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HANDHELD ALL-IN-ONE ELECTRONICS LAB ASSISTANT DEVICE WITH USB CONNECTIVITY

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ABSTRACT

This project presents several measurement experiments performed by means of the Texas Instruments Analog System Lab Kit (ASLK) PRO board in the Electrical and Electronic Measurements laboratory with students in the first year of an undergraduate course of the Faculty of Electronics and Telecommunications from Politehnica University of Timişoara. The experiments deal with: electronic dc analog voltmeter, electronic rectifier-based ac analog voltmeter, resistance-to voltage converter, current-to-voltage converter, and an active bridge. For each above experiment the circuit schematic, the related theoretical expressions, and the required measurements are given.

1. INTRODUCTION

An efficient multipurpose instrument is introduced to measure and test electrical parameters and the output waveforms of power electronics laboratoryexperiments for easy access, accurate and reliable purpose.The project deals with a smart portable handheld device. The USB-UART device is used to have USB connectivity for viewing of results and other measured values. The system consists of several sensors, touch screen, LCD TFT display and USB-UART which are interfaced into a single ARM Cortex M3 microcontroller. The block diagram of this multipurpose handheld device. highly configurable to allow the Cortex M3 processor to address a wide range of applications and be more closely aligned with the system requirements. The Cortex-M3 core and the integrated components (Fig, 1.1) have been specifically designed to meet the requirements of minimal memory implementation, reduced pin count and low power consumption. The main purpose of use of ARM Cortex is an efficient memory usage for lower cost, low cost debugger and trace, low latency interrupt handling scheme, delivering in a field, reliable and secure automotive and industrial control application, fine grain memory protection, lower power consumption and faster access to market.

2. RELATED WORK

Students in engineering curriculum, when exposed to these instruments, often come across a multitude of equipments such as voltmeters, ammeters, oscilloscopes and even simple things like calculator. Even after the touchscreen based smartphone revolution, most of the engineering colleges in India continue the tradition of introducing the students to a decade old instruments. The other drawback in the older instruments is its lack of assistance to develop modern engineering systems which involves embedded systems and VLSI design. Embedded Systems and VLSI Design are a culmination of electronics and computers and as a result requires a special understanding of the subject. Embedded system in itself is a very vast field with multiple sub domains and it has already become a basic skill set necessary for a successful career for a graduate in electronics engineering.

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3. PROPOSED SYSTEM

Our aim is to design and develop a portable device called Super-Scope which is ALL- IN-ONE electronics lab equipment that has multiple functionalities needed by a modern day engineering student for his practical experiments in electronics and computer labs that would replace the existing plethora of instruments. The device is a fully operated from touchscreen using touch buttons and menus.

