CS 223 Computer Organization & Architecture

Lecture 21 [09.03.2020]

Introduction and Course Overview

John Jose

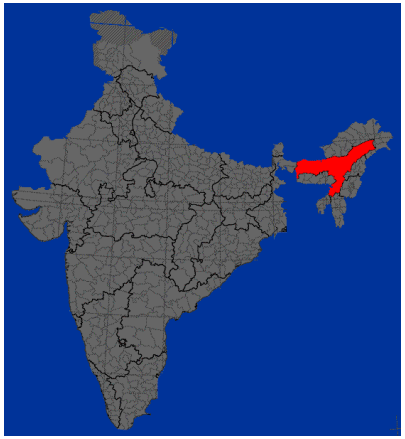
Assistant Professor

Department of Computer Science & Engineering

Indian Institute of Technology Guwahati, Assam.

About Me

I hail from a small village near Kochi, Kerala.



Joined IIT Guwahati as faculty in CSE Dept in 2015

About my educational profile

Ph.D – **IIT Madras**

M.Tech – **VIT University**

B.Tech – **Cochin University**

Few Important Information

- **Instructor: John Jose**
  - **Office Room: H-201, Second Floor, CSE dept**
  - **Personal webpage: http://www.iitg.ac.in/johnjose/**
  - **email: johnjose@iitg.ac.in: Phone: 0361-2583256**
  - **MARS Research Lab: 0361-2583255**
- **Head Teaching Assistants**
  - **Sivakumar S, Manju R. (Ph.D Scholars, MARS Research Lab)**
- **Lecture slots**
  - **A slot (Mon 9 am, Tue 9 am, Wed 9 am) @ L1**
- **Course Page [Intranet only]**
  - **http://jatinga.iitg.ac.in/~johnjose/cs223.html**

Course Objective [Post mid sem. topics]

- **Learn** and **appreciate** RISC instruction pipeline techniques, limitations of pipeline architecture
- **Understand** the concept of pipeline scheduling and superscalar processors.
- **Generate** and awareness on basic I/O operations and its role in enhancing capabilities of a computer system.
- **Know** the working concepts in multi-core processors.
- **Explore** future directions in computer architecture research.

Syllabus

- Review of basic computer organization, RISC vs CISC, processor memory interaction, Performance measurement techniques, benchmarks. Speed-up & Amdahl's Law. [3 hours]
- RISC 5-stage instruction pipeline concepts, pipeline hazards, branch prediction techniques. [4 hours]
- Multicycle pipeline, static and dynamic scheduling, superscalar processors. [4 hours]
- Introduction to I/O techniques, peripheral interfacing, interrupt processing and DMA operations [4 hours]
- Introduction to multicore processors, Tiled chip multicore processors, Network on chips. [4 hours]

Reference Books

- **Computer Organization and Design: The Hardware/Software Interface,** John L. Hennessy, David A. Patterson, Morgan Kaufman
- **Computer Organization** Carl V. Hamacher, Vranesic, Z.G., and Zaky, S.G. McGraw-Hill.
- **Computer Organization and Architecture,** William Stallings, Pearson Eduction India.
- **Computer Architecture-A Quantitative Approach** (5th edition), John L. Hennessy, David A. Patterson, Morgan Kaufman.
- **Principles and Practices of Interconnection Networks**, William James Dally, Brian Towles, Morgan Kaufman.

Grading

- **Grading Scheme**
  - **50% (from topics upto pre-midsem by Prof. J.K.Deka)**

  Split up of remaining 50%

  - **10/15% (1 Short Quiz; 04.04.2020, Saturday)**
  - **40/35% (End semester Examination)**
- **Attendance Policy**
  - **75% attendance rule is strictly enforced.**
  - **Attendance will not be given if you are late.**
  - **Refrain from unethical practices.**

