FAZZA

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SDAIA Data science and artificial intelligence Bootcamp Capstone Project

AI aerial Based Car Accident Detection Drone

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BY

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Abstract

Fazza is a groundbreaking project that leverages artificial intelligence (AI) and advanced drone technology to analyze and understand traffic accidents. With the ability to occur at any time and in any location, traffic accidents pose significant risks to life and property. Fazza's innovative approach involves deploying state-of-the-art drones equipped with cutting-edge sensors and analysis algorithms to swiftly navigate accident scenes. These drones capture high-resolution aerial footage and collect critical data, which is then meticulously analyzed to extract deep insights into the dynamics and underlying causes of accidents. The project's potential for replication offers the opportunity to implement this advanced accident analysis system in different locations, bringing about widespread improvements in road safety. By harnessing the power of AI and drones, Fazza aims to revolutionize accident analysis, enhance preventive measures, and ultimately create safer road environments for everyone.

Introduction

The primary objective of the Fazza project is to meticulously identify the party primarily at fault in accidents, Fazza conducts thorough analyses and promptly sends signals to both parties, facilitating effective communication and resolution. Furthermore, the project boldly aims to revolutionize road infrastructure, prioritizing safety and leaving a lasting impact on various traffic companies. By delivering accurate and comprehensive accident analysis, Fazza saves invaluable time and effort in investigations, while providing profound insights into the intricate dynamics and root causes of accidents.

With its formidable capabilities and unwavering commitment to harnessing the full potential of AI and drone technology, Fazza sets the stage for a new era of efficient accident analysis. By delving deep into accident causes and fostering effective communication between parties, Fazza strives to make significant contributions to enhanced road safety, ultimately minimizing the far-reaching impact of traffic accidents.

By leveraging the immense power of artificial intelligence (AI), Fazza fearlessly dissects and scrutinizes road accidents, all while holding the promise of replication and scalability. The project employs cutting-edge drones, equipped with state-of-the-art sensors and analysis algorithms, which swiftly navigate accident scenes, capturing breathtaking high-resolution aerial footage and collecting invaluable data. This treasure trove of information undergoes meticulous scrutiny, unveiling profound insights into the intricate dynamics and underlying causes of accidents.

Fazza's logo

FAZZA

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TIn the early weeks of the project, we agreed to launch a name and logo for the project. We chose the name "Fazza" for the project because it has a meaning in saudi culture, which signifies helping people in the fastest time possible to solve their problems.
We made sure that the logo carries meaning, pride, and showcases our Saudi Arabian culture by choosing the falcon as a symbol, which also bears a beautiful resemblance to drones.
Our logo carries the colors white, black, maroon, and gray. We added two additional colors, white and maroon, to the main colors to create a cohesive look with the arms of the drone, which also bear the same colors.
After selecting the shape and name, we designed the logo using a powerful logo design software. We continued to develop the design, which helped us achieve a stunning result, as we believe in the importance of the project's interface in attracting people's attention.

Literature Review

The use of artificial intelligence (AI) and advanced drone technology for the analysis of traffic accidents has gained significant attention in recent years. Researchers and practitioners have recognized the need for innovative approaches to swiftly and accurately understand the dynamics and causes of accidents.

Several studies have explored the application of drones equipped with sensors and analysis algorithms in accident analysis. These drones capture high-resolution aerial footage and collect data, enabling a comprehensive understanding of accident scenes. The use of drones offers advantages such as accessibility to remote or challenging locations, faster data collection, and improved accuracy compared to traditional accident investigation methods.

The integration of AI in accident analysis has also been widely investigated. AI algorithms can process the collected data and extract valuable insights regarding accident causes, contributing factors, and patterns. By leveraging AI, the analysis process becomes more efficient, allowing for quicker identification of fault and more effective resolution.

The potential for replicating such advanced accident analysis systems in different locations is an exciting area of research. By implementing similar technologies and methodologies, other regions can benefit from improved road safety measures. This scalability and replicability make projects like Fazza highly promising for widespread adoption and positive impacts on road environments globally.

Overall, the combination of AI and drone technology in accident analysis has the potential to revolutionize how we understand and prevent traffic accidents. By facilitating swift and accurate analysis, preventive measures can be enhanced, leading to safer road environments for all.

The integration of artificial intelligence (AI) and drone technology in accident analysis has emerged as a cutting-edge approach to understanding and preventing traffic accidents. Traditional methods of accident investigation often involve time-consuming on-site inspections and manual data collection, resulting in delays in identifying causes and implementing preventive measures.

Recent research has highlighted the potential of using drones equipped with advanced sensors and AI algorithms for efficient accident analysis. These drones offer the ability to quickly navigate accident scenes, capturing high-resolution aerial footage and collecting valuable data. The sensors on board the drones can detect and record various parameters such as vehicle speeds, collision forces, road conditions, and environmental factors. This rich dataset serves as a valuable resource for in-depth analysis and understanding of accident dynamics.
AI algorithms play a crucial role in processing the collected data and extracting meaningful insights. Machine learning techniques enable the identification of patterns, correlations, and causal relationships within the accident data. By analyzing large volumes of data efficiently, AI-powered accident analysis systems can identify contributing factors, such as driver behavior, road infrastructure deficiencies, or environmental conditions.

