Lesson 11:DESIGN PROCESS EXAMPLES –Mobile-Phone, Mobile-Computer and Set of Robots

Mobile Phone

Mobile phone SoC (System-on-Chip) **Hardware units**

- Microcontroller or ASIP (Application Specific Instruction Set Processor) to process encoding and deciphering and another ASIP for voice compression.
- ASIC for the actions of dialing, modulating, demodulating, interfacing the key board interfacing and multiple line LCD matrix displays, stores data input and recalls data from memory.

Mobile phone SoC (System-on-Chip) Hardware units

- DSP core, CCDSP, DSP, video, voice and Pixel Processors
- Flash, EEPROMs and SRAMs,
- Peripheral circuits, ADC, DAC and Interrupt controller
- Direct Memory Access controller
- LCD controller
- Battery

Mobile Phone Embedded Software components development tools

- Mobile phone software development tools are as follows:
- RTOS– Windows Mobile, Palm OS, or Symbian, BREW
- Java 2 Micro Edition (J2ME) along with KVM as a Java Virtual Machine
- (Java Wireless toolkit with JDK (Java Development kit)

Software components

- Mobile browser for access the Web
- Down-loader for Java games, ring-tones, games, wall papers
- Simple camera with Bluetooth synchronisation, IrDA and WAP connections support

