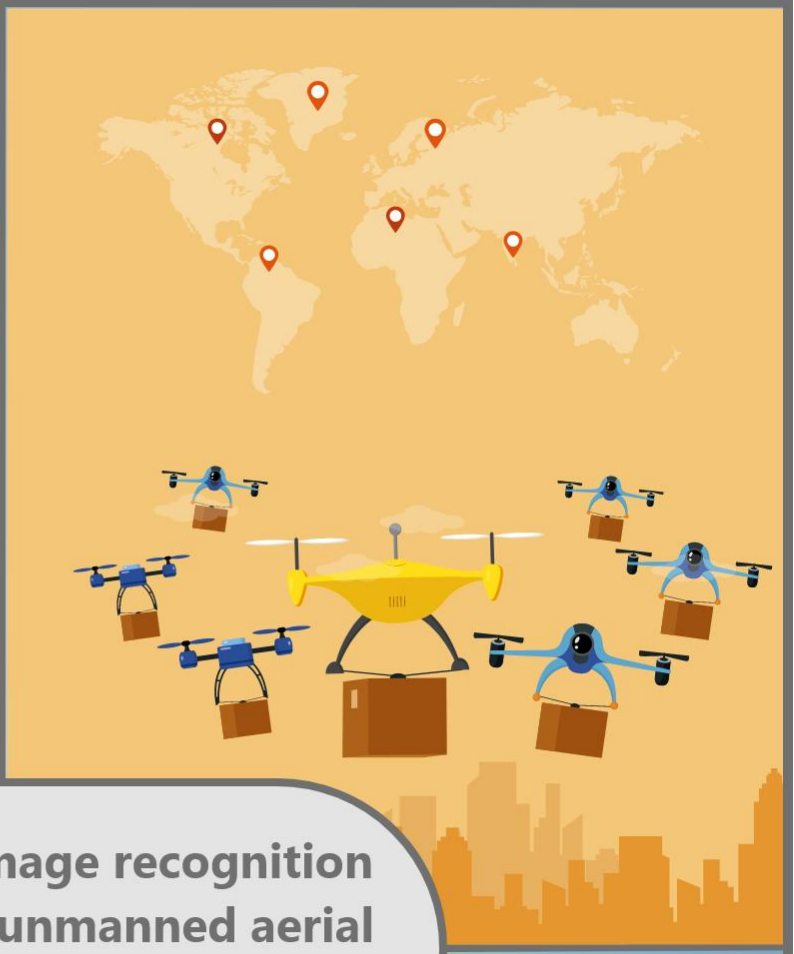
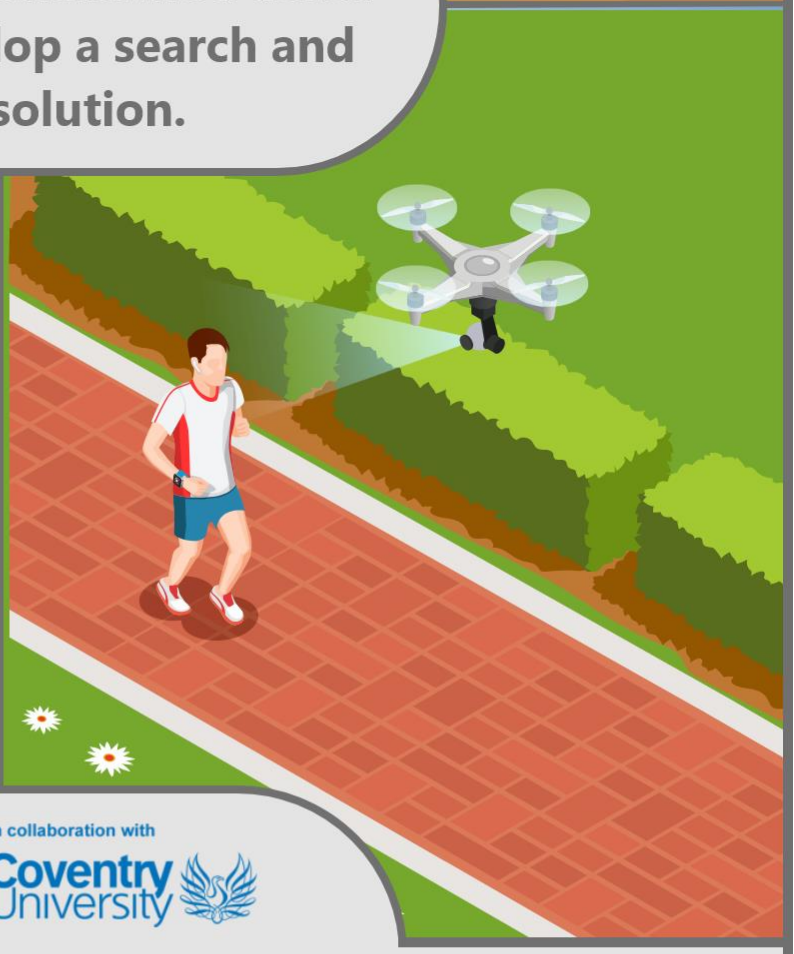


Integration of image recognition technology and unmanned aerial vehicle to develop a search and rescue solution.



in collaboration with

Softwarica College of IT & E-commerce | Coventry University

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Integration of Image Recognition Technology and Unmanned Aerial Vehicle to Develop a Search and Rescue Solution

Abstract

With severe climate changes, the risks of occurring natural disaster is increasing. This is the reason why search and rescue missions have been most important task worldwide in which rescue teams are engaged. Risking their life, rescue teams are involved in missions such as treating the injuries or searching for missing people. To minimize the risks and to reduce the duration of rescue time, an unmanned aerial vehicle (Drone) is introduced in the search and rescue missions. Drones are automated vehicles which can be controlled by humans from a single place. It can easily fly over several dangerous locations where humans could risk their life and collects the images or video of the targeted situation.

This document discusses about how the facial recognition drones can be effectively used in the rescue missions to save lives of people. It focuses on the automating the rescue tasks such as following and searching people by recognizing their face, surveillance and remote monitoring. The face recognition technology used by drone is discussed in this document. The other tools and technologies used in this project are also briefly discussed. This paper deals with several factors that may influence the performance of drones and the face recognition technology. The current laws and policies related to the drone technologies has also been identified. In addition, the PESTEL analysis done on this project is also showed in this document. This helped in identifying the external marketing forces that have an impact on the drone project. This report aims to show the various types of risks that may arise after launching the product in the market. The identification of external and internal stakeholders is included in order conduct feasibility analysis. This paper also includes the other similar kinds of technologies from which many references were taken. Therefore, the aims, objectives, scopes, risks and limitations of the Drone project has been mentioned in this document.

Keywords

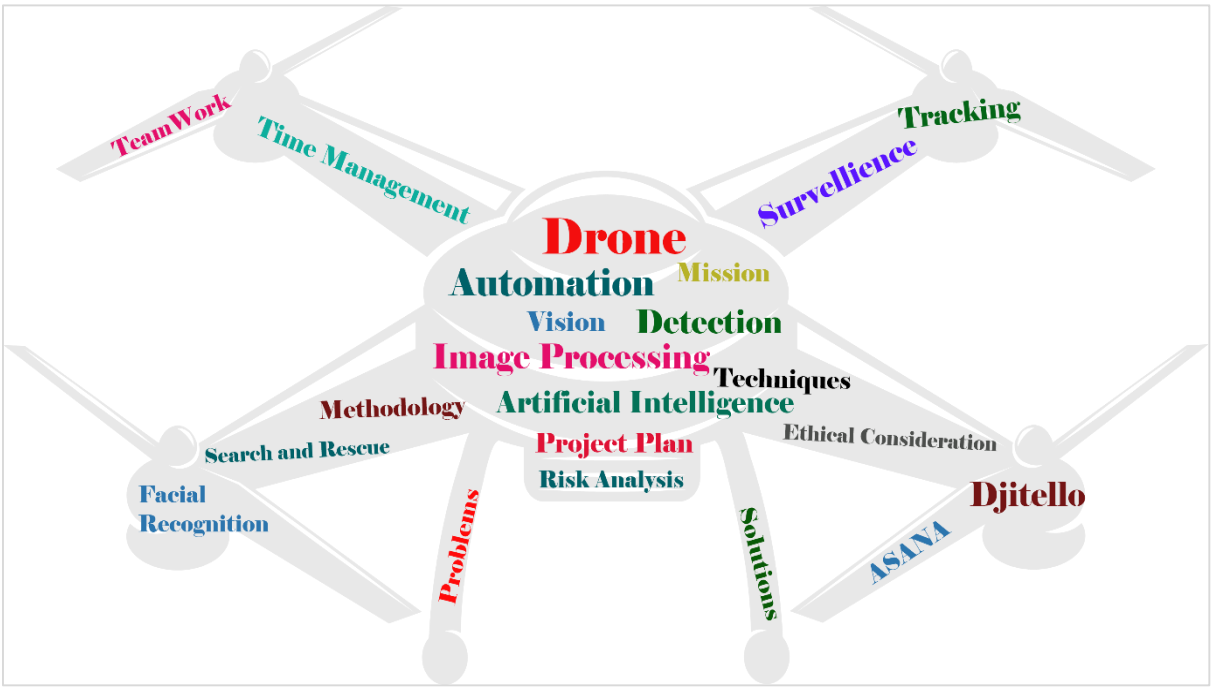

Figure 1: Keywords

Contents

Figures

Abstract - conclusion Word Count: 4491

"Drones overall will be more impactful than I think people recognize in positive ways to help society." – Bill Gates

Introduction

Obstructed geographical terrains and in-efficacious pathways have always been one of the great challenges for human beings. This increase the probability of affecting the productivity and efficiency of most of the business and government organizations for operations like scanning certain locations, delivery services, rescue mission and surveillance. However, the action of search and rescue groups in any operations in the abrupt consequences of natural or man-made disaster around, has become more overriding in last decades.

