Final Project

INFT3075

Pod 7 – Courtney Hagen, Jessey Harlow, zach slaunwhite

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Table of Contents

[Introduction 2](#_Toc37111557)

[Proposal 2](#_Toc37111558)

[Campus Information 2](#_Toc37111559)

[Campus: 2](#_Toc37111560)

[Staff Population: 2](#_Toc37111561)

[Student Population: 2](#_Toc37111562)

[Description of types of student population: 2](#_Toc37111563)

[Statement 2](#_Toc37111564)

[Outcomes 2](#_Toc37111565)

[Smart Technologies Outline 2](#_Toc37111566)

[Phase 1 - Year 1 2](#_Toc37111567)

[Phase 2 – Year 2 2](#_Toc37111568)

[Phase 3 – Years 3-5 2](#_Toc37111569)

[Appendix A 2](#_Toc37111570)

[References 4](#_Toc37111571)

Final Project

# Introduction

The purpose of this assignment is to introduce our smart technology idea and demonstrate the plan for implementation.

# Proposal

## Campus Information

### Campus:

NSCC Institute of Technology Campus

### Staff Population:

599

### Student Population:

Full Time: 871

Part Time: 157

### Description of types of student population:

There are both local and international students of all ages, genders, and abilities that attend the IT campus. There are students in the following programs:

IT Data Analytics

IT Database Administration

IT Generalist

IT Programming

IT Systems Management and Security

IT Web Programming

Adult Learning Program

Academic and Career Connections

Business Intelligence Analytics

Cyber Security

Dental Assisting Level II

English for Academic Purposes

Health Information Management

Industrial Mechanical

Marine – Industrial Rigging

Medical Office Administration

Occupational Health and Safety

Office Administration

Pipe Trades

Plumbing

## Statement

There are many students who do not take fire alarms and other emergency alarms seriously. We have observed many students who think or assume a fire alarm or other emergency alarm is a drill and decide to stay in the campus building during the event or to disobey the directives given. This poses a serious issue in safety for students. We hope to improve the process of detecting if people are still in the building by introducing Emergency Management Drones, and to identify those who are not following procedures so that it can be addressed.

## Outcomes

The outcomes of this technology are to:

* Identify people based on their face and body temperature. The technology should be able to identify people by face if they are staff or students, if they are not either of these groups, the robot will immediately throw that person into another section of group, called unknown. Once in this group a human watching the live feed from the robot will place the person into another subsection of category, either threat, or guest.
* Act differently according to the protocol issues. The robot should be able to act independently depending on the protocol issued to it. In the event of a fire it should be able to use its small canister of fire repellent on all exits from the building from the inside as well as stairwells. If a part of the building collapses it should be able to issue very loud calls to anyone trapped under rubble, with a sensitive sensor for hearing voices and even low breathing from beneath rubble. In the event of an attacker, it should be able to identify the attacker based on it’s population catalogue and attempt to disorientate the attacker with a loud speaker and bright lights on the front facing. If the protocol is a drilling environment, it’s to issue normal instructions, but it’s ability to do anything else will be disabled.
* Issue commands or instructions to students, faculty, attacker and guests. In the case of a fire it should be able to tell anyone which route to an exit it believes should be navigable based on its gathered information, or intervention. During a building collapse it should be able to do the same thing as during a fire, helping the person exit the building based on the information its gathered. During an attack the robot should be able to tell the person to take cover in a classroom and to lock the door, as well as any simple information about the attackers weapon.
* Navigate itself through the environment without human intervention. The robot should be able to navigate the building on it’s own because of it’s map of the building, and with its camera either pick up any new changes to that environment such as fires and building collapse debris.
* Create and updateable map and log of issues, hazards, threats, and humans in the environment for emergency personnel to use. The robot should be able to color code current locations of all categories of people it finds, update the map with fires, areas it hasn’t been areas it has been, and debris, as well as areas of the building it believes to be dangerous.
* Assist in dealing with the emergency in small ways while under human control. While under human control, certain functions of the robot are unlocked. The robot can communicate better with people because a person will be able to take over voice control of it. In the event of an attacker, the taser option of the robot will be enabled. When the taser button is pressed two of the eight sets of tasers will be deployed, they will have the same strength as police issued tasers.

The ultimate goal is to make Emergency Management Drones a part of all emergency processes, but for the early stages, only in fire, building collapse, and attacker situations.

