Project Proposal

for

DEVEMB

by

ResolveSOFT

CENG 490

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Introduction

In DEVEMB project we will implement a software emulator, compiler and development environment for a specific embedded system card called PIC demo board (henceforth PDB),

which is used in “CENG 336 Embedded Systems" course. PDB includes a PIC processor and various peripherals like LCD, Parallel, Serial, USB ports, smartcard reader, LED's etc.
When we were taking Ceng336 course we realized the need of a development environment for high-level programming, debugging and simulating. For a programmer, working with an assembly language is almost painful and by this method sophisticated projects are hard to realize. Moreover assembly programs, being succinct and cryptic, are not very accessible. Beside these, by copying the program to the hardware for every testing is a waste of time. The development of on-chip debuggers, and on-chip BASIC interpreters by an industry in which the profit margins are already slim, is a strong indicator of a need in this field. By using DEVEMB, developer will be able to compile and debug their programs and test their programs in the virtual card emulated by software and upload them to the PDB, quickly.
At present, there are various software and hardware for development for PIC micro-controller units in the market, compilers, debuggers and simulators. However, testing is cumbersome in that software, because development environment and simulation software is not integrated. For instance, when using MPLAB IDE, one can not examine the output of LCD, whereas, when simulating a program on ISIS, basic debugging facilities such as tracing are not available to the programmer. Likewise each of the other similar products suffer some deficiency, be it limited capabilities, limited licenses or high prices. Hopefully, DEVEMB will be a solution to these problems.

2. Possible Application Areas of Our Design

There are two main application areas of our product: Education and industry. Although our design will not see extensive application, it will, hopefully be modular enough to be able to be extended and adapted for technical and occupational purposes.

2.1 Education

For the courses offered at vocational schools and universities about embedded system development, our design can be used as an educational material. Students can use our product for doing their homework and developing their projects.

Although, one does not need to own the hardware to learn basics of programming PIC, a PC will not be enough for learning the practical aspects of PIC, as a PC's peripherals are radically different from an embedded system. With DEVEMB, students will not have to load their code to the embedded system card each time, to test their code's correctness. By using our design they can easily compile and test their code.

2.2 Industry

Our product will have extensive usage in software and electronic industry. They will develop, test and optimize their projects by using our design. Since time is very important for companies, opportunity for doing compilation, testing and according to the test results, making optimizations by using only one product is crucial. Moreover, companies do not have to buy separate software and an electronic device for development and testing. Because of these, our product will have a large application area in the industry.

3. Initial ideas regarding method

For our project, it is going to be designed Emulator and Development Environment for CENG Embedded System Card.

First of all, the project must be designed step by step for the purpose of executing the parts of it separately by debugging feature .Other features that must be implemented are:

- Designing an emulator that holds all the preferences of the board and runs the executable program on PIC.
- Compiler for the high-level language that is going to be used for PICs on the board
- An Interface that is going to be used for installing the program to the PIC.
- Debug feature that executes all features step by step.

For the first feature we should start to write an Emulator. While writing an Emulator we must follow these steps:

First, we are going to select a programming language that fits our expectations:

Selecting the efficient tools to generate the appropriate assembly code would be needed.

Second, we have to find all available information about the emulated hardware:

As we know from Ceng 336 Embedded System Card is going to be used.

Third, we have to try running programs on our emulator and use disassembler and debugger to see how programs use the hardware and adjust our code appropriately.

For the second feature, a compiler will be needed to generate the executable code for PICs.

Therefore, the high-level program that is going to be run on PIC will be written.

Also the project must be user friendly and provides some features. The user can;

1. Compile
2. Upload
3. Debug

their programs for the card. Also, they will be able to test their programs in virtual card that we emulate.

4. Possible features of the end product

1. The project will possibly include a compiler module that will take either PICBASIC or PIC C programs as input and give HEX file as an output.
2. The project will possibly include a PIC16F877 simulator that will run HEX files.
3. The simulator will possibly be able to display the contents of the registers, memory banks and program memory.
4. The simulator will possibly be able to be clocked at the same speeds as a real PIC16F877 microprocessor (henceforth just PIC).
5. The simulator will possibly be able to receive and generate virtual port signals as a PIC would.
6. The simulator will possibly be able to record aforementioned input and output signals.
7. The project will possibly be able to interface real peripherals with the simulator. such as a smart card reader.
8. The project will possibly be able to generate test input signals, such as random signals, prerecorded signals etc...
9. The project will possibly be able to pause the execution of the simulation, resume the execution of a paused simulation, run instructions one at a time, save the state of a paused execution, reload a saved state of execution.
10. The project will possibly simulate LEDs, seven segment displays, LCD, switches, and other peripherals on the card.