A WORKSHOP

Embedded Systems Made Easy

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Date and Venue:

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Hotel Manaki, Janakpur

NEPAL

1 Motivation

Advancement in technology needs a careful and continuous following. Mobile systems, broadcasting methods, medical machinery are few technologies without which life is hard to imagine. Technology is leading the frontiers from saving lives, security, defense, and space exploration to mundane aspects as entertainment or social networking. Electronics, than ever before, is vital part of any society now.

Big industries are investing millions to get innovative application out of Embedded Systems today, they also, however, have started a culture of patents and closed sources. On the other hand, Homebrew, Do It Yourself (DIY) and Open Source are playing important role to keep these technologies transparent and accessible.

Open Source Hardware and Software have massively improved in the quality, user experience and have become more affordable to buy. We are motivated to promote this experience to school students and enthusiasts; introduce them the possibilities beyond simple transistor circuits and facilitate them venture into the embedded systems.

A do it yourself workshop on embedded electronics and applications is an initiative with following key ideas:

- How simple and easy it is

- Think beyond

- Internet of things

- Cheaper hardware

- Coding has never been easier

- Understanding how complex devices work ...

2 Programme

The main agenda is learning by making, therefore, maximum time is assigned for DIY sessions.

1. Each session can have maximum of 10 groups with 2 students per sub-group

2. Each session spans for 4 hour

3. First 30 Minutes will be for basic introduction of:

  - Basic electronic components (LED, Resistor, Relay, Transistor)
  - Microcontroller
  - Basic C coding

4. Do It Yourself (DIY) session for 1 hour with one of the 5 projects:

   - Blink LEDs, Switching and reading Analog signals
   - Reading temperature value
   - Magnetic switch
   - Light sensing
   - Motor driver

5. Demonstration of some finished projects, as, SMS controlled Lights, RGB Lighting

6. Link will be provided prior to Workshop for software along with related documentation.

7. There will be also an open discussion at the end of the programme. Participants are encouraged to interact and pose questions

3   Session description

Due to Limited supply of hardware/components, sessions are conducted in groups with a question-answer session at the end.

1. Each session will have maximum of 20 students forming 10 groups.

2. Each session is dedicated to one institution only.

3. There will be a list of different projects. Each group selects a project from this list.

4. Each group gets a Hardware Kit pre connected to PC

5. Groups can bring their own laptop, this is highly recommended.

   - Can save project data
   - Software can be pre installed to save time
   - Latest OS (tested on windows 7,8, Ubuntu 12.04 or higher, OSX)

6. Participants must abide by basic discipline and be supportive of the event and other groups. Participants who disturb others or violate social discipline will be irrefutably disqualified.

4 Requirements

We are delivering main hardware kits from outside of Nepal (Germany), therefore, participating institutions should cover their own expenses. Each hardware kit contains a complete set of components to begin with basic micro-controller circuits. The calculated price for each hardware kit is Rs.8800. Hardware Kit will be distributed after the workshop. We hope that:

- Each participating institution could buy 3 to 5 hardware kit.

- Institutions may choose to participate without purchasing the hardware kit for Rs. 3500.

The basic raw material cost of these kits is Rs. 8800. The participating institution's willingness to buy these kits will help us finance the workshop. It will also be beneficial for their students to gain more hands on experience with these equipment.

4.1 Online registration

Participating students are encouraged to visit the page `http://lifemachine.net/`. Here, the participants can find the source codes to program the micro-controllers, programming IDE and documentations. The online registration form can also be found on the website.

We encourage the individual students to **register online**. This will help us keep track of the students and copies of the needed software and hardware we have to distribute. This will also be helpful to keep record of their progress and communicate with them in future in case they are willing to learn more or want some help.

5 Future possibilities

After the completion of workshop, students will have working knowledge of Embedded Systems, programming them, designing new projects and using them. Here are few popular topics that will that will be introduced as potential projects:

1. Basic Robotics, i.e. motor control, digital switching and sensing

2. Sensors, Temperature Alarm Systems, Distance measurement, and Reed Switch

3. LED, Dimmers, Optical electronics i.e. LCD, Touch Sensing etc.

4. Power Regulation, AC switching

5. Radio and wireless

6. Binding things to internet

7. BUS systems (SPI, I^2C, 1-Wire etc.)

8. DIY Gadgets

9. Data Logging

10. GPS Sensing

11. Advanced Hardware and Microcontroller (ARM and Higher AVR)

Skill to do comes of doing
Ralph Waldo Emerson

References

1. `http://lifemachine.net/`

2. `http://www.atmel.com/devices/ATMEGA328P.aspx`

3. `http://www.raspberrypi.org/`

4. `http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_(MSP-EXP430G2)`

5. `http://arduino.cc/en/Main/ArduinoBoardMicro`

6. `http://www.pjrc.com/teensy/`

7. `http://www.tkn.tu-berlin.de/`

Special Thanks to