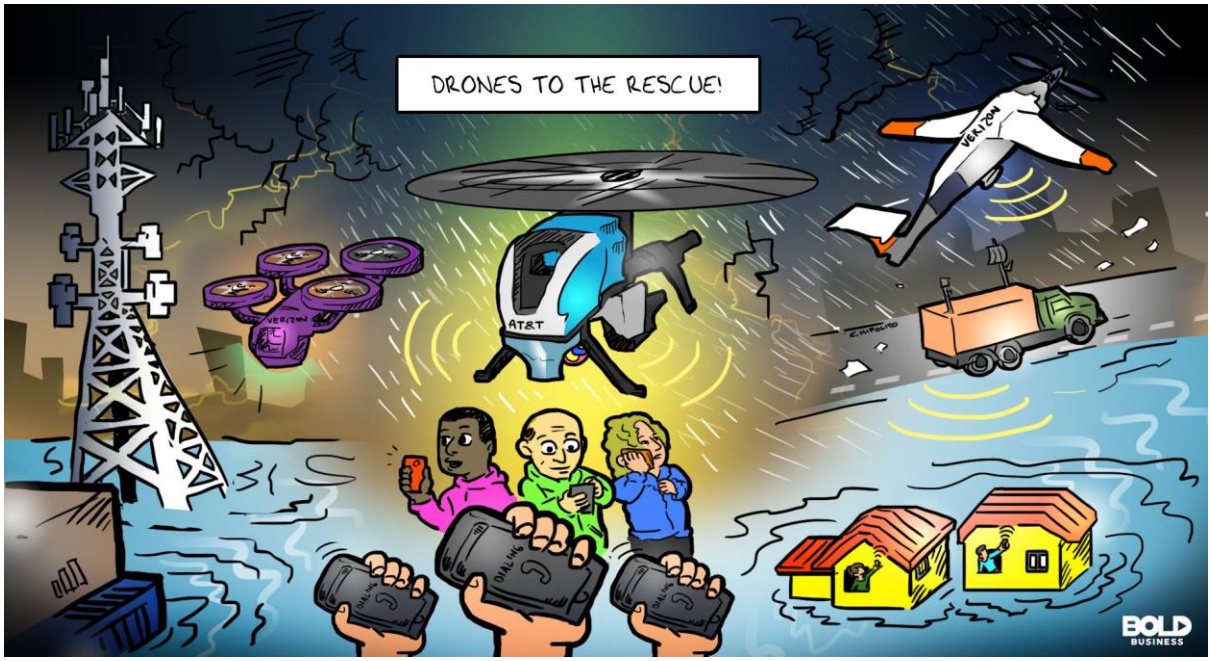

Figure 2: Drones used in the rescue missions
(AT&T Drone - Much Needed Portable Cell Towers In Hurricane-Risk Areas 2020)

So, to reduce such problems, the demand of unmanned aerial vehicles (UAVs) is increasing at a great rate. Drones are all more officially known as unmanned flying vehicles which can be remotely controlled. Drones have become crucial to the services of different companies and governmental agencies and have been able to infiltrate areas in which other industries have flat lined or lagged behind.

With improved performance, enhanced services and customer relationships, and solved security risks, drones have helped to decrease the workload and cost of production with the increment of work efficiency and profitability. Drones can lay out situational awareness over broad area quickly which benefits in reducing the time and the number of rescuers needed to trace and rescue an injured or missing person. It is definite that the remarkable speed of deployment of drones, their adaptability and comfort of use are very valuable for the aid to users. Moreover, drones are proficient of highly sophisticated observation, and are currently being used by law execution that carries different types of resources containing live-feed video cameras, heat sensors, radar and infrared cameras.

Hence, this project proposes an autonomous aerial vehicle which can provide real-time insight into security and spare situations for better control, accurate intelligence congregation, comprehensive situational awareness and more informed decision making.

Mission and Vision Statement

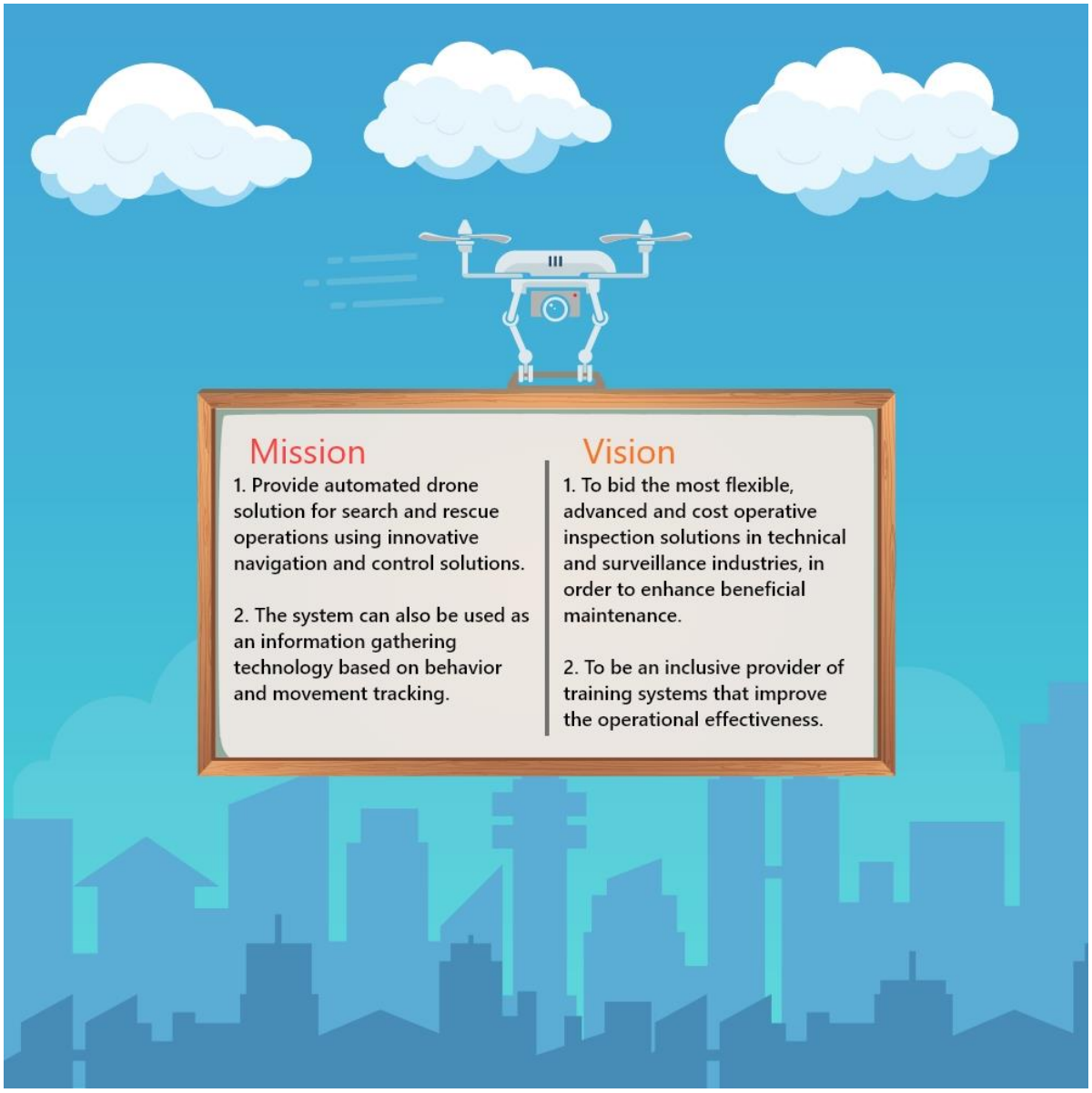

Figure 3: Mission and Vision

Aim

To innovate an autonomous aerial vehicle that can detect and identify the provisional awareness over broad area within certain time minimizing the cost and risks of operations on challenged areas. With little to no effort's drones are programmed to follow certain instructions with valuable outcomes.

Objectives

- Practice research in the fields of drone application and exploring efficiency.
- Access the drones and their software dependencies.
- Explore and implement object detections on drones.
- Analyse risks and critical challenges.
- Develop, improve and explore operations by creating one or more areas of interest with the use of unmanned aerial vehicles
- Connect established technology developments and applications in rescue mission in order to introduce collaborative learning environment.
- Decrease cost and increase UAV performance, drones with smaller, lighter, cheaper parts and materials are used.
- Increase fly time of UAVs by studying the factors effecting the power.
- Can be used in other sectors like agriculture, military, wild life conservation, health care and many more.

Mindmap

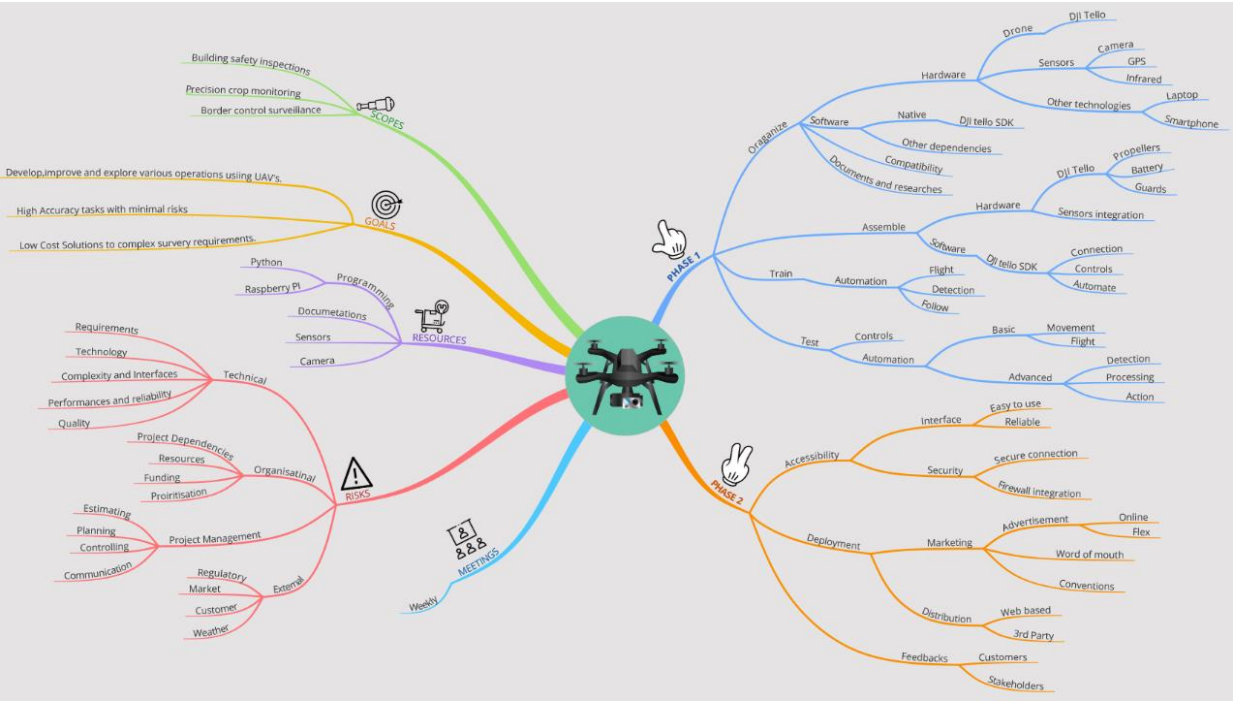

Figure 4: Mindmap

Justification

Unmanned flying vehicles are mostly used for inspecting the areas which are affected by natural disasters like flood, landslide, earthquake etc. Access to these scratched areas may be constrained by civil the ruling classes for numerous days or it may be merely too dangerous for adjusters to enter that affected area. These natural calamities many times oblige as a major challenge as they lead to an enormous death toll either because of people being trapped in the fragments or due to no help received on period. One of the key problems faced by the rescue and search teams during a gigantic catastrophe is the concrete search of survivors and victims as soon as possible and also reaching out geographically difficult areas to make sure people are not caught under the wreckage. Unmanned flying vehicles are capable of making the rescuing and searching mission more efficient and less time consuming.