General Policies

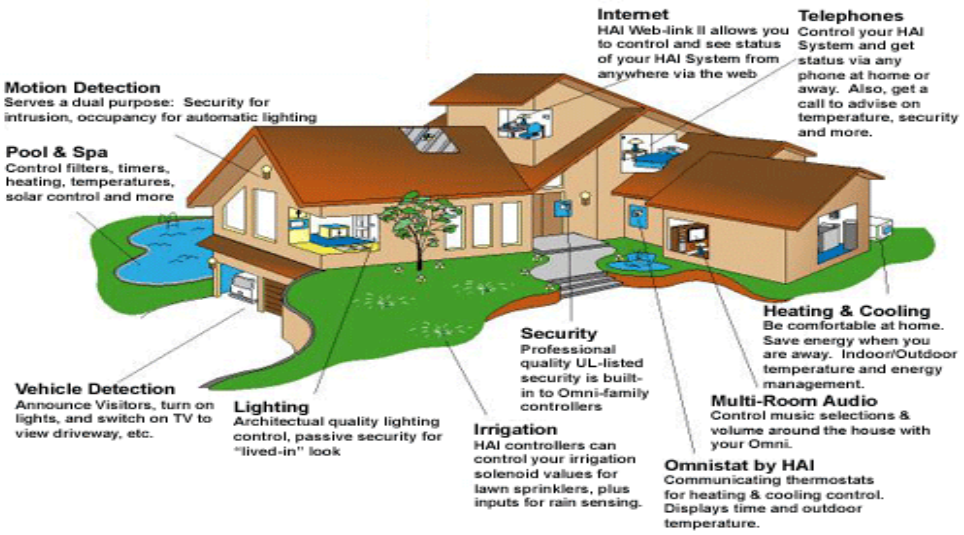
- 100% attendance is preferred. Once you miss the class you will lose the connectivity between topics
- Be on time in attending lecture class. Coming late to the class is discouraged. Introductory 5 minutes is very important for the day's discussion.
- Academic dishonesty cannot be tolerated.
- I know everybody cannot score AA/AS.
  Do your best, Be sincere, Be open.
- It is not the marks but the effort that matters.
- I promise that you will enjoy this course.

Role of Computer Architects

Applications and hand held devices are part and parcel of our day to day life

What are the future applications that need high end architectural features to perform well?

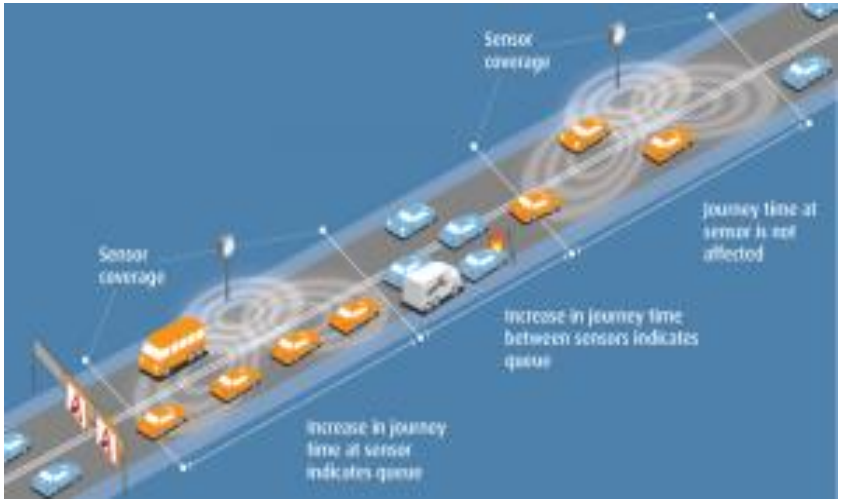
Smart Homes


Internet
HAI Web-link II allows you to control and see status of your HAI System from anywhere via the web
Telephones
Control your HAI System and get status via any phone at home or away. Also, get a call to advise on temperature, security and more.
Motion Detection
Serves a dual purpose: Security for intrusion, occupancy for automatic lighting
Pool & Spa
Control filters, timers, heating, temperatures, solar control and more
Heating & Cooling
Be comfortable at home. Save energy when you are away. Indoor/Outdoor temperature and energy management.
Security
Professional quality UL-listed security is built-in to Omni-family controllers
Vehicle Detection
Announce Visitors, turn on lights, and switch on TV to view driveway, etc.
Lighting
Architectual quality lighting control, passive security for "lived-in" look
Irrigation
HAI controllers can control your irrigation solenoid values for lawn sprinklers, plus inputs for rain sensing.
Multi-Room Audio
Control music selections & volume around the house with your Omni.
Omnistat by HAI
Communicating thermostats for heating & cooling control. Displays time and outdoor temperature.

