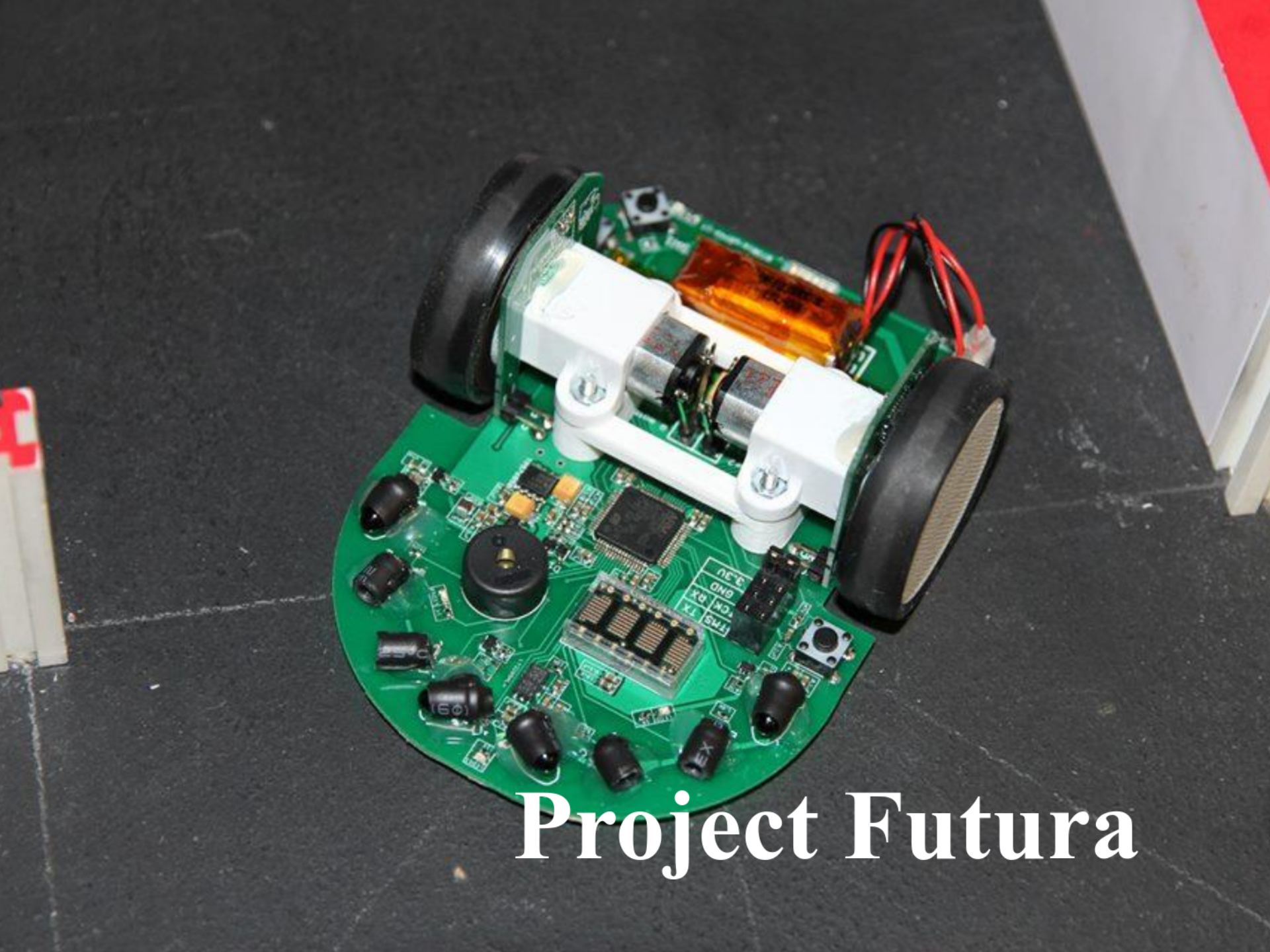

Project Futura

Introduction

- To help relatively experienced student to learn advanced knowledge of Micromouse
- Kit Mouse that capable to make advance movement, such as curve turn and acceleration were made as teach tools
- High resolution encoder is the key.
- You can apply the what you've learned to a working mouse without struggling with potential hardware problem.
- You need to design your own mouse for competition

