Raspberry Pi Anti-squatting Security System

With remote monitoring and alerting

My requirements for remote monitoring of house

Interior monitoring only. Too many animals outside

Motion detection in the house hallway

Trip wire behind a long line of ground floor windows.

Smoke detector, Basement flood detector, thermometer

Sensor on a wall outlet timer sends 4 messages a day,

Programmable and bootable remotely via SSH

Sensor changes logged to local file, email, and text message

Tools and parts

- Soldering iron and solder
- Raspberry 2b+
- Wirewrap tool
- Hot glue gun



Hallway motion detector with light

\$20 Home Hardware HEATH/ZENITH Grey 300 Watt 110 Degree 2 Light Motion Detector Security Light Item #: 3646-371 Model #HZ-5408-GR

\$0.50 One bulb replaced with socket to outlet adapter

Gnd

\$1.25 Five volt power adapter

\$0 Telephone wire to Pi

\$0.20 Voltage divider (3 resistors)



3V / 0V GPIO input (A0)

Light Timer

Similar parts, with timer instead of motion detector, create a sensor for the light timer



Trip wire

When fishing line is tugged, insulating paper is pulled out from between tacks in clothes peg, grounding input. Could I have used the GPIO internal pullup, without the external resistor?



Smoke detector

\$10 Model BRK FG250A smoke detector has signal on pin 2 on IC to be shared, indicating alarm. See Alegro A5338 or RE46C152 http://www.alldatasheet.com/datasheet-pdf/pdf/306425/MICROCHIP/RE46C152.html



Light timer + Wire wrap + telephone block



Python code scans GPIO inputs,

While true

If sensors toggle then

log the change, send an email, and send SMS to phone via gateway

Email the current router address (in case Shaw changes it)

Wait 5 seconds

Loop

Most messages are generated by wall timer event

- Trip wire is inverted logic (1=not pulled)
- cur_hall=0 cur_tmr=0 cur_trip=1 old_hall=0 old_tmr=0 old_trip=0 Sun Oct 1 09:23:15 2017
- cur_hall=1 cur_tmr=0 cur_trip=1 old_hall=0 old_tmr=0 old_trip=1 Sun Oct 1 09:23:59 2017
- cur_hall=0 cur_tmr=0 cur_trip=1 old_hall=1 old_tmr=0 old_trip=1 Sun Oct 1 09:24:27 2017
- cur_hall=0 cur_tmr=1 cur_trip=1 old_hall=0 old_tmr=0 old_trip=1 Sun Oct 1 12:15:06 2017
- cur_hall=0 cur_tmr=0 cur_trip=1 old_hall=0 old_tmr=1 old_trip=1 Sun Oct 1 14:49:36 2017
- cur_hall=0 cur_tmr=1 cur_trip=1 old_hall=0 old_tmr=0 old_trip=1 Sun Oct 1 19:13:43 2017
- cur_hall=0 cur_tmr=0 cur_trip=1 old_hall=0 old_tmr=1 old_trip=1 Mon Oct 2 00:52:04 2017
- cur_hall=0 cur_tmr=1 cur_trip=1 old_hall=0 old_tmr=0 old_trip=1 Mon Oct 2 12:15:21 2017
- cur_hall=0 cur_tmr=0 cur_trip=1 old_hall=0 old_tmr=1 old_trip=1 Mon Oct 2 14:49:51 2017
- cur_hall=0 cur_tmr=1 cur_trip=1 old_hall=0 old_tmr=0 old_trip=1 Mon Oct 2 19:13:08 2017
- lacksquare

What if the router address is changed by Shaw?

The timer message now contains the last address assigned to the router'

cur_hall=0 cur_tmr=1 cur_trip=1 old_hall=0 old_tmr=0 old_trip=1 Sat Oct 14 19:12:39 2017 Current IP Address: 24.68.160.166

import urllib
from email_handler import Class_eMail
myipaddr=urllib.urlopen("http://checkip.dyndns.org/").read()
email = Class_eMail()
email.send_Text_Mail(To_Email_ID, str2write, str2write+" "+ myipaddr[56:92])

Pi environment

SSH is enabled in pi.config because unit is headless, desktop turned off

Python program is invoked via root's crontab

@reboot python /home/pi/...

NAT set up on Shaw Router

Problems with text messaging

I create SMS by sending email with sensor states to [my cell phone number]@msg.koodomobile.com

Unfortunately, Koodo changes this to an MMS, which maybe I have to pay for to open.