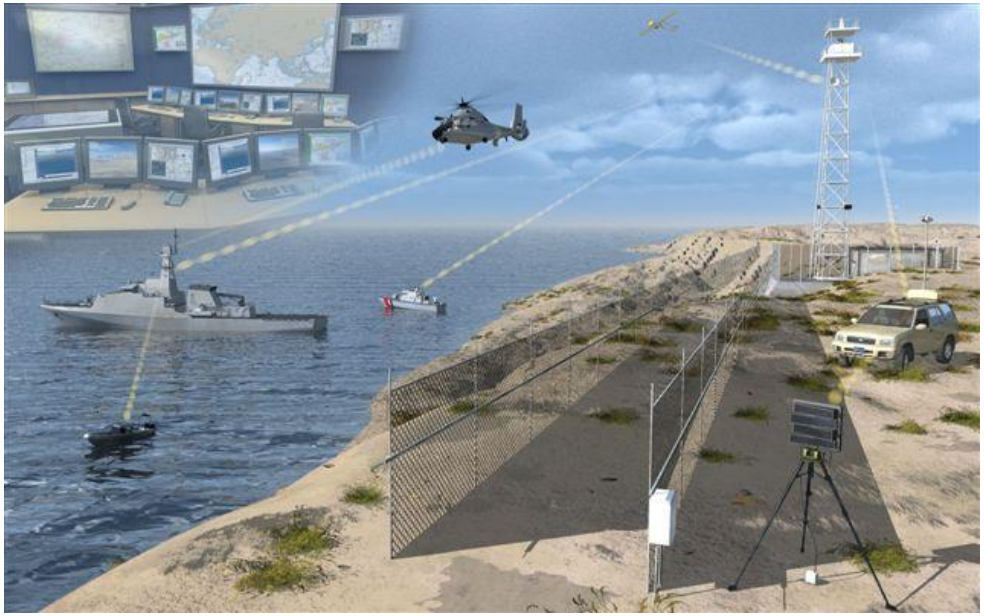

REMOTE HOME CONTROL
ONLINE HOME AUTOMATION
22°C
ECO MODE


THE SMART HOME
- Alarm
- Cameras
- Text/Email Alerts
- Remote Access to Lights & Locks
WiFi
- Networking
- Concierge Service
- Remote Access Via SMART Panel to Home Systems
- Surround Sound
- Whole House Audio
- Video Distribution
- Phone/Tablet as Homes A/V "Remote Control"
76°
- A/C Control
- Fire/ Carbon Monoxide/Water Email and Text Alerts

