

Smart Electronics

March, 2014

“Smart” Electronics—What is it ??



- Everything you see in your daily lives can be made “smart”!
- Sensors receive data, process them, make decision and lead to action.
- A paradigm shift of our lives in the 21st century!

“Smart” Electronics in Future Health Care

- Electronics can be everywhere — **Example:**
Healthcare <http://www.youtube.com/watch?v=C4LbAUa4ZwY>



- This DIP program is to let you explore how electronics can make this future a reality!

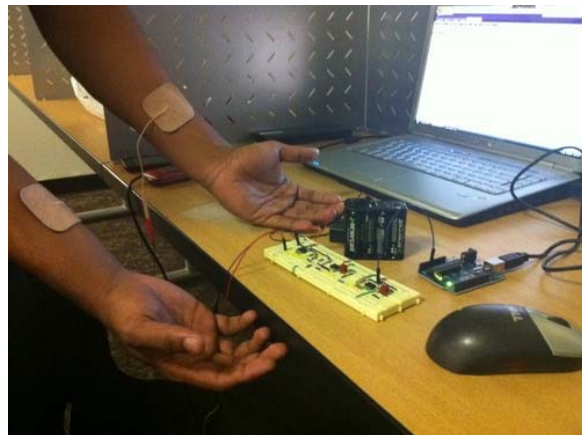
Three Flagship Projects

Project 1: ECG Monitoring System

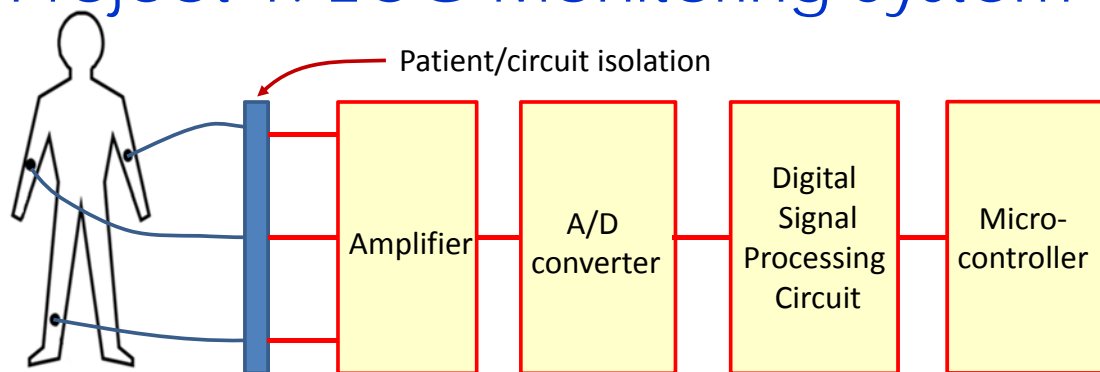


- Wonder how is your ECG waveform look like?

- Design and build your own ECG monitoring system and measure your ECG waveform at home.



Project 1: ECG Monitoring System



- **Involve all aspects of Electronics Engineering**
 - Analog, mixed signal and digital designs
 - Microcontroller design
 - Algorithm development
 - Software programming
- **You can easily find a role to play to suit your interest in the project**



Project 1: ECG Monitoring System

- You will learn the basic designs for each block, but innovative ideas can be added into each block to improve its smart features.
 - How to remove the 50Hz noise coming with the ECG signal?
 - Do the resolution and speed of the ADC matter?
 - What do you want the digital signal processing module to do?
 - In what creative way you want to display and interpret the ECG signals?
 - And many more.....

Project 2: Wireless Audio System



Build a cordless home theater system for yourself!

Getting sick of all the long cables and the messy connections



Project 2: Wireless Audio System



Audio Source

ADC

Transmitter

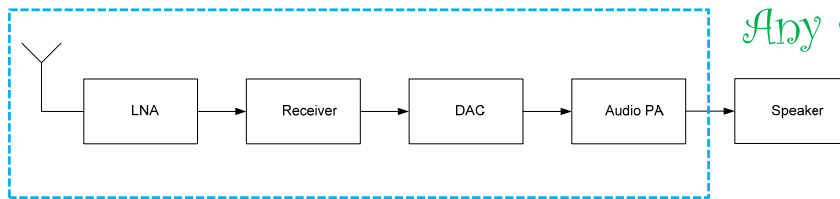
Power Amplifier

Your own audio source:

Handphone; MP3; Tablet etc

Transmitter

Build up your own audio system



Any speaker you want

Receiver



Project 2: Wireless Audio System

What are the challenges?

