

## 03-3 Graphical Front End via node.js

How to add a pretty face via a web browser

# Ways to Add Graphics

- ncurses (<http://www.gnu.org/software/ncurses/>)
- Blessed (<https://www.npmjs.com/package/blessed>)
- X Window System (<http://www.x.org/wiki/>)
- Qt (<http://qt.digia.com/>) both X-based and embedded
- Web server
  - node.js (<http://nodejs.org/>)

# ncurses

## .config - Linux Kernel v2.6.32 Configuration

```
Linux Kernel Configuration
Arrow keys navigate the menu.  <Enter> selects submenus --->.
Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
<M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
for Search.  Legend: [*] built-in [ ] excluded <M> module < >

General setup --->
[*] Enable loadable module support --->
-- Enable the block layer --->
    Processor type and features --->
    Power management and ACPI options --->
    Bus options (PCI etc.) --->
    Executable file formats / Emulations --->
-- Networking support --->
    Device Drivers --->
    Firmware Drivers --->
    File systems --->

v(+)

<Select>  < Exit >  < Help >
```

# blessed

Non eram nescius Brute cum quae summis ingeniis exquisitaque doctrina philosophi Graeco sermone tractavissent ea Latinis litteris mandarem fore ut hic noster labor in varias reprehensiones incurreret nam quibusdam et iis quidem non admodum indoctis totum hoc displicet philosophari quidam autem non tam id reprehendunt si remissius agatur sed tantum stupefacti in eo non arbitrantur erunt etiam et iis in Graecis legendis quidem erunt operam male operam male genus hoc omnis dice responsum accusata et vituperata ego posse iudicare arbitrarer plura suscepi veritus ne movere homines idem si maxime hoc placeat moderatius tamen rantiam postulant in eo quod semel admissum b Hortensio qui liber cum et tibi probatus ideretur et iis quos m studia viderer id volunt fieri coerceri reprimique a philosophia quam desiderant Sive enim ad sapientiam perveniri potest non paranda nobis solum ea sed fruenda etiam sapientia est sive hoc difficile est tamen nec modus est ullus investigandi veri nisi inveneris et quaerendi defatigatio turpis est cum id quod quaeritur sit pulcherrimum etenim si delectamur cum scribimus quis est tam invidus qui ab eo nos

# X Windows

Applications Places System Mon Oct 14, 12:18 PM

Computer  
root's Home  
Trash  
BEAGLEBONE

Terminal - root@yoder-black-bone: ~/exercises

```
sh-4.2# bash
root@yoder-black-bone:~# ls
Desktop exercises
root@yoder-black-bone:~# cd exercises/
/home/root/exercises
root@yoder-black-bone:~/exercises# ls -sh
total 120K
4.0K 3D
4.0K DerekMolloy
4.0K IRtracker
4.0K LEDstring
4.0K Old
4.0K ProjectIdeas
4.0K README.md
4.0K a.out
4.0K audioThru
4.0K autogain
4.0K deviceTree
4.0K diagrams
4.0K etch-a-sketch
4.0K gpio
4.0K gstreamer
4.0K helloWorld.c
4.0K i2c
4.0K imu
4.0K make
4.0K matrix16x24
4.0K mmap
4.0K modules
4.0K node.js
4.0K qt
4.0K realtime
4.0K setup
4.0K test.html
4.0K videoThru
root@yoder-black-bone:~/exercises#
```

System Monitor

Monitor Edit View Help

System Processes Resources File Systems

CPU History

60 seconds 50 40 30 20 10 0

CPU 52.5%

Memory and Swap History

60 seconds 50 40 30 20 10 0

Memory 122.6 MiB (24.7 % of 495.6 MiB)

Swap 0 bytes (0.0 % of 0 bytes)

