



FFAD

FIRE FIGHTER ASSISTANCE DRONE (FFAD)

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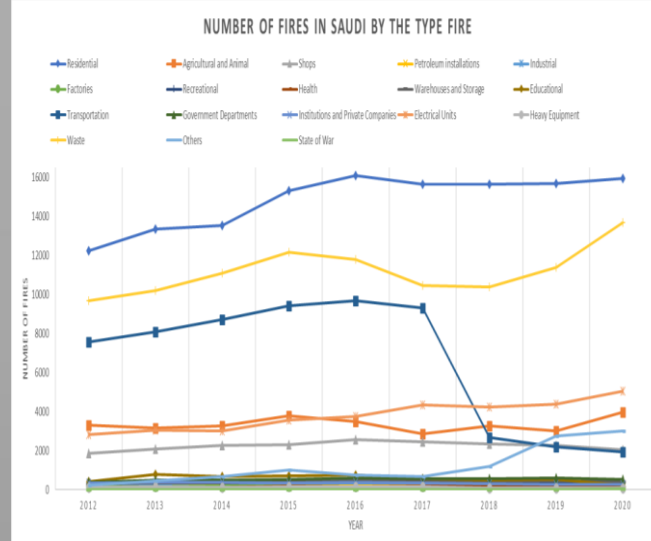
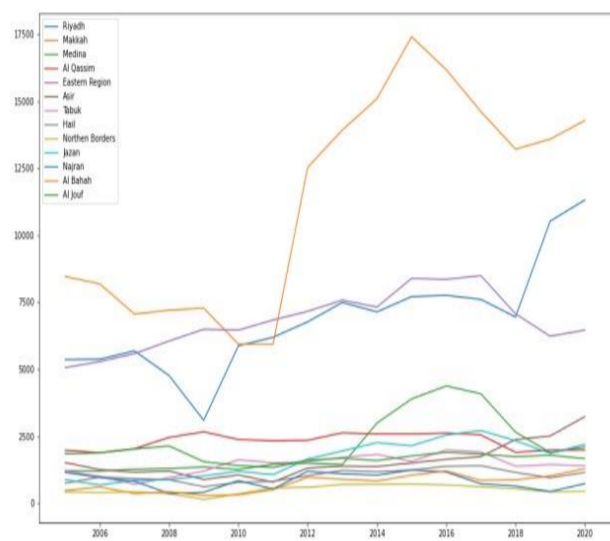
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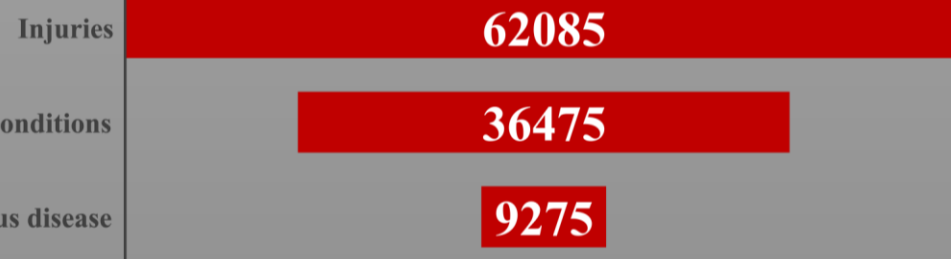
FIRE FIGHTER ASSISTANCE DRONE

MOTIVATION

Fires should be contained as fast as possible to prevent it from spreading, and this should happen without wasting a lot of money and resources while keeping people safe. There are a lot of places that are susceptible to fires, and it will take some time for firefighters to arrive. In that time the fire could spread to a bigger area and cause more damage. Firefighting drones could be a solution for such problems where it can be faster and more reliable than humans. SMART FIREFIGHTING DRONE FOR FIGHTING AND SURVEYING FIRES



Based on 2769 fire department responses, NFPA estimates Firefighters suffered of



CONSTRAINTS & SPECIFICATIONS

- CONSTRAINTS:**
- Operating Environment:** The drone must be designed to operate in the specific environment where it will be used, the ideal environment for a firefighting drone would be one with minimal obstacles, clear lines of sight, and minimal interference from other sources.
- Birds:** Collisions with birds can cause damage to the drone's propellers, motors, and other components.
- High Temperature:** This can cause the drone's batteries and motors to overheat, reducing their efficiency and potentially causing a crash.
- Communication Range:** The drone must have a minimum communication range of 2 kilometres to maintain a reliable connection with the ground control station and transmit data and video feeds.
- Altitude Limit:** The drone must have a maximum altitude limit of 120 meters to comply with FAA regulations and avoid interfering with other airspace users such as helicopters and airplanes.
- SPECIFICATIONS:**
- Time Response:** The time to respond to commands should not exceed 3 seconds.
- Weight:** The drone should be able to carry at least 1- 1.5 KG weight.
- Power Of Battery:** The battery should be at least 11.1 V.
- Camera Range:** The camera of the drone should be able to detect from the height of 10 M.

