

week I, continued

MIT MOTORSPORTS

FORMULA SAE AT MIT

David Gomez  
MIT Motorsports  
Dashboard Control  
Rev1.1  
PCBREV

MIT  
MOTORSPORTS

MIT MOTORSPORTS  
THE TEAM



# TEAM DETAILS

- Student-run
  - Members design, simulate, test, manufacture subsystem
  - Machine shop/garage in N51 (MIT Science Museum)
  - We drive the car
    - National competition in summer
    - Smaller, “shootout” competitions during year
    - Driver training days during the year

# COMMITMENT

- Build days are on Saturday 11a~8pm
  - Bertucci's lunch and Beantown dinner provided
- Weekly meeting/seminar (for course credit)
- Designing/shop days during the week
  - Independently CAD parts, order stock, etc.

# EE AT MIT MOTORSPORTS

- Tractive, High Voltage System (300V)
  - Motors, motor controllers, battery packs
- Grounded Low Voltage “GLV” system (12V)
  - CAN nodes for controls, brain box, dashboard

# CS AT MIT MOTORSPORTS

- Website maintenance - events, membership changes, new pictures and PR material
- Control code for car
  - Traction control, launch control, dash control, torque vectoring, regenerative braking (MATLAB, Simulink, LabView)



MIT MOTOSPORTS  
THE CAR

# MIT MY2014 - GLANCE

- 500 lbs
- Rules limited to 85kW
- Dual EMRAX 207 Motors
- Custom built packs from A123 pouch cells totaling 300V, 5.6 kWh
- 2.64:1 drive ratio direct



MIT MOTORSPORTS



MIT MOTORSPORTS



MIT MOTOSPORTS

# COMPARISON MULTIPLES

	MIT MY2014	KTM XBOW	AERIAL ATOM	CATERHA M 7-280
\$	29,995	88,500	56,480	40,900
P/W	0.428	0.15	0.18	0.12
\$/HP	140.2	315	230.5	292
\$/TQ	136.3	286	392	340.8

# QUESTIONS?



Contact [fsae@mit.edu](mailto:fsae@mit.edu).

MIT MOTORSPORTS







week I, continued

section by Fri at noon

[cs50.harvard.edu/section](http://cs50.harvard.edu/section)

# supersections

**Less Comfortable**

Sun 9/14, 2pm, check [cs50.harvard.edu](http://cs50.harvard.edu) for location

**More Comfortable**

Sun 9/14, 4pm, check [cs50.harvard.edu](http://cs50.harvard.edu) for location

problem set 0

problem set I

# office hours

[cs50.harvard.edu/hours](http://cs50.harvard.edu/hours)

# questions?

[cs50.harvard.edu/discuss](https://cs50.harvard.edu/discuss)



lunch this Fri 9/12, 1:15pm

[cs50.harvard.edu/rsvp](http://cs50.harvard.edu/rsvp)

when  clicked

say [hello, world]

