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A STUDY OF AN ENTRENCHED SYSTEM USING INTERNET OF THINGS

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***Abstract*— This study paper portrays a fresh approach for a course and laboratory design to establish low cost prototypes and other entrenched devices that accentuate virtual programmable logic device (VPLD), object oriented java and real time processing tactics. JAVA is used for software development. The study encompasses the use of host and node application. A high performance, low power AVR with high endurance non-volatile memory segments and with an advance RISC structure is used to construct prototypes. The paperwork deals with the VPLD board which is capable to work as corresponding digital logic analyzer, equation parser, standard digital IC and design wave studio.**

Keywords*— *virtual programmable logic devices(VPLD), real time processing tactics, JAVA, entrenched system, AVR, RISC, TTL/CMOS.

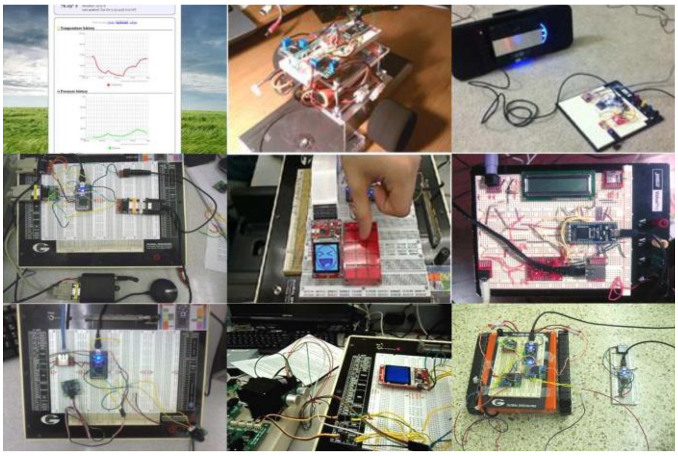
I. INTRODUCTION

An expert artificial intelligence methodology with a staunch purpose that is a part of larger system or a machine is named as entrenched system.

Using liberal photographic facilities, a manufacturer can produce miniature circuits on the surface of a small piece of semiconductor material called a chip. The accomplished network is so minute that you need a microscope to observe the connection. Such a circuit is named as Integrated Circuit (IC) because the components like transistors, diodes, and resistors are an intrinsic part of the chip. Much preponderant IC's are also procurable now, and almost all logic circuits are now realized with such chips. They are now obtainable with some important functional block mount on them, for e.g. functional block like Adders, Flip-flops, Multiplexers, Registers, Encoders, Counters, and Decoders. But they may also impart just an assortment of gates and programmable interconnection switches that can be configured by the designer to realize a variety of arbitrary functions using a single chip. These chips are called as Programmable Logic Devices (PLD).

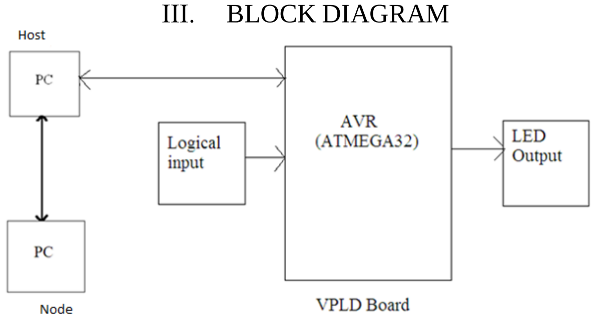
PLD's are the logic circuit, which incriminate of arrays of switching elements that can be programmed to allow execution of SOP expression. Each function in PLD is realized as a sum-of-product terms that involves input variables. A PLD comes in various flavors like PLA (Programmable Logic Array), PAL (Programmable Array Logic), FPGA (Field PGA), CPLD (Complex PLD), etc. Now, such PLD, PLA and PAL IC's are expensive because of its construction. Usually PLD IC's are PROM's (Programmable Read Only Memory) which can be programmed only once. The paperwork presents an IC that can be programmed and re-programmed again and again with any anticipated logic. The presented IC is entirely microprocessor driven. Hence it is a TTL compatible IC. As the IC can be used instead of any TTL IC and can be programmed according to any desired logic we name it Virtual programmable logic device (VPLD). JAVA is entailed as a language for the development of paperwork. Just like visual studio provides development environment for visual basics and .Net, NetBeans provides an integrated development environment (IDE) for JAVA. Regardless of microcontroller with antrorse processing competency present in market, 8-bit microcontroller still embraces its value because of their easy to understand operation, ability to simplify digital circuit and low cost compared to features offered. AVR has an advanced RISC architecture. VPLD is a simple board which acts as a Programmable Logic Device. It looks like an IC and is capable of working like any standard digital IC such as a Logic gate, Timer, Adder, Substractor, Mux, Demux, Counter, Flip-Flop, Encoder, Decoder, Comparator etc.

