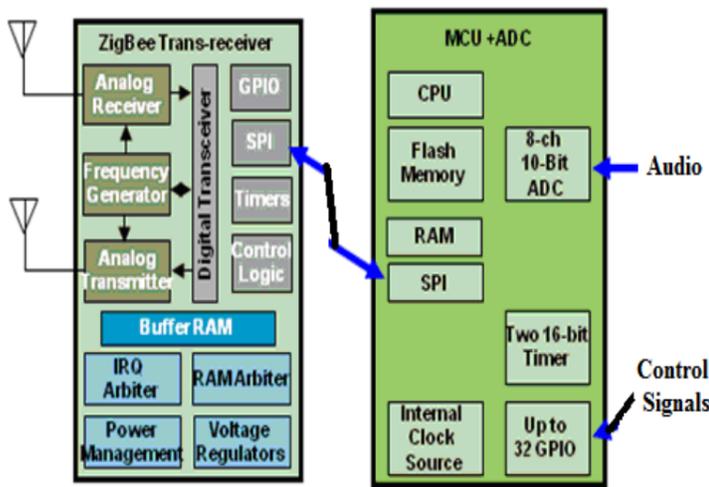


ZigBee based project

Jino M Pattery

The last issue covered an overview of ZigBee and its wide range of applications. This is a small project proposal using ZigBee. The idea is to stream audio signal and control data over IEEE 802.4. The audio from a condenser microphone is connected to an ADC. We have seen that maximum data rate possible with ZigBee is 250 kbps. The spectrum of human voice spans over 100Hz to 7 kHz. But frequencies in the range of 300Hz to 3400Hz are only perceivable. Therefore, if you want to transmit audio signal, say, human voice, required frequency bandwidth is almost 4000Hz. The data rate is two times this bandwidth i.e. 8000samples per second. Even if we do waveform encoding by representing each sample using 12 bit pcm value, it requires a data rate that is well below our transmission capability of 250kbps. Therefore, we can transmit audio along with some control signals easily with ZigBee. We could improve the utilization of available bitrate by compressing data by using parametric coders. Even videos with QCIF resolution can be encoded and streamed at 128 kbps.



Our idea is to control the movement of a remotely placed robotic arm and to stream speech data. The range required is at least 100metres. We can use a ZigBee transceiver interfaced with a micro controller, say, Atmel 89C51. The prototype envisaged has six control signals from a remote control to control the robotic motion as control data and encoded speech. Our idea is to control the movement of a robotic arm and pass on some voice message to it. We can achieve this by using a ZigBee transceiver interfaced with a microcontroller. The voice signal is capacitively coupled to an ADC. The GPIO pins are used for interfacing microcontroller with zigbee and for transferring the information bits.

Students' Page

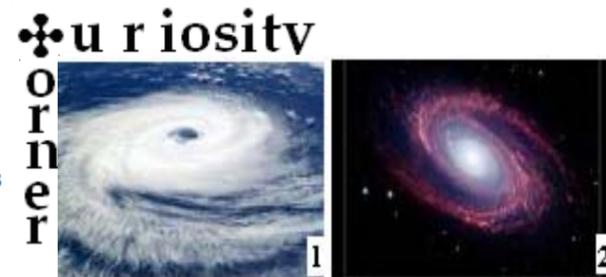
Mobile WiMAX Technology

Most of us have mobile phones that support multimedia and internet access. The increasing demand for broadband access has resulted in new technologies and network architectures. These technologies provide better data rate at lower cost. WiMAX is such a technology developed by WiMAX forum and IEE 802.16. The success of WiFi turned to be a major motivating factor for this effort.

This technology is based on orthogonal frequency division multiple access (OFDMA) with scalable bandwidth in the uplink and downlink. It makes use of advanced antenna technology that allows beam forming and diversity through space time coding and spatial multiplexing. Baseline WiMAX network architecture can be represented by a network reference model (NRM). NRM identifies functional entities and interoperable reference points. WiMAX NRM consists of several logical network entities: Mobile stations (MSs), an access service network (ASN), and a connectivity service network and their interconnection through reference points.

The paper "Overview of Mobile WiMAX technology and Evolution" by Kamran Etemad published in IEEE Communicatins Magazine, October 2008 Issue has details on the WiMAX technology roadmap and timelines, and WiMAX network architecture and evolution.

-Manoj Sreekumar (S6 AEI)



Given above are two images. Can you identify these?

First correct answer will win a small prize

Answer to the question in the previous issue

The high current rating for TV set is due to degaussing circuit. Degaussing a picture tube means to demagnetize and remove any stray magnetic fields on the tube. On older TV sets, the degaussing circuit consisted of a large coil of wire (usually 50 to 100 turns of wire) and a device called a thermistor. The cold resistance rating is usually a very low resistance, while the hot is relatively high. Thus initially current will be very high. The hotter the thermistor gets, the less power flows through the degaussing coil.