play [hello world] yes

```
#include <stdio.h>

int main(void)
{
    printf("hello, world\n");
}
```

```
#include <stdio.h>

int main(void)
{
    printf("hello, world\n");
}
```

```
#include <cs50.h>
#include <stdio.h>

int main(void)
{
    printf("state your name");
    string s = GetString();
    printf("hello, %s\n", s);
}
```

```
#include <cs50.h>
#include <stdio.h>

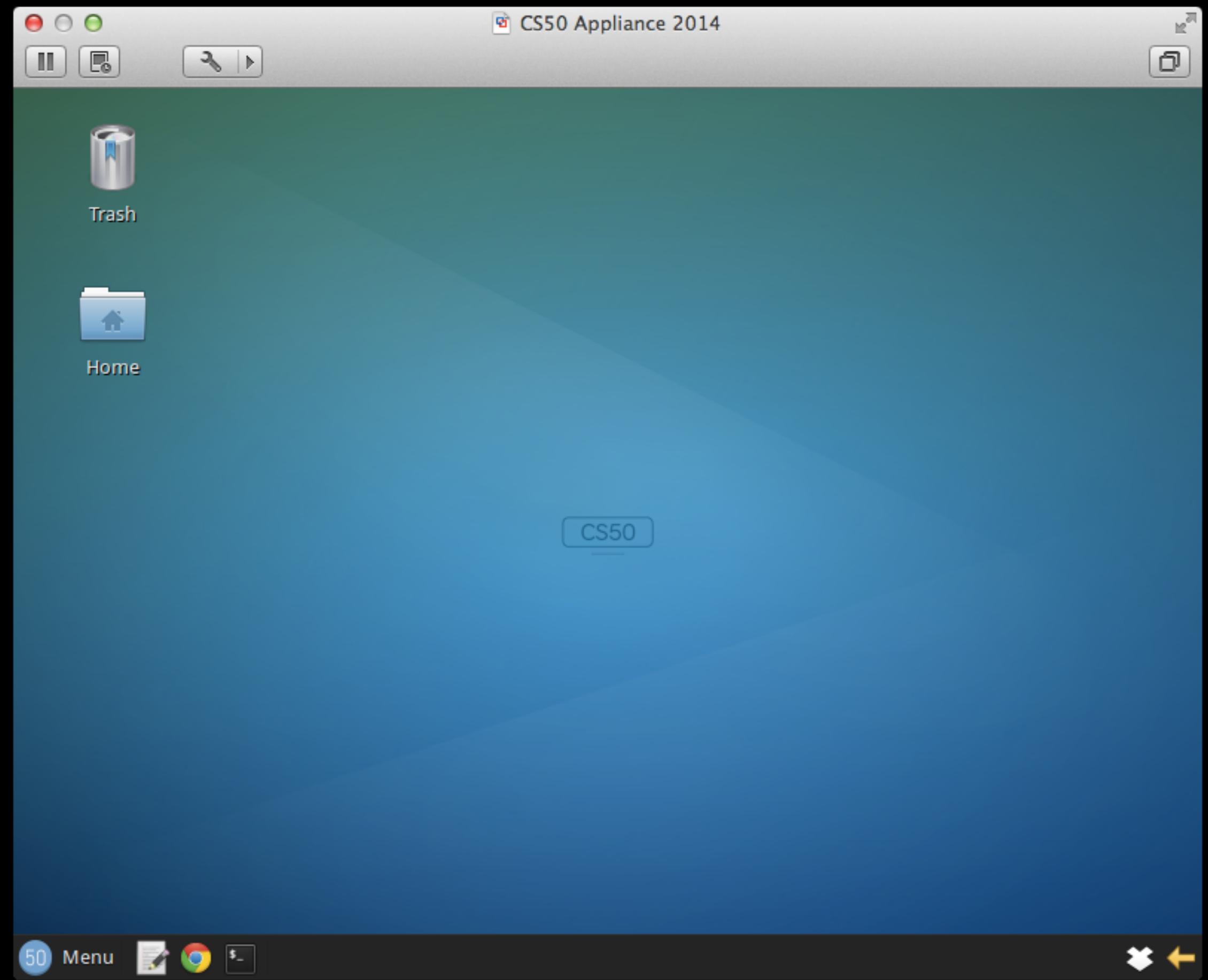
int main(void)
{
    printf("state your name");
    string s = GetString();
    printf("hello, %s\n", s);
}
```

```
#include <cs50.h>
#include <stdio.h>

int main(void)
{
    printf("state your name");
    string s = GetString();
    printf("hello, %s\n", s);
}
```

```
#include <cs50.h>
#include <stdio.h>

int main(void)
{
    printf("state your name");
    string s = GetString();
    printf("hello, %s\n", s);
}
```



CS50 Appliance 2014

\*hello.c (~) - gedit

File Edit View Search Documents Help

Source Code \*hello.c

Functions main

```
1 #include <stdio.h>
2
3 int main(void)
4 {
5     printf("hello, world\n");
6 }
```

jharvard@appliance:~\$

Terminal

C Tab Width: 4 Ln 5, Col 30 INS

50 Menu \*hello.c (~) - gedit

The screenshot shows a desktop environment for the CS50 Appliance 2014. At the top is a menu bar with options like File, Edit, View, Search, Documents, and Help. Below the menu is a toolbar with icons for file operations. The main window title is "CS50 Appliance 2014" and the active tab is "Source Code" containing the file "\*hello.c". The code editor displays the following C program:

```
1 #include <stdio.h>
2
3 int main(void)
4 {
5     printf("hello, world\n");
6 }
```

Below the code editor is a terminal window titled "Terminal" with the prompt "jharvard@appliance:~\$". The terminal is currently empty, showing only the prompt. The status bar at the bottom indicates the current tab is "C", the tab width is set to 4, the line number is 5, the column number is 30, and the mode is "INS". The bottom dock contains icons for various applications, including a browser and a file manager.

make hello

./hello

```
#include <stdio.h>

int main(void)
{
    printf("hello, “friend”\n");
}
```

→ #include <stdio.h>

```
int main(void)
{
    printf("hello, world\n");
}
```

```
#include <stdio.h>

int main(void)
{
    ↑
    printf("hello, world\n");
}
```

```
#include <stdio.h>
```

```
int main(void)
```

```
→ {
```

```
    printf("hello, world\n");
```

```
→ }
```

