

An Investigation into Dual Sensor Security Motion Sensors

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Introduction

Home security is important to allow the public to feel at ease and secure within their homes. Compared to last year there has been an increase in burglary by 9% and an increase in robbery by 33% according to the England & Wales National statistics[1]. With burglaries on the rise I believe home security is important and with the design of and intruder device could potentially lower this figure.

Aims & Objectives

Aims

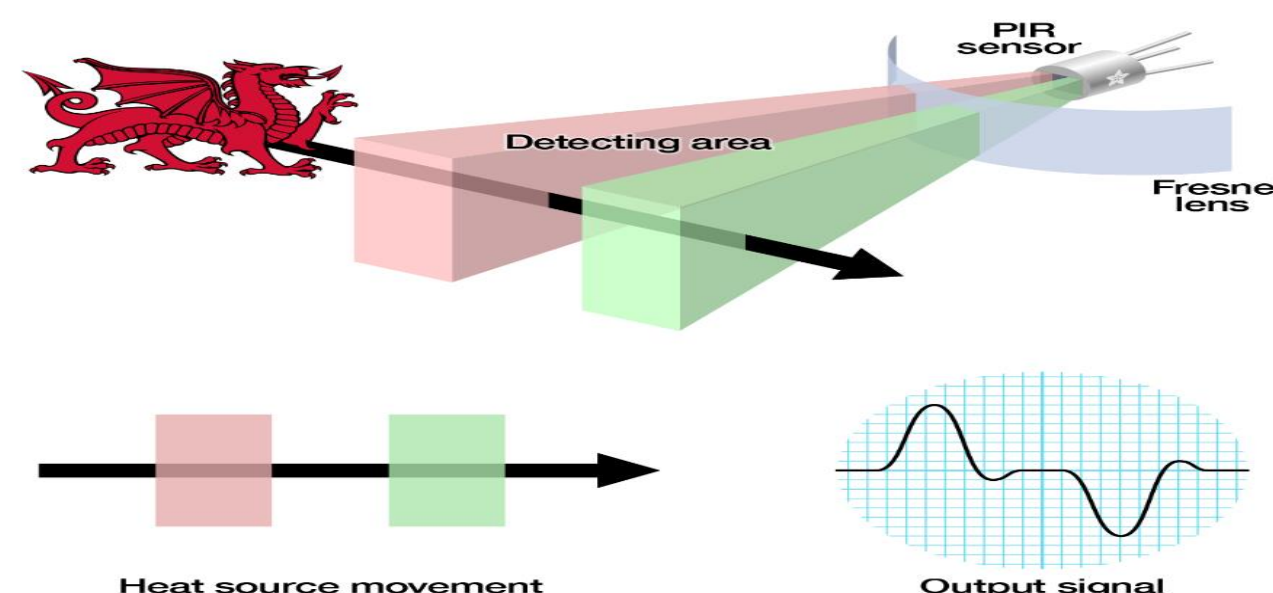
- Create a device that notifies the user of any movement within a given area.
- Installed in indoor/outdoor environments.
- Affordable for all members of the public.
- Minimize the number of false alarms.

Objectives

- Research & Investigate existing technologies/products.
- Adopt specifications and form ideas based on research.
- Theorise, design and build a prototype.