From the HoD's desk

LED's to light up Indian homes very soon

Dear Reader,

The incandescent bulb that changed our life style since 1878 is beginning to dim with the emergence of light emitting diodes. LED technology has improved dramatically over the past two years and is poised to revolutionize the lighting industry. LED's have been around for years in red, yellow, and green, but a recent development of white and blue diodes is bringing these into our living rooms.

White LEDs need 3.6Vdc at approximately 30 mA resulting in power dissipation of approximately 100 mW. It is the chemical makeup of the LED semiconductor which determines the colour of light produced by the LED. The entire unit can be embedded in epoxy which makes it very handy. These are usually driven from a constant current source so that the brightness is independent of variations in supply voltage. Recently the European Union decided to phase out traditional household bulbs in favour of this type of energy saving lighting systems. One major disadvantage is its adverse effect on the human eye when one stares at the light beam at close range. Researchers are focusing on methods to get rid of this defect.

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The function of leadership is to produce more leaders, not more followers

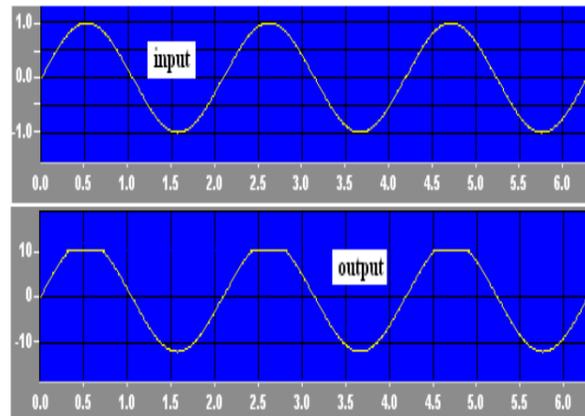
-Ralph Nader

**Observations/Comments**

[A column by PRM]

I had presented a specific observation about a lab experiment in the last issue. I would like to make a note on another important observation I have, a general one, again related to the way in which we carry out experiments at our labs.

Observation: Student hooks up a circuit on the bread board, say, that of an RC coupled amplifier. After wiring, the circuit is checked by another student, or probably by himself/herself, or may be the teacher. It is certified ok. Supplies are switched on, an input is given from the function generator. Alas, the output is seen clipped as shown in the following figure.



What is the next step normally opted for?

How many students spend, or are asked to spend, time on analysing the scenario?

Do they check what has really gone wrong?

How many students check the quiescent conditions and confirm that it is as per design, that it can give output swing as desired?

My observation is that the reason for the failure is not looked into, instead, they start redoing the whole thing. Consequence is obvious. They never make the failure an experience. With such an attitude, experience never becomes a good teacher. We must learn to learn from experience.

Another important observation I have made is that we are not bothered about specifying accuracy. A result without mention of accuracy cannot be accepted.

[In the next issue: on plotting frequency response.]

*Leaders must be close enough to relate to others, but far enough ahead to motivate them.*

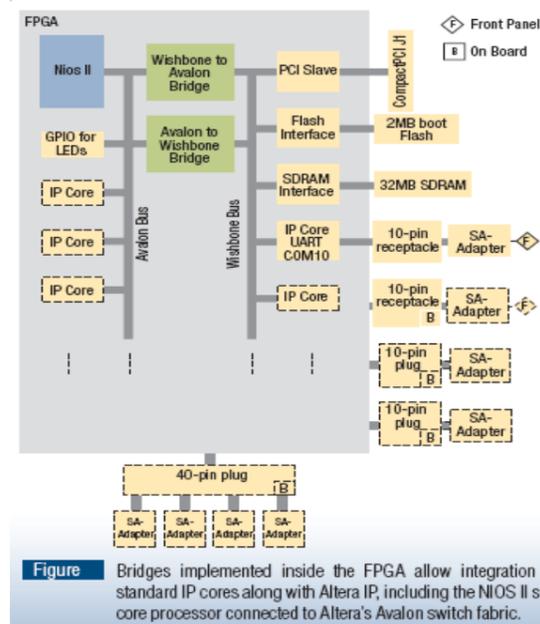
*-John Maxwell*

**I-P Core**

I-P core is an important term connected with embedded systems and VLSI designs. IP core stands for **intellectual property core**. Basically an IP core is a reusable unit of logic circuit, or chip layout design. These cores are available from many sources; some are free and many are intellectual property of companies. They are available in various forms like synthesizable HDL, generic gate net lists, etc. Any digital circuit can be realized using the basic building blocks [AND gates, OR gates, etc.]. Analog and mixed-signal logic generally requires a lower-level physical description. Hence, an analog IP core is distributed in transistor-layout format such as GDSII [Graphic Data System –GDSII stream].

