Home Automation...
...Not as simple as you think

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What is Home Automation?

- Home Automation is anything that your home does for you automatically to make living there more enjoyable or productive. It covers many areas, including remote and timed control of lights and electrical home appliances, distributed media services, and communication.
Appliance Control

- One of the most impressive features of an automated smart home is the ability of a computer to control your lights or to operate the power socket attached to the kettle. Naturally, this requires the addition of hardware such as X10, LightwaveRF, or wemo.
Emailing your light switch

- Write a procmail recipe:

```
:0
* ^From: steev.*
* ^Subject: light
|~steev/lightcontrol $SUBJECT
```

- Write the control script:

```
homedevice default on bedroom2
```
But...

- How is the email authenticated?
- Is the user allowed to issue this command?
- How do we support devices from different manufacturers?
More importantly...

• What if the message is 'off'?
• When does local control override?

• Consider the time line:
  – 1. Human turns light on
  – 2. Machine turns light on
  – 3. Machine turns light off
  – 4. Should the light be on or off?
Then consider...

- ...which human?
Appliance Control – See also...

- Hue
- Lifx
- Insteon
- Etc...
Media Playback

• Play music (in any given room)
• Changing the volume
  – When the doorbell rings
  – When there's incoming VoIP calls
  – When the computer needs to make announcements
  – When requested by a user
Volume Change

$volume = get_volume()

# change $volume in some way

set_volume($volume)
Implementation

- Taken from /dev/mixer it caps at 0 to 100
  - Volume + up + down != volume
  - 95 => 100 => 90

- Taken from /var/log/mymixer we can have
  - Volume + up + up + up = turned_up_to_11
Linear?

- Is volume+1 identical when volume==80 and volume==10?
sub get_delta { 
    my ($volume) = (@_);
    return 1 if $volume > 95;
    return 2 if $volume > 90;
    return 4 if $volume > 80;
    return 8 if $volume > 85;
    # etc
}

No!
Symmetry?

• Does volume up == volume down?
No!

• What's the context for turning it down?
  – The track is too loud, compared to the last
  – The track has a loud bit in the middle
  – There's an advert in the middle
  – Trying to hear if the door bell went

• What's the context for turning it up?
  – You like this song more
  – Trying to hide the noise from the washing machine
  – The reverse of one of the previous 'turn it down'?
Picking a random song

- **Plan A**
  - Pick a random directory
  - If there are more sub-directories, repeat
  - Else, pick a random song

- **Plan B**
  - If there are both songs and sub-directories. Choose 1
  - Continue as A

- **Plan C**
  - Enumerate all songs, in all directories
  - Pick one
Answer: A, B, and C
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• A : Bias towards sub-directories, usually album tracks in 'Z'
• B : Bias for minor tracks amongst albums
• C : Bias towards artists with lots of songs
Answer: A, B, and C

• But don't forget to...
  – Ignore long songs (how long is long?)
Answer: A, B, and C

• But don't forget to...
  - Ignore long songs (how long is long?)
  - Ignore the adagio (sometimes)
Answer: A, B, and C

- But don't forget to...
  - Ignore long songs (how long is long?)
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  - Ignore comedy and spoken word
Answer: A, B, and C

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  – Pink Floyd has a time and place
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  - Seed randomness on milliseconds since epoch
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  - Seed randomness on milliseconds since epoch
  - Skip songs that have been played recently
Answer: A, B, and C

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  - Skip songs that have been played recently
  - Think of how mood changes
Answer: A, B, and C

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  - Pink Floyd has a time and place
  - Seed randomness on milliseconds since epoch
  - Skip songs that have been played recently
  - Think of how mood changes
  - Consider the distribution of artists-vs-letters
Ignore song

• Based on...
  – The user?
  – The location?
  – The time of day?
  – The time of year?
  – The situation?
The other half...

- Motion sensors don't distinguish between users
- Using bluetooth to detect users
- Handling the ignore list (AND or OR the results)
Conclusions

- There are no rules
- Context-sensitive is only the first step
- The 'configuration calibration'
Any Questions?

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**FOSDEM Scorecard:**

Attended: 17
Diaries written: 15
Talks given: 11 (on 9 different topics)

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