Network History

60 seconds 50 40 30 20 10 0

Receiving 222 bytes/s

Total Received 210.1 KiB

Sending 0 bytes/s

Total Sent 70.2 KiB

exercises

File Edit View Go Bookmarks Help

Back Forward 100% Icon View

Places root exercises

root Desktop File System Network BEAGLEBONE Trash

3D DerekMolloy IRtracker LEDstring

Old ProjectIdeas audioThru autogain

deviceTree diagrams etch-a-sketch gdbExample

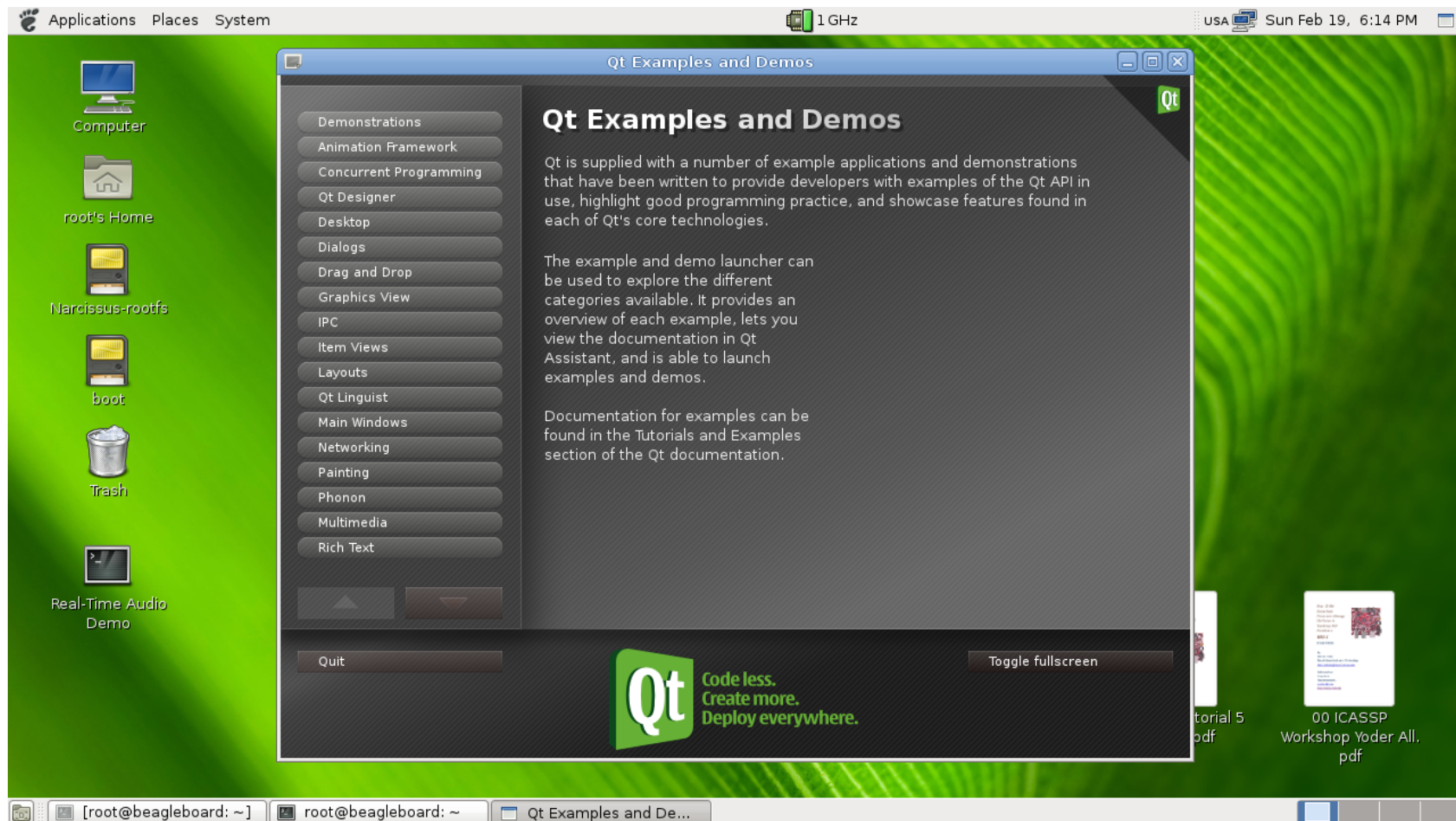
gpio gstreamer i2c imu

29 items, Free space: 3.3 MB

Terminal - root@yoder... System Monitor exercises

beagleboard.org

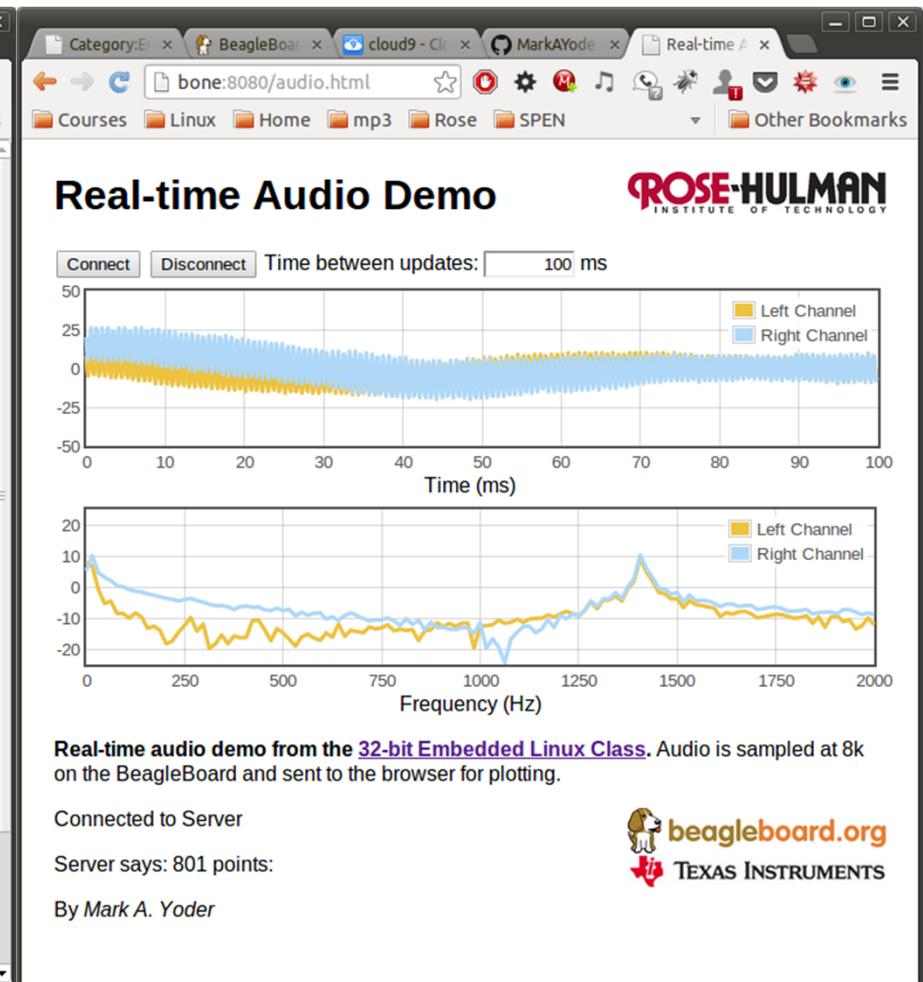
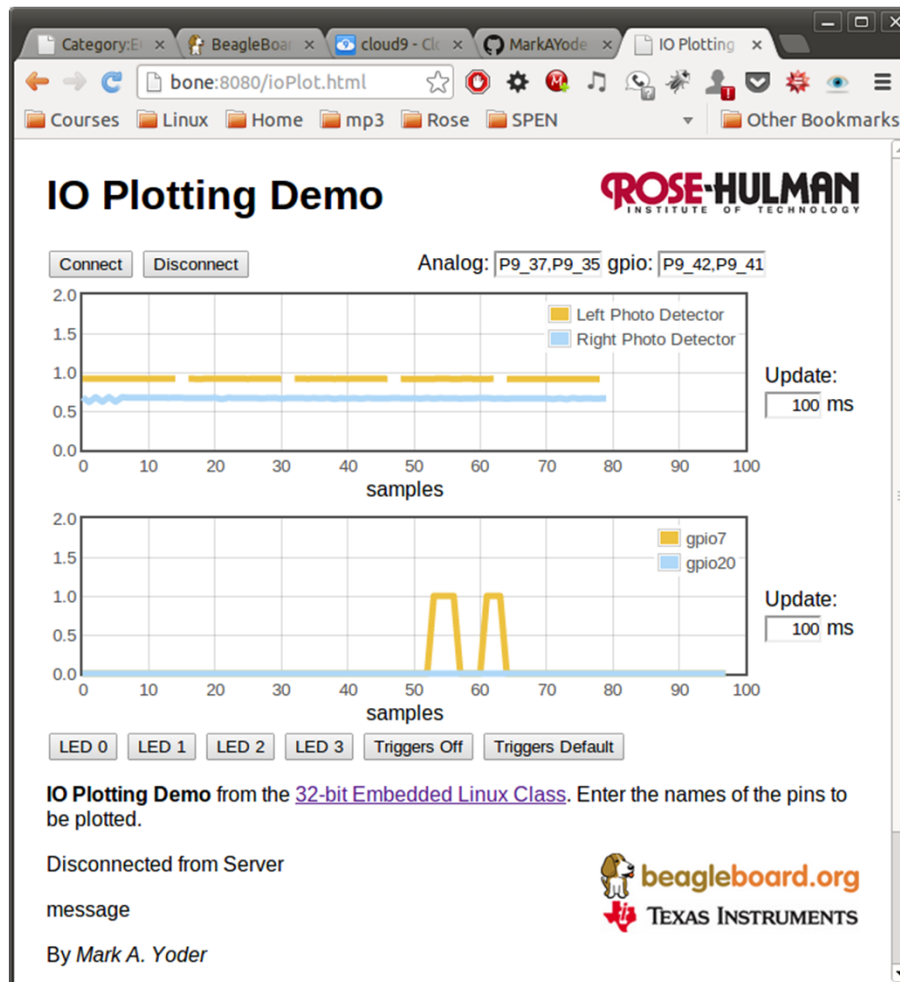
# Qt – Both X and embedded



```
$ sudo apt install qt4-demos
$ qtdemo
```