Driverless Vehicles

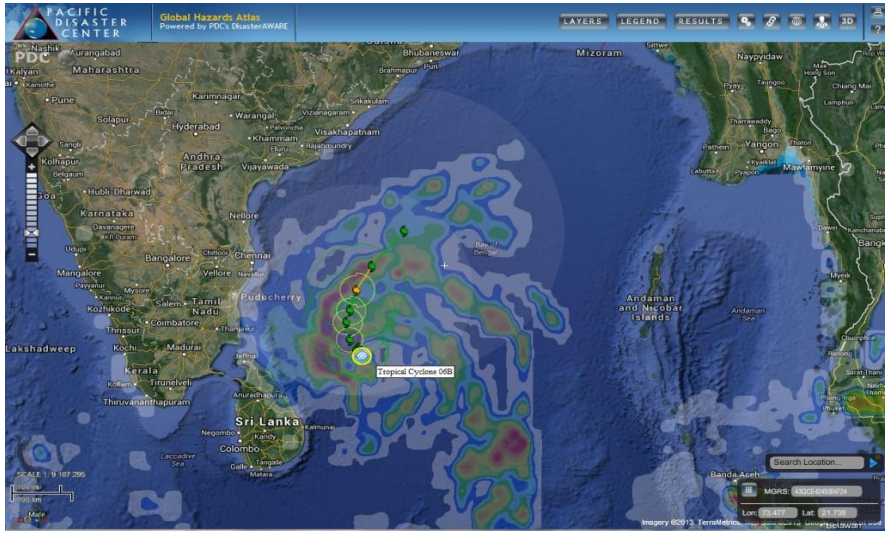


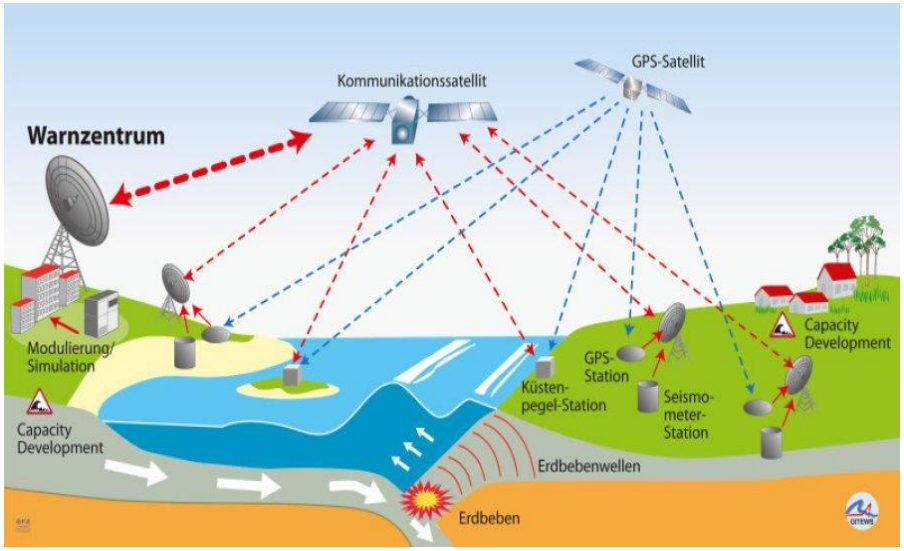
Video Surveillance

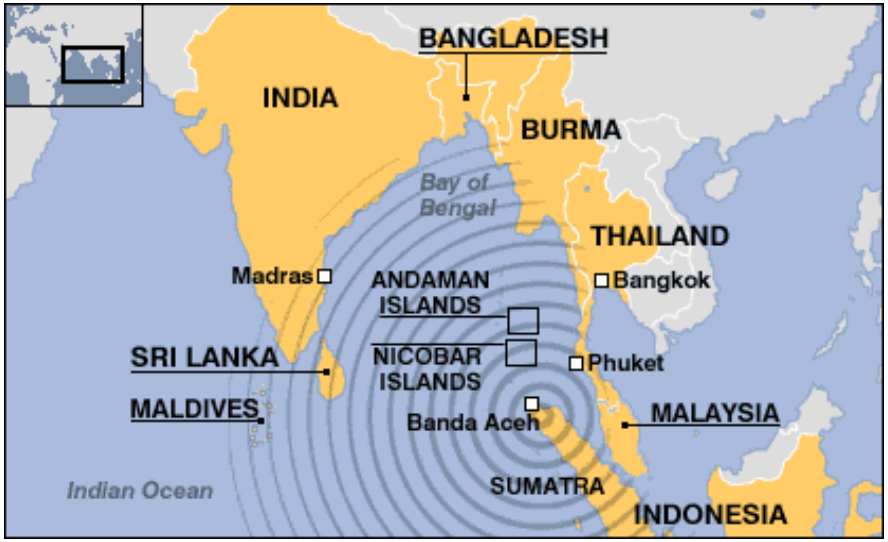


Smart Health Care

Weather Forecasting



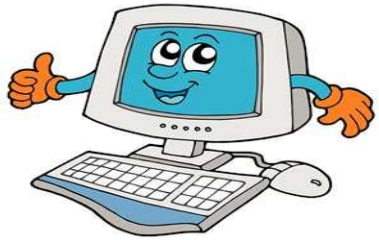


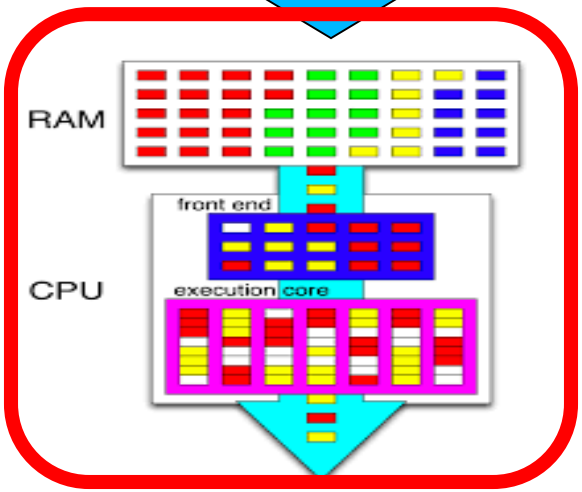


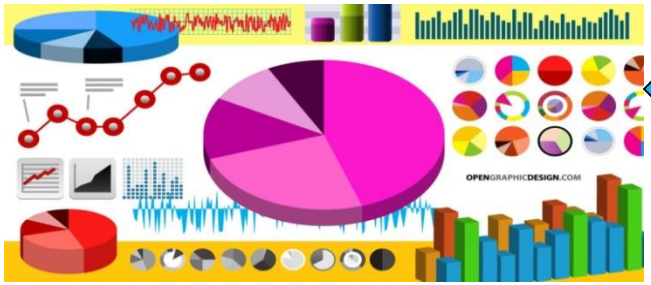
Smart Living Ahead

SmartPlanet

How is this all done ?







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