Unmanned flying vehicle such as drone is very lightweight and resourceful, it can pass unreachable and limited pathways and geographical terrains. The cost of losing a drone on a rescue mission is significantly less than losing an actual person on rescue mission. Also, drones can be integrated with AI technology which can further improve on automatic detection of obstacles and rescue requirements. The combination of these powerful technologies together is arguably more powerful and effective than human eyes to process critical rescue operations.

Figure 5: Different sectors using drones to solve problems

Scope

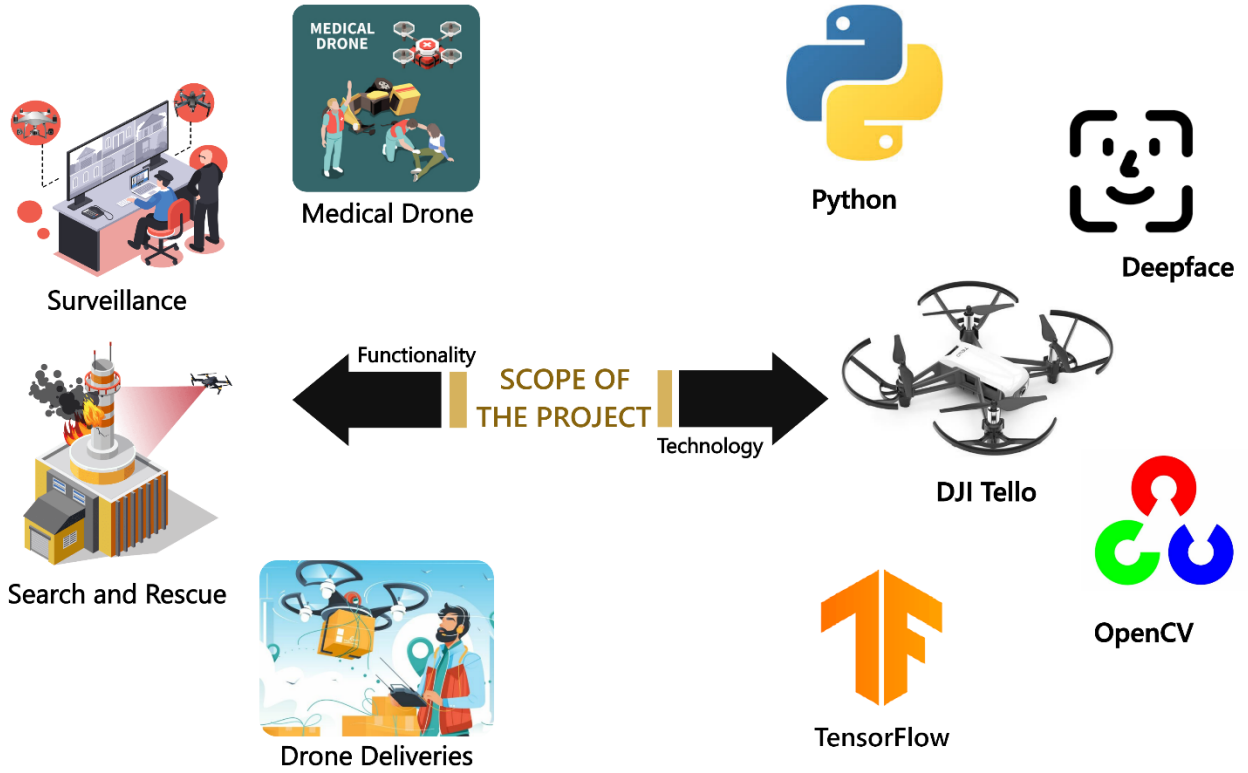

Figure 6: Scope of the Project

Stakeholder Analysis

Figure 7: Stakeholder analysis

Business Canvas

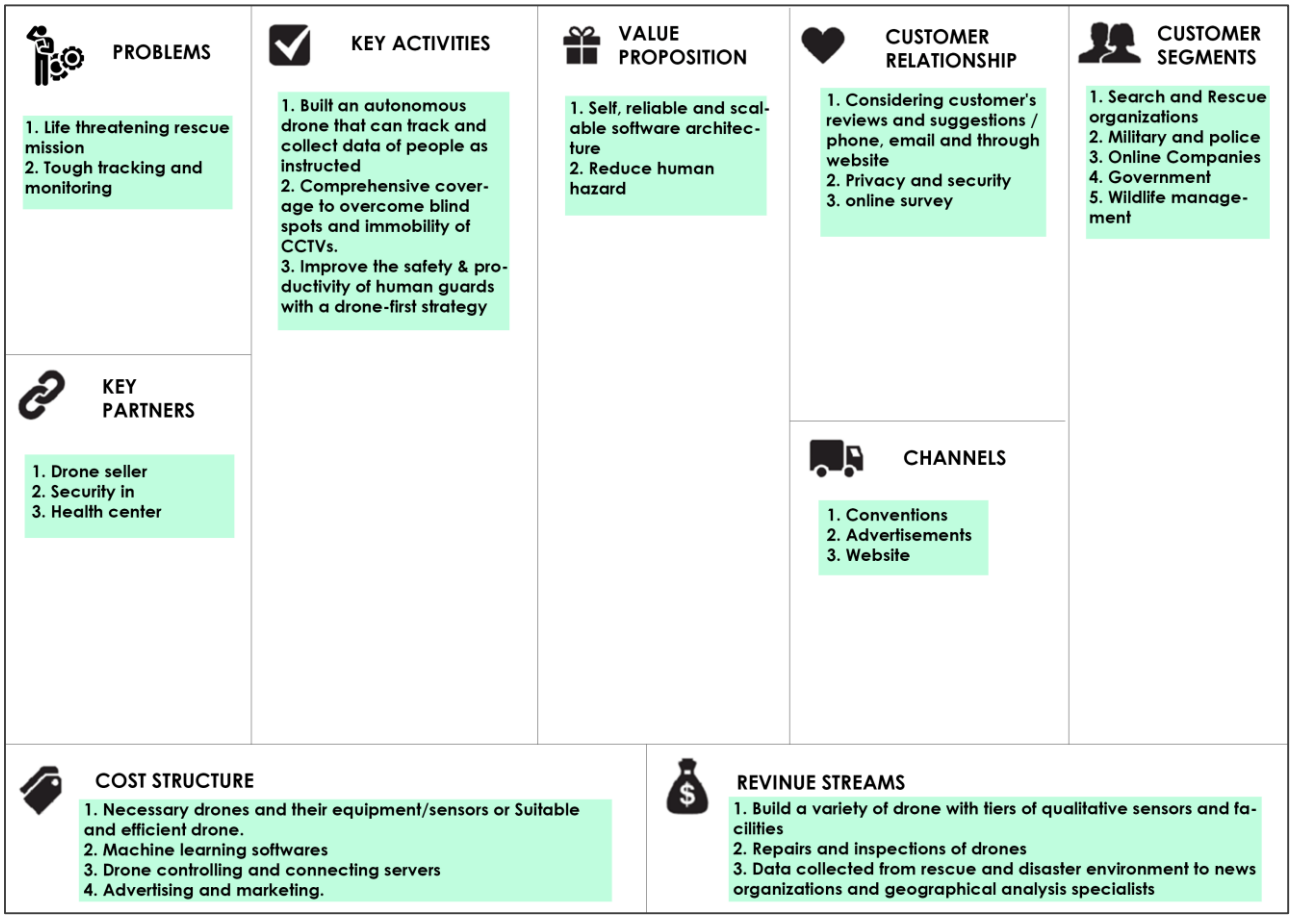

Figure 8: Business Canvas

Ethical Consideration

This project is well intended with consideration of certain ethical issues. In order to understand the ethical issues that are related to drones we firstly need to understand the basics of ethics. Ethics is the moral principle that governs people's behaviour or the conducting of an activity. Data privacy and copyright issues are well acknowledged. The source of citations, research papers and references are credited to their sources. No laws are broken as DJI Tello does not require aviation law. One of the main ethical issue related to drone is that the work done by drone is just an act and this act is an extension of what a person does. The task of the drone is based upon the actions of the person controlling the drone. Due to the lack of test subjects and real-life disaster environment, the current product of this project is limited to facial recognition and autonomous movement of drone according to it. [(2020)]

Figure 9: Ethical Consideration

Literature Review

Amazon Prime Air:

Amazon Prime is a drone delivery service which was launched by Amazon in December 7, 2016. It uses fully automated drones that can deliver packages for their customers which identifies the position and direction of the delivery location. In June 05, 2019, new version of amazon prime air was launched which can fly up to 15 miles and deliver packages under five pounds to customers in less than 30 minutes. Its new hybrid design can do vertical take offs like a helicopter and has efficiency and aerodynamic like an airplane.

Figure 10: Drones used in delivering packages

The drones are integrated with diverse sensors and advanced algorithms, such as multi-view stereo vision, to detect static objects by use of proprietary computer-vision and machine learning algorithms. On descending for delivery, a small area around the delivery location is required. The drones are trained to avoid other obstacles using stereo vision in parallel with sophisticated AI algorithms (Wilke, 2020).

Drones Used for Inspection

Nobody can really question the benefits and utility that inspection drones have bring to the worksites. Shell is one of those company that takes full use of them. Shell is a global group of Energy and petrochemical Companies that deals with producing, refining and marketing of oil and natural gas and chemicals. It has an average of 86,000 employees around more than 70 countries.

Inspecting the flaring stack at Norway's Ormen Lange gas processing plant was a hazardous and lengthy task for Shell. Engineers were forced to search for faults by abseiling the 70-meter high structure, causing the plant to shut down for nearly two weeks.

[(Case Study: Top 5 Companies That Are Using Drones | Commercial UAV News 2020)]

Figure 11: Oil Ring
[(Shell Oil In Ocean - Google Search 2020)]

Figure 12: Flaring Stack

Therefore, drones were deployed which provided images and videos of places and areas that Shell workers are unable to physically reach. Their team uses a remotely operated aerial vehicle fitted with a gas sensor to swoop around and search for any leaks or cracks in the structures. The same task now finishes in just few hours and the plant keeps running ensuring engineer's full safety. [(Eye In The Sky 2020)]

Shell also launched a pilot training program to teach pilots to operate drones properly and is also increasing usage of UAVs and ROAVs equipped with cameras, sensors, GPS, gyroscopes to reach and examine places like tall buildings, towers and hard to reach places because it is safer and efficient rather than sending people. This proves that use of smart drones can increase workplace safety in addition to improve and easy maintenance.

Mobile biometrics and liveness detection

How Latin American banks are using Knomi to attract more clients and avoid fraud?