Specs

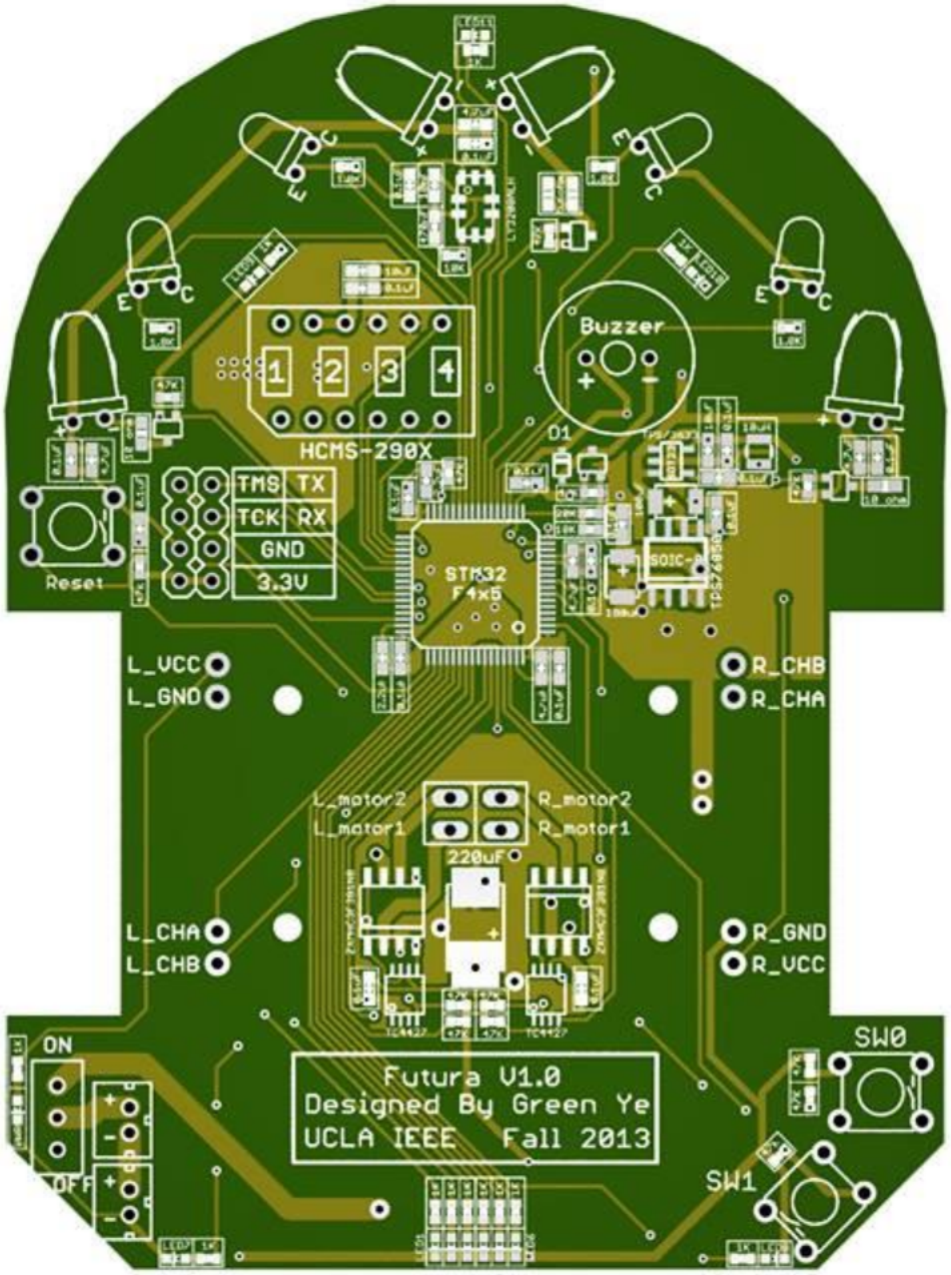
Width	**75mm**
Length	**100mm**
height	**38mm**
weight	**75g w/ battery**
wheel	**3D printed wheel and mount + mini-z tires (MZT302-20)**
Processor	**STM32F405RGT6(168Mhz with internal RC)**
Motor/Encoder	**Pololu 1:10 gear motor HP/AS5304 Encoder**
Gear ratio	**1:10**
battery	**120mah 25C 2s1p**
Motor Driver	**ZXMHC3F381N8+TC4427 (H-bridge + level shifter)**
Sensor	**TEFT4300+SFH4545 X 4**
Gyro	**LY3200**
User Interface	**2 buttons + 11 LEDs + dot matrix display**