## Smart Technologies Outline

* Face detection, information sent to person that can make decisions, follow people, make noises, etc  
    
  In an emergency, the drones must be precise and able to identify a situation quickly. Any errors in the drones can pose an issue for health and safety. The drones have a build in programming language, where libraries exist for face detection already, making this implementation quick and easy to adapt. With face detection, the drones will be able to identify people in danger and can be used by rescuers to quickly act on known locations of trapped individuals.   
    
  This feature is ideal in fires and active threats in the building.  
    
  (Priority is scaled as 1 being the highest and 3 being the lowest)  
  **Priority: 2**  
    
  There are no concerns for this implementation, although will require hiring programmers to be able to configure and troubleshoot the drone, as well as requires a person or operate.
* GPS/location awareness   
    
  The drones are meant to work both independently, and with the assistance of a human operator feeding commands. For the implementation to work as intended, an overview of the drones location is imperative to the success of these drones.   
    
  This feature is ideal in fires and active threats in the building.  
  **Priority: 2**  
    
  There are no concerns to implementing this technology, however, there is the obstacle of being precise on location. To implement this feature properly (and have it be exact), there will need to be sensors built on multiple floors, and different areas of the building to be able to identify the position of the drone.
* Collision detection/autonomous (for physical control): The drones will need to work together to optimize efficiency. The drones will be aware of their surroundings and be able to fly autonomously, and will also avoid colliding with other drones.  
    
  Uses: This is ideal in every situation.  
  **Priority: 1**  
    
  Giving self control to drones can lead to unexpected issues if there are flaws in the code. They could lead to injuring students or faculty if there is any errors in the programming.
* Extreme temperatures detection  
    
  This is crucial as to keep the drones from being damaged or malfunctioning, as well as identify a potential hazard such as a fire.

Uses: This is ideal in fire emergencies and is not crucial to be able to identify fires. Rendering it lowest on the priority list   
**Priority: 3**

No risks involved for this feature

* Data capture, collection, transfer: Being able to record the surroundings of the drone  
    
  Not only is being able to monitor the surrounding areas valuable, being able to record and store images and videos can be used for legal reasons, and help with improvement of the drones. The drones will be able to analyze images, and if given a photo of someone, will be able to find them if they are in the building.   
    
  Uses: This is ideal for if there is a threat, such as an active shooter, in the building particularily, but is useful in all situations.  
  **Priority: 1**  
    
  There are legal regulations around photos and video capture of students, thorough research should be conducted around the laws before implementation of this feature
* Hooked up to sprinklers  
    
  The drones will be linked to the sprinkler system, this is more ideal than having an individual room or hallway linked as it would require way to many sensor systems to each room, or will be a failsafe for if a room does not detect the hazard. With a drone being able to be located through a positioning system, only required sprinklers will be activated – minimizing water damage to the building and equipment, while still being efficient.  
    
  Uses: Fire   
  **Priority: 2**  
    
  This could lead to unexpected activation of the sprinkler system if there are errors in the code, or could be activated by accident due to human error.
* Phone monitoring access  
    
  For the drones to be fully taken advantage of, they will be monitored by authorized personnel through a phone app, being able to watch a live feed of each drone. This will be visual only, and not have any access to controlling the drones.  
    
  Uses: All situations  
  **Priority: 1**  
    
  If there is insufficient security, unathorized individuals could potentially gain access to live video of the school.

## Phase 1 - Year 1

### Goal

Introduce Emergency Management Drones to fire drills.

### Deadlines

|  |  |
| --- | --- |
| Action | Deadline |
| Testing Emergency Management Drone features for fire before adding them to the fire drills. | 6 months from start date. |
| Emergency Management Drone is consistently used in all fire drills. | 6 months from initial testing ends. |

### Implementation

The initial part of Phase 1 will be focused on testing the features of the Emergency Management Drone. This will include creating mini testing environments for the various features. These features should be tested for the full 6 months to uncover any potential issues. Multiple features can be tested at once, however, some features such as CO2 detection and connecting to sprinklers would need to have an isolated environment that may not be able to be tested with other features. For example, the face detection may not be ideal to test in the CO2 testing environment because we do not want to put people in harms way to test the device.

Phase 1 will be conducted with only 3 drones, keeping the amount of drones low for testing, while still being able to test features such as collision detection between drones, and optimizing the amount of area that they can cover, ideally working together to minimize the time of searching the building.

An ideal drone for the testing phase would be the Ryze Tello, costing roughly $110 CAD. Keeping the cost low during the initial phase at a total of $330.