[http://elinux.org/ECE497\\_Notes\\_on\\_Qt](http://elinux.org/ECE497_Notes_on_Qt)

# Via the Web via node.js



```
bone$ cd ~/exercises/realtime
```

```
bone$ ./boneServer.js
```

# Via the Web via node.js

The image displays two browser windows side-by-side, both showing a web interface for controlling a BeagleBoard LED matrix. The left window shows the 'Matrix LED Demo' page, which includes a grid of 8x8 LEDs, a 'Connect' button, and a 'Disconnect' button. The right window shows the 'ballAndCube.html' page, which displays a 3D wireframe cube with a red sphere inside, and a 'Connected to Server' status message.

**Matrix LED Demo**

Connect Disconnect

i2c: 0x70

Update Display from LED

0,7 1,7 2,7 3,7 4,7 5,7 6,7 7,7

0,6 1,6 2,6 3,6 4,6 5,6 6,6 7,6

0,5 1,5 2,5 3,5 4,5 5,5 6,5 7,5

0,4 1,4 2,4 3,4 4,4 5,4 6,4 7,4

0,3 1,3 2,3 3,3 4,3 5,3 6,3 7,3

0,2 1,2 2,2 3,2 4,2 5,2 6,2 7,2

0,1 1,1 2,1 3,1 4,1 5,1 6,1 7,1

0,0 1,0 2,0 3,0 4,0 5,0 6,0 7,0

Matrix LED demo from the [32-bit Embedded Linux Class](#).

Connected to Server

By Mark A. Yoder

Setup: Connect an [Adafruit bicolor LED matrix](#) to the i2c bus. The default address is 0x70.

**ballAndCube.html**

Connected to Server

```
bone$ cd ~/exercises/realtime
```

```
bone$ ./boneServer.js
```



# node.js

- Platform built on Chrome's JavaScript runtime for easily building fast, scalable network applications.
- Uses an event-driven, non-blocking I/O model that makes it lightweight and efficient, perfect for data-intensive real-time applications that run across distributed devices.
- Programmed in JavaScript on both server and client.

<http://nodejs.org/>

# node.js example: Webserver

- This simple web server written in Node responds with “Hello World” for every request.

```
var http = require('http');  
http.createServer(function (req, res) {  
  res.writeHead(200, {'Content-Type': 'text/plain'});  
  res.end('Hello World\n');  
}).listen(1337);  
console.log('Server running on port 1337');
```

- To run the server, put the code into a file example.js and execute it with the node program:

```
$ node example.js
```

```
Server running on port 1337
```

# Things to know

- JavaScript
  - socket.io
  - jQuery
  - DOM
- html
- CSS
  
- Where to you start?