Demo

http://www.youtube.com/watch?v=YJhf3xfEgZY

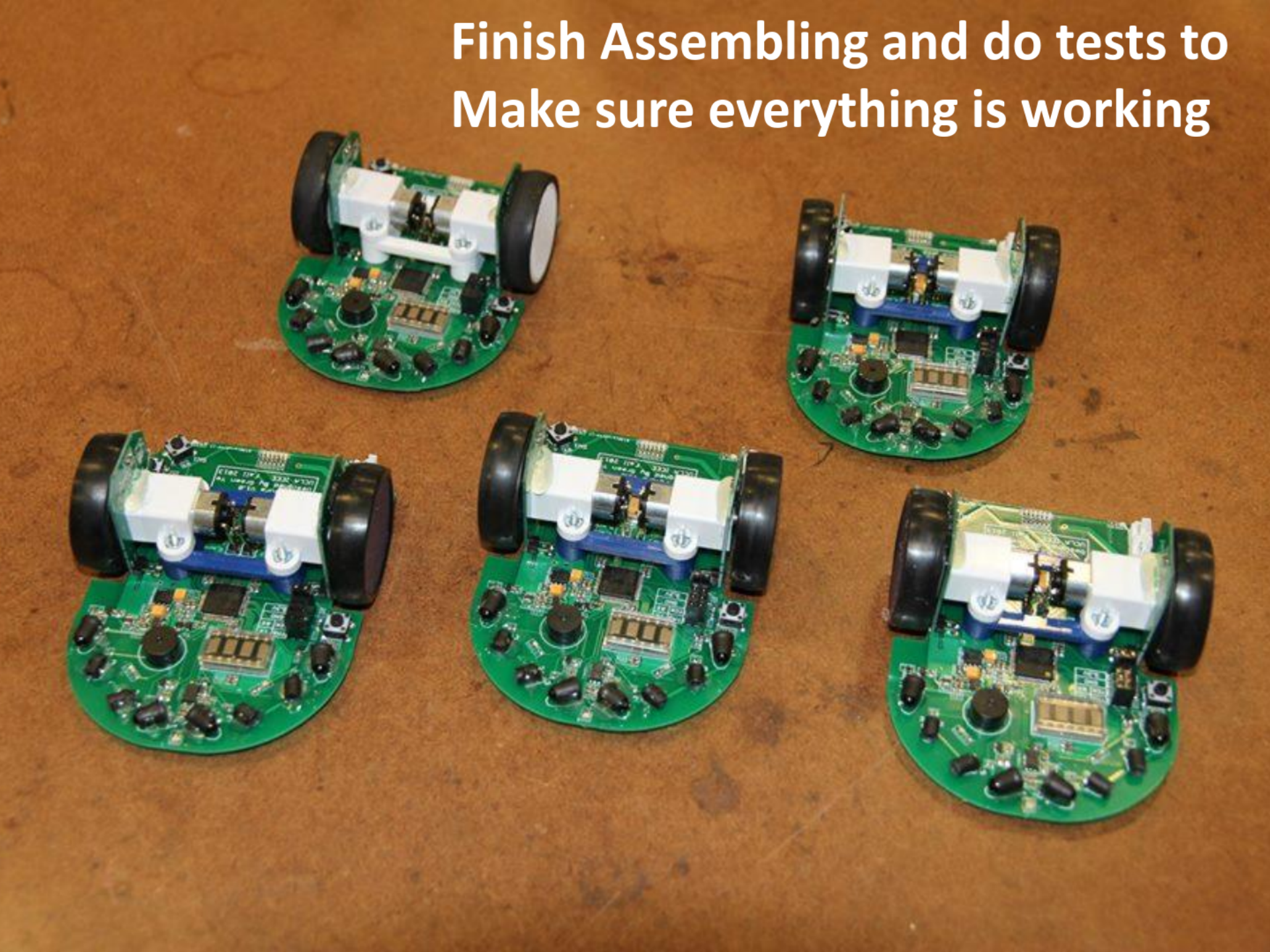
How it’s made?

