

# 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 21<sup>st</sup> 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!

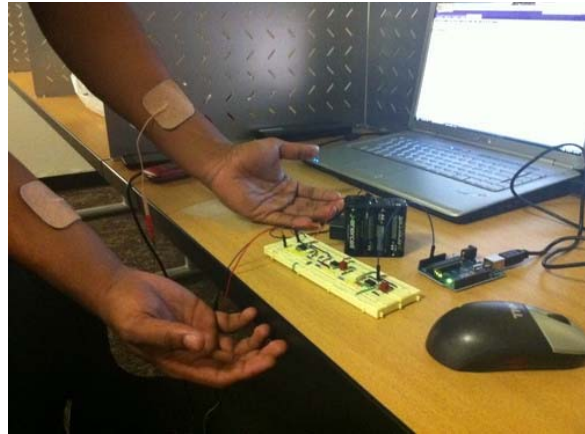
## **Three Flagship Projects**

# Project 1: ECG Monitoring System

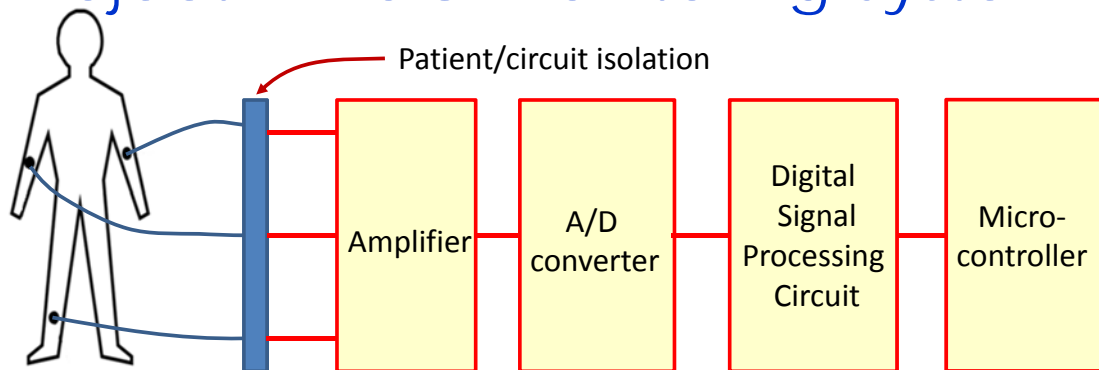


- Wonder how is your ECG waveform look like?

- 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

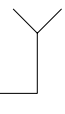


Audio Source

ADC

Transmitter

Power Amplifier

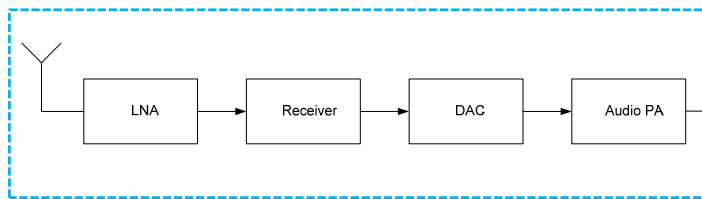


*Your own audio source:*

*Handphone; MP3; Tablet etc*

**Transmitter**

**Build up your own audio system**



**Receiver**

*Any speaker you want*



# 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?

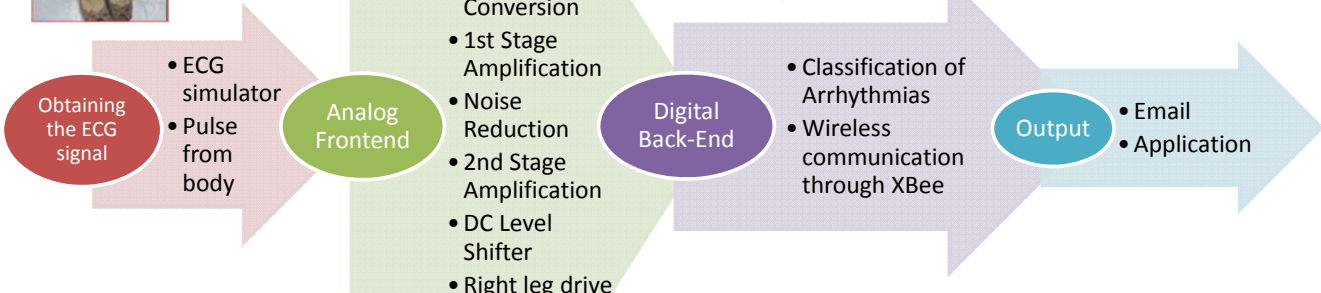
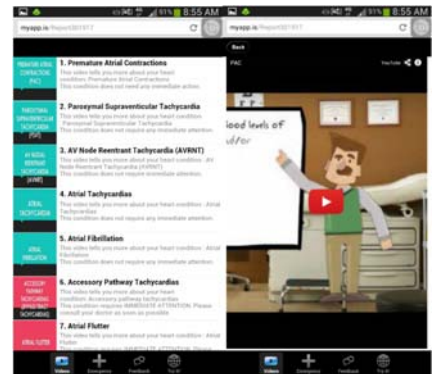
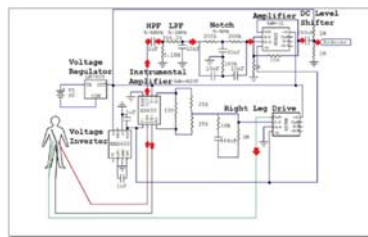
# Project 3: Remote Controlled “Intelligent” Racing Car