# Javascript – C-like

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

```
main() {
```

```
    int i;
```

```
    for(i=0; i<5; i++) {
```

```
        printf("i=%d\n", i);
```

```
    }
```

```
}
```

```
var i;
```

```
for(i=0; i<5; i++) {
```

```
    console.log("i=%d", i);
```

```
}
```

# Things to know

- JavaScript
  - socket.io
  - jQuery
  - DOM
- html
- CSS

# socket.io

- <http://socket.io/>
- **Socket.IO** aims to make realtime apps possible in every browser and mobile device, blurring the differences between the different transport mechanisms.
- It's care-free realtime 100% in JavaScript.

# socket.io

- Server

```
var io = require('socket.io').listen(80);
io.sockets.on('connection', function (socket) {
  socket.emit('news', { hello: 'world' });
  socket.on('my other event', function (data) {
    console.log(data);
  });
});
```

- Client - Browser

```
<script>
var socket = io.connect('http://localhost');
socket.on('news', function (data) {
  console.log(data);
  socket.emit('my other event', { my: 'data' });
});
</script>
```

# socket.io

- See: **Getting Started With node.js and socket.io (v0.7+) – Part 2**
- <http://www.codehenge.net/2011/12/getting-started-with-node-js-and-socket-io-v0-7-part-2/>
- My code is based on this

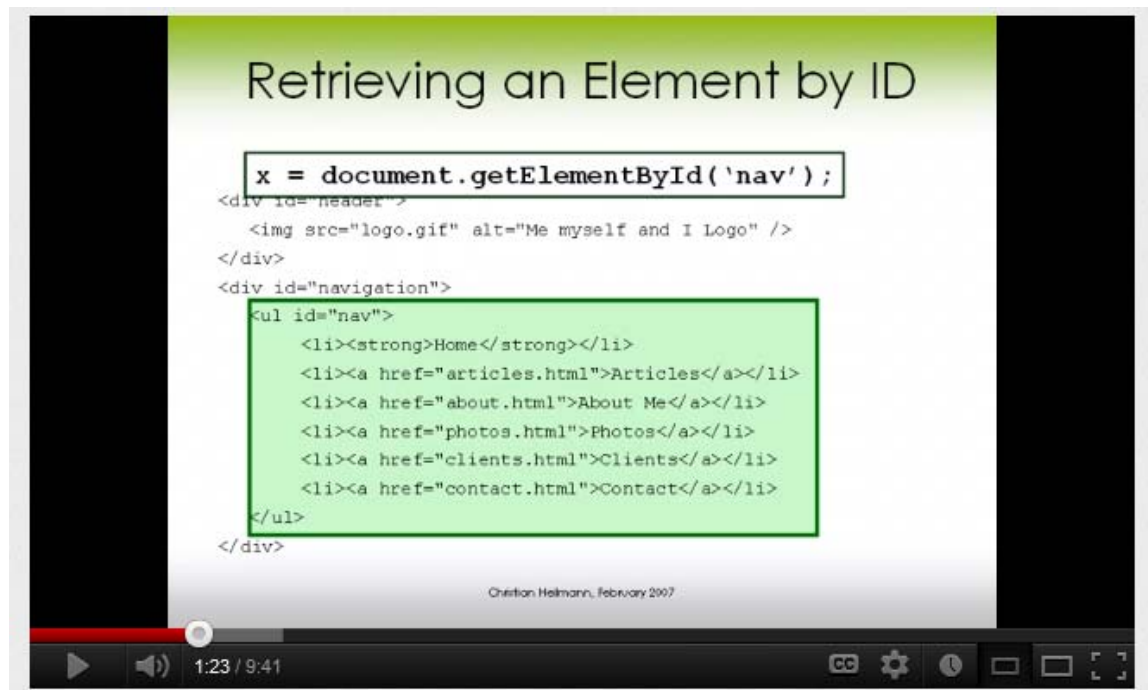


# Things to know

- JavaScript
  - socket.io
  - DOM
  - jQuery
- html
- CSS

# DOM

- Essentials of the DOM and JavaScript in 10 Minutes
- <http://www.youtube.com/watch?v=URF2sVQWuxU>
- 10 minute YouTube video
- However we'll use jQuery, it's much more compact



