Bohunt School (Wokingham)

A fun project - as told by Mr D

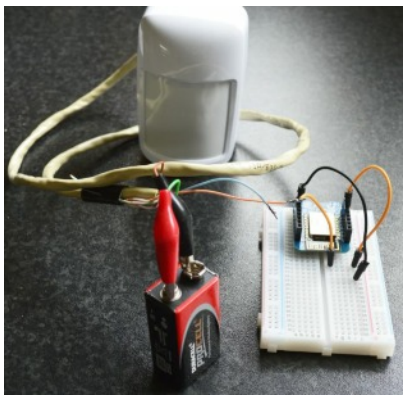
This is a story of a very simple project that just grew and grew.

An infrared detector

A few weeks ago I purchased an infrared (IR) detector as an impulse-buy as it was on special offer from a major UK supplier.

The unit runs off of a 9V battery and has voltage-free relay contacts which means it can be interfaced to a microcontroller.

My initial "lash-up" - yes I know it looks "tacky"



Here's a photo of my initial lash-up.

I used a piece of discarded telephone cable to connect the IR detector to a Wemos Mini D1 on a breadboard.

A couple of crocodile clips held the wires onto the 9V battery - they did fall off from time to time!!

It looked a mess - but it worked and gave out signals to Node-RED via MQTT when body-heat was detected.

Inspiration kicks in…

Flushed with success (well mild success) I thought if I had more than one of these things I could "protect" my house, so I ordered a few more.

The 9V battery was supposed to go inside the plastic unit and last for a few months before it needed to be replaced. This sounded like a bad idea as I would have to climb a ladder, outside of my house, to replace each battery.

DC to DC step-up converter

This neat little device came to my rescue.

As the name suggests, it converts a lower voltage to a higher voltage. In my case it converted 3V3 (which is used to power the Wemos D1 Mini) to 12V for the IR detector. The specification says the IR detector will work off any voltage between 9V and 15V, so I thought 12V would be a good choice as it allowed a bit of voltage drop along the long connecting cables. There is a multi-turn variable resistor mounted on the PCB (Printed Circuit Board) to set the output voltage.

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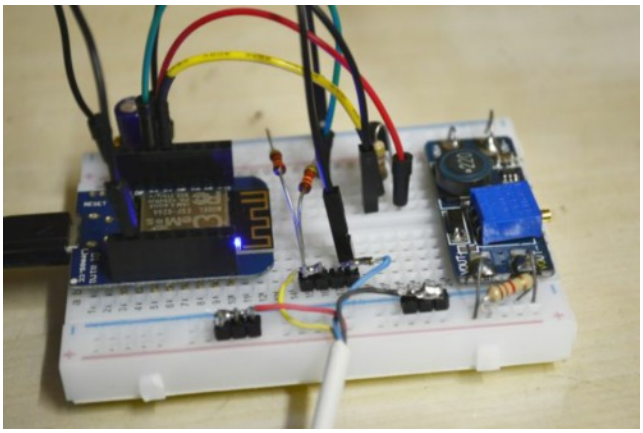
Getting it together

Here's a photo of the breadboard complete with a Wemos D1 Mini, DC-to-DC converter and the terminated ends of a reel of 4-core security-alarm cable.



Two of the cable's cores are used to pass 12V and 0V to the unit whilst the other two connect to the voltage-free contacts.

As I had room left on the breadboard I inserted a DS18b20 - temperature sensor so I could monitor the temperature where the breadboard was located.

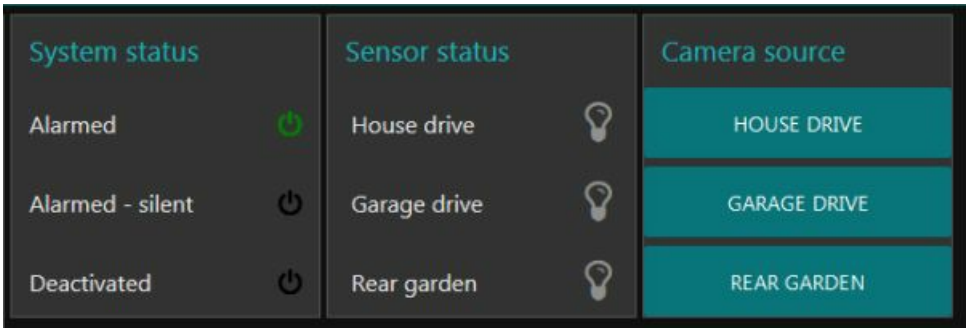
External IR sensor

Here's a photo of the IR detector installed on an external wall of my house. Before you say it… Yes - I know having an exposed trailing cable is not "secure".

I plan to fix some plastic trucking to the wall so the cable cannot be reached or tempered with by an intruder!!!

I bought a 100m reel of 4-core security cable so I could cable up the whole of the external part of my house.

User Interface



Here's a view of the user interface.

My initial idea was to indicate when a sensor had been triggered.

This was quickly overtaken with the idea of having a set of cameras to take a picture whenever a sensor triggered.

The project developed quickly into… sending the camera's image to a server via FTP (File Transfer Protocol) and to sending an alert via "Telegram".