Dramatic changes in mobile networks and technology extant banks the prospect to make their amenities more reachable. Clients can now use their cell phone to rapidly create account, credit lines, access to their account material and also accomplish different dealings, acquisition all without visiting ATM or a branch.
Biometrics and facial recognition in exact are playing a vital role in making mobile banking more accessible, convenient and secure (Aware and Aware, 2020). They are using "liveness detection" vacant as part of Aware's Knomi mobile biometric authentication solution. This detection process is making sure that the facial metaphors are being collected and can be reliable for a diversity of biometrics-based security checks (Aware and Aware, 2020). It functions during the boarding of new clients and also hightened login to mobile apps through biometric authentication.

Figure 13: mobile biometrics and liveness detection

Banks that have unified Knomi software into their systems can control an applicant's conscious selfies to deportment several individuality checks that assist to positively validate their individuality and also to perceive when the fraud is being attempted. Different forms of Knomi permit the process to be directed either from the bank's mobile application or an alternative application that is a web page on a mobile phone or a desktop (Aware and Aware, 2020).

Micro pilot UAV in agriculture fields

MicroPilot is one of the leading autopilot company in the world which has served their clients by providing high end autopilots since 1994. A UAV named as CropCam equipped with a stripped-down Pentax digital camera was launched by MicroPilot to automate the agricultural sector. It is integrated with GPS server, antenna, Camera box, Airframe, MP2028g autopilot and many other required features. The electric UAVs are controlled remotely by the farmers at a ground station or autonomously directed by the pre-programmed flight plan.

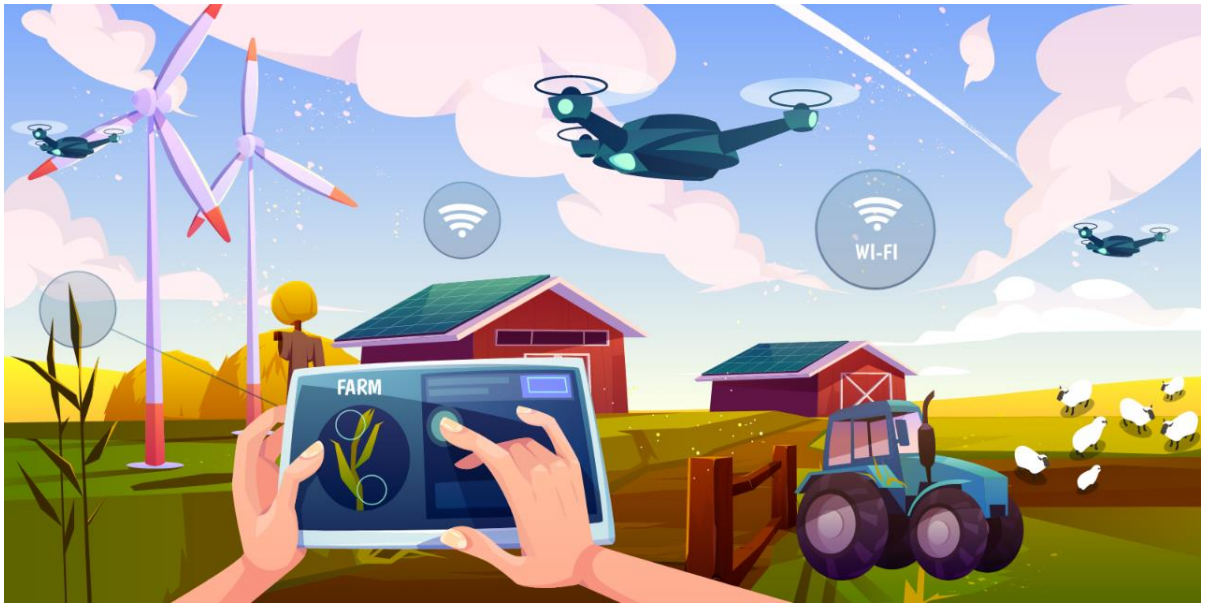

Figure 14: UAVs in agricultural sector

The farmers were able to monitor their own field as the system would fly over the agricultural fields and collect GPS marked digital images before landing. This device solved and improved the problem of hiring expensive professional aerial photographers. UAV also allows farmers to obtain sky-view which can help in investigating various issues on the farm. The problems such as irrigation problems, infestations, soil variation can be monitored through UAVs. The UAVs can also be used to monitor animals in the farms through which farmers can study about health and eating habits of the animals. After getting all the information farmers can then start providing efficient and fast solutions to the problems that are arising in the farm. This will ultimately help to produce more profit in the agricultural sector. (UAV 2020)

Using Drones to locate Landmines

In 2013, as per the article by the Center for Mine Safety (BH-MAC) in Bosnia and Herzegovinia, two million ground mine and unexploited grenades were predicted in some 28,700 localities throughout the civil war 1992-1996. Around 1,230 square kilometre area was converted into a mine zone which brought difficulties for rescuer in the area of the devastation. During the monsoon, several blockages were ruptured in the environment of Kopanice village at southeast of the north-eastern Bosnian city of Orasje. Several minefields as well as pasturelands remained swamped, so to deploy rescue teams in these areas was dangerous. Moreover, landslides in Maglaj led the environment transpose all the minefields. As a consequences, about 25,000 residents was not able to passage freely.

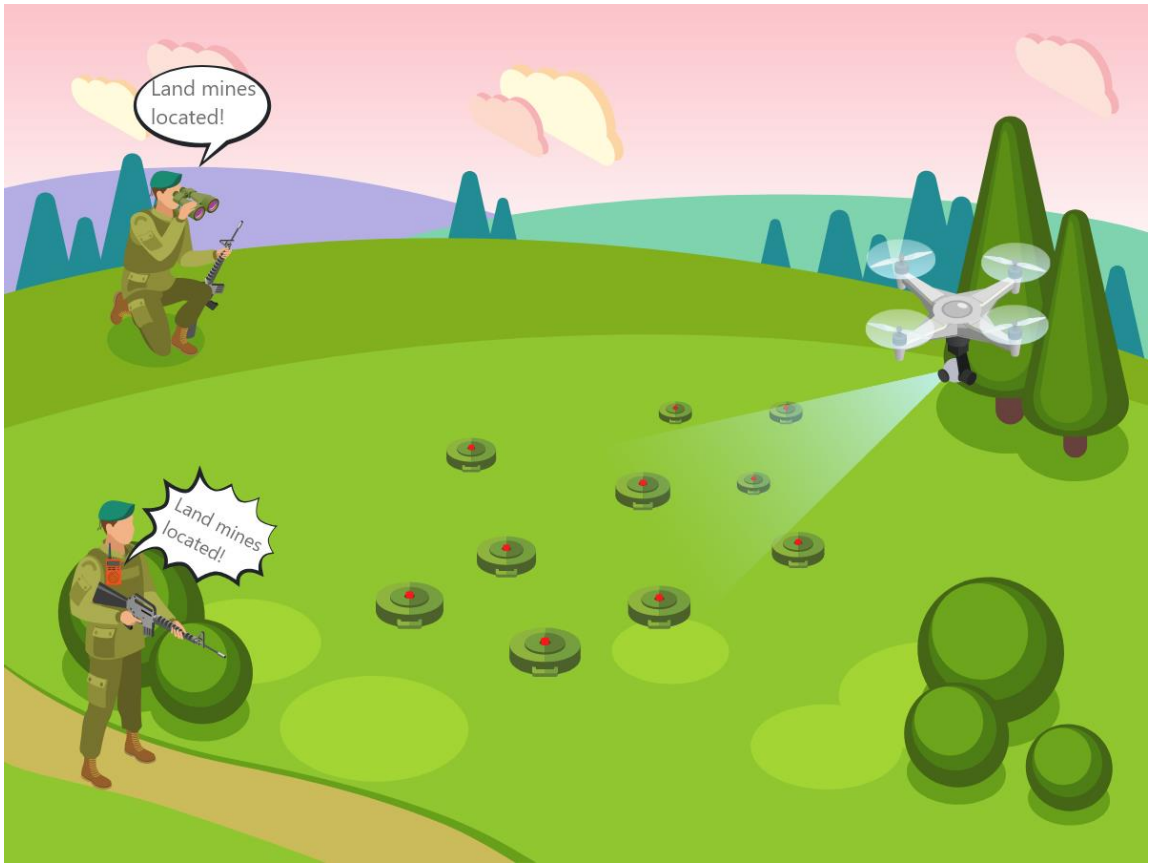

Figure 15: Drones to locate landmines

With the aid of UAVs, precise airborne 3D photos was taken for the affected ranges, which help out to evaluate area where the minefields had shifted. Mines were found as far as 23 kilometres far from their native areas. Accordingly, aerial fund conveyed crucial support for rescuer distribution in calamity area. As noted by B-FAST team, couple of hours of drone operation protected the rescuer by three days. (Belgian Rescue Teams Deploy Microdrones In Disaster Areas 2020)

Apple Face Id

Apple introduced a facial recognition technology called Face ID in November, 2017 with the launch of iPhone X which revolutionized the authentication of apple devices. Face ID provides intuitive and secure authentication with the use camera along with the advanced technologies which maps the facial structure and geometry of a user's face accurately and efficiently. With little to no effort, Face ID securely unlocks devices on a glimpse of a face.

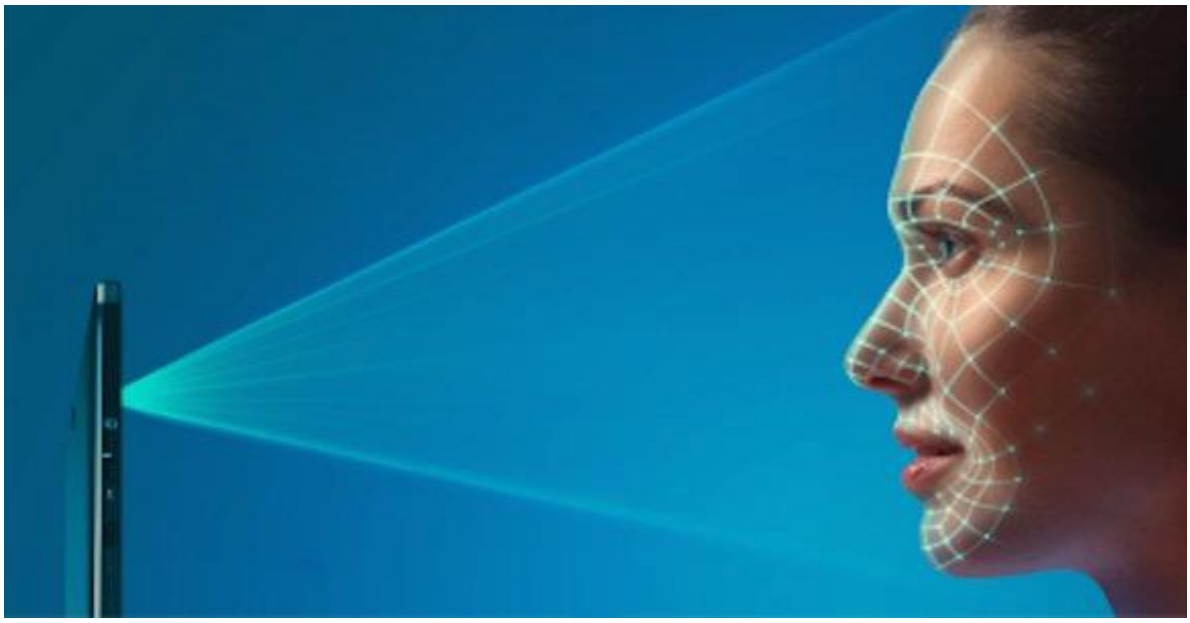

Figure 16: Apple's Face ID (About Face ID Advanced Technology 2020)

The hardware used for Apple's Face ID is named The TrueDepth camera which accurately captures the data of face by projecting and analysing over 30,000 invisible dots to create a depth map of your face and also captures an infrared image of your face. It then processes and transforms the depth map and infrared image into a mathematical representation and compares that representation to the enrolled facial data.