**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

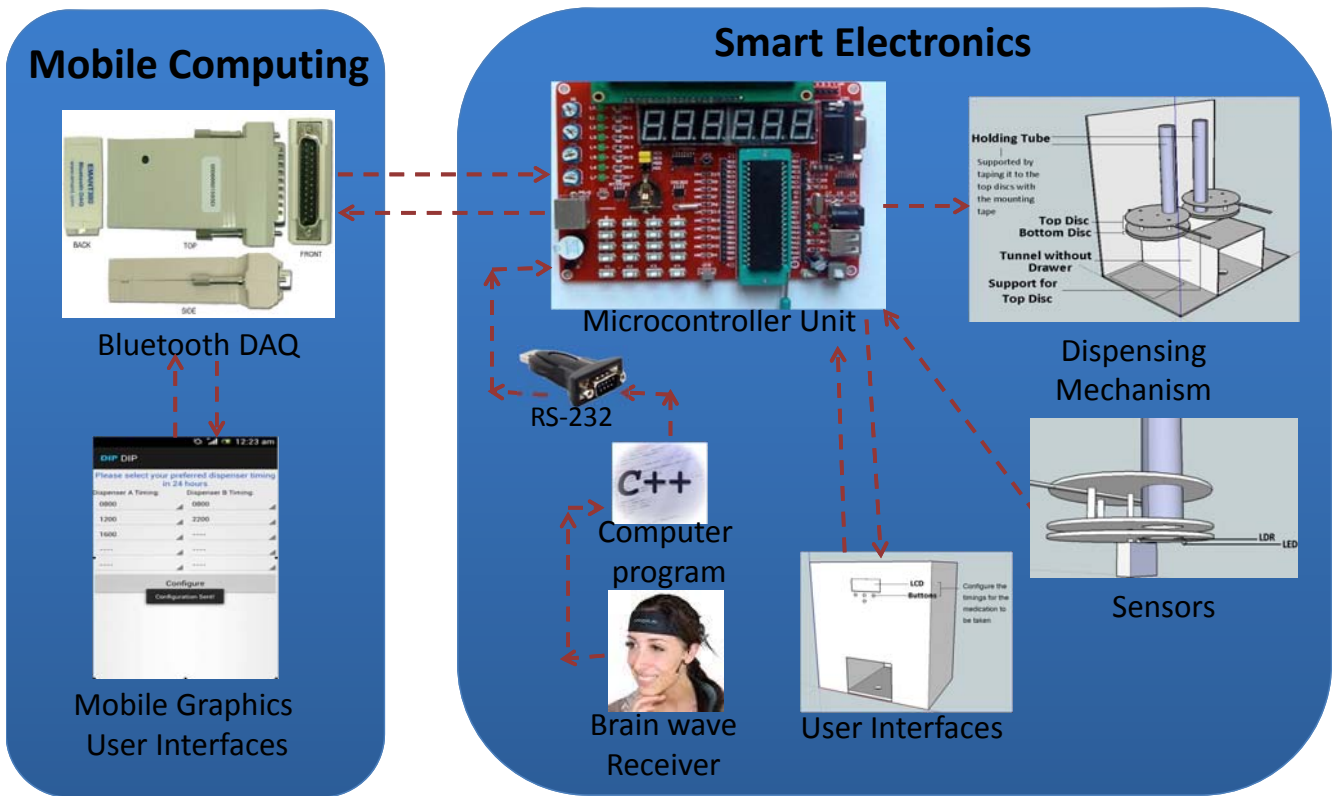
Feng Yuxi  
Zhou Wei  
Zhang Yixuan

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