Several studies have demonstrated the effectiveness of AI and drone-based accident analysis systems in improving road safety. The swift and accurate identification of accident causes enables timely implementation of preventive measures, such as targeted road infrastructure improvements, enhanced driver education, or adjustments in traffic management strategies. By addressing the underlying factors that contribute to accidents, these systems have the potential to significantly reduce accident rates and mitigate their impact on individuals and society.

The replication and scalability potential of projects like Fazza are also noteworthy. The utilization of standardized drone technology and AI algorithms allows for the implementation of similar accident analysis systems in various locations. This scalability offers the opportunity to improve road safety on a broader scale and share best practices across different regions.

While the integration of AI and drones in accident analysis is a relatively new field, the potential benefits are evident. Further research is still needed to refine algorithms, optimize data collection processes, and evaluate the long-term impact of these systems. However, the results so far indicate that this innovative approach holds great promise for revolutionizing accident analysis, enhancing preventive measures, and ultimately creating safer road environments for everyone.

Data Description and Structure

Dataset Structure:
Source: kaggle -Synthetic Dataset for Accident Detection
Total Images: 13,228
Car Accident Images: 6,614
Non-Accident Images: 6,614
Image Format: JPG
File Structure:

The dataset contain two main folders:
car_accident : Contains 6,614 images related to car accidents.
non_accident : Contains 6,614 images depicting scenarios without accidents.

Labeling:
For each image, there be labels or annotations indicating if it belongs to the 'car_accident' category or 'non_accident' category.

Image Naming or ID:
This structure straightforward organization of the dataset, with two main folders separating images based on whether they depict car accidents or not. The metadata or labeling information would help in associating the images with their corresponding .categories during model training or evaluation

Methodology

The VGG16 model is a convolutional neural network (CNN) architecture known for its depth and simplicity. Its methodology typically involves the following steps:

Architecture Description: VGG16 consists of 16 weight layers, including 13 convolutional layers and 3 fully connected layers. The convolutional layers are organized in blocks, each containing multiple convolutional layers followed by max-pooling layers.

Preprocessing: Prepare the dataset by resizing images to the required input size of VGG16 (usually 224x224 pixels) and normalizing pixel values (commonly to the range [0, 1] or [-1, 1]).

Loading Pretrained Model : Often, VGG16 is pretrained on large datasets We used YOLOV8 for create cars boundries . You can load these pretrained weights, which might benefit the model's performance, especially if your dataset is small or similar to the pretraining dataset.

Fine-Tuning or Feature Extraction: Depending on your task and dataset size, you might fine-tune the pretrained VGG16 model on your specific dataset or use it as a feature extractor by removing the top fully connected layers. Then, add and train new layers specific to your task (like classification, object detection, etc.).

Training: Train the VGG16 model using your dataset. Use appropriate hyperparameters, loss functions, and optimizers. Monitor the training process by observing metrics such as accuracy, loss, and validation performance.

Evaluation: Evaluate the trained model on a separate test/validation dataset to assess its performance metrics such as accuracy, precision, recall, etc.

Prediction/Inference: Use the trained VGG16 model to make predictions on new unseen data.

Convolutional Neural Networks (CNNs) are widely used for image detection and recognition due to several reasons:

Hierarchical Feature Learning: CNNs can automatically learn hierarchical representations of features from raw pixel values. Through convolutional layers, these networks detect simple patterns (edges, textures) in early layers and gradually learn more complex and abstract features in deeper layers.

Translation Invariance: CNNs are designed to be translation invariant, meaning they can detect features regardless of their location in the image. This property is facilitated by shared weights and pooling layers, allowing the network to recognize patterns irrespective of their position.

Parameter Sharing: CNNs exploit the spatial locality and correlation present in images. Shared weights across the convolutional filters help in reducing the number of parameters, making the model more efficient and easier to train.

Effective Feature Extraction: The convolutional layers act as feature extractors, automatically identifying essential visual elements within the images. This capability is crucial for tasks like object detection, segmentation, and classification.

Performance and Accuracy: CNNs have demonstrated state-of-the-art performance in various image-related tasks, achieving high accuracy and robustness when trained on large datasets.

Due to these advantages, CNNs have become the backbone of many computer vision applications, including image classification, object detection, image segmentation, facial recognition, and more. Their ability to automatically learn hierarchical representations makes them well-suited for handling complex visual data.

Project Plan

Our team has been diligent from the early days in developing a comprehensive project roadmap and identifying the tasks that need to be accomplished by the end of each week. This approach has greatly contributed to our thorough understanding of building the project from scratch and executing the required tasks within their designated timelines. Additionally, it has fostered a collaborative and enthusiastic work environment.

It is worth noting that we have been working on the reports, presentations, and demos since the initial stages of the project, continuously updating them on a daily basis. We have strived to refine and enhance them to align with the evolving project developments.