The TrueDepth camera is automated, as it requires no additional hardware interaction to work. The primary process of using a Face Id is by just lifting up a phone and level it to a user's face. For each time the device is unlocked, the TrueDepth camera recognizes user by capturing accurate depth data and an infrared image which is matched against the stored mathematical representation to authenticate (About Face ID advanced technology, 2020).

Therefore, drones have now surpassed and increased their reputation as technology as they are used by both average people and companies. They have become the new normal. After amazon first came up with the idea of drone delivery other companies have also come up with new creative ways to implement drones into their business.

Methodology:

Waterfall

Waterfall methodology is a software development life cycle process. It illustrates a firm schema of software development process in a linear sequential flow.

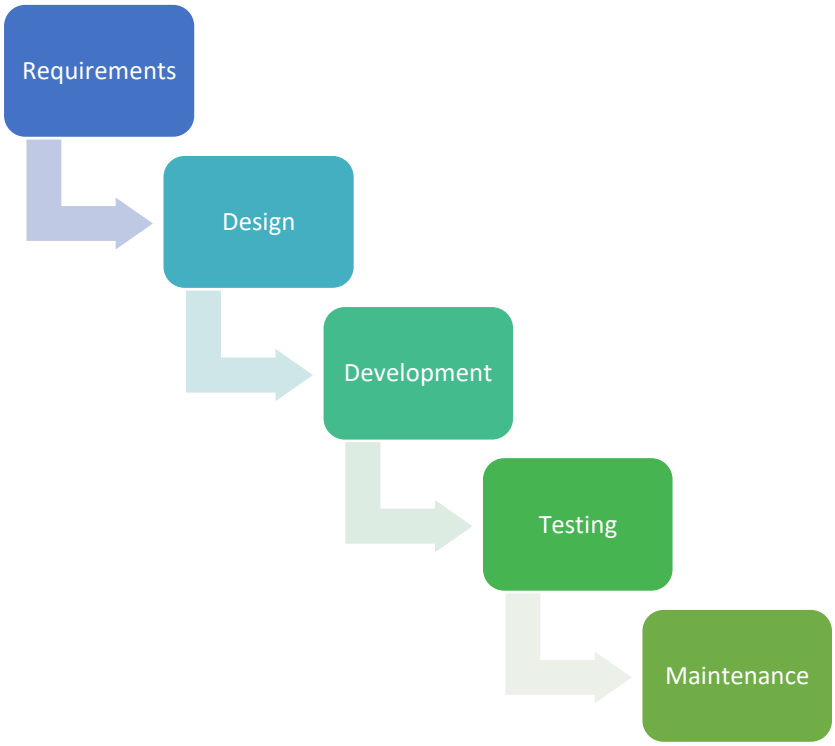

Figure 17: Waterfall Model

Tools and Technologies:

- DJI TELLO: DJI Tello is the drone used for this project. This small and portable drone is manufactured by "RYZE Tech" which has a stable aerial flight and equipped with an HD camera.
- Python: Python version 3.8 is the main source of programming language for this project. It supports image processing, machine learning and TELLO's development environment.
- OpenCV: OpenCV (Open Source Computer Vision Library) is utilized for the image processing that is used in drone. It is an open source computer vision and machine learning software library built in order to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products.
- Deepface: Deepface is an AI framework developed research group of Facebook which identifies human faces in a digital environment. This project uses Deepface AI framework along with OpenCV to detect a certain individual.
- DJI SDKs: DJI's python source code is initiated to control the drone programmatically in python environment.

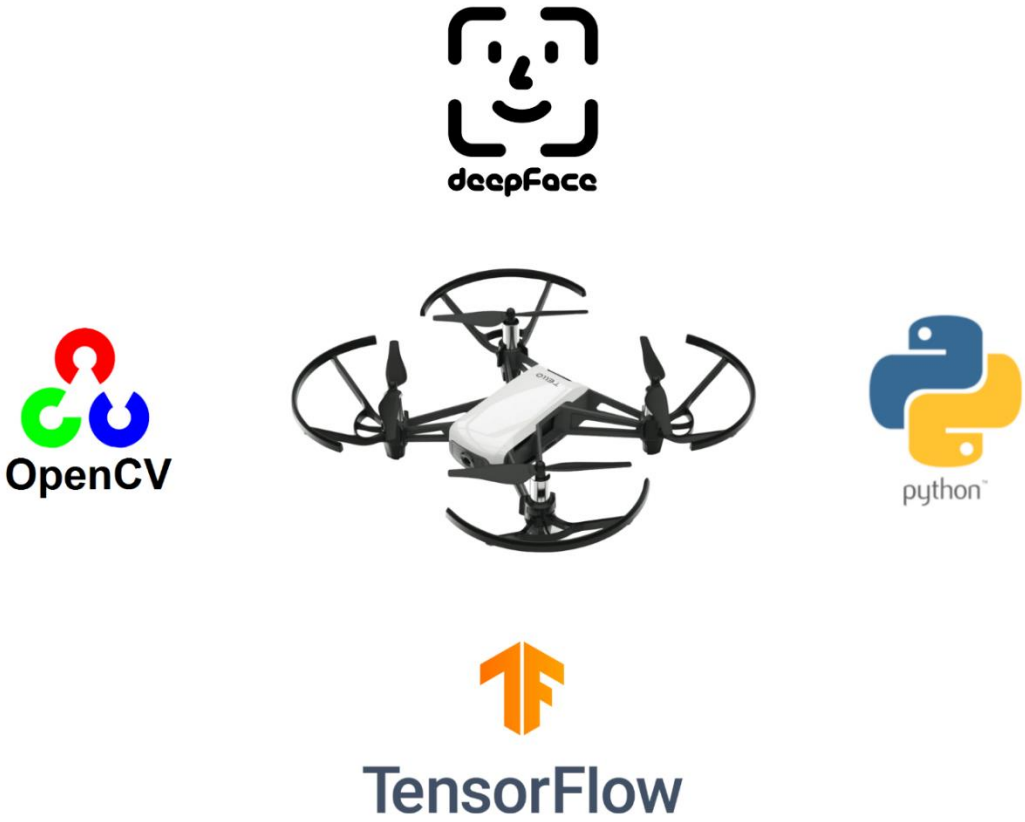

Figure 18: Tools and technologies

Techniques:

Artificial Intelligence with Machine Learning and Deep Learning
Deep learning is a subset class of machine learning algorithms which uses multiple layers to progressively detect and extract more informatics features from the raw input. In image processing these higher layers identifies and detect the concepts relevant to a human vision.
Phases of deep learning:

- Training of networks: To train a network of data, a large number of data needs to be collected and a model which will learn their features are designed.
- Transfer Learning: Transfer Learning can be also seen as tweaking a pre-trained model and creating a new task to perform afterwards. This stage reduces the computation time each time the model is transferred.
- Feature Extraction: Once the layers of models are trained, the unique features are extracted from them and output will be predicted with consistency and high accuracy.

Integration:

Starting from waterfall methodology, the requirement of this project was divided into parallel 2 factors; Drone manipulation and Image processing.
The design of the product was not much of a challenges as pre-built drone technologies were used. Although the design for the user interface was built on python using Tkinter and pygame.
The development phase of this product was also divided into 2 factors as per requirements.

- Drone manipulation: Connection of DJI TELLO in python using the SDK provided by manufacturer.
- Image Processing: OpenCV is used as the backbone of image processing. The Deepface framework is used to handle the facial recognition along with TensorFlow to train the Deepface model of a particular person. The pieces of Deepface model is then merged with OpenCV to create an AI that detects a person which is stored in Deepface database.

Finally, both drone manipulation and image processing are combined together to automate drone to follow a person which was processed in Deepface AI model.
Testing of this product passed two consecutive instances, where the photo of two team members were allocated in Deepface database. The drone followed only the persons whose photos were stored in database and ignored all the other persons in an environment of about 10-15 people.
Maintenance was done to optimize the product, initially the image processing was only done with OpenCV, the model trained to detect a particular person was highly inaccurate. This led to using deep learning AI module of Deepface. Also, the override of automated drone was implemented with computer keyboard, which further led to control of drone with a game controller.

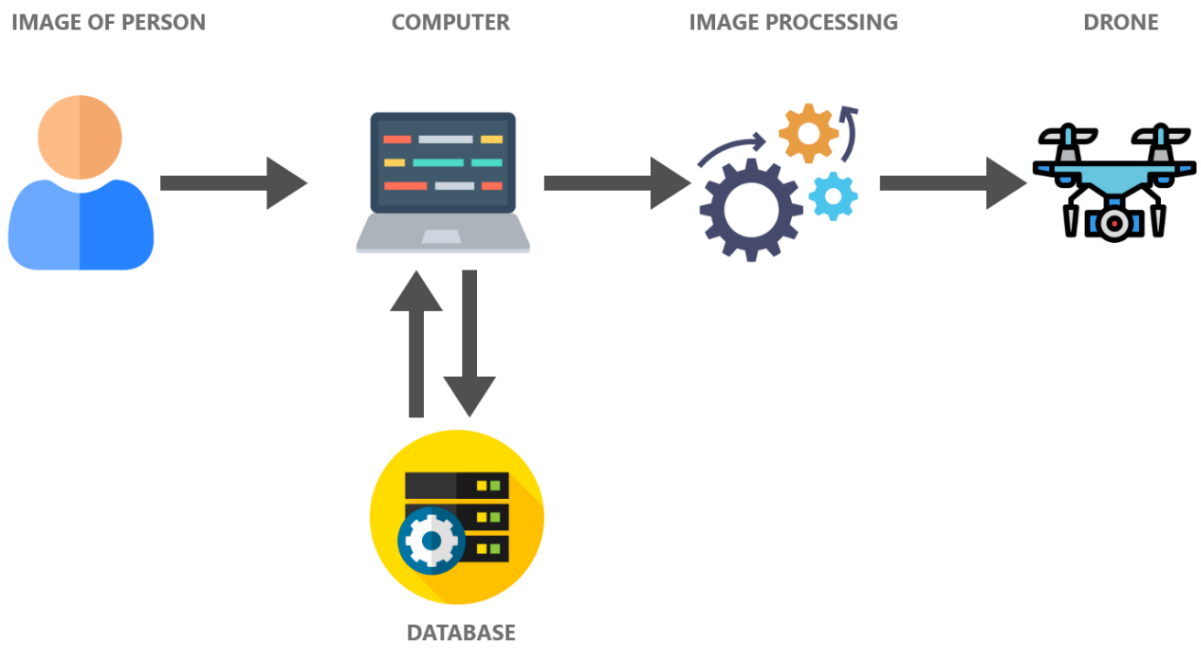

Figure 19: Workflow of the product

PESTEL Analysis

A PESTEL analysis is a tool used by marketers worldwide to identify the various external marketing forces that have an impact on any business company. Before starting any project or business, the analysis of the marketing forces must be done in order to successfully launch the product. For the drone project PESTEL analysis has been done. (Analysis 2020)