IP cores can be used as building blocks within ASIC [application specific integrated circuit] chip designs or FPGA [field programmable gate array] logic designs. A designer procures ip cores from a vendor, and integrates it into the asic or system on chip [SoC].

**IP-Core based SoC Design: a Typical Example**



**Figure** Bridges implemented inside the FPGA allow integration of standard IP cores along with Altera IP, including the NIOS II soft core processor connected to Altera's Avalon switch fabric.

**Net list** A net is a set of all points connected by a conductive path. A net list is a list of nets which define the conductivity interconnection scheme.

**HDL** is Hardware description language like VHDL, Verilog or systemC.

Krishna Kumar

**Smart Parking Using RFID Technology**

Car parking is done in many countries using conventional methods. Check-ins and check-outs involve a wide range of processes. A lot of time gets wasted waiting in queues. The scenario is fast changing with the introduction of smart parking method making use of radio frequency Identification (RFID) technology. As you are aware, RFID is one of the most fundamental technologies that enable wireless data transmission.

**Introduction to RFID**

RFID is an area of automatic identification that has quietly been gaining momentum in recent years, and is now being seen as a radical means of enhancing data handling processes, complementary in many ways to other data capture technologies such as bar coding. Developments in RFID technology continue to yield larger memory capacities, wider reading ranges, and faster processing. The objective of any RFID system is to carry data in suitable transponders, generally known as tags, and to retrieve data, by machine-readable means, at a suitable time and place, to satisfy particular application needs. Data within a tag may provide identification for an item in manufacture, goods in transit, a location, a vehicle, an animal or an individual. This system requires, in addition to tags, a means of reading or interrogating the tags and some means of communicating the data to a host computer or information management system. A system will also include a facility for entering, or programming, data into the tags, if this is not undertaken at source by the manufacturer. Quite often an antenna is considered as a separate part of an RFID system. Both readers and tags have antenna which are essential for communication between the two.

An RFID system has the following components: RFID device, that contains data about an item, antenna, used to transmit the RF signals between the reader and the RFID device, RF transceiver that generates the RF signals and the reader, that receives RF transmissions from the RFID device. The read data is passed to a host system for processing.

**General structure and design of the system**

In a study and test setup, parking-lot check-ins and check-outs were configured using a central database system. Hardware components were used for the central management of the parking lot, while software components were used to control the hardware. Hardware consisted of RFID readers, labels, USB cables, toy cars, barriers with USB port connection and laptop computers. A database management system was used as software to store and manage the vehicle tracking data. Identification data that was read by the RFID reader consisted of 40 bits. The RFID readers utilized were considerably small with circular shape and thus they could easily be attached to the vehicles.

The computers used in this application were connected to the internet. In the database, a main table "Vehicle Information" and a sub table "Vehicle CirculationInfo" were created. The general information about a vehicle was stored in the main table and its circulation information was kept in the sub table. Vehicle Information table consisted of fields such as vehicle ID, plate number, type and model. "VehicleCirculationInfo" table was used to monitor a vehicle's check-in and check-out attempts, the date, the time, the parking-lot information and total parking fee. These two tables were prepared by a database management system and administered through software. RFID reader was connected to a computer's USB port by USB cable for communication between the developed software and RFID reader. For each of the parking lots, one barrier and one RFID reader were utilized. A USB connection was established for the barrier as well. All the information about a vehicle possessing an RFID label was easily accessible from the VehicleInformation system. When a vehicle arrived at any parking-lot to check-in, the system checks whether it is already registered with it or not. If it is registered, and it does not have any check-in or check-out records available, the check-in information is stored in the database and the barrier lifts off for the vehicle to drive in. A checking-out vehicle's identification information is searched in the database first. If it is a registered vehicle and it did not have any unauthorized access, the system would allow its check-out. During the check-out, the system finds its check-in date and time and updates check-out date and time. If a vehicle doesn't have any previous entry corresponding to it in the database, the initial entry level information of a vehicle is stored in the database. If a vehicle has a previous record stored in the system, there won't be any secondary information entry, thus avoiding duplication. If a checked-in vehicle does not get checked-out in the records maintained in the data base, it won't be able to check-in to any of the parking lots in the city. Only the administrator of the central database could bring a solution to this problem. If two vehicles enter a parking-lot side by side, being within the range of the RFID reader, the system will not read their identification information and process it. To avoid such problems, parking-lot entrances should be designed to enable passage for only one vehicle at a time. Spot lights directly connected to the RFID reader that notify drivers about the availability of parking space in the lot will provide great convenience if located at the entrances of parking-lots. Failure in internet connection during any process will shut down the connection to the central database. In such cases, a local database will get enabled. When Internet connection is restored, the system will switch back to the remote database. The system can keep account of payments also, so that vehicle owners need not have to make payments upon every check-out.

Anu S. S.