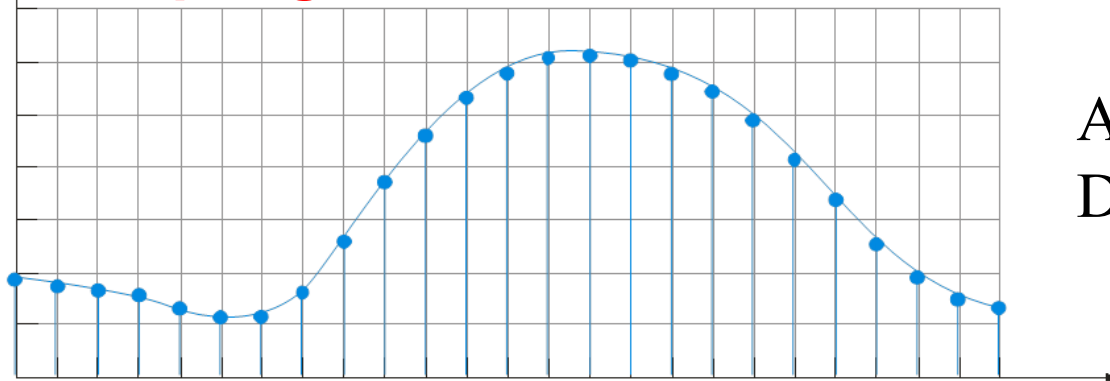- Cheaper device.

CD drive

10110011101
Digital data

Digital-to-analog converter

Analog reproduction of music audio signal

Linear amplifier

Speaker

Sound waves

Digital System (Why)
Analog vs. Digital

Most natural quantities (such as temperature, pressure, light intensity, …) are **analog** quantities that vary continuously.

Sampling and Quantization

Analog = continuous
Digital = discrete

Digital systems can process, store, and transmit data more efficiently but can only assign discrete values to each point.

IC Technologies

- ASIC (**A**pplication **S**pecific **I**ntegrated **C**ircuit)
  - ❑ Full Custom (Transistor Level)
  - ❑ Standard Cell (Gate Level – libraries)
  - ❑ Gate Array (Gate Level already created of the wafer)
- Filed Programmable Devices
  - ❑ Complex
    - ▪ **Complex Programmable Logic Devices (CPLD)**
    - ▪ **Field Programmable Gate Array (FPGA)**
  - ❑ Simple
    - ▪ **Programmable logic Devices (PLD)**
- Off-The-Shelf Components
  - ❑ MSI / SSI (Transistor Transistor Logic TTL - Series 7400), (Complementary Metal Oxide Semiconductor CMOS - Series 4000)

Digital System Implementation Spectrum

Hardware
ASIC

Reconfigurable Architectures

Software

- CPLD
- FPGA
- Customized Processors
- Coarse Grain
- Reconfigurable Array

- μProcessor
- μController
- DSP

← → flexibility   trade-off   efficiency