Once the initial testing period is complete, the features that have been determined fully functional and useful can be decided upon. It can then be decided which of those features to implement in the fire drills. Once decided, an action list should be created to determine how the emergency management drone will interact with a fire emergency. Once that action list is created, the emergency management drone should be introduced to all fire drills. The team to test this should be separate from any existing emergency management teams as to ensure the drill is still being efficiently practiced as it exists and to ensure the safety of students and staff.

## Phase 2 – Year 2

### Goal

Introduce Emergency Management Drones to lockdown drills.

### Deadlines

|  |  |
| --- | --- |
| Action | Deadline |
| Test Emergency Management Drone lockdown features before adding them to lockdown drills. | 6 months from Phase 1 end. |
| Emergency Management Drone is consistently used in all lockdown drills. | 6 months from lockdown drill feature testing ends. |

### Implementation

The initial part of Phase 2 will be focusing on testing features for lockdown procedures. Though most of the features will overlap in usefulness for the two types of drills, if the intention is set to test for a lockdown, the tests will then become focused on testing for that type of event. This will give the opportunity to determine if all the features will also work in lockdown events and will give testers the opportunity to decide against certain features if they provide more harm than usefulness.

Once the features have been once again confirmed and an action plan is set based on those features to use in a lockdown event, the emergency management drone will be implemented into the actual lockdown drills. The same team that were responsible for the emergency management drone in the fire drill implementation will be responsible for it in the lockdown drill implementation to ensure a focus on all other staff and to students to learn the procedure as it existed prior to the drones for everyone’s safety.

## Phase 3 – Years 3-5

### Goal

Introduce Emergency Management Drones to all active emergency events.

### Deadlines

|  |  |
| --- | --- |
| Action | Deadline |
| Introduce Emergency Management Drone to all emergency drills. | 1 year from start of Phase 3 |
| Emergency Management Drones used for all active emergency events | End of Phase 3 (Year 5) |

### Implementation

The first part of Phase 3 is to continue to test the emergency management drones, but this time in all emergency drills. This will allow additional time to have a firm grasp on how they will be used, and to be able to troubleshoot any problems.

The last part of the last phase is to introduce the emergency management drones to all active events. They will continue to be used in drills; however, a live environment provides the ideal testing environment. As long as the team responsible for the testing of the drone is separate, the safety of students and staff should not be impacted, even if the drones are to be used in a live event. They should use the action plans created during the testing in the live event and make any modifications as necessary during the last part of the phase lasting 4 years. This will be a decision period to determine if the drones provide more benefit than problem.

Due to the nature of emergency management procedures, the use of the drone may evolve well beyond these implementation phases, however, this gives a process which allows most of the major issues to be worked out before active events are introduced.

# Appendix A

Individual Work Logs

Courtney Hagen

|  |  |
| --- | --- |
| **Total time spent:** | **5 Hours** |
| **Details of work completed:** | Gathered campus information, wrote statement, planned the phases, created document |

Zach Slaunwhite

|  |  |
| --- | --- |
| **Total time spent:** | **3 Hours** |
| **Details of work completed:** | Smart outline section, as well as developed the overall concept of the drones. |

Jessey Harlow

|  |  |
| --- | --- |
| **Total time spent:** | **2 Hours** |
| **Details of work completed:** | I did the outcomes section of the assignment. |

Marking Rubric

Courtney Hagen

|  |  |  |  |
| --- | --- | --- | --- |
| Criteria | Courtney | Zach | Jessey |
| Attendance | 1 | 1 | 1 |
| Submission Deadline | 1 | 1 | 1 |
| Quality of Work | 1 | 1 | 1 |
| Communication | 1 | 1 | 1 |
| Participation | 1 | 1 | 1 |

Zach Slaunwhite

|  |  |  |  |
| --- | --- | --- | --- |
| Criteria | Courtney | Zach | Jessey |
| Attendance | 1 | 1 | 1 |
| Submission Deadline | 1 | 1 | 1 |
| Quality of Work | 1 | 1 | 1 |
| Communication | 1 | 1 | 1 |
| Participation | 1 | 1 | 1 |

Jessey Harlow

|  |  |  |  |
| --- | --- | --- | --- |
| Criteria | Courtney | Zach | Jessey |
| Attendance | 1 | 1 | 1 |
| Submission Deadline | 1 | 1 | 1 |
| Quality of Work | 1 | 1 | 1 |
| Communication | 1 | 1 | 1 |
| Participation | 1 | 1 | 1 |

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