Software Control of Home Automation Systems

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Abstract
Software can greatly enhance existing hardware home automation systems, giving them smarts. This talk covers many software programs for home automation.

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Dumb Home Automation Devices

- Timers
- Clapper
- Dawn/Dusk Sensors
- Motion Sensors

My other presentation, *Practical Computerized Home Automation*, covers the hardware aspects of home automation.
What Does Software Control Enable?

- Device behavior can be combined
- No distance limitations
- Activity detection
- Fully programmable / scriptable
- Access to external data
How Is This Possible?
Home Networks

• Wired telephone
• Cordless telephone (900MHz, 2.4GHz, 5.8 GHz, 1.9GHz)
• Wireless remotes
• Wired local area network (Ethernet)
• Wireless local area network (802.11)
• Electrical (X10)
Software Control

Input

Program

Output
Inputs

- User commands
- Clock/Timer
- Dawn/Dusk sensors
- Wireless remotes
- Caller Id
- Telephone Dialing
- Web sites, e.g. outside temperature
Outputs

- Lights
- Motors
- Appliances, e.g. coffee maker
- Sounds
- Network broadcast messages
- Slideshow
Home Application: First Floor

Garage

Bedroom

Office

Dining Room

Kitchen

Family Room

Living Room

Entry

Hallway

Coffee Maker

Screen

Wireless Remote

Chime

Light

Computer/Power Line Interface

Dawn/Dusk Sensor

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Home Application: Second Floor

Pool Pump (outside)

Wireless Remote

Chime

Bedroom

Hallway

Bedroom

Light

Bedroom

Bedroom

Play
Heyu

X10 devices are controlled and monitored using the X10 CM11a computer interface device and the open source heyu control software. For heyu information, see http://www.heyu.org/. Heyu can be customized by defining devices in ~/.x10config:

remotebed  I 1  # downstairs remote alloff
entrytable I 2
bookcase   I 3
 couch     I 4
tiffany    I 5
schoolroom I 6
fireplace  I 7
laundry    I 8
wireless   I 9  # wireless outlet, makes click noise
masterbed  I 10
...

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Heyu Wrapper Script

Instead of:

$ heyu turn couch on

a script can be created:

$ x10on couch

The script can handle multiple devices:

$ x10on tiffany bookcase

and groups of devices can be defined:

$ x10off video
Simple Time-Based Activity

cron

Time Output
Crontab Scheduler

0 7 * * * root x10on slideshow
0 11 * * * root x10on decor
0 12 * * * root touch /u/x10/wait_for_dusk
0 14 * * * root x10on bathroom
30 20 * * * root x10on boyscolor catherine
# fade
30 21 * * * root x10dim entrytable decor bathroom
# off
0 21 * * * root x10off bookcase
0 23 * * * root frontlights off; x10off decor tiffany
0 0 * * * root x10off 'x10group 1 | egrep -v '^entrytable$'
0 0 * * * root touch /u/x10/wait_for_dawn
59 0 * * * root x10dimoff_slow laundry
59 1 * * * root ! is_tz_fallback && x10alloff
Dawn/Dusk Activity

Dawn/Dusk Sensor (via X10)

x10monitor daemon

Inside Lights On

Outside Lights On

+30 minutes
Monitoring X10 Activity

7/6 at 05:40:49  address unit  8 : housecode d (entrymotion_dusk)
7/6 at 05:40:49  function Off : housecode d unit 8 (entrymotion_dusk)
7/6 at 20:35:57  address unit  8 : housecode d (entrymotion_dusk)
7/6 at 20:35:57  function On : housecode d unit 8 (entrymotion_dusk)
7/6 at 22:05:46  address unit  3 : housecode f (catherine)
7/6 at 22:05:46  function Off : housecode f unit 3 (catherine)
7/5 at 23:18:20  address unit 13 : housecode i (remotebed2)
7/5 at 23:18:21  function Off : housecode i unit 13 (remotebed2)
Acting on X10 Events (Dusk)

```bash
x10 monitor | while read LINE
do
echo "$LINE" >>/var/log/x10
case "$LINE" in
  # is it dusk?
  *" On : "*"(entrymotion_dusk)"*)
    if [ -f /u/x10/wait_for_dusk ]
     then  rm /u/x10/wait_for_dusk
    x10on 1
      echo "heyu turn masterbath on;
          heyu turn laundry on" |
     at now +45 minutes
    fi
  ;;
```
X10 Already Supports Wireless Remotes
Coffee Maker Timer

```
*" On : "*(coffeepot"*"))*
   echo "heyu turn coffeepot off" | at now +30 minutes
```

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Telephone Notification

- Caller ID (via modem)
- Numbers/Names from Contact Directory
- caller_id daemon
- Broadcast Message
- Call Chime (optional)
- Logfile
Caller ID

AT#CID=1

Wed Jul 8 21:34:00 EDT 2009 DATE = 0708
Wed Jul 8 21:34:00 EDT 2009 TIME = 2134
Wed Jul 8 21:34:00 EDT 2009 NMBR = 6107429657
Wed Jul 8 21:34:00 EDT 2009 NAME = PENNSYLVANIA

Lookup phone number in contact directory.

Wed Jul 8 21:34:04 EDT 2009 Bruce and
Christine Momjian from Bruce's cell phone (610) 742-9657

Log call, and optionally sound X10 chime if phone call is from an important phone number.
Outgoing Calls

User Command → dial script → Outgoing Call

Numbers/Names from Telephone Directory
Telephone Dialing

Dial phone number from contact directory:

ATDT16107429657
Tue Apr 7 14:57:26 EDT 2009 16107429657 Bruce and
Christine Momjian to Bruce's cell phone

This can also be used to automatically dial recently received calls using
the log.
Pool Pump

Outside Temperature (via weather web site) → job scheduler → Poolpump On (time varies with temperature)

A script allows scheduled pump control with manual override.
Family Activity Screen

Screen is shown on a dummy display and also on laptops throughout the house. Source available at http://code.google.com/p/infodisp.
Time to Eat

Wireless Remote (via X10) → \texttt{x10monitor}\hfill \texttt{daemon} \hspace{0.5cm} → "Eat" Chime
Broadcast Message
Activity Screen Off (for 50 minutes)
Conclusion

SMART HOME HACKS
Tips & Tools for Automating Your House

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