

Ethical considerations

The intended end use of this system is for hazard monitoring specifically in industrial settings. It is reasonable to consider that this system could be used to capture imagery of individuals without their consent since this system features a sensor containing an array of pixels. A choice was made to integrate a screen during development only, to visualise the data processed by the sensor. Image frames captured by this sensor are neither transmitted externally nor recorded internally so this system cannot be used to capture imagery of unknowing persons.

One of the control enhancements outlined in NIST Special Publication 800-53 [1] for the use of sensor capabilities and data is “collection minimization” [1] which states that they should be configured to minimise the collection of information about individuals that is not needed. In this I have not introduced a capability into this system for imagery to be transmitted or recorded.

Risk Management

The three tables below form the risk assessment.

Table 1: Risks to the investigator

Risk to investigator	Mitigation	Risk
Inhalation of soldering fumes during assembly of circuits.	A fume extractor will be present an appropriate distance away from the soldering activity (< 55 mm).	Low
Burns arising from contact between a hot soldering iron and human skin/clothes.	Care will be taken to ensure that the soldering iron does not come into contact with skin/clothes.	Low
Adverse health effects from certain types of solder.	Leaded solder will not be used at any point during this research.	Low
Electric shock from high voltage circuits.	No high-voltage equipment will be used at any point during this research.	Low
Physical harm from body parts becoming compressed between two electronically controlled moving parts of the system being built.	An emergency stop button should be present.	Low

Table 2: Risks to the environment

Environmental risks	Mitigation	Risk
Carbon emissions incurred during the transport of supplies.	Where economically practical, components, equipment and other required supplies will be purchased	Low

	through local supplies to reduce the carbon footprint of this research.	
Release of fumes due to excessive heating of electronic components.	Work in a space with a fume extractor and perform additional checks the first time a new component is introduced into any circuits.	Low

Table 3: Risks to the University/Employer

University/Employer risks	Mitigation	Risk
Financial loss resulting from funding a project that is not feasible.	The feasibility of the project should be assessed to determine if it is achievable within the allotted timeframe.	Low
Release of private or restricted company data to unintended recipients.	Restricted company data will not be used at any point during this project.	Low
Release of personal data.	Personal data will not be collected at any point during this project.	Low

Equality, Diversity and Inclusion

A potentially commercialised product that has applications across a range of industries, including search and rescue operations; surveillance; pet, captive wildlife and child monitoring, and industrial hazard monitoring must be able to use a team which has a wide range of backgrounds to create a product team which has diverse knowledge and experience required to operate across multiple industries. A diverse team provide many different perspectives and networks which leads to a deeper understanding of stakeholders and their needs. My organisation is a signatory of the Derby House Principles [2] which is a commitment to the belief that “promoting diversity and inclusion is the right thing to do” [2].

Quality Management

Developing a product aimed for a commercial market means that repetition and quality assurance across units is essential. This project already makes use of a version control which keeps track of changes to source code and design documentation alongside logging utilities which report data about the system over a serial connection.

Quality assurance can be achieved by developing a test bed to run automated test scenarios against each new unit and comparing them to previous known good samples.

A Quality Management System (QMS), such as ISO 9001:2015 [3], provides a framework for continuous improvement, allowing the product team to identify and address areas

for improvement, reduce errors, and increase customer satisfaction. ISO9001 [3] stresses QMS must be endorsed and enforced by the project leadership and planned into the life of the project.

Continuous Professional Development

I gained a deeper understanding of the complexities of communicating with devices that output data in a dynamic format with the infrared sensor. I learned to navigate the challenges of parsing and interpreting the data, creating software that is still capable of running even after data format output from a sensor has changed.

I had to teach myself about the intricacies of camera sensor technologies, including the principles of thermal imaging and the characteristics of different infrared sensors.

Realising sooner that wireless data transfer was not feasible and halting research into the technology sooner would have left more time for the rest of the project. I would define a minimum viable product which doesn't require researching all the individual technologies upfront and explore exact solutions once it has been proven that the pre-requisites have been met. In this project, that would be implementing tracking algorithms using wired connections first, before exploring wireless data transfers.

References

- [1] N. I. o. S. a. Technology, "Security and Privacy Controls for Information Systems and Organizations," 10 December 2020. [Online]. Available: <https://doi.org/10.6028/NIST.SP.800-53r5>.
- [2] ""Derby House Principles | PAXsims"," PAXsims, June 2020. [Online]. Available: <https://paxsims.wordpress.com/derby-house-principles/>. [Accessed 10 June 2025].
- [3] International Organization for Standardization, "ISO 9001:2015 - Quality management systems — Requirements," International Organization for Standardization, September 2015. [Online]. Available: <https://www.iso.org/standard/62085.html>. [Accessed 10 June 2025].