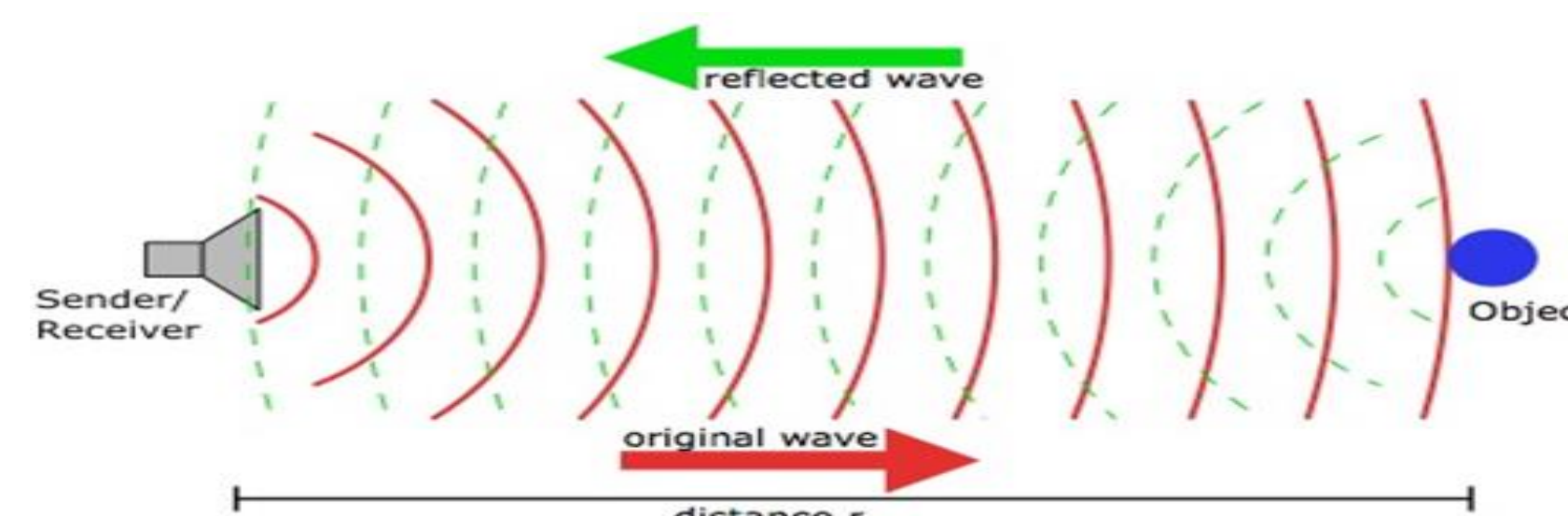
Passive Infrared

- Low cost.
- Simplicity.
- Can detect heat signatures up to 10 meters.
- Can be used in harsh weather environments.
- Does not interfere with devices within proximity.[2]



Microwave

- Can be used in harsh temperature environments.
- Can detect movement of a max range of 20 meters.
- Large frequency range, avoiding interference. [3][4][5]

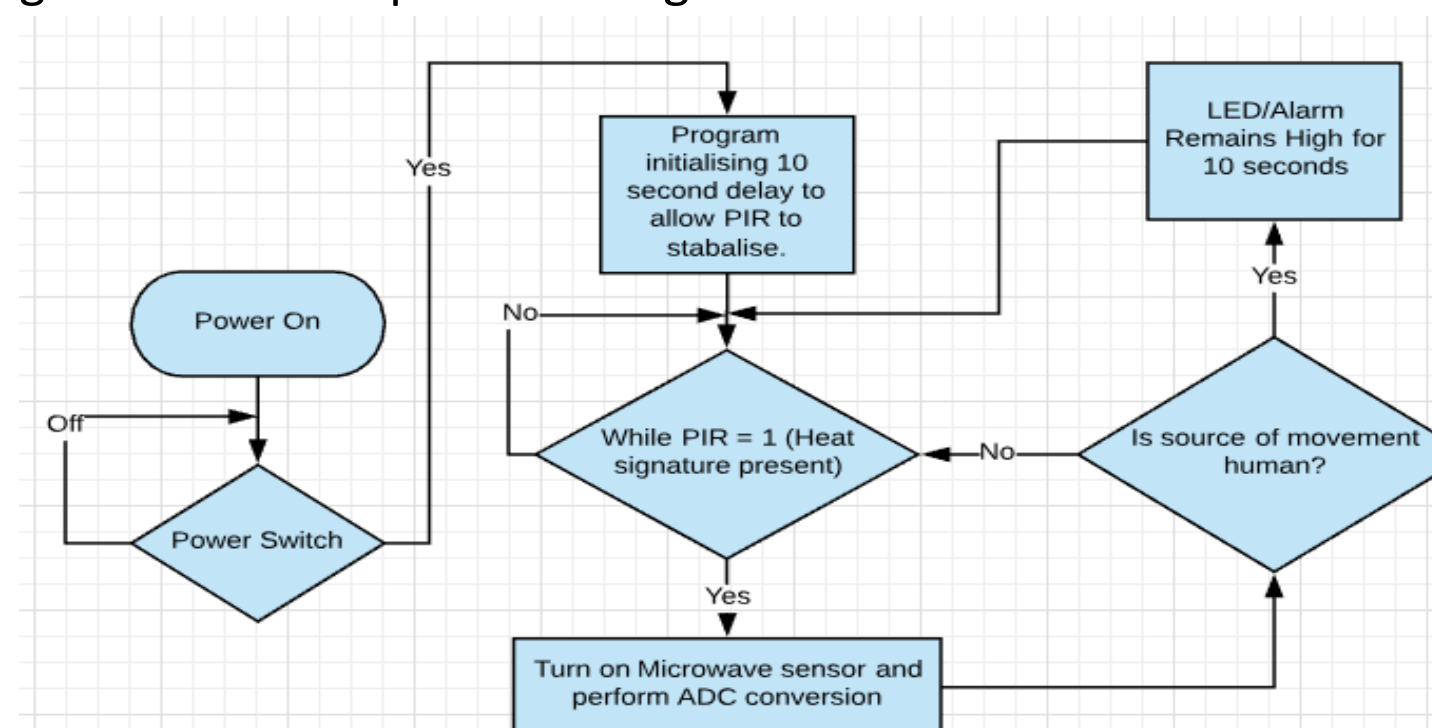


Research Overview

The two technologies chosen is very popular within intruder detectors. The two technologies chosen inversely complement each other as ones weakness is the other ones strength, using these technologies together will minimize the number of false alarms and increase the overall accuracy of the device.