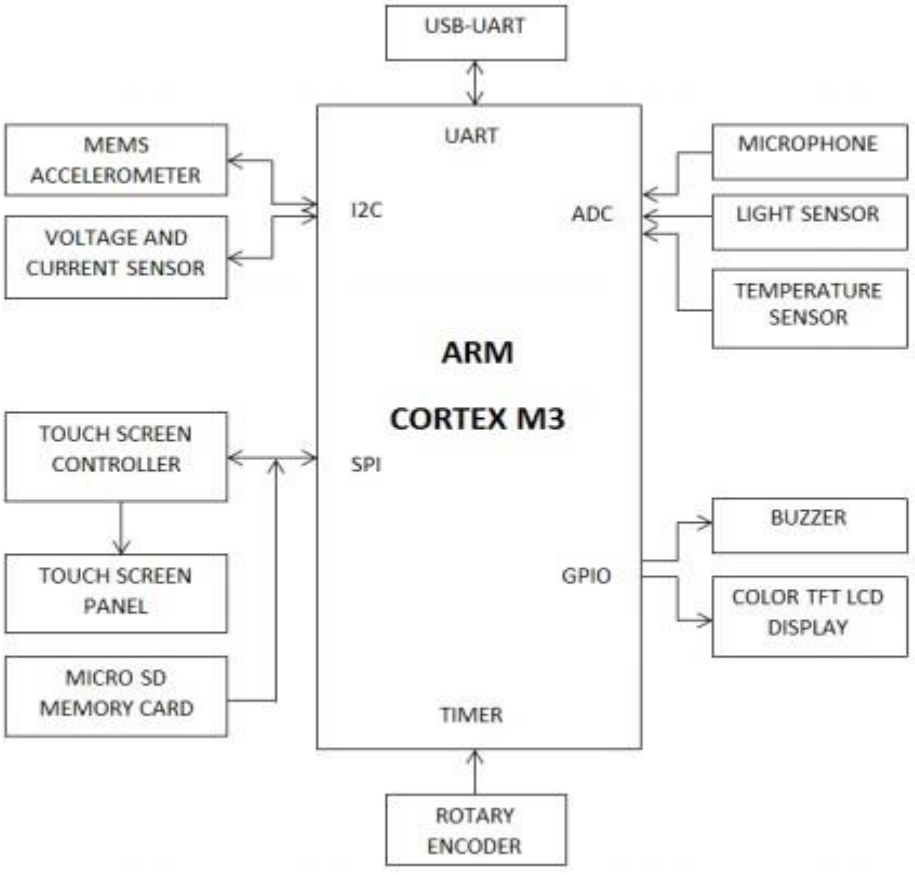

Fig.1. Block Diagram

This situation has fostered the development and adoption of remote laboratories as a replacement. Recently, remote laboratories based on a large variety of technologies have been developed at multiple universities and adopted in industrial electronics engineering education. Furthermore, some of these laboratories are replicated at Many universities.This was the commencement of a new mainstream that advocates a better remodeling of those laboratories to allow their allocation, sharing among universities, and their interoperable communication with other heterogeneous educational systems, e.g., learning management systems (LMSs). STEM education must keep pace with industry leading technologies in order to produce graduates with 21th century knowledge and skills. Teaching methods and approaches are continuously challenged and they evolve as innovative instructional technology becomes available on the market.Every course in engineering technology programs has a multitude of learning objectives. Students must learn discipline-specific knowledge, including the concepts and theories in the subject, and skills in using materials, tools and/or technology central to the subject Student population today is different than 10-15 years ago. Educators should understand the new type of

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students and should try to develop new and innovative methods and approaches to engage the students of the new millennium. Although computer literate, today's students do not entercollege with the same level of "hands---on" experience with hardware that prior generations had. As a result, students have less "gut intuition" and expert skills than prior generations possessed when entering the job market.

4. RESULT ANALYSIS

The device has the following features built in: Digital Signal Oscilloscope – used to monitor the signals acquired through the inbuilt 10- bit A to D converter. This device is a single channel, 100 KHz bandwidth. The signals will be shown in color waveforms 2GB Micro SD memory card. Waveform Storage and Playback- used to generate pulses at variable frequencies with added pulse width control. Logic Analyzer is used to analyze serial protocols such as UART.

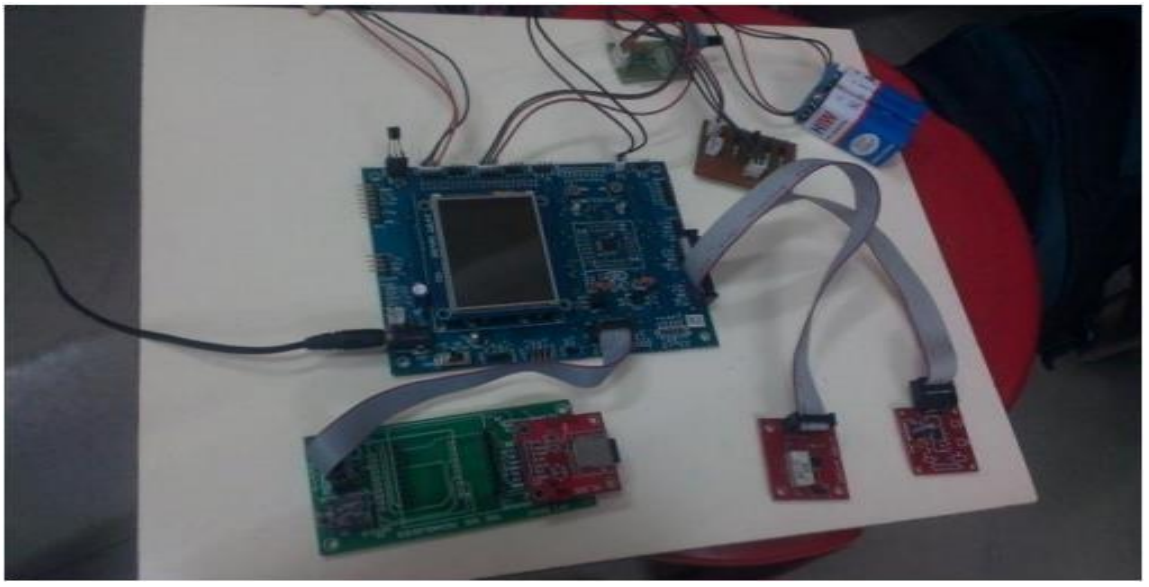

Fig.2. Hardware Kit

Voltmeter is used to measure the input DC voltage. Ammeter is used to measure the input DC current using current shunt resistor drop. Ohmmeter is used to find the resistor values, short circuits and components such as diodes. Tachometer is used to measure the speed of the rotating shaft of the motor using the Rotary Encoder. Audiometer is used to monitor the audible frequency signals sensed via Microphone circuitry. 3-axis Motion Monitor is used to measure acceleration or tilt or motion on all three axis using 3-Axis MEMS Accelerometer. Light Meter is used to measure the brightness of the incident light in terms of Luminosity using Light Sensor. Temperature Probe is used to measure the atmospheric temperature or the temperature of an object in degree Celsius. Calculator is used to perform math calculations using touch screen keypad.

CONCLUSION

Students want to solve problems and experience engineering regardless of where they are in lecture, in the laboratory, or the study room. Professors want to provide a hands-on learning experience to empower students who want to tinker, experiment, and explore concepts. With a portable laboratory, a student can

learn concepts in their preferred environments and provides a supplement to the traditional lecture and laboratory based courses. we can also include many features integrated into the single device in the future that should be very useful for the students.

FUTURE DEVELOPMENT

With a portable laboratory, a student can learn concepts in their preferred environments and provides a supplement to the traditional lecture and laboratory based courses. We can also include many features integrated into the single device in the future that should be very useful for the students.

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