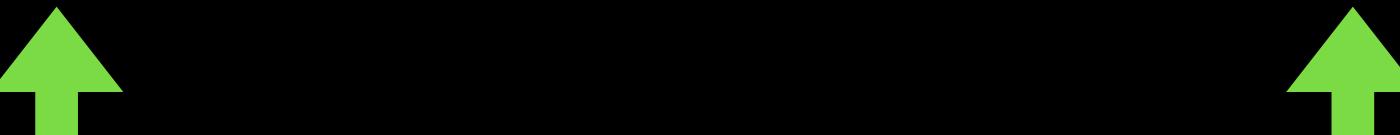
```
#include <stdio.h>

int main(void)
{
    printf("hello, world\n");
}
```



```
#include <stdio.h>

int main(void)
{
    printf("hello, world\n");
}
```



```
#include <stdio.h>

int main(void)
{
    printf("hello, world\n");
}
```



```
#include <stdio.h>

int main(void)
{
    printf("hello, world\n");
}
```



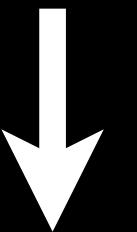
```
#include <stdio.h>

int main(void)
{
    printf("hello, world\n");
}
```



# source code

# source code



# source code

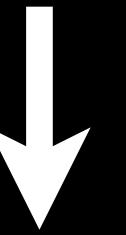


# compiler

source code



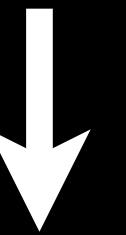
compiler



source code



compiler



object code

10000011	00000001	00010001	00000000	00111101	11111100	01110100	00111101
00000000	01000000	00000000	00000000	00000000	00000000	00000000	00000000
10010000	00000000	00000000	00000000	01010000	00000000	00000111	00110000
00001011	00000001	00001011	00000011	00001010	00000000	00000000	00000000
00000000	00100000	00000000	00000000	00000000	00000000	00000000	00000000
00000000	00100000	00000000	00000000	00000000	00000000	00000000	00000000
00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
01110000	00010000	00000000	00100000	00000001	00000000	00000000	00000000
00000000	00000000	00000000	00100000	00000001	00000000	00000000	00000000
00000000	00000000	00000000	01000000	00000001	00000000	00000000	00000000
00000000	00100000	00000000	01000000	00000001	00000000	00000000	00000000
11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
10010000	10000000	00000000	01000000	00000001	00000000	00000000	00000000
00101110	01100100	01111001	01101110	01100001	01101101	01101001	01100011
10110000	00000100	00000000	00100000	00000001	00000000	00000000	00000000
10110000	00000100	00000000	00100000	00000001	00000000	00000000	00000000
10100000	00000001	00000000	00000000	00000000	00000000	00000000	00000000
10110000	00000100	00000000	00000000	00000000	00000000	00000000	00000000
00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
00000000	00000000	00000000	00000000	00000000	00100000	00000000	00000000

...

make hello

```
clang -o hello hello.c
```

```
clang -o hello hello.c -lcs50
```

# Standard Library

stdio.h

printf

...

printf

\n

\r

\'

\"

\\"

\θ

...

printf

%c

%d, %i

%f

%lld

%s

...

# types of variables

char

double

float

int

long long

...

# CS50 Library

## cs50.h

bool

string

# CS50 Library

## cs50.h

GetChar

GetDouble

GetFloat

GetInt

GetLongLong

GetString

```
#include <stdio.h>

int main(void)
{
    printf("hello, world\n");
}
```

# conditions

```
if (condition)
{
    // do this
}
```

# conditions

```
if (condition)
{
    // do this
}
else
{
    // do that
}
```

# conditions

```
if (condition)
{
    // do this
}
else if (condition)
{
    // do that
}
else
{
    // do this other thing
}
```

# Boolean expressions

```
if (condition && condition)
{
    // do this
}
```

# Boolean expressions

```
if (condition || condition)
{
    // do this
}
```

# switches

```
switch (expression)
{
    case i:
        // do this
        break;

    case j:
        // do that
        break;

    default:
        // do this other thing
        break;
}
```

# loops

```
for (initializations; condition; updates)
{
    // do this again and again
}
```

# loops

```
while (condition)
{
    // do this again and again
}
```

# loops

```
do
{
    // do this again and again
}
while (condition);
```

# variables

```
int counter;  
counter = 0;
```

# variables

```
int counter = 0;
```

# functions

```
printf("hello, world\n");
```

# functions

```
string name = GetString();
printf("hello, %s\n", name);
```

```
#include <stdio.h>
int main(void)
{
    int count;
    for(count = 1; count <= 500; count++)
        printf("I will not throw paper airplanes in class.");
    return 0;
}
```

MONO 10-3

MONO 10-3

NICE TRY.





to be continued...