Libraries

#Base:
YOLOv8
Matplotlib>=3.2.2
Opencv-python>=4.6.0
Pillow>=7.1.2
PyYAML>=5.3.1
Requests>=2.23.0

#Plotting:
Pandas>=1.1.4
Seaborn>=0.11.0

Scipy>=1.4.1
Torch>=1.7.0
Torchvision>=0.8.1
Tqdm>=4.64.0



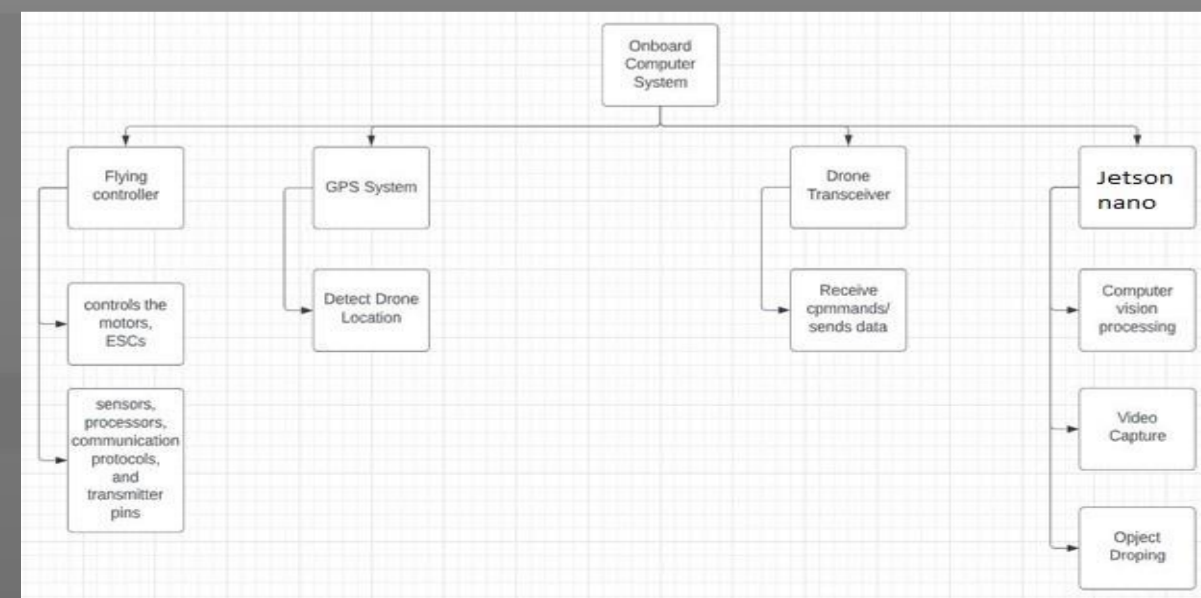
COMPONENTS & DESIGN

Quantity	Name	Weight	Cost
1	Jetson Nano	45 g	700.00
1	Binocular Camera	25 g	237.51
1	SD card	NN	36.00
1	Pitihawk	100 g	854.06
1	Battery	450 g	227.00
4	Thin Electric Propeller, 12 x 6E	90 g	768.00
1	Arducam 1080P Low Light WDR Ultra Wide Angle USB Camera	30 g	281.29
1	FlySky Controller	NN	256.69
1	Drone Frame Kit	750 g	474.04
4	Brushless Motor	560 g	916.05
1	Fire Ball	1.3 kg	40.00
1	Acrylic Case for Jetson	10 g	89.43
4	ESC	65 g	320.00
1	Dropping mechanism & servo	215 g	220.00
Total	NN	3640 g	5,420.07

SPECIFICATIONS

- Light Weight**
Only 1.3 kg, children and elderly people can use it easily
- Easy use**
Just throw it into the fire or install it in any fire risk areas
- Wide application**
Suitable for many places
- Safe to use**
No need to get close to the fire
- Non-toxic to the environment**
Fire Extinguisher Ball is made from human and environmental friendly materials
- No need special maintenance**
For a period of 5 years without maintenance required, always on guard for you with its unique capability to emit loud noise less than 140dB as a fire alarm upon activation

Function of Product



TESTING

Method	Trial	%Fire	%Non
Method 1	1	15	85
Method 1	2	5	95
Method 1	3	1	99
Method 1	4	1	99
Method 2	1	77	23
Method 2	2	97	3
Method 2	3	99	1
Method 2	4	49	51

Using Ecalc, a well trusted tool by Airbus, Boeing, and more big companies. We get very accurate results for our selection of components.



RESULTS & IMPACTS

The classification can reach up to 90% accuracy, and the detection up to 70% accuracy. The Jetson Nano 4GB ram hardware requires less heavy model to operate faster than 5 FPS. Fly time is around 6 minutes and can go up to 15 minutes with bigger capacity battery. The range of the drone is about 1.5 KM, while carrying a 1.3 KG payload. The drone Rate of Climb is around 16 Km/h at full throttle. The drone Maximum speed is around 45 Km/h at full throttle. The drone is connected to a ground station in case the Jetson nano fails, which receives and transmits commands and video. The drone can be controlled using a 4 channel RC controller for manual flight.

AI BASED FIRE DETECTION