ID	Task Name	Start	Finish	Duration	Complete
1	Create project plan	2023-10-30	2023-10-31	2.0 d.	100.0%
2	Dataset Collection	2023-11-01	2023-11-04	3.5 d.	100.0%
3	Data Preprocessing	2023-11-05	2023-11-08	2.3 d.	100.0%
4	Logo Design	2023-11-05	2023-11-08	2.3 d.	100.0%
5	**Drone Building**	2023-11-08	2023-11-17	9.4 d.	100.0%
6	Installing and configuring the new microcontrolling	2023-11-08	2023-11-10	2.4 d.	100.0%
7	Buying raspberry pi and learing how to deal with it	2023-11-08	2023-11-13	5.4 d.	100.0%
8	Repairing the power management module	2023-11-09	2023-11-13	4.8 d.	100.0%
9	Changing the hardware connection	2023-11-08	2023-11-13	4.8 d.	100.0%
10	Flying the drone with RC controller	2023-11-09	2023-11-13	4.8 d.	100.0%
11	Redesign the drone structure	2023-11-12	2023-11-16	4.8 d.	100.0%
12	Test sub system 1(Drone)	2023-11-15	2023-11-17	3.0 d.	100.0%
13	Model Training	2023-11-10	2023-11-15	5.3 d.	100.0%
14	Integration with Drone System	2023-11-15	2023-11-20	5.3 d.	100.0%
15	Testing and Quality Assurance	2023-11-21	2023-11-24	3.5 d.	100.0%
16	Prepare the final report	2023-11-24	2023-11-26	2.5 d.	100.0%
17	Prepare the final presentaion	2023-11-24	2023-11-26	2.5 d.	100.0%
18	Prepare project demo	2023-11-26	2023-11-28	2.5 d.	100.0%

Datasets & Models

- Insufficient Data
- Lack of Domain-specific Data
- Handling large size of image dataset.

Model Challenges

- Preprocessing Issues.
- Training Time (14 hours).

Drone

- The components & Tools.
- The weights .
- The flight Controllers .
- The isolation between the hardware and software systems .

1- Brushless DC motors (BLDC):
It is more efficient, more reliable, saves battery life, and is quieter than a brushed motor.

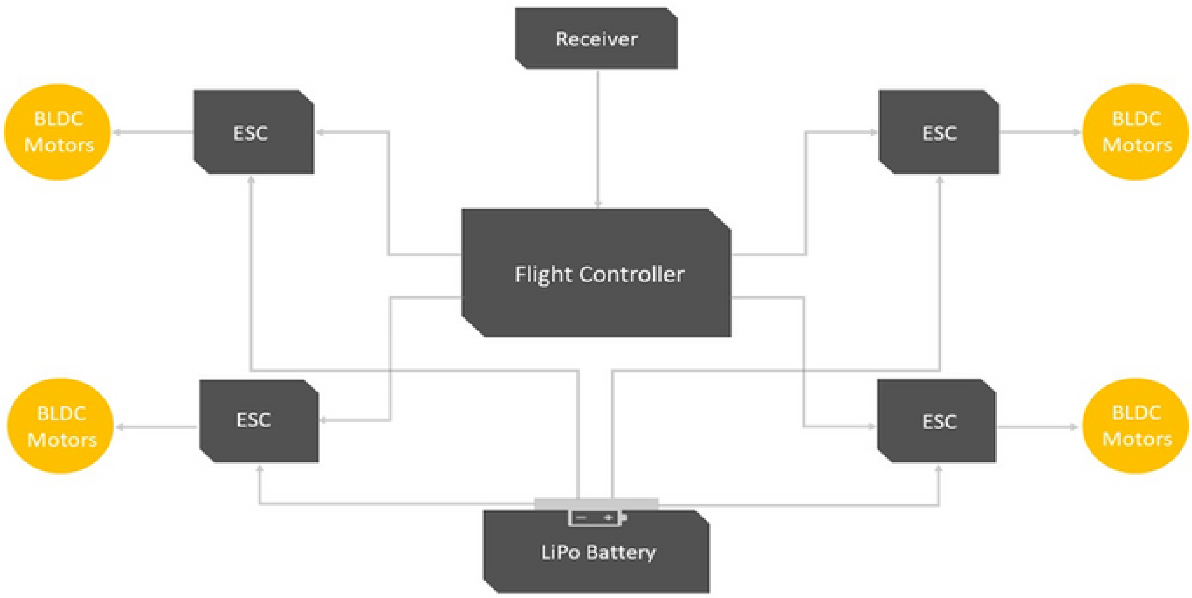
2-Landing Gears:
To avoid omitting landing gear altogether.

3-Electronic speed controller (ESC):
offer high power, high frequency, high resolution 3- phase AC power to the motors in an extremely compact miniature package, it is used to control the electric motor's speed and direction also the dynamic brake. It is converted DC signal to AC signal. DC from battery power to AC for brushless motors.

4-GPS:
Requirement for waypoint navigation

5-Receiver:
The minimum number of channels needed to control a quad drone is 4 channels.[1]

Drone Architecture



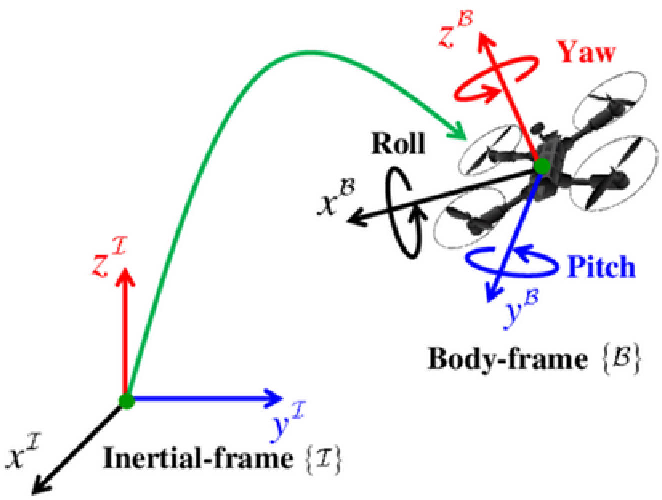
In this chapter, we will describe the 6-DoF (six degrees of freedom) and two frames in which we will operate need to be introduced.