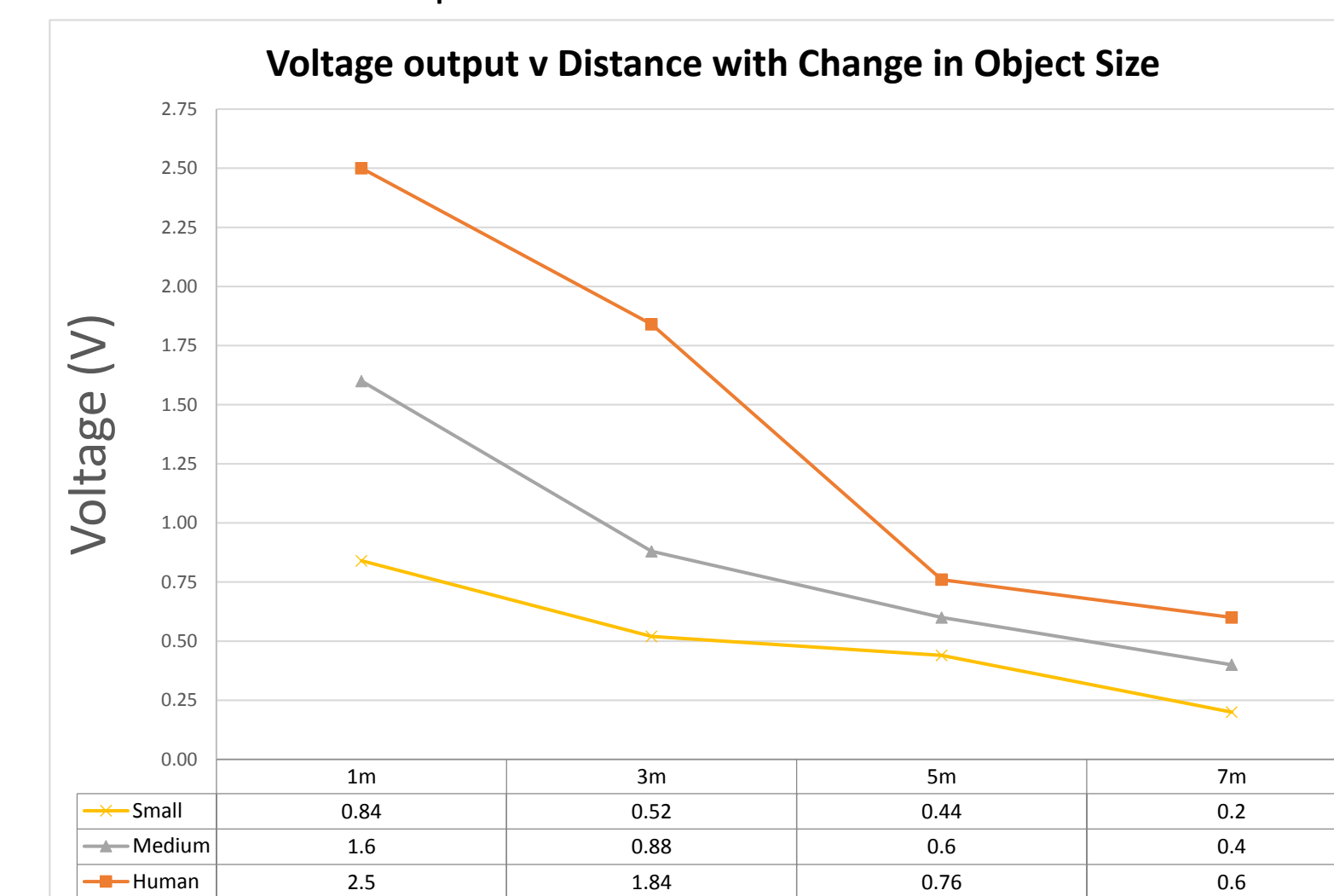
Design & Implementation

- Passive Infrared Sensor (AMN14111) is used as an automatic switch when a moving heat signature is detected.
- When a moving heat signature is present current is supplied to the microwave sensor (HB100) and gives a voltage output proportional to the amount of radio frequency reflected.
- Using a pic16f887, logic was designed so that when both sensors detected movement it would generate an output in form of an LED/Buzzer.
- To minimize false alarms, pet immunity was implemented using an ADC and creating a window comparator using 'C' software.



Testing & Results

An experiment was conducted to determine the voltage thresholds needed for the window comparator in order to distinguish between a human and different sized pets.



- Larger the object passing the motion sensor, the higher the voltage output.
- Further away the object is from the sensor the lower voltage output.

Conclusion

- Implementation of dual technology was successful.
- Implementation of a microprocessor was included.
- Overall approximate cost of the project was £35.
- Implementation of pet immunity resulted in less false alarms.
- With the use of a IP65 casing allowed it to be used indoors/outdoors.

References

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