**HomeAlone** (aka SmartCare ®)

Summary

The HomeAlone device monitors activity (movement) over a rolling period. This activity period can be user defined. For this document, we will assume an activity period of 15 minutes.

Activity in each 15-minute period will be uploaded to the ThingSpeak IoT repository in the cloud.

Advisory emails are sent to a user-defined list of recipients if insufficient activity has been detected over a number of activity periods. The exact email alert period can be user defined. For this document, we will assume an email alert period of 75 minutes.

For example, as there five fifteen-minute periods in 75 minutes, the email alert facility will check at the end of 75 minutes whether the user-defined activity threshold has been reached. If it has, nothing happens. If it has not, an advisory email is sent to the list of recipients.

Note that the email alert reporting period should be greater than the activity period or the universe, as we know it, will implode.

Start Up Process

When the HomeAlone device starts up (that is, is powered up) it will immediately attempt to connect to the user-specified Wi-Fi, using the SSID name and password specified in the config.txt file on the SD card. This step must succeed for the device to continue. It will reboot itself if it cannot attach to the Wi-Fi within a reasonable timeframe.

A full list of the SD card parameters in config.txt can be found in Appendix A.

The device will then attempt to get the current date and time from the internet. This must succeed for the device to continue. If it fails, it will reboot itself until it has successfully completed this step.

Whilst these steps are in progress there may be some on-screen progress messages. The date and time should also appear.

Once the device has successfully attached to the local Wi-Fi and obtained the current date/time from the Internet, it will send an advisory email to the recipient list that the device has been restarted or rebooted (a possible sign of malfunction).

Normal Behaviour

The device will continuously check for movement in about a 5 metre radius from the front of the unit.

At periodic activity intervals it will upload the activity count to the ThingSpeak IoT repository. This can be monitored using the ThingSpeak graph app on Smartphones.

Once the email reporting period has been reached the system will ensure that sufficient activity level has been achieved in the intervening activity periods. If not, an advisory email will be sent to the recipients list.

AWAY behaviour

When the occupant, or Elvis, leaves the building she should press the Going Out button to avoid the system generating advisory emails during her absence.

The system will start an Exit beep during which time the PIR will not respond to further movement.

Once the exit period has expired (when the beeping has stopped) further activity will cancel the Away status and start recording the usual activity level again.

*The time for the exit period (beeping) is user definable on the SD card and nominally set to 30 seconds. This may not be sufficient for older or slower occupants to exit the dwelling.*

Upon returning from an AWAY state, the PIR starts recording activity events automatically. As soon as the activity threshold has been reached it will upload that value to indicate normal activity has been detected.

Exceptions to Normal Behaviour

If an activity period has less than the expected level of activity (the threshold) recorded, the system will immediately upload further data once the activity threshold has been reached.

For example, if during the 15-minute period 12:00 – 12:15 only 2 movements were recorded, but at 12:20 there were a total of 6 activity movements detected then it would immediately upload that information. The fifteen minute activity checking process would start from that point again.

*Note that the threshold for normal activity during an activity monitoring period is user-specified on the SD card.*

After a device power up (reboot) the device will immediately upload a special value to the ThingSpeak IoT repository of -15 (minus 15) to make reboots easily identifiable.

Additionally, once the activity threshold has been exceeded after a reboot, that value is immediately uploaded to the ThingSpeak IoT repository to indicate that activity movements are being successfully recorded.

*By uploading events like these to the ThingSpeak IoT repository it obviates the need for more frequent advisory emails*.

During power up, the PIR is disabled for about 1 second to allow the microcontroller to boot successfully.

Email Advisory

As previously described, the email advisory check is carried out periodically, as per the user-defined email interval (assumed 75 minutes in this document).

If the activity level for the email reporting period exceeds the user-defined threshold then no email is sent and all ongoing counts are reset to zero.

If, at the time of the email check, the aggregate activity levels or previously uploaded activity events are insufficient and would warrant sending an email, a further check is carried out to determine whether the current (but, as yet, unreported activity count exceeds the threshold). If it does, no email is sent.

For example, using the 75 minute email reporting period, let’s assume that activity has been recorded as follows: 0, 1, 2, 2, making a total of 5.

In the final two minutes before the email check occurs the system records a further single activity event but this has not yet been uploaded to the ThingSpeak IoT repository as the upload period has not yet ended.

The email system will determine that the 5 events are insufficient and will prepare to send an email. It then checks what the *current* level of activity is (it is 1) and adds that to its aggregate count, making 6 events, which is sufficient to prevent an advisory email being sent out.

This is done to ensure that the system does not report unnecessarily.

Appendix A – SD card Parameters

# NB do NOT use chevrons (angle brackets) in any comments or the universe will implode  
# ThingSpeak channel<ThingSpeakChannelNo><123456>

#Thingspeak Field no (1 = Activity, 2 = Temperature, 3= Humidity)<ThingSpeakFieldNo><1>

#ThingSpeak WRITE API KEY<ThingSpeakWriteAPIKey><22YYDBWC9B56U96N>

#Data Upload frequency<MinutesBetweenUploads><14>

#Wifi stuff<SSID><SSID HERE><Password><WIFI PASSWORD>

#To get the right time on the display choose the right Time Zone#GB for England/Eire etc#EUR for (most of) Europe<Timezone><EUR>

#NTP pool address for local region# For GB: uk.pool.ntp.org For GER: de.pool.ntp.org<NTPpool><de.pool.ntp.org>

#Who is getting emails? You can specify up to NINE (9) emails here. There can be gaps.<Email1><ralphie@home.com>  
<Email2><jerry@norway.com>  
  
#Send email when movement count is at or below this figure in the period#Another email is sent when it exceeds this value after a low/away period<emailTriggerLevel><5>

#Email interval period - best not to do “on the hour”<MinutesBetweenEmails><88>

#Exit GOING OUT period in seconds<TimeOutPeriod><30>

#Maximum activity count in an hour before we stop counting<MaxActivityCount><75>

#Short bip sound (=1) when movement detected (OK for debugging, annoying otherwise =0)<BeepOnMovement><1>

#Do not report on low activity levels between these hours (from incl, to excl)<QuietHoursStart><20>  
<QuietHoursEnd><8>

#Time for screen to stay on after some activity<ScreenTimeOutSeconds><20>

Technical Information

The USB port can be used to display debugging messages in this version (i.e. they have not been switched off).

Use PUTty or the Arduino IDE Serial Monitor window, baud rate 76800 (or the nearest one to this value) and the PORT number that you plugged the USB cable into.

Note that the action of plugging in the USB cable will probably cause the device to reboot.

Even if you can’t work out the error you can copy/paste the log into an email and send it to me. My trash folder is quite large.

Phone App to Monitor Activity

Go to **Google Play** and download **IoT ThingSpeak Monitor Widget**

Add the following parameters (the colours and suchlike I’ll leave to you)

Channel ID: 123456

Read API key: ABD46KHQFZIY223

Field ID: 1

ROUND, DECIMAL PLACES: 0

Update Timeout, Minutes: 20