Inertial Frame

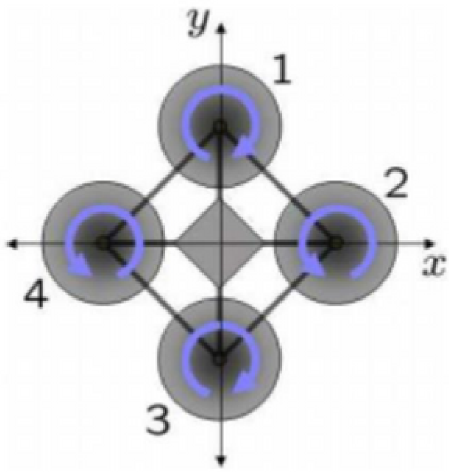
reference-frame with a time-scale, relative to which the motion of a body not subject to forces is always rectilinear and uniform, accelerations are always proportional to and in the direction of applied forces, and applied forces are always met with equal and opposite reactions [10]. So the body is defined by its position concerning the ground along with gravity pointing in the (Negative z-direction), An inertial frame is a frame in which the laws of physics have the simplest form. [11,12]

Section: Body Frame

It is defined by the quadcopter's different orientation, the figure7 below describes the relative between inertial-frame and body-frame.



Changing the speed of each quadrotor's motor by a certain value enables us to control the position and attitude, there are some forces and moments performed on the drone such as the thrust force and the rolling, the pitching and the yawing moments, the rotation of the motors produced by the thrust, then the thrust of the difference of the four motors will produce the rolling and the pitching moments, but when two motors rotate in the opposite direction the yawing moment may be canceled out. So we will split the motors into two parts, which have two diametrically opposite motors in each part, we can distinguish their rotation's direction in figure 8 shown below.

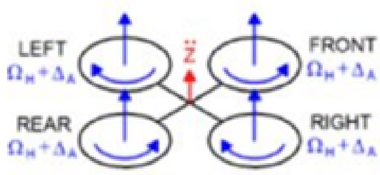


• front and rear propellers (numbers 2 and 4), rotating counterclockwise.
• right and left propellers (numbers 1 and 3), rotating clockwise.

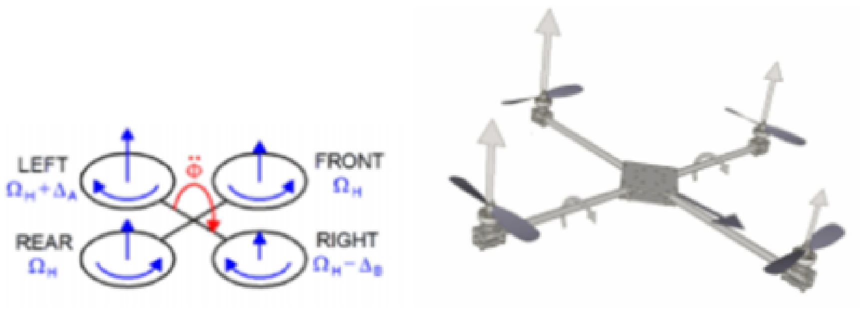
Six Degrees Of Freedom (6-DoF)

The motions include forward and backward movements, lateral movement, vertical motion, roll motion, and pitch and yaw motions, these six degrees of freedom motions can be controlled by adjusting the rotational speeds of different motors, and any rigid body moves in the space can divide its motion into two parts: barycenter movement and movement around the barycenter, to describing any time-space motion we require Six degrees of freedom, They are three barycenter movements and three angular motions, three translation and three rotation motions along three axes when combined generate what we call by the six degrees of freedom, The quadrotor's yaw motion is realized by the motor that produces a reactive torque. The reactive torque's size is relative to the speed of the motor[13], When the four motor speeds are the same, the reactive torques will balance each other and the quadrotor will not rotates, the quadrotors will start to rotate if the speed of the four motors is not absolutely the same and there will not be a balance in the reactive torque, the quadrotor must be a rigid body; the structure is symmetric; the ground effect is ignored to be controlled, Depending on the speed rotation of each propeller it is possible to identify the four basic movements of the quadrotor

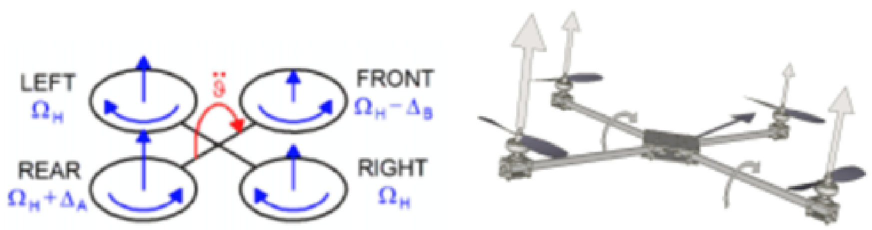
• The Throttle Movements: This movement is provided by decreasing or increasing the speed of all the propellers by the same amount, which leads to a vertical force with respect to the body frame that lowers or raises the quadrotor.