# Things to know

- JavaScript
  - socket.io
  - DOM
  - jQuery
- html
- CSS

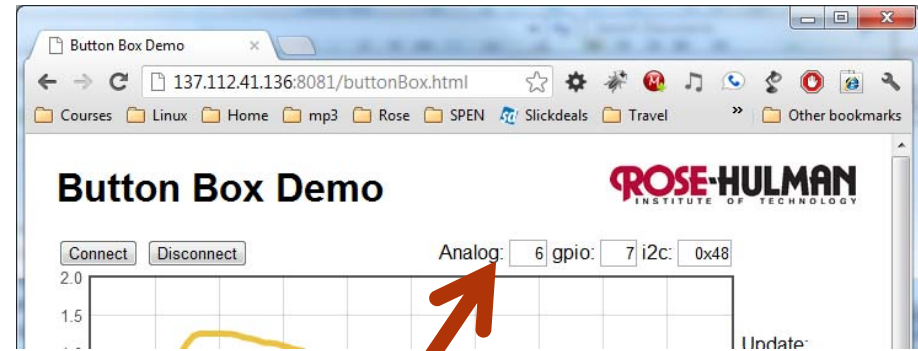
# jQuery

- <http://jquery.org/>
- jQuery is a fast and concise JavaScript Library that simplifies HTML document traversing, event handling, animating, and Ajax interactions for rapid web development.
- jQuery is designed to change the way that you write JavaScript
- Looks like `$ ( )` in html

Analog: `<input id="ainNum" type="text" value="" style="text-align: right; width:2em">`

- In JavaScript

```
$("#ainNum").val(ainNum).change(function () {  
    ainNum = $(this).val();  
});
```



# Things to know

- JavaScript
  - socket.io
  - DOM
  - jQuery
- html
- CSS
- FLOT
- <http://www.flotcharts.org/>
- Flot is a pure JavaScript plotting library for jQuery, with a focus on simple usage, attractive looks and interactive features.

# To Do

- Look at `~/exercises/realtime` and see what you can figure out.

Category: E x BeagleBoard x cloud9 - Cl x MarkAYode x Matrix LED x

bone:8080/matrixLED.html

Courses Linux Home mp3 Rose SPEN Other Bookmarks

### Matrix LED Demo

Connect Disconnect

ROSE-HULMAN  
INSTITUTE OF TECHNOLOGY

i2c: 0x70

Update Display from LED

0,7	1,7	2,7	3,7	4,7	5,7	6,7	7,7
0,6	2,6	3,6	4,6	5,6	6,6	7,6	
0,5	1,5	2,5	3,5	4,5	5,5	6,5	7,5
0,4	1,4	2,4	3,4	4,4	5,4	6,4	7,4
0,3	1,3	2,3	3,3	4,3	5,3	6,3	7,3
0,2	1,2	2,2	3,2	4,2	5,2	6,2	7,2
0,1	1,1	2,1	3,1	4,1	5,1	6,1	7,1
0,0	1,0	2,0	3,0	4,0	5,0	6,0	7,0

Matrix LED demo from the [32-bit Embedded Linux Class](#).

Connected to Server

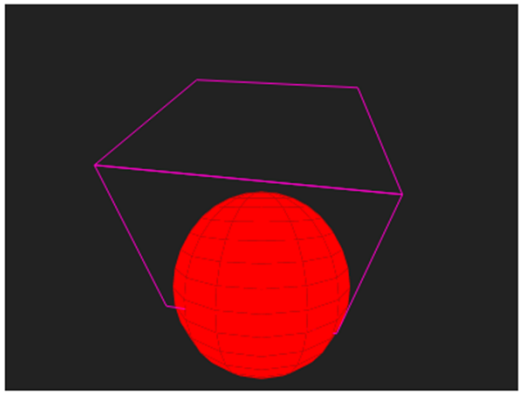
By Mark A. Yoder

Setup: Connect an [Adafruit bicolor LED matrix](#) to the i2c bus. The default address is 0x70.

Category: E x BeagleBoard x cloud9 - Cl x MarkAYode x Sample Thr x

bone:8080/ballAndCube.html

Courses Linux Home mp3 Rose SPEN Other Bookmarks



Connected to Server