So I put the sensor report in the email subject line and delete the mms from my phone without opening. (Data does need to be turned on to read the message)

Problem is that if you don't open the MMS, koodo re-sends every day.

I tried setting MMS validity period to only an hour on phone but

Alternatives

- Property is guarded anyway. Bear on property is often visible from the street.
- Commercial motion detector and camera costs about \$300 but is not as tailored. I used an Internet enabled camera, pointed at the TV.
- Shaw is charging \$60/month for 5mbps used only for this system. Instead, I could tether ESP8266 to old smartphone. Would be nice to get smartphone to text the message as SMS too. Or use a Adafruit Feather 32u4 FONA to avoid the smartphone.



Camera on internet

This is wired directly to router and does not go through the Pi.

NAT is set up on router

Camera's default password is changed.



Now using SMS texting on a \$60 Adafruit Feather 32u4 FONA Arduino microcontroller with built in Cellular, replaces Raspberry Pi



- Texting on SpeakOut 7-Eleven Wireless costs 15c per text message, \$25 per year
- Text of sensor status is sent to me
 - \circ when alarm trips or
 - \circ $\,$ when I text to Fona
- Saved \$60/month for 5mbs Shaw internet..Hooray
- Using 5 Analog / digital inputs. Hooray
- Move from python to C. Ughh

Supplies



Battery from Hometech Games Plus (reverse leads for correct polarity)

Yagi Antenna wire from Burnside Home Hardware, BC Razor

SIM card from 7-Eleven

Some parts from Queale Electronics, Gov't Street

Feather Fona from BC-Robotics in Nanaimo

Wire wrapping





Tool can be made from ball point pen cartridge, or hobby brass tubing.

Yagi Antenna



https://273k.net/gsm/designing-and-building-a-gsm-antenna/yagi/gsm-1900_6element_yagi_template.pdf

Adafruit Feather FonaTEST Interactive Test Sketch

Use to verify phone functions and to copy code fragments into your own sketch

// SMS
N] Number of SMSs
r] Read SMS #
R] Read All SMS
d] Delete SMS #
s] Send SMS
u] Send USSD

// Time

y] Enable network time sync (FONA 800 & 808)Y] Enable NTP time sync (GPRS FONA 800 & 808)t] Get network time

//System
a] read the ADC 2.8V max (FONA800 & 808)
b] read the Battery V and % charged
C] read the SIM CCID
U] Unlock SIM with PIN code
i] read RSSI for Signal Strength
n] get Network status

// GPRS
G] Enable GPRS
g] Disable GPRS
I] Query GSMLOC (GPRS)
w] Read webpage (GPRS)
W] Post to website (GPRS)

Plus

// FM radio control,// Phone call control// Audio volume control

Main loop

void loop() {

int8_t smsQty = fona.getNumSMS(); // test if SMS received

if (smsQty > 0) { // I sent it a text

fona.deleteSMS(1); delete any SMS's

fona.deleteSMS(2);

mySendSMS(20); //20 is just a debugging value

} else if (myGpios() && (myGpios() != previousGpios)){ // GPIO alarm raised mySendSMS(30);

} else if (myGpios() && ((millis() - previousSendTime) > 3600000)) { // if alarm is raised, repeat SMS once an hour

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mySendSMS(40);}
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delay(5000); // loop every 5 seconds.

Sending SMS (text) message

void mySendSMS(int ReasonCode){

char sendto[] = "2501234567", message[141]; char cstr[16];

previousGpios=myGpios(); save GPIO state strcpy(message, "Hall=");

strcat(message, itoa(hall,cstr,10));

strcat(message, " Trip=");

strcat(message, itoa(trip,cstr,10));

Reading GPIO

int myGpios(){ hall=digitalRead(A0); if(digitalRead(A1)){ trip=0; } else {trip=1; } smoke=digitalRead(A2); thermis=analogRead(A3); bsmt=analogRead(A4); return hall+2*trip+4*smoke;

To do's

- Signal smoke detector to sound its loud piezo.
- Enable / disable remotely. Will be required to let realtors into the house, if piezio is used.
- Need detectors for snow depth, humidity, furnace oil theft, auto theft
- I expect that 2G GSM will be phased out (only Rogers and their network resellers are left now). Need a 3g Controller, or cell phone with GPIO for the following frequencies and protocols:

HSDPA 850/1900, HSPA+ 850/1900, UMTS 850/1900, WCDMA 850/1900