All these (extra nodes) items are available on "nodered.org"

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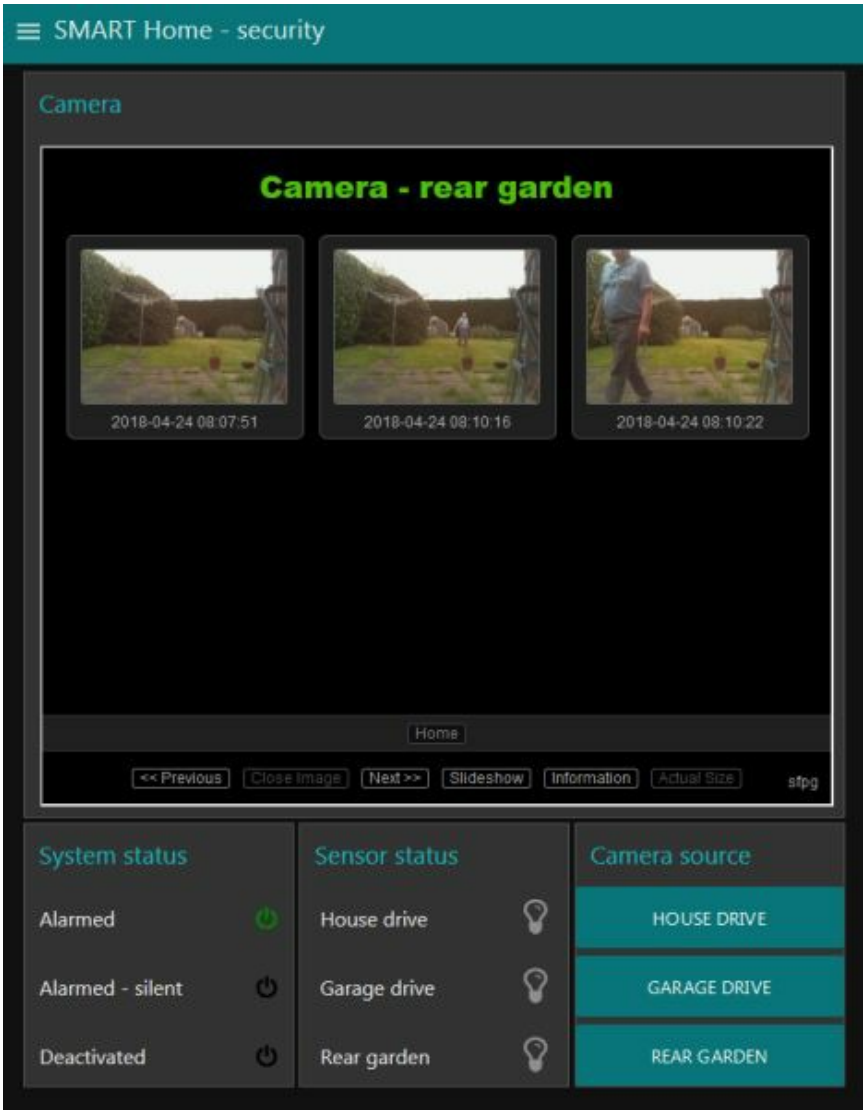
User Interface - full view



Here's a view of the complete User Interface.

The main part of the screen shows the time-lapse images captured from the Raspberry Pi camera.

The System status panel allows control of the system.

The Sensor status panel shows whether any sensors have been triggered.

The Camera source panel allows the user to select which camera's photos will be displayed.

Clicking on an image brings up a panel to show further details like…

** time taken*

** date taken*

** the camera's EXIF details*

** filename*

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Mobile friendly

Here's a photo of what the security system (Graphical User Interface) looks like on a tablet - pretty neat hey for an amateur like me?

Technical aspects of the project (for anyone who is interested)

Main electronic items include:

* **Raspberry Pi 3+ (running Node-RED and MQTT)**
* **Raspberry Pi Zero W (running Node-RED and MQTT)**
* **Pi camera fitted to Raspberry Pi Zero W**
* **Wemos D1 Mini (WiFi-enabled microcontroller) running ESP Easy**
* **Honeywell - IS312B Passive Infrared Motion Sensor.**
* **Step-Up Power Supply Module 2A, 2V-24V DC-DC Booster**

As mentioned previously in the text, the IR detector was powered by the DC-DC step up voltage converter. This in turn was powered from the +3.3V voltage supply that was used to feed the Wemos D1 Mini microcontroller.

The voltage-free, normally-closed contact from the IR detector connects to pin D6 on Wemos D1 Mini via a 2K2 resistor and to +3.3V also via a 2K2 resistor. I am paranoid about connecting things directly to micro controllers and always use resistors to limit the current and voltage-protect the inputs.

The normally-closed contact drags the voltage on the input of the D1 Mini to 0V or logic '0'. When the IR sensor is triggered (when it detects body heat) the contact opens allowing the input voltage to rise to +3.3V or logic '1'.

Whenever a change occurs, the Wemos D1 Mini sends the logic level, via MQTT, to the Raspberry Pi 3+ which is acting as the main controller in the system. This unit is running quite a few "systems" in my SMART home including external and internal lighting, humidity and temperature database logging, as well as the brand new security system (and other systems yet to be designed).

When the Raspberry Pi 3+ receives a signal, indicating body heat has been detected, it sends a "trigger signal" via MQTT to the Raspberry Pi Zero W to operate the attached camera. The captured image is time and date stamped and then sent via FTP (File Transfer Protocol) to a commercial web server.

A clever piece of software (running on the server called "Single File PHP Gallery") accepts the captured image and automatically catalogues it in a very simple database.

The dashboard, within Node-RED, contains soft-buttons that can access the Single File PHP Gallery and display the database contents in a template node.

Conclusion

This write-up just goes to show how a very simple application can grow and grow into a full-blown project.

I hope you have enjoyed reading this as much as I enjoyed making it.

Don't forget to checkout…

https://nodered.org

https://discourse.nodered.org/

http://sye.dk/sfpg/