II. TECHNOLOGY



Earlier most of the hardware was made using bread board. This describes a course and laboratory designed to allow students to develop low-cost prototypes of robotic and other embedded devices that feature Internet connectivity, I/O, networking, a real-time operating system (RTOS), and object-oriented C/C++. The application programming interface (API) libraries provided permit students to work at a higher level of abstraction. A low-cost 32-bit SOC RISC microcontroller module with flash memory, numerous I/O interfaces, and on-chip networking hardware is used to build prototypes. A cloud-based C/C++ compiler is used for software development. All student files are stored on a server, and any Web browser can be used for software development. Breadboards are used in laboratory projects to rapidly build prototypes of robots and embedded devices using the microcontroller, networking, and other I/O subsystems on small breakout boards. The commercial breakout boards used provide a large assortment of modern sensors, drivers, display ICs, and external I/O connectors. Resources provided include eBooks, laboratory assignments, and extensive Wiki pages with schematics and sample microcontroller application code for each breakout board. There are several commercial and open-source options for ARM C/C++ compilers. The most widely used and supported software development tool for embedded is the cloud-based C/C++ compiler. It runs on any PC platform with a Web browser and is extremely easy for use. Typically, programming, digital logic design and often a computer architecture course are prerequisites for the more advanced embedded systems or microprocessor design course that is the focus of this paper. For software development in the embedded systems industry, the C/C++ family of languages is still used in the large majority of new designs, according to annual industry surveys. Many embedded systems, microcontroller, or microprocessor design courses started out with low-cost 8-bit processors with limited capabilities, but most of the development effort in industry has moved on to modern System on-a-Chip (SOC) 32-bit devices that contain a reduced instruction set computer (RISC) processor with volatile memory, non-volatile flash memory, and a wide assortment of standard I/O interfaces, all on a single chip. Rapid advances in technology force instructors to frequently update embedded system courses. Selection of the hardware and software for a student laboratory is always a complex decision. It also requires significant curriculum development effort and funding to update the laboratory with new technology. By adopting the some of the recent approaches being used in industry, students should be more productive and more rapidly able to produce prototypes of robots and other complex embedded devices.

III. BLOCK DIAGRAM



The VPLD board consists of an AVR microcontroller, which will have an input logic as switch and output logic as LEDs. Instead of using a bread board we are using VPLD board which acts as AVR microcontroller. This hardware will be connected to the host by RS232 connector and to convert the TTL/CMOS logic level to RS232 logic level during serial communication of microcontroller with P.C we are using MAX 232. The main host is connected to various nodes and these nodes can also control the hardware. The software used before was C/C++, but here the software we are using is JAVA. The input can be applied through the hardware as well as through software and the output can be available on hardware with the help of LED. In this paper work we are studying the digital operations to be performed. This digital operation consists of four main parts as described. For example The diagram above shows how VPLD IC is used to implement a digital equation (/A.B)+(A./B)

The input pins are configured as A and B (via, pins if microcontroller) and output pin is configured as pin Y (which again is an output pin of microcontroller)

When user selects a mode on computer a truth table for it is either loaded from memory.

When user selects the VPLD in digital equation mode, the truth table for it is accepted from user and in case the user selects digital IC mode, the truth table for it is already present in computer so is directly selected from database.

This truth table has information about which are input pins and which are output pins. Accordingly the PC sends the I/O pin information to microcontroller.

The code written in microcontroller reads this configuration and accordingly sets its required pins as Input and required pins as Output.

Once the configuration is done the microcontroller continuously reads the data from input pins, sends it to computer. The PC side software accepts the input pin information, calculates the output based in input data and truth table (for currently selected mode and device) and sends the output information to microcontroller.

The microcontroller upon receiving the output information immediately updates the output pins and repeats the process indefinitely until the PC selects some other mode. The paperwork comprises of four parts.

EQUATION PARSER: The first part, in which the manipulator can programme an equation parser which accepts the equation from user and verify the equation parameters and if the equation is correct than it can be used to drive digital circuitry which is connected to our system via parallel port. E.g. an equation in manner of Y=(A+B).(C+/D), can be enrolled with the support of the software and the hardware will start acting accordingly. One of its pin will act as output Y and the other four will act as input A, B, C and D. The software displays the pin assignments

STANDARD DIGITAL IC: The second part is in which VPLD can be used to substitute any standard digital IC like gates, encoder, decoder, multiplexer etc. There is a pre-programmed list of all the ICs used on day-to-day basis in JAVA used for software development. All the user has to do is point and click on the IC that is to be adapted by the VPLD.

DIGITAL LOGIC ANALYSER: The third part, provides the feature called as DLA (Digital Logic Analyzer). DLA used to monitor the circuits amongst which the IC is inserted, that means we are checking inputs as well as output of the external device which is connected to the system via parallel port. This can be used to troubleshoot the hardware environment in which the IC is plugged in.

DESIGN WAVE STUDIO: The fourth part, presents the feature called as DWS (Design Wave Studio). There are endless applications, in which a specific clock signal is used to drive some digital hardware. In this section we provide a GUI through which the user can design their own waveform or a clock signal and then fire it on to the pins of the Digital Logic Workbench at the required frequency.

IV. ADVANTAGES

The list of pre-programmed modes for the IC to work in for example gates, encoders, counters, drivers, etc.

Equation Parser to accept user defined equations to drive the IC.

The user won't be able to enter false equation due to the use of equation parser.

An inbuilt Digital Logic Analyzer to monitor the entire circuit board where the VPLD IC is inserted.

A Digital Function Generator to eliminate the need for clock/signal generation hardware. Higher device monitoring is possible with the help of this device.

V. CONCLUSION

This project will be replacing all the standard digital ICs with a single hardware. It can be used in digital logic design laboratory.

Instead of using multiple devices we are using a single device.

Hence the requirement of materials will be reduced.

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