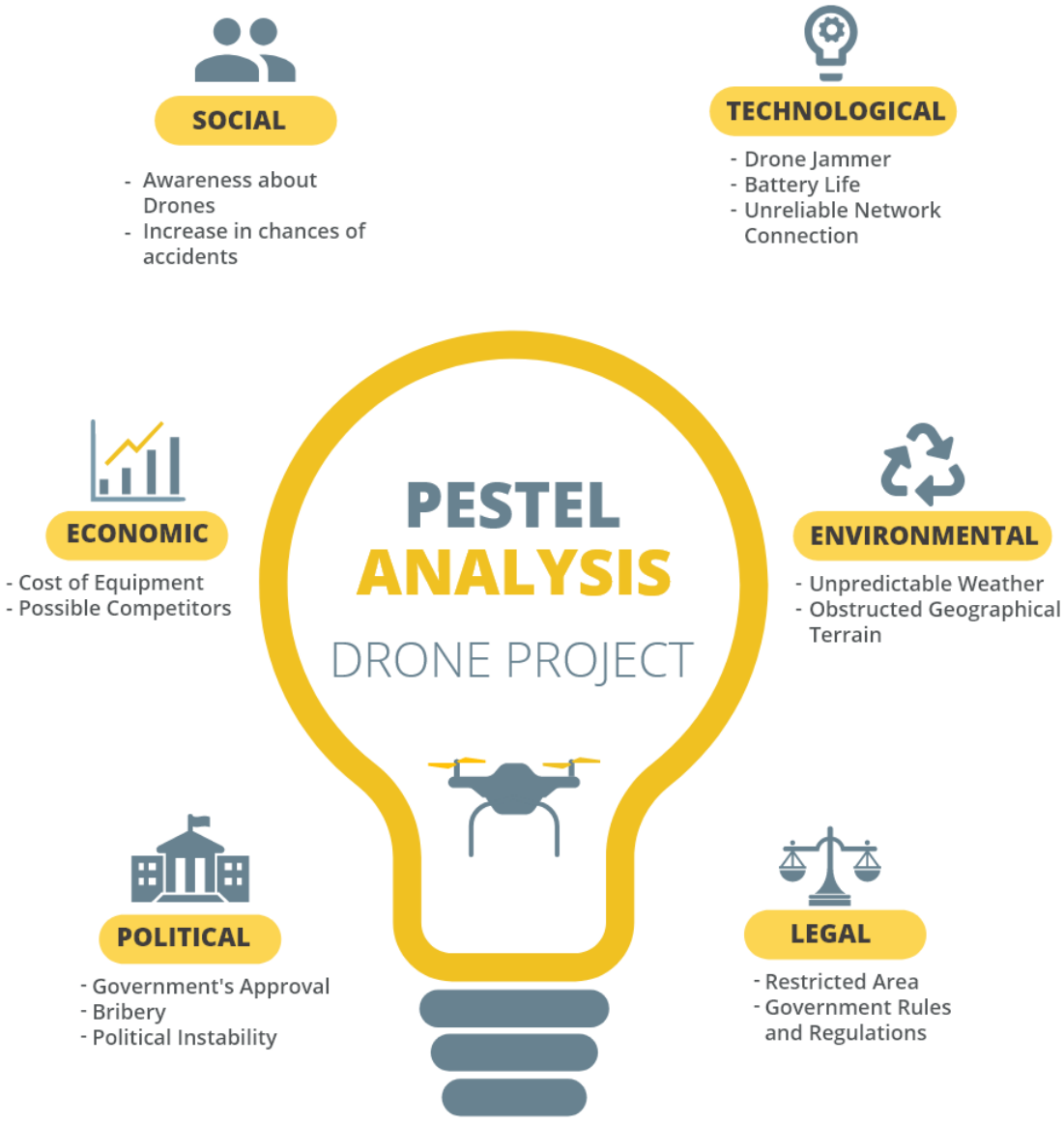

Figure 20: PESTEL Analysis

Drone industry can mainly be affected by the political environment as the government can either ban or allow the drones to fly over certain area. Currently, most of the countries are under the control of Government, so the government has full authority to manage rules and regulations related to all the technical projects. To avoid delay in launching of project, ones should complete the project in legalized way. Government's Approval must be accomplished before introducing the product in the market.

Talking about the cost of equipment, setting budget is one of the most important and difficult tasks. So, the developers should allocate appropriate budget for all equipment along with proper planning and research.
As drone is an automated vehicle, there can be high chance of unexpected accidents. Therefore, social awareness regarding unmanned aerial vehicle must be conducted in order to maintain safety measures.
Due to the unpredictability of drone's battery life, batteries of name brand should be used. Also reliable antennas which can give better reception should be used. Places with low data connection should be analysed beforehand and actions should be taken accordingly.
Using image processing to detect obstruction and utilizing effective path finding algorithm for efficient pathway of drone. Also, to withstand challenging weather, better and powerful hardware to maintain precision of flight. (Kumar 2020)