- Interference from other RF sources in your house
- Multi-path distortions
- Disruptions to the RF signal from people or moving objects
- Multichannel audio delivery
- Signal loss in long distance transmission

Project 3: Remote Controlled "Intelligent" Racing Car



- Dream to be a F1 racing car driver?

- Develop your own racing car and be the fastest driver in your class!



Project 3: Remote Controlled "Intelligent" Racing Car



All aspects of circuit design are important for the full system!

- RF circuits for wireless control.
- Encoder/ Decoder for commands (left, right, speed, etc.)
- Intelligence from Infra-red sensors.
- Analog-Digital conversion to interface with uP
- Signal processing on uP to avoid obstacles automatically in a maze.

Project 3: Remote Controlled “Intelligent” Racing Car

- You can design one or several parts of the system.
- **Sub-project 1:** Design of Wireless transmitter/receiver.
 - **Challenge:** Over what distance can you control the car?
- **Sub-project 2:** Design of Remote control encoder/decoder.
 - **Challenge:** How many different functions can you support?
- **Sub-project 3:** Design of Infra-red Sensor interface.
 - **Challenge:** How quickly can you navigate through a maze?

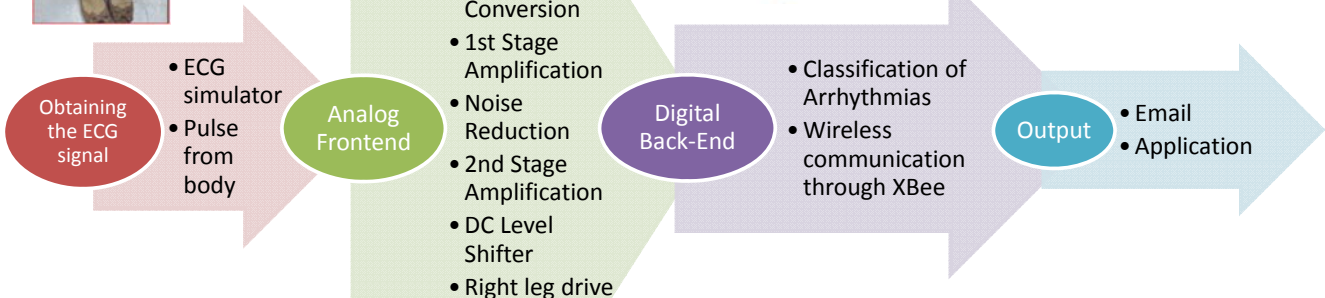
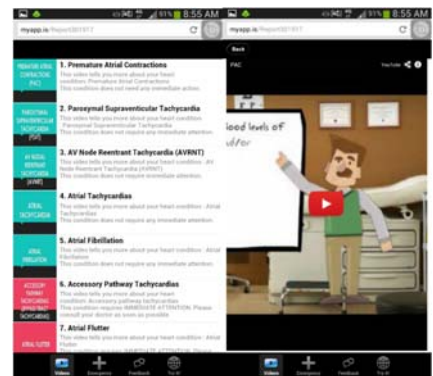
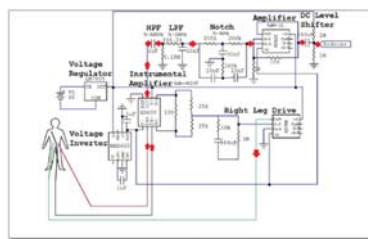
Project 3: Remote Controlled “Intelligent” Racing Car