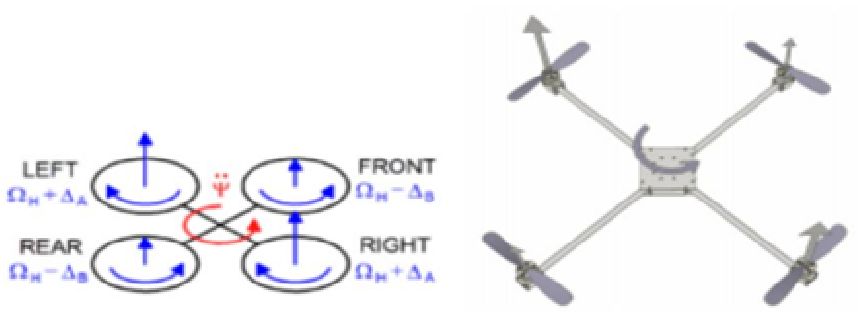
• The Roll Movements: This movement is provided by decreasing or increasing the left and right of the propellers' speed. With respect to the x-axis.



• The Pitch Movements: This movement is very similar to the roll one and is provided by decreasing or increasing the rear and front of the propellers' speed. With respect to the y-axis.



• The Yaw Movements: This movement is provided by decreasing or increasing the rear and front of the propellers' speed and by increasing and decreasing that of the right-left couple. With respect to the z-axis.



·FRAME: The frame of the drone is like its skeleton, it is what keeps all the parts of the helicopter together, The frame of a quadcopter is strong, but also flexible enough to compensate for the vibrations produced by the engines. It contains the following parts:

1. Center Holding Plate – for installing the electronics.
2. Arms – four arms on a quad.
3. Motor Brackets –four of them for connecting the motors on each arms end.

The frame can be made of aluminum, carbon fiber, or wood but the material that is mostly used for the arms is aluminum, it is lightweight, relatively rigid, and cheap. But since it isn't known as a great compensator for kinetic vibrations like carbon fibers, it can confuse sensors. so we used S500 carbon fiber frame because it offers much better absorption of the motor vibrations and is the most rigid one. But, it is also the most

why we choose Raspberry Pi?

Criteria	**Arduino Uno**	**Raspberry Pi**
Start-up and installation	Easy to install and run codes using Arduino IDE	Difficult to use where it run Linux operating system
Flash	32KB	SD Card
Size	7.6x1.9x6.4 cm	8.6x5.4x1.7 cm
Control Unit family	Atmega family	ARM family
Platform type	Microcontrollers: Good at controlling motors and several types of sensors.	Microprocessor: Single Start-up and installation Board Computer (SBC). Include USB ports, audio/HDMI output
Computation speed and real time.	16 MHz	1.2 GHz
RAM	2KB	8GB
Language used	C/C++	Python
Simplicity	More simplistic approach and easier time interfacing with analog sensors, IMU, GPS, and motors due to built-in library	More complicated to play with or interface hardware. But good at doing multiple tasks at same time as capture the target and perfume processing for detection
cost	$20 only need standard A/B cable	$120 without SD cards and cables
Power consumption	It consumes less power (200 MW) with more stability and security.	High power consumption (700 MW).

· Brushless motors: These motors are almost the same thing as traditional DC motors, but the shaft on them doesn't come with a brush, which is there to change the direction of the power that goes through the coils. The most important one is the "Kv-rating", which describes the number of RPMs the motor is capable of generating with a certain amount of electric power. For instance, a motor with a Kv value of 1000 will refer to 1000 RPM in 1 volt. If the motor is a 12 Volt one, then it is likely to rotate at a speed of 1200 RPM and at a voltage of 12 V. When the Kv value decreases, there is an immediate increase in the torque produced by the motor so we use 1000Kv brushless motor as figure 14. Four motors drive the fans, and these motors are of type 1000kv brushless motor, which weighs 58 grams and has a rotational speed of 1000 RPM/V with the current capacity of 12A/60s, compatible with 2-3s Li-Poly, motor size is 27.5 * 27mm. motors can rotate counter-clockwise so that they counteract the propeller's torque effect. The thrust that allows the quadcopter to get airborne is provided by Brushless DC motors and each of them is separately controlled by an electronic speed controller or ESC.

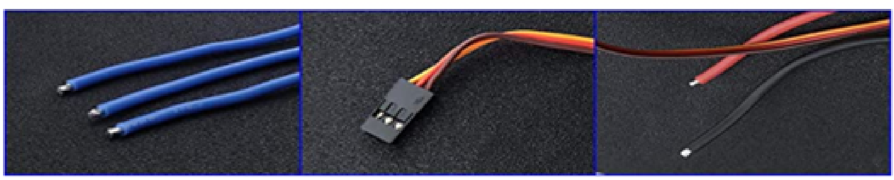
Number of cells	2-3 Li-Poly
KV	1000 RPM/Volt
Resistance	0.090 ohms
No load current	0.5 @ 10V
Max efficiency	80%
Max efficiency current	4-10A (>75%)
Thrust	@ 3s with 1045 propellers: 800gms approx.
Minimum ESC Specification	18A (30A recommended)
Max current	13A for 60S
Max Watts	150W
Size	27.5mm diameter X 27.5mm bell length
Weight	58 grams
Quadcopter model to be used with	Medium size around 500mm
Shaft diameter	3.2mm
poles	14

Shaft diameter	**3.2mm**
poles	14

The I/O test data :

volts	Amps	RPM
7	0.6	7400
8	0.64	8450
10	0.72	10500

• Electronic speed controllers (ESCs): The motors (arm or leg muscles) receive movement information from the brain (flight controller) through the electronic speed controller. The quad's speed and direction changes are controlled by how much power is sent to the motors. The motor output is 30A with three phases, and four of them for each motor, as shown in figure 15.