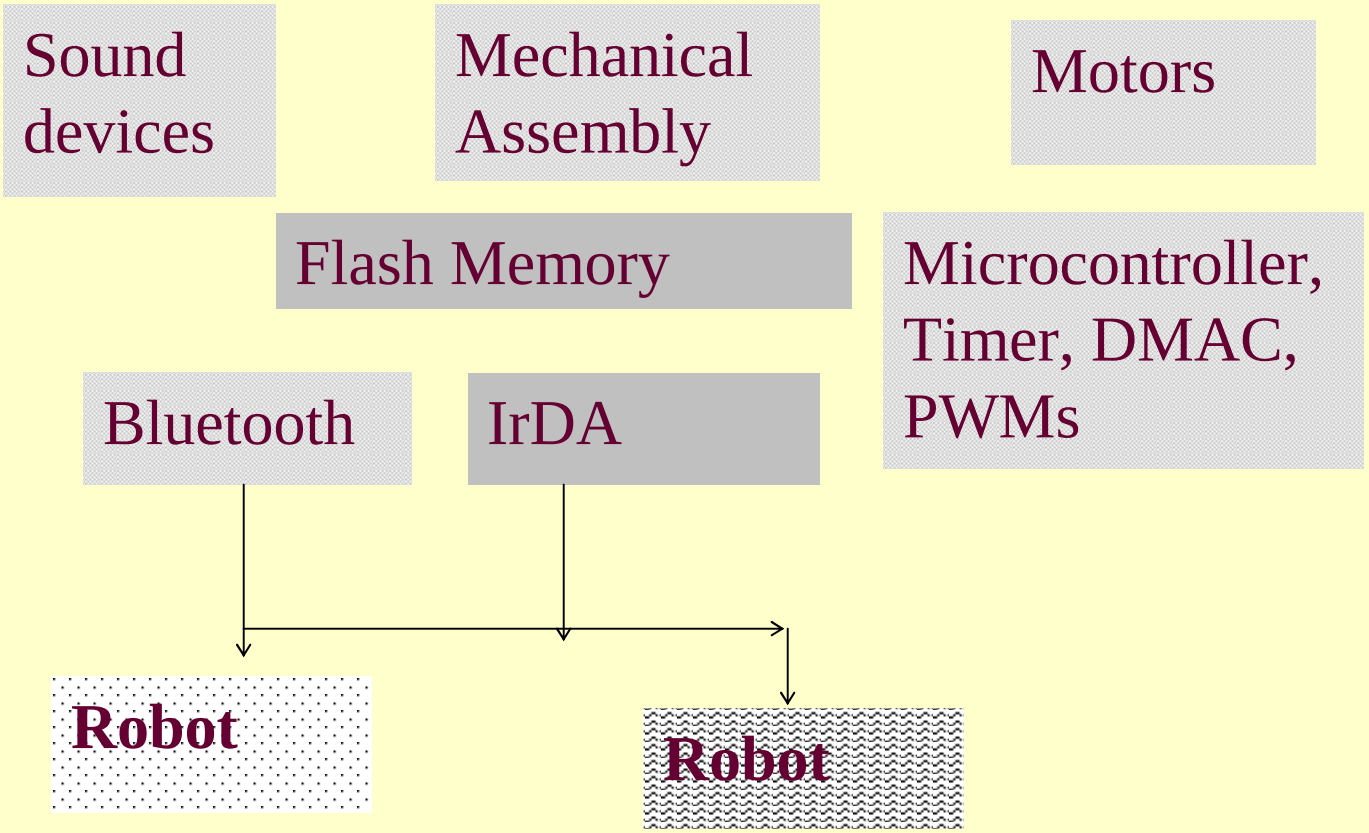
Mobile Computer

Mobile Computer software components

- RTOS (Windows CE, Windows Mobile, PocketPC, Palm or Symbian
- Touch screen GUIs, Memory and file systems
- Memory stick
- Outlook, Internet explorer, PocketWord, PocketExcel, PocketPowerPoint, hand written text processor
- Applications or Enterprise software

Set of Robots

Hardware components in the set of robots



Master Robot Functions

- It receives from a remote controller commands to start the music, stop the music and the code for the specific orchestra to be played.
- It sends the PWM signals to the ports for the moving the sticks in both hands as per the program.

Master Robot Functions

- It establishes and binds the sockets (the virtual devices) connection with the slaves. It sends the signals through sockets using IrDA protocols. The byte streams response to the clients are as per the music file being played .

Slave Robot Functions

- It establishes and binds the sockets (the virtual devices) connection with the master.
- It receives from a master socket the commands accept ( ) and write ( ) from the master. It receives commands from master to start the music, stop the music and the code for the specific orchestra to be played.

Slave Robot Functions

- It receives the signals through sockets using IrDA protocols. The byte streams from the server re as per the music file being played.
- Slave robots speaker outputs for playing the music.

Robot Hardware units

- Microcontroller or ASIP (Application Specific Instruction Set Processor)
- Music file processor
- RAM for storing temporary variables and stack
- ROM for application codes and RTOS codes for scheduling the robot actions and tasks

Robot Hardware units

- Timer, Flash memory for storing user preferences and music files.
- IrDA controller (Section 3.10.3)
- Direct Memory Access controller (Section 4.8)
- Power supply source or battery

Microcontrollers

- Each robot has a microcontroller with expansion ports, P0, .., P8.
- A single ASIC can perform the multiple port functions of a microcontroller. When the engineering cost of ASIC development is high, a general purpose microcontroller 68HC12 or 8051 is used.

Control Funtions

- Master robot signals the commands and slave robots play according to the signals from the master.
- Each robot is assumed to have five degrees of freedom. At each degree of freedom, there is a servomotor.
- A servomotor controls by PWM method.
- Each motor is controlled in a sequence to let the robot perform the desired action.

Ports and Flash Memory

- The port outputs from the port(s) connect the motors and PWM outputs drive the motors in each robot.
- Each robot has a serial input/output through IrDA protocol.
- Internal memory flash to store the OS, embedded software and limited number of music.

Robot Software Components

- Socket functions
- Music coding
- Music decoding
- Memory and file systems
- Light, flash and display device drivers
- IrDA and socket Port device drivers
- Motor drivers
- IO Interrupt Service routines

Software components in the set of robots in which a master robots signals the commands and slave robots play according to the signals from the master

- Client and server sockets
- Music file processing
- IrDA protocol stack
- Bluetooth protocol stack
- Music instrument and Bluetooth or IrDA device drivers

Summary

We learnt functions, hardware and software components for

- Mobile phone and computer
- Set of robots

End of Lesson 11