Updated Project Plan

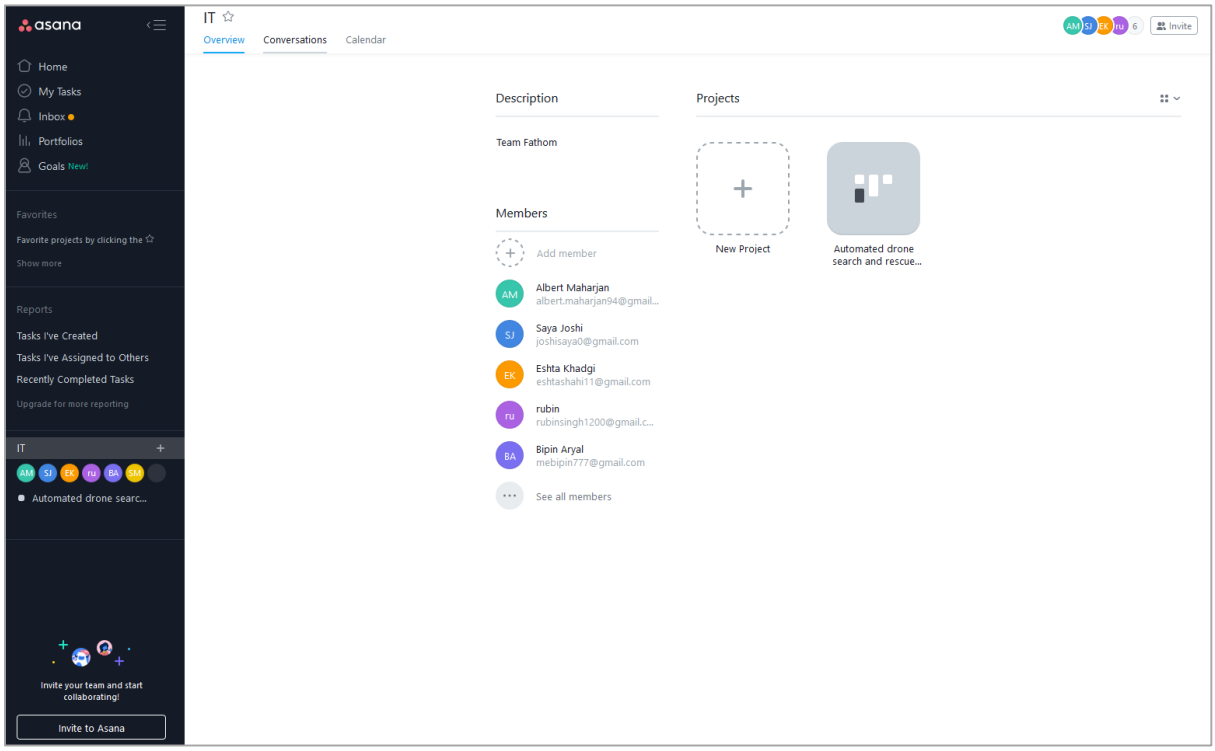

Figure 21: Team members of Team Fathom

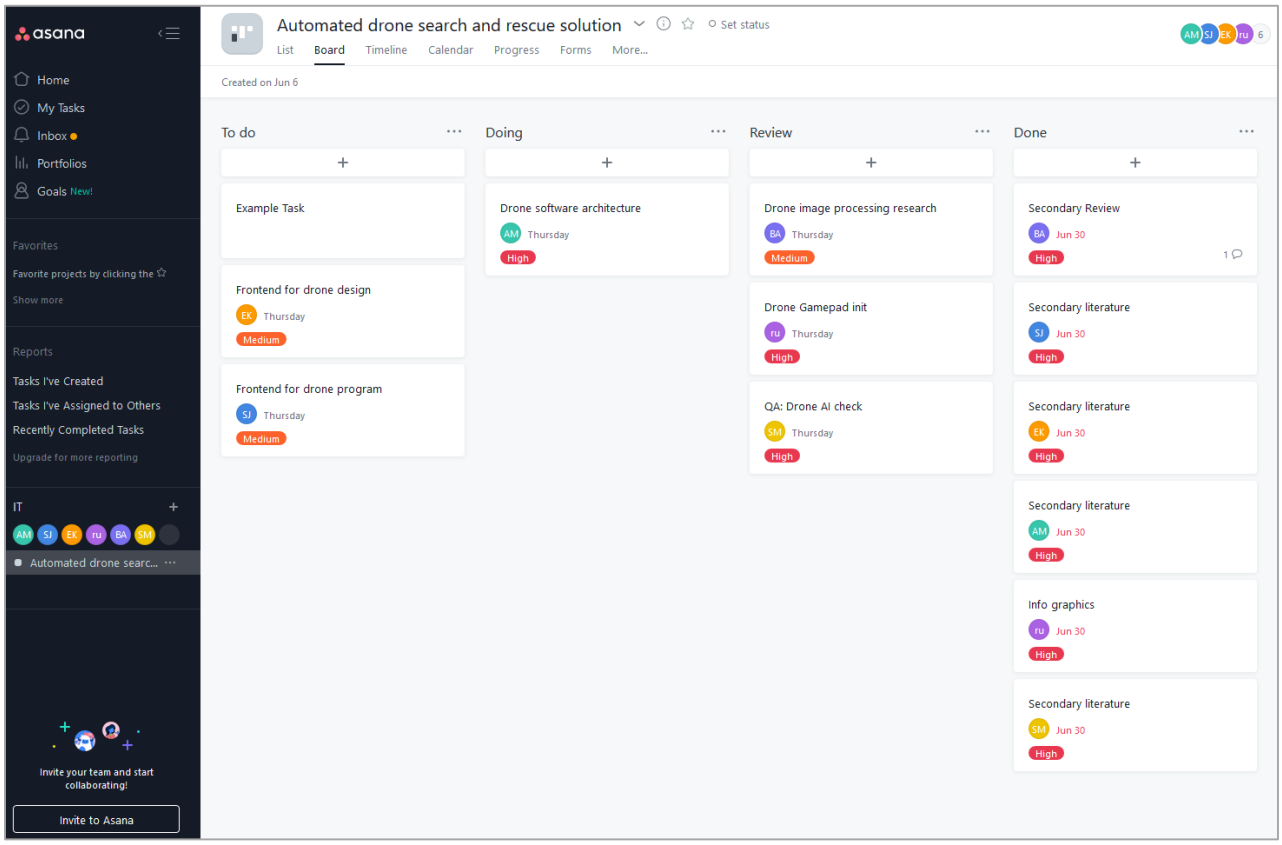

Figure 22: Asana task division

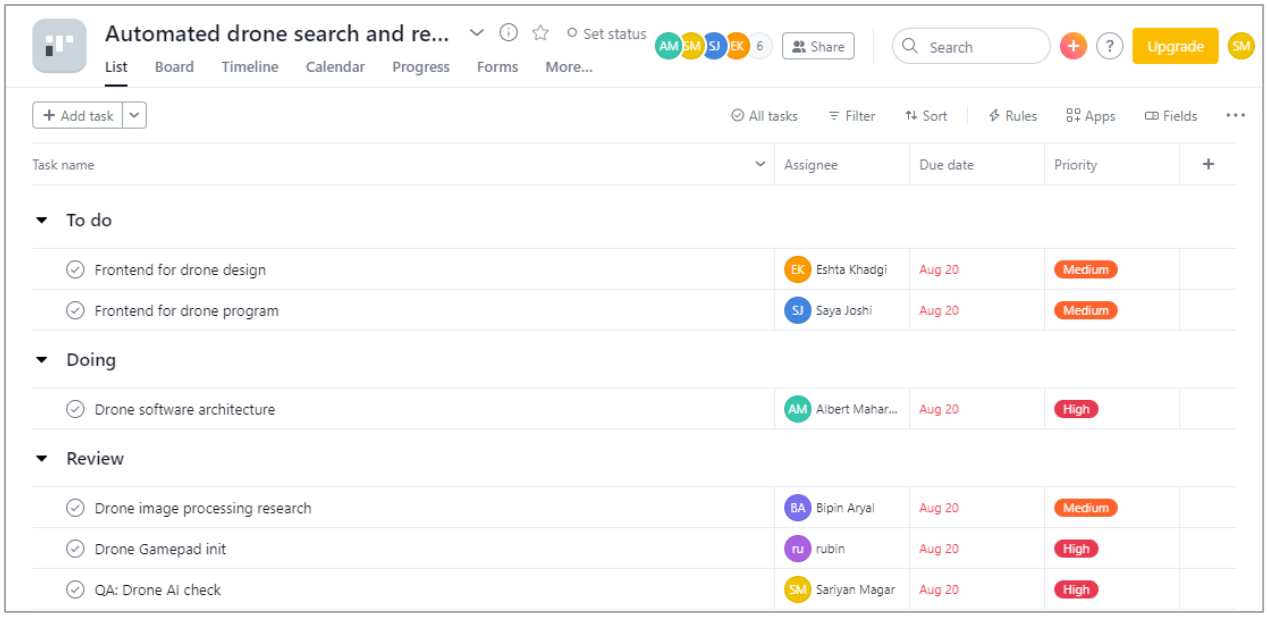

Figure 23: Asana task division

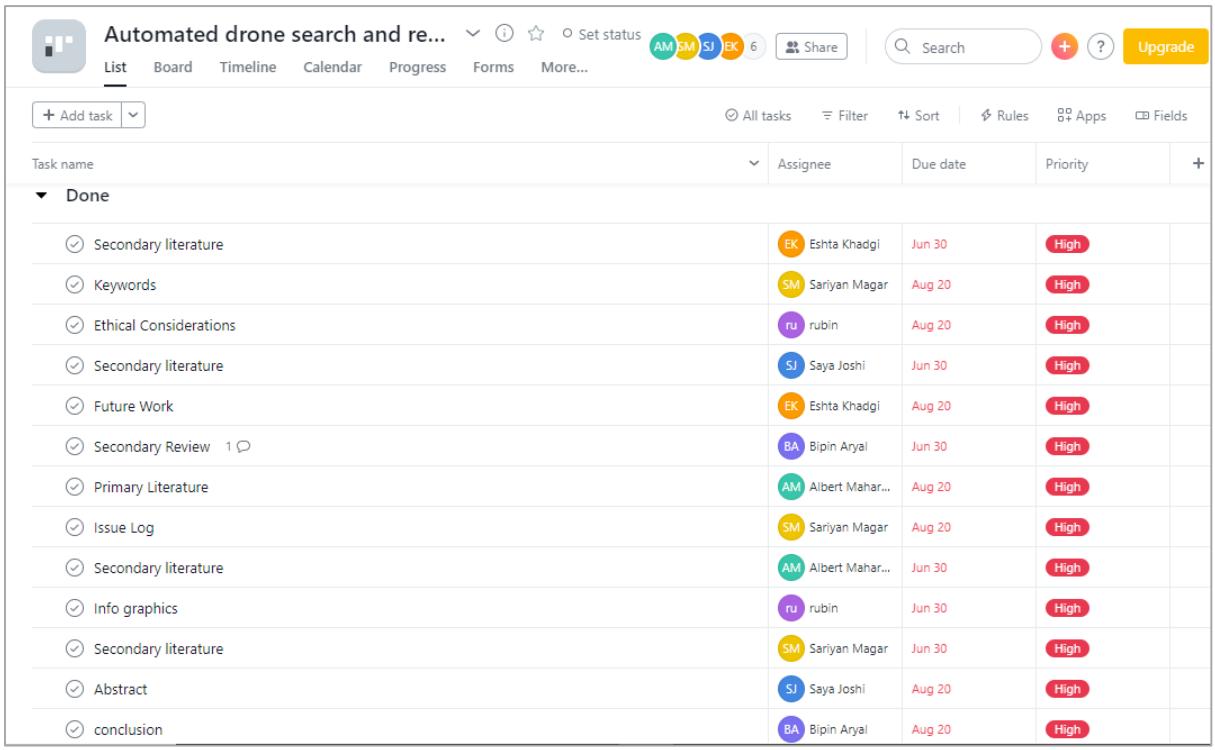

Figure 24: Asana Task Division

Risk Analysis and Issue Log

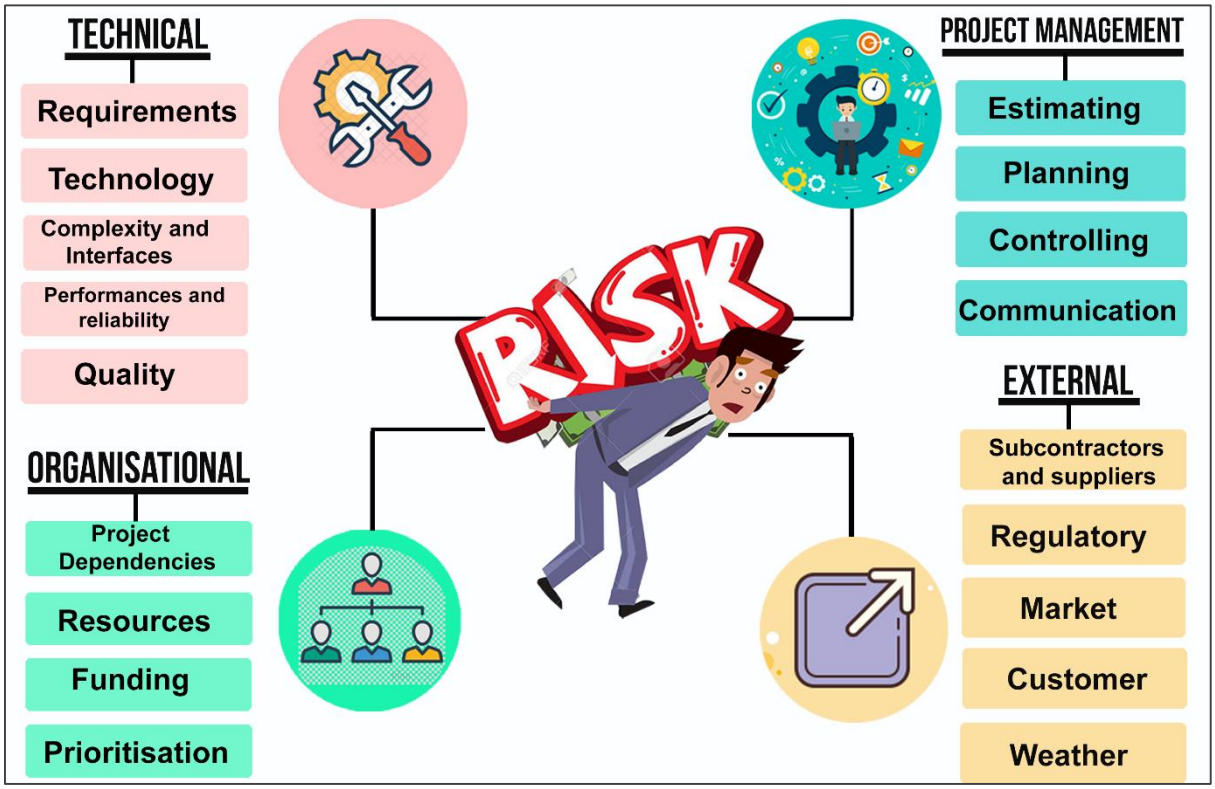

Figure 25 Risk Assessment

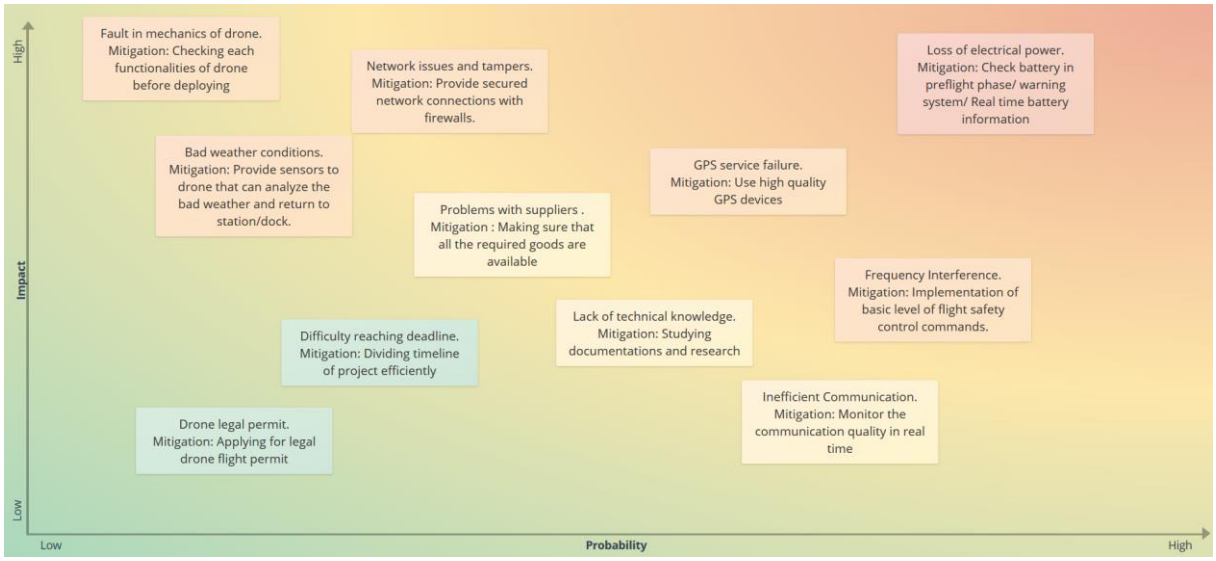

Figure 26: Risk Analysis

Working in a real-world project give rise to various issues within the developing phase of the project. The issues are listed below:

- Inconsistent battery life
- Limited connection capability
- Ineffective camera
- Lack of sensors
- Difficulty in debugging code error

Future Works

These unmanned aerial miniature vehicles can be used for rescue and surveillance undertakings. Originally, drones were industrialized to be used by military in war sectors that is why they bid excessive observation, rescue and security advantages and also deliver evidence on targeted range. Despite of all the advantages, sometimes ecological and internal factors can affect effectiveness of drone's performance.

Limitations

Some of the limitation of the drone project regarding surveillance and rescue are mentioned below:

- Inadequate frequency range:
  The unmanned air vehicles are effortlessly dejected because of limitation of frequency range. Due to lack of frequency bounding in drones, it creates disposed to de-authentication and congestion outbreaks.
- Battery life:
  The battery life restricts the flying time of drone and sometimes the user needs to contain numerous batteries formfitting on drone to outspread the flying time of drone. Specially, during flying the drones in cold temperature areas, battery life tends to reduce faster. (10 Limitations of Drones - Grind Drone, 2020)
- Weather fluctuations:
  The changes in weather of any area affects performance of drones. Flying drones depends upon wind speed of area as well as design of drone. Damage in electronic components due to rain or snow can create difficulties in communication between the controller and the drone. (10 Limitations of Drones - Grind Drone, 2020)
- Limited budget:
  Purchase of components that concludes overall requirements may be very expensive and out of budget. The drone requires good quality of hardware, software and camera features which will be costly. Special training is obligatory for the operators of the drones which may add cost as well.
- Vulnerable to hackers:
  Controlling drones in remote areas involves data link with the base controls. Hackers can interrupt the data link network and admittance the system. The hacking of system can disturb performance and monitoring of the area and even trace the controller's location. (10 Limitations of Drones - Grind Drone, 2020)

Future Works

To overcome the limitations in future, some tasks need to be watched over and accomplish. Some of those tasks that need to be directed are mentioned below:

- Design of drone:
  Improving the design of hardware of drone and enhancement in quality of camera along with upgrading of autopilot approaches and safety modes. Along with enhancing the quality of camera, work on progression of higher-value instrumentation and intellectual conducting modes will be directed as well. (Drone technology uses and applications for commercial, industrial and military drones in 2020 and the future, 2020)
- Appropriate storage and use of assembled evidences:
  Creating virtuous database management system for storing the gathered evidence. And using gathered evidence for inadequate determinations like frightens perjury and truth-seeking procedure.
- Governments consent:
  Acquisition of all the approval from government to accomplish mission without any restrictions and mistakes regarding the law. Fulfilment of all the paper works for permission to fly drone with infringement in any rules and guidelines.
- Improving operator's skills:
  Advanced trainings and improving skills to fly drone accurately. Moreover, achieving qualified certificate to fly unmanned aerial vehicle with proper knowledge regarding areas and drones.
- System security and information privacy:
  Enlightening both hardware and software including camera features and information security. Working on information safekeeping so that any hacker cannot hack any information while having network problem during data link.

Conclusion

In this document, a brief report about how the Unmanned Automated Vehicle (Drones) might be used for different critical surveillance and potential rescue missions. Automated surveillance and rescue missions using drones represents a very promising research and applicable field. While there exists numerous constraint that need to be addressed to allow drones flying through various areas to conduct surveillance. Researches and different approaches in this field provides clear insight that seems to be viable using drone technologies. Drones represent an opportunity to design and implement new drone technologies and strategies due to their light body with capacity of loads, computing power with high reliability. The final selection which was chosen to inbuilt into drone was face recognition, which can aid to surveillance and rescue missions. The results that is obtained so far confirms that drones can technically be a viable solution and opportunity and also can be used in real time monitoring, surveillance or rescues. Furthermore, while working on this project as a group, various new techniques were introduced. Different challenges were faced on the course which were crucial as well as essential in order to realize how important working in a group is and its aspects.