Continuous current	30A
Burst current (>10s)	40A for 15 seconds
Battery cell	2-3s Li-Poly
Maximum speed	210000 RPM (2 poles motor), 70000 RPM (6 poles motor), 35000 RPM (12 poles motor)
Usage	Applicable for medium size quadcopter
Weight	39 g
Dimensions	68mm × 25mm × 8mm
Bec output	5V/ 2V
Bec mode	Linear
Motor type	Brushless
Voltage input	6.4V- 16.8V

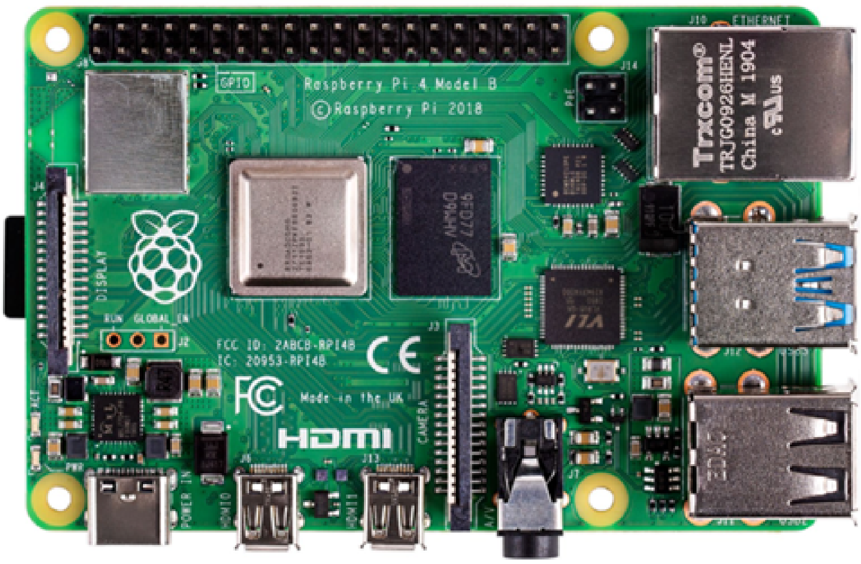
• Propellers: Propellers generate thrust, and each motor needs one in order for the quad to fly. the proper rotating pairs of propellers for clockwise and counterclockwise rotation. according to the size of the frame, we choose 10 inches in diameter and 4.5 in pitch.

• Battery: The most recommended power source for quadcopters is the LiPo. It’s not heavy, and the current levels are ideal The most popular version among drone hobbyists is known as the 3SP1 battery , which comes with three cells and provides 11.1V.

• flight controllers: we use the Pixhawk flight controller and it is Designed for low-cost autonomous aircraft, the PX 4 autopilot system is an open-source platform. Availability and low cost make it attractive to hobbyists. Small planes that are controlled remotely are known as remotely piloted aircraft. It can be used in fixed wings, multi-rotors, helicopters, vehicles, boats, and any other robotic platform that can roll. A wide range of people, including scientists, amateurs, and industry, use the site.

• Global Positioning System: A GPS receiver provides a geolocation and time indication whenever a GPS satellite passes over a particular area on or near the earth's surface. Some mountains and houses block the direct line of sight for four or more GPS satellites on the surface of the Earth. The area of the Earth where four or more GPS satellites can see each other without being hindered. Mountains and homes, which are relatively tiny, block GPS signals. While these advancements will make GPS locating more useful, The GPS does not allow the user to send data and works regardless of cellular or internet reception

Raspberry pi 4 model B: We needed to add some extra hardware to the quadcopter for it to fly autonomously. The Raspberry Pi 4 Model B is the most recent addition to the popular Raspberry Pi computer family. It improves on the previous-generation Raspberry Pi 3 Model B+ in terms of CPU speed, multimedia performance, memory, and connection while maintaining backward compatibility and power efficiency. In terms of desktop performance, the Raspberry Pi 4 Model B is equivalent to entry-level x86 PCs. A high-performance 64-bit quad-core processor, dual-display support at resolutions up to 4K via a pair of micro-HDMI ports, hardware video decode at up to 4Kp60, up to 8GB of RAM, dual-band 2.4/5.0 GHz wireless LAN, Bluetooth 5.0, Gigabit Ethernet, USB 3.0, and PoE capability are among the key features of this product (via a separate PoE HAT add-on).