Design PCB


Buzzer
HCMS-290X
1
2
3
4
TMS
TCK
GND
3.3V
TX
RX
Reset
STM32
F4x5
D1
L_VCC
L_GND
R_CHB
R_CHA
L_motor2
L_motor1
R_motor2
R_motor1
220uF
L_CHA
L_CHB
R_GND
R_VCC
ON
OFF
SW0
SW1
Futura V1.0
Designed By Green Ye
UCLA IEEE Fall 2013

Solder and prepare all parts/components/testing tools

Finish Assembling and do tests to Make sure everything is working



Pack them into containers
Ready to use for future

We spent lots of efforts to make these mouse, play it carefully since they will be used repeatly in the future

Lecture 1

Keil IDE

- We will be using the Keil IDE to write our code and program the mouse
- Step 1: Install the file **mdk460.exe**
- Step 2: Install the **st-link_v2_usbdriver**
- Step 3: Open the file **FuturaProject/project/micromouse_test.uvproj** with **Keil uVision4**

Adding a new file to Keil

- Step 1: Create the file in either **user_Libraries/src** (.c files) or **user_Libraries/inc** (.h files)
- Double click on the group **user_Libraries_src** or **user_Libraries_inc** in the “Project” pane and select your file

Downloading your code to the mouse

- Connect the three mouse pins, TMS, TCK, and GND, to the ST-link programmer pins, IO, CLK and GND respectively
- In Keil uVision, compile your code by pressing F7. Then click Flash->Download.

Sensors

- **void readSensor()**
  - Reads each sensor and places the results in the global variables: **LFSensor**, **RFSensor**, **DLSensor**, and **DRSensor**.
  - This should be called in your systick handler

Gyro

- **void readGyro()**
  - Similar to readSensor()
  - Sets the variables **aSpeed** (your mouse's angular speed) and **angle** (the current angle of your mouse

Volt Meter

- **void readVolMeter()**
  - Sets the variable **voltage**
  - Always make sure your batteries are well charged, especially when using the small batteries

Encoders

- **int32_t getLeftEncCount()** & **int32_t getRightEncCount()**
  - Returns the current encoder count
  - 3520 encoder counts per revolution

User Interface

- Buzzer
  - **void shortBeep(int duration, int freq)**
    - duration – milliseconds
    - freq – Hz (example 8000)
- Matrix display
  - **void displayMatrix(const char* s)**
    - s – 4 character (max) string
  - See others in matrixDisplay.h
- LEDs
  - LED1_ON, LED2_ON … LED11_ON
  - LED1_OFF, LED2_OFF … LED11_OFF

Delay

- **void delay_ms(u32 nTime)**
  - **nTime** – milliseconds

Interrupts

- **void systick()**
  - A 1 millisecond timed interrupt
  - It is a function that runs every millisecond

- **void button1_interrupt()** & **void button2_interrupt()**
  - These functions are run when a button is pressed

Motors

- **void setLeftPwm(int32_t speed)** & **void setRightPwm(int32_t speed)**
  - speed – A value ranging from -999 through 999, representing the duty cycle of the pwm for the motor.

printf

- Used to print debugging information
- Example:
  - printf(“Left front sensor: %d\r\n”, LFSensor);
- See more information here: http://www.cplusplus.com/reference/cstdio/printf/

PuTTY

- PuTTY is a desktop application that can be used to communicate with the mouse
- Download the windows version here: http://the.earth.li/~sgtatham/putty/latest/x86/putty.exe
- Set connection type to “Serial”
- Under “Serial line” type “COM**X**” where **X** is your COM port number
  - You can find the COM port in Windows Device Manager
- In the “Serial” tab, set “Flow control” to “None”
- Default options should be fine for everything else

PuTTY

- Connect the FTDI board pins TX, RX, and GND to the RX, TX, and GND pins on the mouse

- TX connects with RX
- RX connects with TX
- You can now communicate with your mouse using printf and PuTTY