**Have fun and be the best team to
win the race!!**

Awarded Projects in Smart Electronics DIP in AY 2013-2014 S1

E005 ECG Monitoring System – Best Presentation



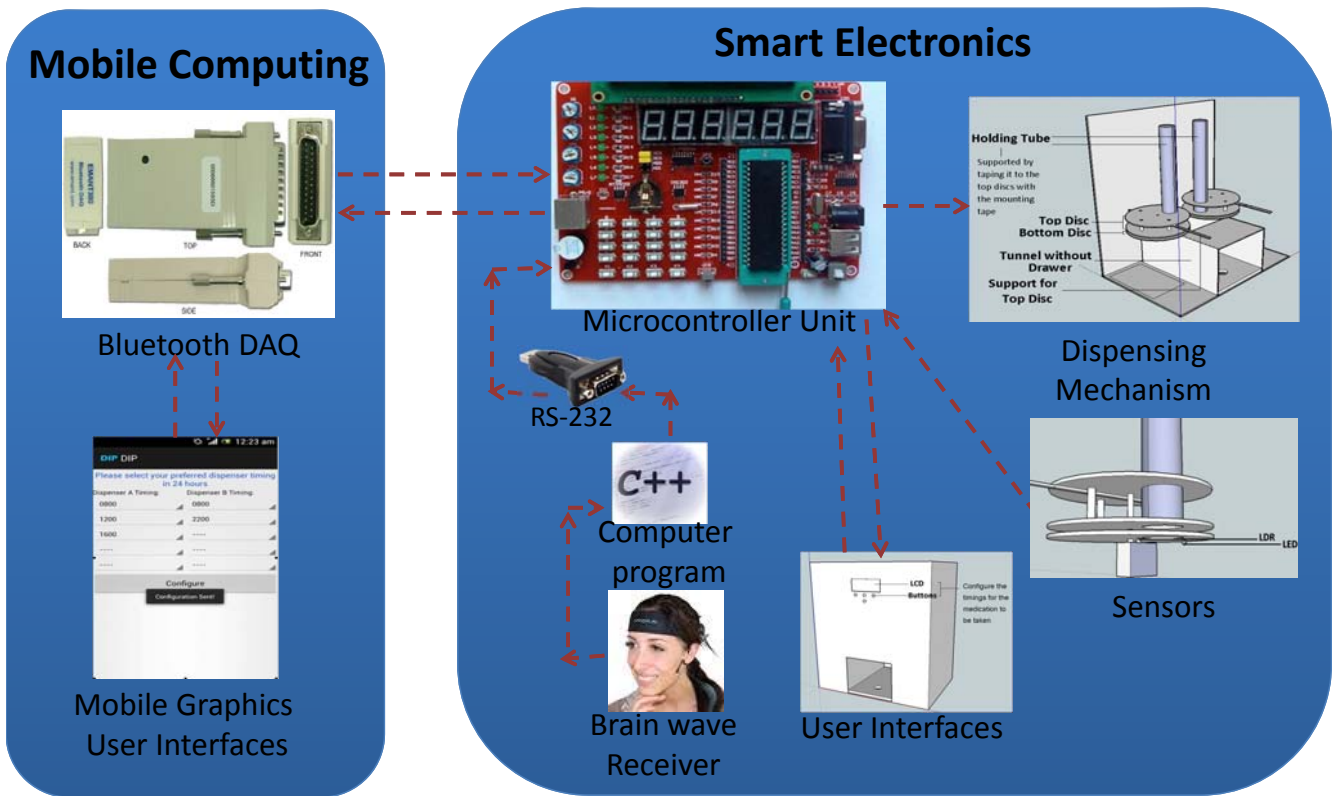
Michelle Lim Mei Xian

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Yang XiaoXuan
Chua Xin Ying
Hasinah Binte Mohamed Amin
Koh JieYu Belinda

Kang Kai Jun
Toh Xue Le Cheryl

E072 - Pill Dispenser and Brainwave Analyser – Best Demo



E061 - UNMANNED GROUND RECONNAISSANCE VEHICLE

– Champion Group



Smart Electronics

**We welcome you to be the
future innovative designer of
Smart Electronics**

- For more information, please contact
 - Dr. Yu Yajun, for the ECG monitoring system
 - Dr. Zheng Yuanjin, for the wireless audio system
 - Dr. Arindam Basu, for the remote controlled car