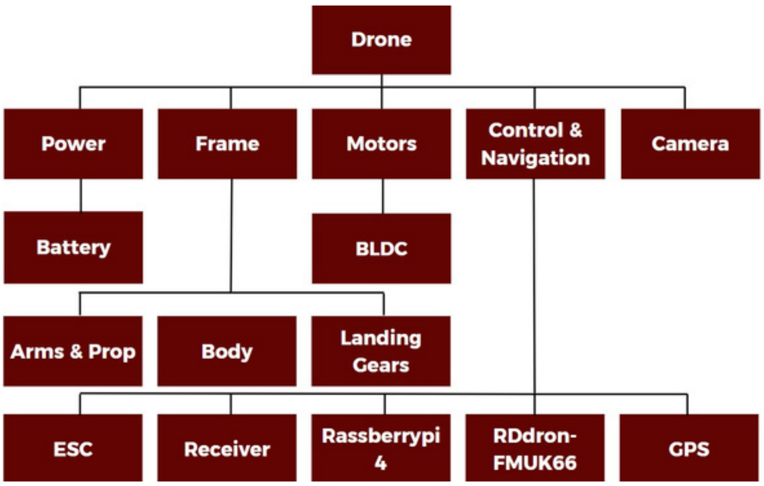


Design

Mechanical Design:

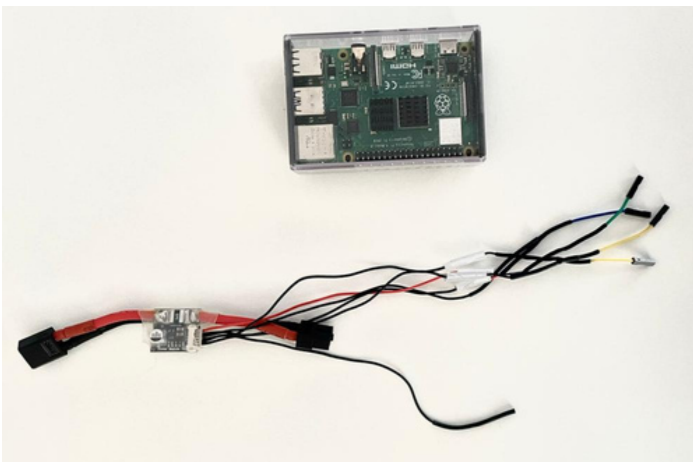
The project design was based on the S500 quadcopter kit, which comes with chassis, screws and bolts, motor propellers, "motor" attachments, weldable connectors (ESCs), and motors. The battery is not only soldered to the voltage terminals of the drone. The wires are soldered to the power management unit, which in turn distributes power to the drone. This enables us to disconnect and reconnect the plug to the battery, making it possible to manually disable the power supply in an emergency.

Next, the battery was attached to the drone with several adhesive pads and Velcro straps. The PX4 microcontroller was placed on top of the drone and secured with a tape to allow easy access to the screws.



New Design:

From the design phase, we made the decision to separate the flying system from the task system. This step ensures that our aircraft is user-friendly and allows us to quickly track and resolve any issues without impacting the rest of the system.
We encountered a problem with supplying voltage to the Raspberry Pi. Through research, we found that most solutions involve using a flight controller. However, considering that this solution is ineffective despite its common use for addressing such problems, we devised a new solution by creating a connection link between the battery and the Raspberry Pi. This enables us to even control the voltage level at 5 or 10 volts, providing us with the capability to develop the drone while maintaining system isolation.



This section shall show the testing of motors operation, supplying power, flying height, and flight duration and include the number of experiments conducted in each of the parts mentioned as well as how the experiment was performed and the results of the experiment whether it was successful or not

Test plan 1: motors operation

Experiment	**procedure**	**Pass Condition**
1	Driving Motor 1 to FULL power	pass
2	Driving Motor 2 to FULL power	pass
3	Driving Motor 3 to FULL power	pass
4	Driving Motor 4 to FULL power	pass
5	motor 1 and motor 2 speed equally	pass
6	motor 3 and motor 4 speed equally	pass
7	motor 1 and motor 4 speed equally	pass
8	motor 2 and motor 3 speed equally	pass

The table above shows the experiment regarding motors operations.

Test plan 2: Suppling Power

Experiment	procedure	Pass Condition
1	Supplying power to flight controller	pass
2	Supplying power to raspberry pi	pass
3	Supplying power to ESCs	pass
4	Supplying power to motors	pass
5	Supplying power to receiver	pass
6	Supplying power to the power management module	pass

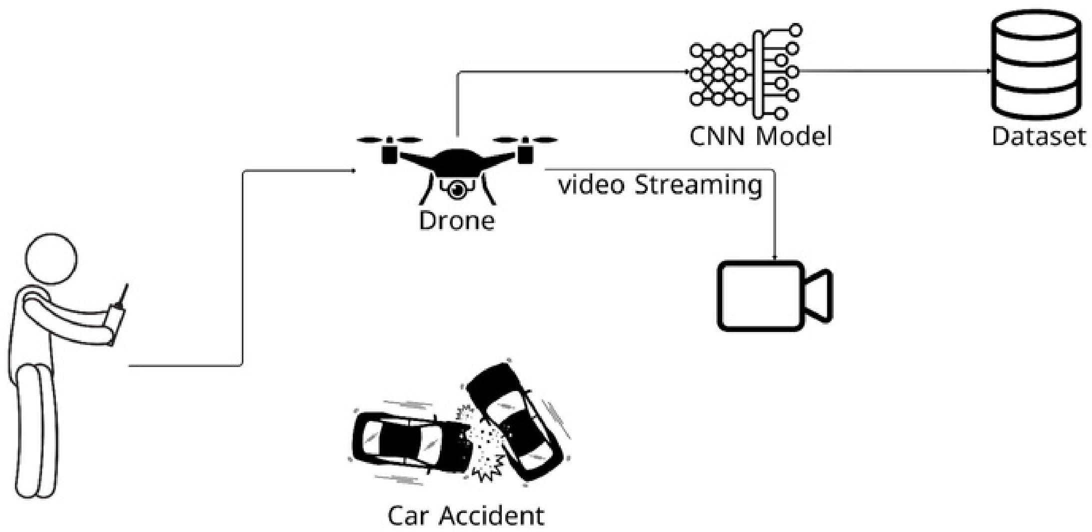
Table above shows the experiments regarding the suppling power