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Appendix

Important Source Code of this Project

```
#DeepFace model
base_model = Sequential()
base_model.add(Convolution2D(32, (11, 11), activation='relu', name='C1', input_shape=(152, 152, 3)))
base_model.add(MaxPooling2D(pool_size=3, strides=2, padding='same', name='M2'))
base_model.add(Convolution2D(16, (9, 9), activation='relu', name='C3'))
base_model.add(LocallyConnected2D(16, (9, 9), activation='relu', name='L4'))
base_model.add(LocallyConnected2D(16, (7, 7), strides=2, activation='relu', name='L5') )
base_model.add(LocallyConnected2D(16, (5, 5), activation='relu', name='L6'))
base_model.add(Flatten(name='F0'))
base_model.add(Dense(4096, activation='relu', name='F7'))
base_model.add(Dropout(rate=0.5, name='D0'))
base_model.add(Dense(8631, activation='softmax', name='F8'))

base_model.load_weights("weights/VGGFace2_DeepFace_weights_val-0.9034.h5")

#Drop F8 and D0 layers. F7 is the representation layer.
model = Model(inputs=base_model.layers[0].input, outputs=base_model.layers[-3].output)

#------------------------
def l2_normalize(x):
    return x / np.sqrt(np.sum(np.multiply(x, x)))

def findEuclideanDistance(source_representation, test_representation):
    euclidean_distance = source_representation - test_representation
    euclidean_distance = np.sum(np.multiply(euclidean_distance, euclidean_distance))
    euclidean_distance = np.sqrt(euclidean_distance)
    return euclidean_distance

#
```

Figure 27: Deep face Model Initialization

```
try:
    detected_face = cv2.resize(detected_face, target_size) #resize to 152x152
    img_pixels = image.img_to_array(detected_face)
    img_pixels = np.expand_dims(img_pixels, axis = 0)
    img_pixels /= 255
    distances = []
    captured_representation = model.predict(img_pixels)[0]


    for i in users:
        user_name = i
        source_representation = users[i]

        distance = findEuclideanDistance(l2_normalize(captured_representation), l2_normalize(source_representation))
        distances.append(distance)

    is_found = False; index = 0
    for i in users:
        user_name = i
        if index == np.argmin(distances):
            print(distances[index] )
            if distances[index] <= 0.67:

                print("detected: ",user_name, "(",distances[index],")")
                user_name = user_name.replace("_", "")
                similarity = distances[index]

                is_found = True

                break

        index = index + 1
    print(is_found)
```

Figure 28: Open CV

```
if is_found:
    # these are our target coordinates
    targ_cord_x = int((end_cord_x + x)/2)
    targ_cord_y = int((end_cord_y + y)/2) + UDOffset

    # This calculates the vector from your face to the center of the screen
    vTrue = np.array((cWidth,cHeight,tSize))
    vTarget = np.array((targ_cord_x,targ_cord_y,end_size))
    vDistance = vTrue-vTarget

    #
    if not args.debug:
        # for turning
        if vDistance[0] < -szX:
            self.yaw_velocity = S
            # self.left_right_velocity = S2
        elif vDistance[0] > szX:
            self.yaw_velocity = -S
            # self.left_right_velocity = -S2
        else:
            self.yaw_velocity = 0

        # for up & down
        if vDistance[1] > szY:
            self.up_down_velocity = S
        elif vDistance[1] < -szY:
            self.up_down_velocity = -S
        else:
            self.up_down_velocity = 0

        F = 0
        if abs(vDistance[2]) > acc[tDistance]:
            F = S

        # for forward back
        if vDistance[2] > 0:
            self.for_back_velocity = S + F
        elif vDistance[2] < 0:
            self.for_back_velocity = -S - F
        else:
            self.for_back_velocity = 0
```

Figure 29: Drone AI with Open CV and Deepface

Project proposal

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Group number: 6

Group leader: Saya Joshi

Group members: Albert Maharjan, Saya Joshi, Rubin Singh Maharjan, Sariyan Magar, Eshta Khadgi, Bipin Aryal

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Project title: Integration of Image recognition technology and unmanned aerial vehicle to develop a search and rescue solution.

What is the problem the group try to address?

Carrying a rescue mission can be a life-threatening task and there are not any efficient technical solutions that can assure safety as well as tracking and monitoring is a tough job too. Tracking and monitoring can be complex, time consuming and inaccurate which does not ensure the success of rescue missions.

The proposed solution.

To innovate an autonomous aerial vehicle that can detect and identify the provisional awareness over broad area within certain time minimizing the cost and risks of search and rescue missions. This fetched data can then be used to understand unusual behaviours. This fetched data can then be used to analyze the situation of the environment and threats nearby of the affected zones, hence simplifying the process of recuse mission with the optimum solution.

Potential competitors.

- e-agriculture
- Skydio: The Skydio drone is mainly used in sports, but it does not have the ability to recognize the disaster affected areas and people.

Issues.

- Limited battery life.
- Unpredictable weather conditions.
- Difficulties in training machine learning.
- Lack of high quality sensors.