Test plan 3: Flying Test

Experiment	procedure	Pass Condition
1	drone can reach a height of 1 meter	pass
2	drone can reach a height of 2 meter	pass
3	drone can reach a height of 3 meter	pass
4	drone can reach a height of 4 meter	pass
5	drone can reach a height of 10 meter	pass
6	drone can reach a height of 15 meter	pass

Overview Of The System

Fazza's drones are remotely controlled to the accident site, where they capture video footage. The footage is then segmented into frames and analyzed using a CNN model for comprehensive accident analysis.



The project is in alignment with the goals and objectives of Saudi Vision 2030. By utilizing technology-driven solutions to address traffic accidents and congestion, the project contributes to various aspects outlined in Vision 2030, such as diversifying the economy, enhancing quality of life, developing smart cities, promoting innovation, and building a sustainable environment. The societal and economic impact of traffic accidents and congestion in Saudi Arabia is well understood, and the project aims to improve road safety, manage traffic efficiently, attract investments, and promote sustainable development. By doing so, the project seeks to make a positive contribution to Saudi society and its economy. Specifically, the project supports the objective of diversifying the economy by reducing dependence on oil. Through the use of technology and innovation in the transportation sector, the project helps develop a non-oil industry. By improving road safety, traffic management, and transportation efficiency, the project can attract investments, create job opportunities, and stimulate economic growth in related sectors.

The Fazza project results is to support accident victims and parties involved in accidents by enhancing communication and resolution processes. Through rapid accident analysis and fault identification, Fazza streamlines the claims process, facilitating quicker resolution and reducing the impact on victims and involved parties. Insurance companies can benefit from Fazza accurate accident analysis and fault identification, as it provides them with reliable data for claims processing and reduces the need for lengthy investigations. This improves efficiency in claims settlement and potentially lowers costs for insurance companies. Additionally, the Fazza project indirectly benefits the general public and road users by contributing to enhanced road safety. By identifying accident causes and implementing targeted measures, Fazza helps create safer roads, reducing the risk of accidents and improving overall road conditions.

Conclusion and Future Work

- ## Aims

1. Improve Accident Analysis: The primary aim of the Fazza project is to enhance the process of accident analysis by utilizing advanced drone technology and AI algorithms. The project aims to provide accurate and comprehensive insights into accident dynamics, causes, and fault identification.
2. Enhance Road Safety: Fazza aims to contribute to improved road safety by identifying accident causes and implementing targeted measures. The project aims to reduce the frequency and severity of accidents, making roads safer for all road users.
3. Streamline Accident Resolution: The project aims to streamline the accident resolution process by facilitating effective communication and faster claims processing. Fazza aims to expedite the resolution of accidents, reducing delays and minimizing the impact on accident victims and involved parties.

- ## Objectives

1. Develop Drone Technology: The project's objective is to develop and deploy advanced drone technology capable of capturing high-resolution aerial footage and collecting critical data at accident scenes. The drones will be equipped with sensors and imaging capabilities to facilitate accurate accident analysis.
2. Implement AI Algorithms: Fazza aims to develop and implement AI algorithms that can analyze the collected data and provide comprehensive insights into accident dynamics, causes, and fault identification. The objective is to automate and improve the accuracy of accident analysis processes.
3. Improve Fault Identification: The project aims to develop algorithms that can accurately identify the party primarily at fault in traffic accidents. The objective is to provide objective and fair fault identification based on the analysis of collected data.
4. Enable Effective Communication: Fazza aims to develop a system that facilitates effective communication between the parties involved in accidents, including accident victims, insurance companies, and law enforcement. The objective is to streamline the communication process and enable prompt resolution.
5. Provide Recommendations for Road Safety Measures: The project aims to provide recommendations and insights based on accident analysis to local authorities and traffic companies for road safety improvements. The objective is to contribute to the enhancement of road infrastructure and safety measures based on data-driven insights.

Project Team

In conclusion, the Fazza project represents a groundbreaking and transformative approach to accident analysis and road safety. By harnessing the power of artificial intelligence and advanced drone technology, Fazza enables swift and accurate understanding of accident dynamics, paving the way for effective preventive measures. With its potential for scalability and global impact, Fazza has the capacity to revolutionize road environments and ensure a safer future for communities worldwide.

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These team members have collaborated diligently to bring the Fazza project to fruition, leveraging their expertise and skills in AI, drone technology, data analysis, and project management. Their dedication and collective efforts have been instrumental in the success of the project.

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